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**A GUIDE FOR REPORTING  
EXPLORATION INFORMATION, MINERAL  
RESOURCES,  
AND MINERAL RESERVES**

**SUBMITTED BY:**

**THE RESOURCES AND RESERVES COMMITTEE**

**TO**

**THE BOARD OF DIRECTORS  
OF  
THE SOCIETY FOR MINING, METALLURGY AND  
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## Foreword

1. In 1988, at the request of members of the Society for Mining, Metallurgy, and Exploration (SME), Inc., the President of SME formed Working Party #79, Ore Reserve Definition, with the mission to develop guidelines for the public reporting of exploration information, resources, and reserves. A Subcommittee was appointed by the Working Party to draft these guidelines and submit recommendations to SME. The Subcommittee's recommendations were published by SME in the April 1991 issue of "Mining Engineering", and as a document entitled "A Guide for Reporting Exploration Information, Resources, and Reserves" in January 1992. Work continued on an ad-hoc basis until 1996, when Working Party #79 was renamed the SME Committee on Resources and Reserves and became a standing committee.

Since 1994, the Council of Mining and Metallurgical Institutions (CMMI) has been working to create a set of international definitions for reporting mineral resources and mineral reserves. An ad-hoc International Definitions Group was formed, with representatives from mining and metallurgical institutions from the United States (SME), Australia (AusIMM), Canada (CIM), the United Kingdom (IMM) and South Africa (SAIMM). A major breakthrough came on October 18, 1997 when the CMMI International Definitions Group met in Denver, Colorado and reached a provisional agreement (the Denver Accord) on definitions of mineral resources and mineral reserves. Concurrently, and since 1992, the United Nations Economic Commission for Europe (UN-ECE) has been developing an international framework classification for mineral resources and mineral reserves. A joint meeting was held in Geneva on October 4, 1998 between the CMMI International Definitions Group and the UN-ECE Task Force. Agreement was reached to incorporate the CMMI standard reporting definitions for mineral resources and reserves into the UN framework classification, thus giving truly international status to the CMMI definitions.

2. The 1999 updated version of the SME Guide takes into account the October 1998 agreement reached in Geneva to develop an internationally accepted set of definitions and reporting standards. This has resulted in changes to the wording of the originally published definitions, but has not changed the meaning of the definitions or the intent of the Guide. The opportunity has also been taken to respond to many constructive suggestions received since the original publication of the Guide in April 1991.

The main changes can be summarized as follows:

- introduction of the concept and definition of "Competent Person";
- adjustments to the definitions of "Mineral Resource", "Measured Mineral Resource", "Indicated Mineral Resource", "Inferred Mineral Resource", "Mineral Reserve", "Proved Mineral Reserve" and "Probable Mineral Reserve" to reflect the agreement reached between organizations participating in the CMMI initiative; the adjustments do not change the basis of the definitions; and

- recognition that in certain situations, Measured Mineral Resources could convert to Probable Mineral Reserves rather than to Proved Mineral Reserves, because of uncertainties associated with modifying factors which are taken into account in the conversion from Mineral Resources to Mineral Reserves.

3. The Guide has been adopted by the Society for Mining, Metallurgy, and Exploration, Inc. and is therefore strongly recommended to be used by members of this organization.
4. The United States Securities and Exchange Commission (U.S. SEC) regulates the reporting of exploration information, resources and reserves by organizations, individuals or companies (“entities”) subject to the filing and reporting requirements of the U.S. SEC. Decisions as to when and what information should be publicly reported are the sole responsibility of the entity owning the information, and are subject to U.S. SEC rules and regulations. These rules and regulations vary from time to time, and at any given time may not be consistent with the content of this Guide. At the time this Guide was prepared, the U.S. SEC did not allow the use of the terms “Mineral Resource”. The advice of securities counsel should be sought in preparing filings for the U.S. SEC or other securities regulatory authorities, and in preparing other public disclosures.
5. The Guide is recommended as a minimum standard for reporting exploration information, Mineral Resources and Mineral Reserves for public and private purposes. In terms of the Guide, a public report is a report on exploration information, Mineral Resources or Mineral Reserves, prepared for the purpose of informing the general public.

*Public reports include, but are not limited to: company Annual Reports, quarterly reports, press releases and other reports. It is recommended that the Guide apply to the following reports if they have been prepared or are likely to be used for informing the general public: information memoranda, expert reports and technical papers reporting on exploration information, Mineral Resources or Mineral Reserves.*

6. Public companies should provide all relevant and material information, necessary for an intelligent layman to make a reasonable and balanced assessment of the exploration information, Mineral Resource or Mineral Reserve being reported.

*While every effort has been made within the Guide to cover most situations likely to be encountered in the reporting of exploration information, Mineral Resources and Mineral Reserves, there will inevitably be occasions when doubt exists as to the appropriate procedure to follow. In such cases, users of the Guide and those compiling reports under the Guide should be guided by its intent, which is to provide a minimum standard for 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 judgment regarding the exploration information, Mineral Resource or Mineral Reserve reported.*

*Table 1, included at the end of the Guide, supplies an outline of items that should be considered when evaluating a project. The importance of each item will vary with the project and it is recognized that, for some projects, other items may be relevant which are not on the*

*list. The Table should be considered a guide to facilitate a rational and orderly approach to evaluation. However, the need remains for exploration and mining professionals to make difficult decisions, such as the classification of material as a Mineral Resource or a Mineral Reserve. Decisions remain a matter of professional judgment based on knowledge, experience, and industry practices.*

*The relative importance of the items in Table 1 will vary with each project depending on the geological environment and technical constraints, as well as economic and legal conditions pertaining at the time of evaluation. When evaluating a project, the relative importance of each item should be weighed. All relevant information must be given careful consideration before deciding which information should be reported to the public.*

*Where a particular report addresses only some of the items in Table 1, the report should disclose its limited scope and should refer to other information required for a complete evaluation of the exploration information, Mineral Resource or Mineral Reserve being reported. While such limited scope reports are commonly prepared as part of the overall preparation of an evaluation, such reports may contain information warranting public disclosure independent of the results of other studies and the authors of such reports should be aware of their responsibilities with respect to public disclosure.*

*Public disclosure may be required of factors most likely to affect the accuracy of estimates made in the report. The authors of reports should both identify and evaluate these important factors within their reports.*

*For a variety of reasons, including the need for confidentiality, all data used to evaluate a project need not be made public. However, the public can reasonably assume that all necessary information is available to support public statements at the time they are made.*

*Demonstration of economic feasibility is not required before reporting exploration information or Mineral Resources. However, particular attention should be given to all relevant information that increases or decreases the chances that the project will result in economic exploitation. Demonstration of economic feasibility is required before reporting Mineral Reserves.*

*It is recognized that estimates of exploration information, Mineral Resources, and Mineral Reserves, being predictions of what will occur in the future based on imperfect knowledge of the present, are inherently forward-looking statements, and will be inaccurate to some degree. It is also recognized that different individuals analyzing the same data may arrive at somewhat differing interpretations and conclusions. The fact that a Mineral Reserve estimate is misclassified or proven inaccurate at a later date, when additional information becomes available or economic conditions have changed, does not necessarily mean that the estimate was made incompetently or fraudulently. Statements concerning exploration information, Mineral Resources and Mineral Reserves must have a reasonable basis and be made in good faith.*

7. It is recognized that further review of the Guide will be required from time to time. Constructive suggestions are solicited from all users of this Guide. Comments should be sent directly to the Resources and Reserves Committee, care of SME.

## **Competence and Responsibility**

8. A public report concerning an entity's exploration information, Mineral Resources and/or Mineral Reserves is the responsibility of the entity acting through its

governing board. Any such report must be based on, and fairly reflect, the content of a report prepared by a Competent Person (or Persons) as defined below.

In reporting exploration information, Mineral Resources and/or Mineral Reserves in a public report, an entity may need to edit the report prepared by the Competent Person. Where such editing takes place, the entity should ask the Competent Person to give his/her consent in writing to the edited information in the form and context in which it appears in the public report.

9. Reports detailing Mineral Resource and Mineral Reserve estimates from which a public report on Mineral Resources and Mineral Reserves is prepared, must be prepared by or under the direction of, and signed by, a Competent Person or Persons.
10. A **‘Competent Person’** is a person who is a member of a professional society for earth scientists or mineral engineers, or has other appropriate qualifications. The Competent Person must have a minimum of five years experience which is relevant to the style of mineralization 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 analysis 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 a difficult area and common sense has to be exercised. For example, in estimating vein gold mineralization, experience in a high nugget, vein-type mineralization such as tin, uranium etc. will probably be relevant whereas experience in (say) massive-type deposits may not be. As a second example, to be considered competent in evaluating and reporting on placer or alluvial gold deposits, a person would need to have considerable (at least five years) experience in this type of mineralization, 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 appropriate 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 (say) 20 years experience in Mineral Resource estimation in a variety of metalliferous hard-rock deposit types may not require five years specific experience in (say) 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 mineralization, a Competent Person reporting Mineral Resources must have sufficient experience in the sampling and assaying techniques relevant to the deposit under consideration to be aware of problems which could affect the reliability of the data. Knowledge 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 either seek concurring opinions from other colleagues or should decline to sign as a Competent Person.*

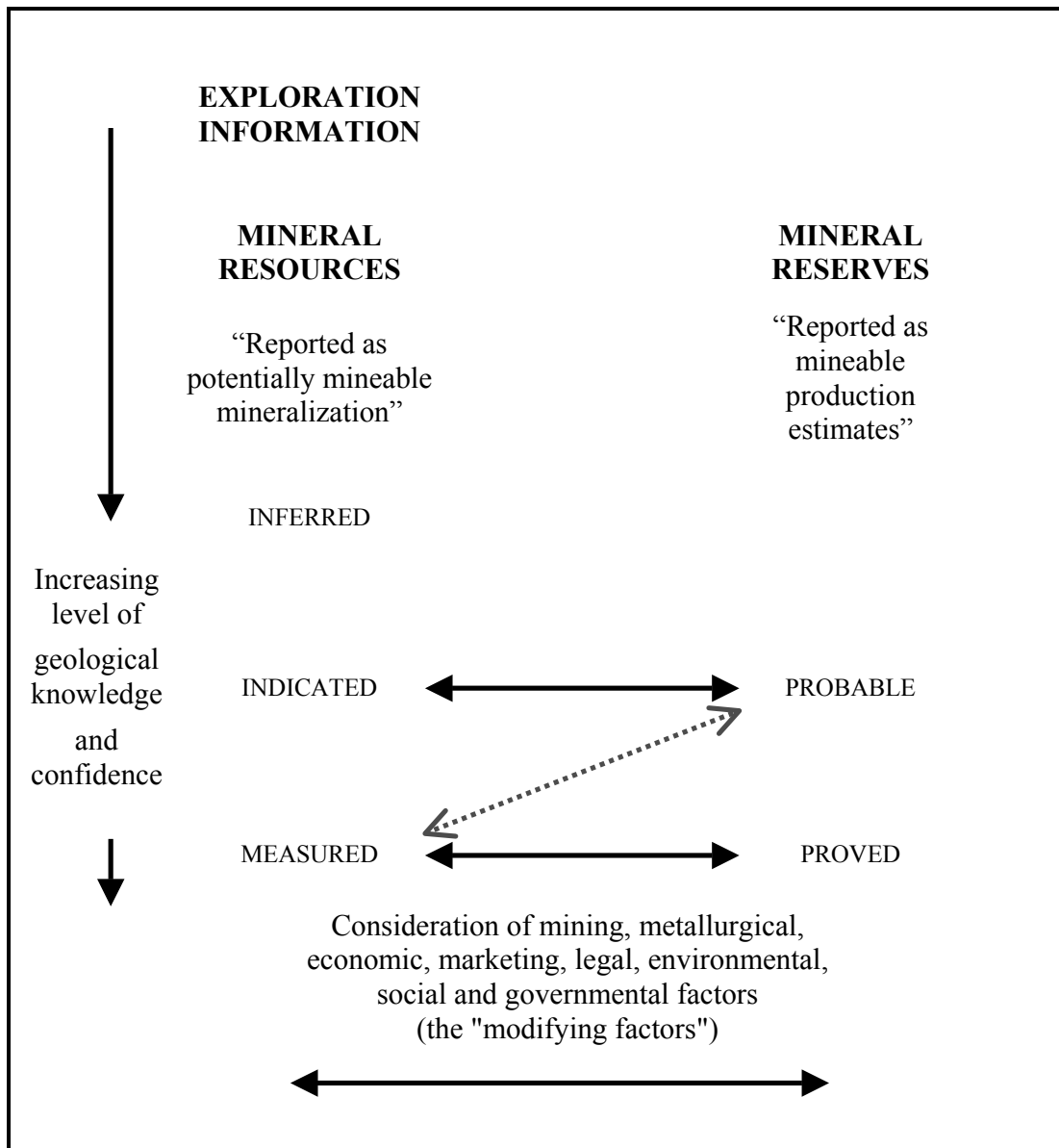
*Estimation of Mineral Resources may be a team effort (for example, involving one person or team collecting the data and another person or team preparing the Mineral Resource estimate), and estimation of Mineral Reserves is commonly a team effort involving a number of technical disciplines. The Competent Person (or Persons) who signs the report is responsible and accountable for the whole of the report under the Guide. However, it is recommended that, where there is a clear division of responsibilities within a team, each Competent Person accept responsibility for his or her particular contribution. For example, one Competent Person could accept responsibility for the collection of geological data, another for the Mineral Resource estimation process, another for the mineability 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 to the Competent Person.*

*Rules, regulations or guidelines concerning the Competent Person differ from country to country. In the United States, the U.S. SEC does not currently require that a Competent Person sign a public report on exploration information, Mineral Resources or Mineral Reserves. In Australia, the Australian Stock Exchange Limited (ASX) requires that releases by entities which make statements about Mineral Resources or Mineral Reserves are based on information compiled by a "Competent Person" as defined by the "Australasian Code for Reporting of Mineral Resources and Ore Reserves (The JORC Code)". In Canada in 1998, the Mining Standards Task Force of the Toronto Stock Exchange and Ontario Securities Commission recommended that the concept of "Qualified Person" be incorporated formally into rules applicable to the publication of Mineral Resources and Mineral Reserves. In these and all other jurisdictions, it is the responsibility of the Competent Person and the entity making a public report to ensure that the appropriate rules, regulations and guidelines are followed.*

## **Reporting Terminology**

- 11.** Public reports dealing with exploration information, Mineral Resources and/or Mineral Reserves must only use the terms set out in Figure 1.

**Figure 1 – General Relationship between Exploration Information, Mineral Resources and Mineral Reserves**



*Figure 1 sets out the framework for classifying exploration information, tonnage and grade estimates and contained or recoverable minerals as applicable. This classification reflects different levels of geological confidence and different degrees of technical and economic evaluation. Mineral Resources can be estimated mainly on the basis of geoscientific information with some input from other disciplines. Mineral Reserves, which are a modified sub-set of the Indicated and Measured Mineral Resources, require consideration of those factors affecting extraction, including mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors, and should in most instances be estimated with input from a range of disciplines.*

*In certain situations, Measured Mineral Resources could convert to Probable Mineral Reserves rather than to Proved Mineral Reserves because of uncertainties associated with modifying factors which are taken into account in the conversion from Mineral Resources to Mineral Reserves. This relationship is shown by the broken arrow in Figure 1. In such situations these modifying factors should be fully explained.*

*In certain situations, previously reported Mineral Reserves could convert back to Mineral Resources because of new information according to which a Mineral Reserve can no longer be reported. The resulting two-way relationship is shown by the two-headed arrows in Figure 1. The modifying factors which resulted in reclassification of a Mineral Reserve should be fully explained.*

## **Public Reporting – General**

12. Reports concerning an entity's exploration information, Mineral Resources or Mineral Reserves should include a description of the style and nature of mineralization.
13. An entity must disclose relevant information concerning the status and characteristics of a mineral deposit which could materially influence the economic value of that deposit. To meet disclosure obligations, an entity may be required to promptly report any material changes in its Mineral Resources or Mineral Reserves.
14. Throughout the Guide, where appropriate, "quality" may be substituted for "grade" and "volume" may be substituted for "tonnage".
15. Units used for reporting Mineral Resources or Mineral Reserves should be those generally applicable within the industry and within the jurisdiction where reporting takes place, for the mineral being reported.

## **Reporting of Exploration Information**

16. An entity may choose or be required to report exploration information. If an entity reports exploration information in relation to mineralization not classified as a Mineral Resource or a Mineral Reserve, estimates of tonnage and average grade, except for the weighted average grade of specified assay intervals, must not be reported.

*Where descriptions of exploration targets or exploration potential are given in public reports, any figures mentioned must be clearly order-of-magnitude and conceptual in nature and expressed so as not to misrepresent them as an estimate of Mineral Resources or Mineral Reserves.*

17. Public reports of exploration information relating to mineralization not classified as a Mineral Resource or Mineral Reserve must contain sufficient information to allow a considered and balanced judgment of the significance of the results. This must include relevant information such as the geological setting, sampling intervals and methods, sample locations, assay data, laboratory analyses, data aggregation methods

plus information on any of the criteria listed in Table 1 that are material to an assessment. The reporting of exploration sampling or geophysical results must not be presented so as to unreasonably imply that a potentially economic deposit has been discovered.

*Table 1 is a checklist which those preparing reports on exploration information, Mineral Resources and Mineral Reserves should use as a reference. The checklist is not prescriptive and, as always, relevance and materiality are overriding principles which determine what information should be publicly reported. Reporting of isolated assays without placing them in perspective is unacceptable.*

## Reporting of Mineral Resources

- 18.** A **‘Mineral Resource’** is a concentration or occurrence of material of intrinsic economic interest in or on the Earth’s crust (a deposit) in such form and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.

*The term “Mineral Resource” covers deposits which have been identified and estimated through exploration and sampling and from which Mineral Reserves may be defined by the consideration and application of technical, economic, legal, environmental, social and governmental factors.*

*The term “reasonable prospects for eventual economic extraction” implies a judgment (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 mineralization drilled or sampled, regardless of cut-off grade, likely mining dimensions, location or continuity. It is a realistic inventory of mineralization which, under assumed and justifiable technical and economic conditions, might become economically extractable.*

*Where considered appropriate by the Competent Person, Mineral Resource estimates may include mining related assumptions which should be clearly stated.*

- 19.** 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/or 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. The*

*assumptions made in evaluating an Inferred Mineral Resource must be reasonable, after considering all available information. Due to the uncertainty which may attach 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 not sufficient to allow the appropriate application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Caution should be exercised if this category is considered in economic studies.*

20. 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 continuity 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.

*A deposit may be classified as an Indicated Mineral Resource when the nature, quality, amount and distribution of data are such as to allow the Competent Person determining the Mineral Resource to confidently interpret the geological framework and to assume continuity of mineralization. Confidence in the estimate is sufficient to allow the appropriate application of technical and economic parameters and to enable an evaluation of economic viability.*

21. 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/or grade continuity.

*A deposit may be classified as a Measured Mineral Resource when the nature, quality, amount and distribution of data are such as to leave no reasonable doubt, in the opinion of the Competent Person determining the Mineral Resource, that the tonnage and grade of the deposit can be estimated within close limits and that any variation from the estimate would not significantly affect potential economic viability. This category requires a high level of confidence in, and understanding of, the geology and 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.*

22. The choice of the appropriate category of Mineral Resource depends upon the quantity, distribution and quality of data available and the level of confidence that attaches to those data. The appropriate Mineral Resource category must be determined by the Competent Person.

*Mineral Resource classification is a matter for skilled judgment and the Competent Person should take into account those items in Table 1 which relate to confidence in Mineral Resource estimation.*

*In deciding between Measured Mineral Resource and Indicated Mineral Resource, the Competent Person may find it useful to consider, in addition to the phrases relating to geological and grade continuity in Clauses 20 and 21, the phrase in the guideline to the definition for Measured Mineral Resource: "... any variation from the estimate would not significantly affect potential economic viability".*

*In deciding between Indicated Mineral Resource and Inferred Mineral Resource, the Competent Person may wish to take into account, in addition to the phrases relating to geological and grade continuity in Clauses 20 and 21, the guideline to the definition for Indicated Mineral Resource: "Confidence in the estimate is sufficient to allow the appropriate application of technical and economic parameters and to enable an evaluation of economic viability", which contrasts with the guideline to the definition for Inferred Mineral Resource: "Confidence in the estimate is not sufficient to allow the appropriate application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Caution should be exercised if this category is considered in economic studies".*

23. 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 appropriately significant figures and by qualification with terms such as 'approximately'.

*Depending on the accuracy of the estimate, rounding to the second or third significant figure should be sufficient. For example 10,863,425 tons at 8.23 per cent could be stated as 11 million tons at 8.2 percent or 10.9 million tons at 8.23 percent. In order to emphasize the imprecise nature of a Mineral Resource or Mineral Reserve estimate, it is recommended that the final result always be referred to as an estimate not a calculation.*

24. Mineral Resource reports must specify one or more of the categories of "Inferred", "Indicated" and "Measured". Reports must not contain Inferred Mineral Resource figures combined with either of the other two categories. The Measured and Indicated categories must be separately reported if this information is material. A Mineral Resource must not be reported in terms of contained metal content unless corresponding tonnage and grade figures are also presented. Mineral Resource figures must not be aggregated with Mineral Reserve figures.
25. Table 1 provides, in a summary form, a list of the main criteria which should be considered when preparing reports on exploration information, 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.

*It is not necessary, when publicly reporting, to comment on each item in Table 1, but it is essential to discuss any matters which 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 exploration information 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.*

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

*Mineral Resource or Mineral Reserve estimates are sometimes reported after adjustment by cutting of high grades, the application of factors such as dilution, mine or mill “call factors”, and similar modifying factors. If any of the data are materially adjusted or modified for the purpose of making the estimate, this should be clearly stated in a public Mineral Resource or Mineral Reserve report and the nature of the adjustment or modification described.*

26. 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 technical, economic, legal, environmental, social and governmental 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 the Mineral Reserves are no longer viable, the Mineral Reserves must be reclassified as Mineral Resources or removed from Mineral Resource/Mineral Reserve statements altogether.

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

## **Reporting of Mineral Reserves**

27. A ‘**Mineral Reserve**’ is the economically mineable part of a Measured 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 reasonably 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 all mining factors, result in an estimated tonnage and grade which, in the opinion of the Competent Person making the estimates, can be the basis of a viable project after taking account of all relevant metallurgical, economic, marketing, legal, environmental, social and governmental factors. Mineral Reserves are inclusive of diluting material which will be mined and delivered to the treatment plant or equivalent.*

*The term “economic” implies that extraction of the Mineral Reserve has been established or analytically demonstrated to be viable and justifiable under reasonable investment and market assumptions. The term “Mineral Reserve” need not necessarily signify that extraction facilities are in place or operative nor that all governmental approvals have been received. It does signify that there are reasonable expectations of timely approvals.*

*It should be noted that the Guide does not imply that an economic operation must have Proved Mineral Reserves. Situations arise where Probable Mineral Reserves alone may be sufficient to justify extraction, as for example with some alluvial tin or gold deposits. This is a matter for judgment by the Competent Person and the management of the entity owning the information.*

*The terms "Ore Reserves" and "Mineral Reserves" can be used interchangeably where it is customary to do so, usually for metallic deposits and some industrial minerals.*

- 28.** A **'Probable Mineral Reserve'** is the economically mineable part of an Indicated and, in some circumstances, 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 reasonably justified. A Probable Mineral Reserve has a lower level of confidence than a Proved Mineral Reserve.
- 29.** 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 reasonably justified.
- 30.** The choice of the appropriate category of Mineral Reserve is determined primarily by the classification of the corresponding Mineral Resource and must be made by the Competent Person.

*The Guide 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 geoscientific confidence for Probable Mineral Reserves is the same as that required for the determination of Indicated Mineral Resources and for Proved Reserves is the same as that required for the determination of Measured Mineral Resources.*

*The Guide provides for a two-way relationship between Measured Mineral Resources and Probable Mineral Reserves. This is to cover the situation where uncertainties associated with any of the modifying factors considered when converting Mineral Resources to Mineral Reserves may result in there being a lower degree of confidence in the Mineral Reserves than in the corresponding Mineral Resources.*

*If the uncertainties in the modifying factors that prevented the Measured Mineral Resource being converted to a Proved Mineral Reserve are removed, then the Measured Mineral Resource may be converted to a Proved Mineral Reserve. 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 which exists in the Mineral Resource. Under no circumstances can an Indicated Mineral Resource be converted to a Proved Mineral Reserve, unless new information first justifies conversion to a Measured Mineral Resource. Under no*

*circumstances can an Inferred Mineral Resource be converted to a Mineral Reserve unless first converted to an Indicated or Measured Mineral Resource.*

*Application of the category of a Proved Mineral Reserve implies the highest degree of confidence in the estimate.*

*Refer also to Clause 22 regarding classification of Mineral Resources.*

31. Mineral Reserve estimates are not precise calculations. Tonnage and grade figures in reports should be expressed so as to convey the order of accuracy of the estimates by rounding off to appropriately significant figures.

*See Clause 23 regarding rounding of Mineral Resource estimates.*

32. Mineral Reserve reports must specify one or both of the categories of ‘Proved’ and ‘Probable’. Reports that combine Proved and Probable Mineral Reserve figures must provide estimates for each category if this information is material. Reports must not present contained metal figures unless corresponding tonnage and grade figures are also presented.

33. When reporting a Mineral Reserve, tonnages, grades and mineral or metal contents must be reported after taking into account mining loss and mining dilution. Mineral and metal contents can be reported after also taking into account processing recoveries. If processing recoveries are not taken into account, the percentage expected to be recovered or lost after processing must be reported.

34. 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 that the Mineral Resources are additional to the Mineral Reserves.

*An appropriate form of clarifying statement may be:*

*“The Measured and Indicated Mineral Resources are additional to the Mineral Reserves.”*

*It is strongly recommended that, if there is a significant difference between a Mineral Reserve and the Mineral Resource from which this Mineral Reserve was estimated, an explanation of the reasons for the difference should be included in the report. This will assist the reader of the report in making a judgment of the likelihood of the remaining Mineral Resources eventually being converted to Mineral Reserves.*

*When converting Mineral Resources to Mineral Reserves, Mineral Reserves may incorporate material (dilution) which may not have been included in the original Mineral Resource. This fundamental difference between Mineral Resources and Mineral Reserves should be explained if of material significance.*

*Remaining Mineral Resources must be reported separately from Mineral Reserves because the resulting total may be very misleading in economic terms and may be misunderstood or, more seriously, misused to give a false impression of the prospectivity of a project.*

*Public reporting of tonnage and grade estimates other than Mineral Resources and Mineral Reserves is not permitted under the Guide. Other estimates may be useful for an entity in its*

*internal calculations and evaluation processes, but their inclusion in public reports could cause confusion.*

*In preparing the Mineral Reserve statement, the relevant Mineral Resource statement on which it is based should first be developed. This should be reconciled with the Mineral Resource statement estimated for the previous comparable period and differences (due, for example, to mine production, exploration, etc.) identified. The application of appropriate factors to the Mineral Resource can then be made to develop the Mineral Reserve statement which can also be reconciled with the previous comparable Mineral Resource statement. Mining companies are encouraged to reconcile estimates whenever possible in their reports. A detailed account of differences between Mineral Reserves and corresponding Mineral Resource figures is not essential, but sufficient comment should be made to enable significant variances to be understood by the reader.*

35. Table 1 provides, in a summary form, a list of the main criteria which should be considered when preparing reports on exploration information, 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 Reserves. In reporting Mineral Reserves, information on assumed metallurgical recovery factors is very important, and should be included in public statements. Changes in economic or political factors alone may be the basis for significant changes in Mineral Reserves and should be reported accordingly.

*See guidelines to Clause 25 regarding references to Table 1.*

### **Reporting of Mineralized Stope Fill, Stockpiles, Remnants, Pillars, Low-Grade Mineralization and Tailings**

36. The Guide applies to the reporting of all potentially economic mineralized material including mineralized stope fill, stockpiles, remnants, pillars, low grade mineralization and tailings.

*For the purposes of the Guide, mineralized stope fill and stockpiles of mineralized material can be considered to be similar to in situ mineralization when reporting Mineral Resources and Mineral Reserves. Consequently the Competent Person carrying out the assessment of the fill or stockpiles must use the bases of classification outlined in the Guide. In most cases, the opinion of a mining engineer should be sought when making judgments about the mineability of fill, remnants and pillars.*

*If there are not reasonable prospects for the economic extraction of a particular portion of the fill or stockpile, then this material cannot be classified as either Mineral Resources or Mineral Reserves. If some portion 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. Such stockpile material may include old dumps and tailings dam material. 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 in-situ mineralization, sometimes referred to colloquially as “mineralized waste” or “marginal-grade material”, and often intended for stockpiling and treatment towards the end of mine life. For clarity of understanding, it is recommended that tonnage and grade estimates of such material be itemized 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. Mineralized material in the course of being processed (including leaching), if reported and of material importance, should be reported separately together with the basis for estimation.*

*Mineralized remnants, shaft pillars and mining pillars which are potentially mineable are in situ mineralization and consequently are included in the Guide definitions of Mineral Resources and Mineral Reserves.*

*Mineralized remnants, shaft pillars and mining pillars which are not potentially mineable must not be included in Mineral Resource and Mineral Reserve statements.*

## **United States Securities and Exchange Commission**

37. The United States Securities and Exchange Commission (U.S. SEC) regulates the reporting of exploration information, resources and reserves, by entities subject to the filing and reporting requirements of the U.S. SEC. Decisions as to when and what information should be publicly reported are the sole responsibility of the entity owning the information, and are subject to U.S. SEC rules and regulations. These rules and regulations vary from time to time, and at any given time may not be consistent with the content of this Guide. At the time this Guide was prepared, the U.S. SEC did not allow the use of the term “Mineral Resource”. The advice of securities counsel should be sought in preparing filings for the U.S. SEC or other securities regulatory authorities, and in preparing other public disclosures.

**TABLE 1. Checklist of Assessment Criteria**

Estimates of the value of mineral projects are expressions of judgment predicated on knowledge and experience. Such estimates are more than arbitrary determinations; they seek to attach value as a consequence of method. The methods employed must be scientifically valid, tested, using accepted scientific definitions of terms and accepted procedures, and best suited to the making of reliable estimates for the project in question. Evaluation of mineral projects requires periodic examination and evaluation of all new and existing data. The dynamic nature of the evaluation of mineral projects implies that a valid estimate made at a given time may be significantly changed when new information becomes available. Evaluation of a mineral project should consider all the criteria listed below and such additional criteria that may be viewed as significant. The relative importance of the criteria will vary with the particular project and the legal and economic conditions pertaining at the time of evaluation. When information is publicly reported, it must be sufficient to enable an intelligent layman to make a reasonable and balanced assessment of the significance of this information. When and whether information should be publicly released is subject to current laws and regulations in the relevant jurisdictions.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
<b>A. General</b>			
1. Purpose of report	Statement of person for whom the report was prepared, whether it was intended as a full or partial evaluation, what work was conducted, what work remains to be done.	See Exploration Information	See Exploration Information
2. Project Description	Description of commodity, magnitude of project, background, and business arrangement.	See Exploration Information	See Exploration Information
3. Project Location	Description of location (country, state or province, county, township and range, easting and northing, etc.); a map showing location and access should exist.	See Exploration Information	See Exploration Information
4. Property Ownership	Description of ownership of surface rights, mineral rights, access rights, leases, concessions, royalties, and other encumbrances and liabilities.	See Exploration Information	See Exploration Information

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
<b>B. Project Data</b>			
1. Location of Project Data	Maps and cross sections or other two- or three-dimensional representation of information should exist, showing location of samples, drill holes, exploration pits, underground workings, geological data, etc. When evaluating drill hole information, consideration should be given to depth to top and bottom of mineralization, to total length and average grade of intercepts, and to the accuracy of survey information including downhole surveys.	See Exploration Information. Particular attention should be given to drill hole and other sample survey information including downhole surveys. If the sample locations are not well known, the effect on the resource estimates should be considered.	See Mineral Resource. The location of samples and other relevant features (property lines, mine workings, etc.) should be well-known. The location of drill hole collars should be accurate and the adequacy of the downhole surveying technique should be reviewed and commented on.
2. Geological Data	Description of the nature, detail, and reliability of geological information (rock types, structure, alterations, mineralizations, and relation to known mineralized zones, etc.). Description of geophysical and geochemical data. Reliable geological maps and cross sections should exist to support interpretations.	See Exploration Information. Particular attention should be given to drill hole logging and other sample information used in resource evaluation. Description of the thoroughness with which all significant lithologic, structural, mineralogical, alteration, or other geological or geotechnical characteristics were recorded. Significant data, or data that could materially influence the estimated quantity and quality of the resource, should be discussed.	See Mineral Resource

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
3. Sampling			
a. Method	<p>Description of sample type and sample collection method (hand, grab, trench, channel, or chip sample; core hole, rotary hole, or reverse circulation; bulk sample, etc.). Discussion of sample quality and representativeness (sample recovery, high grading, selective losses or contamination, and any other factors that may have resulted in sample biases, etc.). Discussion of whether duplicate samples or alternative methods of sampling were used to verify sample quality. If indirect methods of measurement were used (geophysical methods), these should be described, with attention given to errors in interpretation.</p>	<p>See Exploration Information. The quantity and quality of sample information is critical to the reliability of resource estimates. Particular attention should be given to this information.</p>	<p>See Mineral Resource. Adequate sampling verification techniques, including appropriate numbers of duplicates and appropriate statistical analyses of duplicates are required.</p>
b. Preparation	<p>Description of laboratory and method used for sample preparation, subsampling and size reduction, and likelihood of inadequate or nonrepresentative samples (improper size reduction contamination, etc.). Discussion of whether tests were performed to verify the suitability of sample preparation.</p>	<p>See Exploration Information</p>	<p>See Exploration Information. Verification of the suitability of sample preparation is required.</p>

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
c. Analysis	Identification of laboratory and analytical method (fire assay, AA assay, emission spectroscopy, etc.). Discussion of precision and accuracy, including the use of check assays, quality control programs, and submission of samples to other laboratories for verification.	See Exploration Information	See Exploration Information. Verification of analytical techniques and quality control programs are required.
d. Specific Gravity and Bulk Tonnage	Generally not determined.	Discussion of how the tonnage factor was determined (assumed or measured). If assumed, which assumptions were made and on which basis. If measured, by what method and how frequently. Discussion of whether different tonnage factors were used in different parts of the deposit and why.	See Mineral Resource. The specific gravity and bulk tonnage must have been measured by methods that adequately account for void spaces (vugs, porosity, etc.) and for differences between rock and alteration zones within the deposit.
<b>C. Interpretation</b>			
1. Geological Interpretation And Model	Description of geological model and inferences made from this model. Discussion of adequacy of data density and reliability, and whether the quality and quantity of information are sufficient to support statements made or inferred concerning potential for significant economic discovery.	See Exploration Information. Discussion of sufficiency of data density to assure continuity of mineralization and provide an adequate data base for the estimation procedure used. Discussion of the extent to which the interpretation is based on data or on assumptions and whether consideration was given to alternative interpretations or models.	See Mineral Resource.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
2. Numerical Model	Generally not determined.	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.	See Mineral Resource.
2. Numerical Model (Continued)	Generally not determined.	If a computer method was chosen, description of programs 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.	See Mineral Resource.
<b>D. Extraction</b>			
1. Mining			
a. Method	Description of any obvious mining factors that could have a significant impact on the project feasibility.	Description of any mining factors that could have a significant impact on the project feasibility. Discussion of possible mining methods.	Description and justification of mining method(s) to be used. Discussion of mining rate, equipment selected, ore control methods, geotechnical and hydrological considerations, personnel requirements, dilution, and mine recovery.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
a. Method (Continued)			For open pit mines, discussion of pit slopes, slope stability, and strip ratio. For underground mines, discussion of mining method, rock mechanics considerations, mine design characteristics, and ventilation.
b. Costs	Generally not determined.	Stated reasonable assumptions.	Description and justification of capital and operating costs.
<b>2. Processing</b>			
a. Method	Description of any obvious processing factors that could have a significant impact on the project feasibility.	Description of any processing factors that could have a significant impact on the project feasibility. Discussion of possible processing methods.	Description and justification of processing method(s) to be used, equipment, plant capacity and personnel requirements. Justification of estimated recovery (proportion of material sent to the processing plant that will be recovered) whether based on historical information, laboratory test, or pilot plant results.
b. Costs	Generally not determined.	Stated reasonable assumptions.	Description and justification of capital and operating costs.
<b>3. Recovery</b>			
a. Mining	Generally not determined.	Stated reasonable assumptions.	Reported tonnages, grades and mineral contents must take into account mining dilution and losses. Description and justification of mining dilution and losses is required.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
b. Processing	Generally not determined.	Stated reasonable assumptions.	Discussion of whether the reported tonnages and grades consist of material in place or whether processing recoveries are included. If in-place values are reported, information must be supplied concerning expected processing losses or recoveries. Justification of processing recoveries is required.
4. Environmental Compliance and Reclamation	Description of obvious environmental factors likely to stop the project.	Description of any environmental factors that could have a significant impact on the project feasibility. Discussion of possible means of mitigation.	The necessary permits have been obtained, or there is reasonable basis to believe that all permits required for the project can be obtained in a timely manner. Description of environmental compliance methods and costs.
5. Cutoff Grade	Generally not determined.	Justification of the cutoff grade used to report resources.	Description of methods used to calculate cutoff grades.
<b>E. Feasibility</b>			
1. Other Economic Considerations	Description of valuable and potentially valuable product(s) including suitability of products to market.	See Exploration Information. A resource represents material from which economic extraction of a product is currently or potentially feasible. Before reporting resources, consideration should be given to this definition.	Description of product to be sold. Discussion of whether there exists a ready market for the product, whether contracts for the sale of the product are in place or expected to be readily obtained. Justification of assumptions made concerning production cost and value of product. Transportation, marketing, and other costs should be considered.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
2. Valuation Methods	Generally not applied.	Stated reasonable assumptions.	Detailed description of the method used to determine the economic feasibility of the project.
<b>F. Assurance Classification</b>	Data to support estimates with a sufficient degree of assurance is lacking. Specific quantities and grades cannot be reported.	Description and justification of criteria used to classify the resource. When reported, a resource should be classified as measured, indicated, or inferred. Depending on materiality measured and indicated resources may be combined and need not be reported separately. To classify a resource as measured or indicated, there must be a reasonably high level of confidence with respect to the quality of the information used to calculate this resource, as well as the interpretation of this information.	Description and justification of criteria used to classify the reserves. Reserves are classified as proven or probable to reflect relative degrees of geological assurance. Depending on materiality, proven and probable reserves may be combined. There should not be significant uncertainty concerning the economic viability of the project. Only measured and indicated resources can be considered for inclusion in the reserve. Resources classified as inferred lack the requisite degree of assurance to be included in the reserve.

<b>Evaluation Criteria</b>	<b>Exploration Information</b>	<b>Mineral Resource</b>	<b>Mineral Reserve</b>
<b>G. Other Considerations</b>	Description of any other significant information that is likely to prevent or facilitate the economic viability of the project. Identification of work or conditions required to demonstrate the presence of a resource or to evaluate this resource.	Description of any other material information that could prevent or facilitate the economic viability of the resource. Identification of work or conditions required to convert the resource to a reserve. A resource represents material that has the potential of being of economic value. No specific economic criteria need be assumed when evaluating a resource. However, known information that significantly reduces or increases the probability of economic feasibility should be reported.	While any other material information affecting the project should be discussed, no material impediments to the profitable exploitation of the property should remain. Material uncertainties about the geology, extraction, processing, marketing, and legal requirements have been eliminated. It is not required that all permits be issued or that mining and processing facilities have been constructed. However, there should be a reasonable basis to believe that permitting and construction of the necessary facilities can be accomplished in a timely manner.
<b>H. Qualification of Estimator(s)</b>	Name and qualification of the Competent Person(s) preparing and reviewing the foregoing.	See Exploration Information	See Exploration Information