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**DENR Administrative Order
No. 2023 - 05**

SUBJECT : REVISED GUIDELINES FOR THE CLASSIFICATION AND REPORTING STANDARDS OF EXPLORATION RESULTS, MINERAL RESOURCES AND MINERAL RESERVES

Pursuant to the pertinent provisions of Republic Act (RA) No. 7942, otherwise known as the Philippine Mining Act of 1995, and its implementing rules and regulations, and in line with the continuing thrust of the Government to revitalize the Philippine minerals industry and promote responsible mining, the following guidelines for the classification and reporting standards of exploration results, mineral resources, and mineral reserves in accordance with the Philippine Mineral Reporting Code of 2020 (PMRC 2020), amending certain provisions of the DENR Administrative Order No. 2010-09, are hereby promulgated for the guidance and compliance of all concerned:

**CHAPTER I
INTRODUCTORY PROVISIONS**

SECTION 1. Rationale. To further ensure the effective implementation of R. A. No. 7942, its revised implementing rules and regulations under Department Administrative Order No. 2010-21, and Executive Order No. 270, series of 2004, certain provisions of DENR Administrative Order No. 2010-09 are hereby amended to provide for appropriate and up-to-date classification and reporting standards of exploration results, mineral resources and mineral reserves consistent with the advances and upgrades of internationally accepted standards for local industry adoption.

The imposition of such standards among mining contractors, permittees, permit holders and operators, together with mining applicants, is expected to harmonize and streamline the entire reporting process related to mineral exploration results and translate to a more expeditious evaluation and development of mining projects.

SECTION 2. Objectives. This Order intends to achieve the following:

- a. To establish a standard for reporting exploration results, mineral resources and mineral reserves based on the local industry and global standards;
- b. To promote transparency, competence and professionalism in reporting exploration results, mineral resources and mineral reserves; and
- c. To achieve worldwide compatibility in reporting exploration results, mineral resources and mineral reserves.

SECTION 3. Scope and Limitations. This Order shall cover the adoption of PMRC 2020 and in effect amending certain provisions of DENR Administrative Order No. 2010-09, as provided by Table 1 ("Annex A"), in a summary form, a list of the criteria which must be considered by the ACP when preparing a report on Exploration Results, Mineral Resources or Mineral Reserves.

The standards provided herein shall apply only to the solid and non-energy mineral resources of the country. This can include mineralized fill, remnants, pillars, low grade

mineralization, stockpiles, dumps, and tailings (remnant materials) where there are reasonable prospects for eventual economic extraction in the case of Mineral Resources, and where extraction is reasonably justifiable in the case of Mineral Reserves.

To provide for more clarifications, the Mines and Geosciences Bureau (MGB) may formulate and issue the necessary Supplementary Implementing Guidelines for the guidance of all concerned.

SECTION 4. Definition of Terms and Acronyms. The following terms shall be defined as follows.

- a. **Accredited Professional Organization or APO** refers to a professional organization in the field of geology, mining engineering or metallurgical engineering, namely, the Geological Society of the Philippines (GSP), Philippine Society of Mining Engineers (PSEM), or the Society of Metallurgical Engineers of the Philippines (SMEP), respectively, accredited by the Philippine Professional Regulation Commission (PRC).
- b. **Accredited Competent Person or ACP** is a minerals industry professional who is a Member or Fellow of PSEM, GSP and/or SMEP, duly accredited as such by the professional organization to which he/she belongs, or of a 'Recognized Professional Organization' (RPO), as included in a list promulgated by PSEM, GSP, and SMEP through the PMRCC, as the need arises, subject to applicable laws and regulations. He/she must have a minimum of five years relevant experience in the style of mineralization or type of mineral deposit under consideration and to the activity which that person is undertaking.
- c. **Contractor** is a qualified person acting alone or in consortium who is a party to a Mineral Agreement or to a Financial or Technical Assistance Agreement.
- d. **Feasibility study** is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessment of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project.
- e. **MGB** refers to the Mines and Geosciences Bureau of the Department of Environment and Natural Resources.
- f. **Mineral Resource** is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade (or quality), continuity, and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence, including sampling.
- g. **Mineral Reserve**¹ 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 or extracted and is defined

¹ Mineral Reserve replaced the term "Ore Reserve" as referred in PMRC 2007 edition and DENR Administrative Order No. 2010-09 in accordance with the CRIRSCO International Template Reporting 2019, one of the internationally recognized reporting standards to which the PMRC 2020 was modelled after.

by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

- h. **Modifying Factors** are considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social, and governmental factors.
- i. **Permittee** is a holder of an Exploration Permit.
- j. **Permit Holder** refers to a holder of a national government issued mining permit other than an Exploration Permit.
- k. **Philippine Mineral Reporting Code (PMRC) or the Code** sets out minimum standards, recommendations and guidelines for Public Reporting in the Philippines of Exploration Results, Mineral Resources, and Mineral Reserves with its latest edition in 2020. The PMRC 2020 Edition is an upgrade of the PMRC 2007 Edition and modeled substantially after the International Reporting Template (2019) of the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) and the Australasian Code for Reporting of Exploration Results, Mineral Resources, and Ore Reserves (JORC Code) of the Australasian Joint Ore Reserves Committee (JORC).

CHAPTER II SYSTEM OF CLASSIFICATION

SECTION 5. Reference to the Philippine Mineral Reporting Code 2020 Edition.

The system of classification provided herein shall be guided by the local industry standards as contained in the Philippine Mineral Reporting Code (PMRC) of 2020.

Attached as Table 1 (Annex "A") and made as an integral part hereof is a revised checklist of assessment and reporting criteria in preparing reports on exploration results, mineral resources and mineral reserves.

SECTION 6. General Framework. The classification of exploration results, mineral resources and mineral reserves shall be guided by the stage or phase of mineral exploration, feasibility study and economic viability.

The evaluation of exploration results is succeeded by the assessment and categorization of the mineral resources to Inferred, Indicated and Measured. Feasibility Study can be done on a Measured Mineral Resource and/or Indicated Mineral Resource to ascertain if either or both can be classified as Probable and/or Proved Mineral Reserve. The state of economic viability of a mineral deposit is categorized as either economic or potentially economic.

CHAPTER III REPORTING TERMINOLOGY

SECTION 7. Statements to be used in Reporting Prospecting and Preliminary Exploration Results. When reporting results of prospecting and preliminary exploration activities involving a mineralization that cannot be classified as mineral resource or mineral reserve owing to the insufficiency of data and thereby prevent the reasonable estimates of tonnage and average grade, such mineralization should be termed only as **Exploration Target**. The exploration report prepared by the ACP and submitted to MGB

must contain sufficient information to allow a balanced judgment on the significance of the results. The ACP shall be guided by the list of particulars in Table 1 of the PMRC.

SECTION 8. Categories for Reporting Mineral Resources. Mineral Resources are subdivided, in order of increasing geological confidence, into Inferred, Indicated, and Measured categories.

- a. **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity, and grade (or quality) are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify, geological and grade (or quality) continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.
- b. **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade (or quality), densities, shape, and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the mineral deposit. 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. Geological evidence is derived from adequately detailed and reliable exploration, sampling, and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings, and drill holes, and is sufficient to assume geological and grade (or quality) continuity between points of observation.
- c. **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade (or quality), densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support mine planning and final evaluation of the economic viability of the mineral deposit. Geological evidence is derived from detailed and reliable exploration, sampling, and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings, and drill holes, and is sufficient to confirm geological and grade (or quality) continuity between points of observation.

SECTION 9. Categories for Reporting Mineral Reserves. Mineral Reserve is sub-divided in order of increasing confidence into Probable and Proved Mineral Reserves:

- a. **Probable Mineral Reserve** is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proved Mineral Reserve.
- b. **Proved Mineral Reserve** is the economically mineable part of a Measured Mineral Resource. A Proved Mineral Reserve implies a high degree of confidence in the Modifying Factors.

SECTION 10. Reporting of Exploration Results, Mineral Resources and Mineral Reserves to Government. Every contractor, permittee and permit holder shall be guided by the standards provided herein in complying with the reporting requirements of the Mining Act and its IRR.

SECTION 11. Administration of Mineral Resources and Mineral Reserves Database. Pursuant to the provision of Section 267 Department Administrative Order No. 2010-21, as amended, a Mineral Resources and Mineral Reserves database shall be established by the MGB and its Regional Offices to serve as a repository of all exploration and related data from mining projects for national and regional policy and planning studies, monitoring and research purposes. The MGB Central Office shall be the national repository of the said database.

All relevant data contained in reports on mineral resources and mineral reserves shall be recorded and incorporated in this database. Public access to this database shall be subject to existing policies on disclosure of information.

CHAPTER IV RESPONSIBILITY OF REPORTING AND COMPILATION OF REPORTS

SECTION 12. Preparation of Reports on Exploration Results, Mineral Resources, Mineral Reserves and Other Reports. Exploration results, mineral resources and mineral reserves reports for public disclosure must be prepared by an ACP or ACPs. ACP Geologist(s) shall disclose reporting of exploration results and mineral resources, ACP Mining Engineer(s) shall disclose reporting of mineral reserves, and ACP Metallurgical Engineer(s) shall disclose reporting of metallurgical testworks which is a part of a Feasibility Study of a mineral project.

If only one ACP signs the Mineral Resource or Mineral Reserve documentation, that person is responsible and accountable for the whole documentation under the Code.

All reports on mineral resources and mineral reserves shall be signed and sealed by an ACP or ACPs with a sworn statement affirming that he/she/they personally undertook or reviewed the relevant evaluation process.

If a report is prepared by a team of professionals or experts, the team leader should be an ACP who is responsible and accountable for the whole report. If responsibility is shared by the team leader with other ACP, each team member shall clearly state the coverage or scope of his/her responsibility in the report. The team leader and his/her members shall jointly sign the sworn statement and affix their individual scopes of responsibility to the report. In this case, the ACPs in the team share the responsibility over the report.

SECTION 13. Qualifications of an Accredited Competent Person. Accredited Competent Person is defined in this Administrative Order as a technical professional or expert possessing the following qualifications:

- a. Must be a Geologist, a Mining Engineer or a Metallurgical Engineer licensed by the PRC;
- b. Must be a member in good standing of any of the APO and accredited by the APO's respective accreditation committees; and
- c. Must have a minimum five (5) years relevant experience in the style of mineralization or type of mineral deposit under consideration and to the activity which that person is undertaking.

A foreign geologist, mining engineer and/or metallurgical engineer may also be qualified as an ACP if the following conditions are satisfied:

- a. His/her professional organization has a reciprocal arrangement with the equivalent local accrediting professional organization/s; and
- b. He/she is an Accredited Competent Person by his/her professional organization/s in his/her home country.

An ACP shall be required to obtain an accreditation of his/her professional and educational qualification and relevant working experience from the APO where he/she belongs. This accreditation shall certify that he / she is capable to perform mineral resources assessment based on his/her working experience and shall state the scope of his/her professional competency.

The APOs shall provide the MGB with a regular update of the roster of their Accredited Competent Persons.

CHAPTER V MISCELLANEOUS PROVISIONS

SECTION 14. Transitory Provision

A period of two (2) years shall be provided as the transition phase upon approval of this Order. Provided, that an ACP can use the PMRC 2020 even during the transition period. Provided further, that he/she cannot use the PMRC 2007 again on a resource/reserve/activity reported using PMRC 2020. Provided finally, that he/she cannot mix both codes in reporting a resource/reserve/activity.

SECTION 15. Penal Provision. Any false statement, misrepresentation and/or misreporting in connection with the preparation and submission of reports on exploration results, mineral resources and/or mineral reserves shall be a ground for filing a perjury or fraud case against the Accredited Competent Person concerned. It shall also constitute a violation of the terms and conditions of the mining contract or permit concerned.

SECTION 16. Separability Clause. If any provision of this Order shall be held invalid or unconstitutional, the other portions or provisions hereof which are not affected shall continue in full force and effect.

SECTION 17. Repealing Clause. DENR Administrative Order No. 2010-09, "Providing for the Classification and Reporting Standards of Exploration Results, Mineral Resources and Ore Reserves", and other similar issuances inconsistent herewith are hereby revoked, amended, or modified accordingly.

SECTION 18. Effectivity. This Order shall take effect fifteen (15) days after its publication in a newspaper of general circulation and upon acknowledgment of the receipt of the copy thereof by the Office of the National Administrative Register (ONAR).


MARIA ANTONIA YULO LOYZAGA
Secretary



ANNEX A. TABLE 1 – REVISED CHECKLIST OF ASSESSMENT AND REPORTING CRITERIA

Table 1 provides, in a summary form, a list of the criteria which must be considered by the ACP when preparing a Public Report on Exploration Results, Mineral Resources or Mineral Reserves. In the context of complying with the principles of the Code, comments relating to the items in the relevant sections of Table 1 should be provided on an 'if not, why not' basis within the ACP's documentation.

		Exploration Results	Mineral Resources	Mineral Reserves
Introduction				
Introduction	General	(i)	<i>The scope of work or terms of reference</i>	
		(ii)	<i>The Accredited Competent Person's relationship to the issuer of the Public Report, if any.</i>	
		(iii)	<i>A statement for whom the Public Report was prepared; whether it was intended as a full or partial evaluation or other purpose, work conducted, effective date of Public Report, and remaining work.</i>	
		(iv)	<i>Sources of information and data contained in the Public Report or used in its preparation, with citations if applicable, and a list of references.</i>	
		(v)	<i>A title page and a table of contents that includes figures and tables.</i>	
		(vi)	<i>An Executive Summary, which briefly summarizes important information in the Public Report, including mineral property description and ownership, geology and mineralization, the status of exploration, development and operations, Mineral Resource and/or Mineral Reserve estimates, and the Accredited Competent Person's conclusions and recommendations. If Inferred Mineral Resources are used, a summary valuation with and if practical without inclusion of such Inferred Mineral Resources. The Executive Summary should have sufficient detail to allow the reader to understand the essentials of the project.</i>	
		(vii)	<i>A declaration from the Accredited Competent Person, stating whether 'the declaration has been made in terms of the guidelines of the PMRC 2020 Edition. If a reporting code other than the PMRC having jurisdiction has been used, an explanation of the differences.</i>	
		(vii)	<i>Diagrams, maps, plans, sections, and illustrations, which are dated, legible, and prepared at an appropriate scale to distinguish important features. Maps including a legend, author or information source, coordinate system and datum, a scale in bar or grid form, and an arrow indicating north. Reference to a location or index map and more detailed maps showing all</i>	

			<i>important features described in the text, including all relevant cadastral and other infrastructure features.</i>	
		(ix)	<i>The units of measure, currency and relevant exchange rates</i>	
		(x)	<i>The details of the personal inspection on the mineral property by each Accredited Competent Person or, if applicable, the reason why a personal inspection has not been completed.</i>	
		(xi)	<i>If the Accredited Competent Person is relying on a report, opinion or statement of another expert who is not an Accredited Competent Person, then a disclosure of the date, title, and author of the report, opinion, or statement, the qualifications of the other expert, the reason for the Accredited Competent Person to rely on the other expert, any significant risks, and any steps the Accredited Competent Person took to verify the information provided.</i>	
1.1	Location	1.1.1	<i>Description of location and map (country, province, and closest town/city, coordinate systems and ranges, etc.).</i>	
		1.1.2	<i>Country Profile, with a description of information relating to the project host country that is pertinent to the project, including relevant applicable legislation, environmental and social context etc. An assessment, at a high level, of relevant technical, environmental, social, economic, political, and other key risks.</i>	
		1.1.3	<i>A general topo-cadastral map.</i>	<i>Topo-cadastral map in sufficient detail to support the assessment of eventual economics.</i>
1.2	Mineral Property Description	1.2.1	<i>Brief description of the scope of project (i.e., whether in preliminary sampling, advanced exploration, Scoping, Pre-Feasibility, or Feasibility Study, Life-of-Mine plan for an ongoing mining operation or closure)</i>	
		1.2.2	<i>Description of topography, elevation, drainage and vegetation, the means and ease of access to the mineral property, the proximity of the mineral property to a population center, and the nature of transport, the climate, known associated climatic and seismic risks and the length of the operating season and to the extent relevant to the mineral project, the sufficiency of surface rights for mining operations including the availability and sources of power, water, mining personnel, potential tailings storage areas, potential waste disposal areas, heap leach pad</i>	

			<i>areas, and potential processing plant sites (noting any conditions that may affect possible exploration/mining activities).</i>	
1.3	Adjacent properties	1.3.1	<i>Details of relevant adjacent properties. The inclusion on the maps of the location of common structures, whether related to mineralization or not, in adjacent or nearby properties having an important bearing on the Public Report. Reference to all information used from other sources.</i>	
		1.4.1	<i>Historical background to the project and adjacent areas concerned, including known results of previous exploration and mining activities (type, amount, quantity, and development work), previous ownership and changes thereto.</i>	
1.4	History	1.4.2		<i>Previous successes or failures referred to transparently with reasons why the project should now be considered potentially economic.</i>
		1.4.3		<i>Known or existing historical Mineral Resource estimates and performance statistics from actual production in the past and in current operations.</i>
		1.4.4		<i>Known or existing historical Mineral Reserve estimates and performance statistics from actual production in the past and in current operations.</i>
1.5	Legal Aspects and Permitting	<i>A statement from the Accredited Competent Person on the confirmation of the legal tenure, including a description of:</i>		
		1.5.1	<i>The nature of the issuer's rights (e.g., exploration and/or mining) and the right to use the surface of the properties to which these rights relate. The date of expiry and other relevant details.</i>	
		1.5.2	<i>The principal terms and conditions of all existing agreements, and details of those still to be obtained, (such as, but not limited to, concessions, partnerships, joint ventures, access rights, leases, historical and cultural sites, wilderness or national park and environmental settings, royalties, consents, permission, permits or authorizations).</i>	
		1.5.3	<i>The security of the tenure held at the time of reporting or that is reasonably expected to be granted in the future along with any known impediments to obtaining the right to operate in the area. Details of applications that have been made. See Clause 32 for declaration of a Mineral Reserve.</i>	

		1.5.4	<i>A statement of any legal proceedings, for example: adverse/competing claims, or land claims that may have an influence on the rights to prospect or mine for minerals, or claims that the tenorial instrument is defective, or an appropriate negative statement.</i>			
		1.5.5	<i>A statement relating to governmental/statutory requirements permits, and consents as may be required, have been applied for, approved or can be reasonably be expected to be obtained. A review of risks that permits will not be received as expected and impact of delays to the project</i>			
1.6	Royalties	1.6.1	<i>The royalties or streaming agreements that are payable in respect of each mineral property.</i>			
1.7	Liabilities	1.7.1	<i>Any liabilities, including rehabilitation guarantees and decommissioning obligations that are pertinent to the project. A description of the rehabilitation liability and decommissioning obligation, including, but not limited to, legislative/administrative requirements, assumptions, and limitations.</i>			
Section 2: Geological Setting, Mineral Deposit, Mineralization						
2.1	Geological Setting, Mineral Deposit, Mineralization	2.1.1	<i>The regional geology.</i>			
		2.1.2	<i>The project geology including mineral deposit type, geological setting, and style of mineralization.</i>			
		2.1.3	<i>The geological model or concepts being applied in the investigation and on the basis of which the exploration program is planned, along with a description of the inferences and assumptions made from this model.</i>			
		2.1.4	<i>Data density, distribution, and reliability and whether the quality and quantity of information are sufficient to support statements, made or inferred, concerning the mineral deposit.</i>			
		2.1.5	<i>Significant minerals present in the mineral deposit, their frequency, size and other characteristics, including a discussion of minor and gangue minerals where these will have an effect on the processing steps and the variability of each important mineral within the mineral deposit.</i>			
		2.1.6	<i>Significant mineralized zones encountered on the mineral property, including a summary of the surrounding rock types, relevant geological controls, and the length, width, depth, and continuity of the mineralization, together with a description of the type, character, and distribution of the mineralization.</i>			
		2.1.7	<i>The existence of reliable geological models and/or maps and cross sections that support interpretations.</i>			

Section 3: Exploration and Drilling, Sampling Techniques, and Data

3.1	Exploration	3.1.1	<i>Data acquisition or exploration techniques and the nature, level of detail, and confidence in the geological data used (i.e., geological observations, remote sensing results, stratigraphy, lithology, structure, alteration, mineralization, hydrology, geophysical, geochemical, petrography, mineralogy, geochronology, bulk density, potential deleterious or contaminating substances, geotechnical and rock characteristics, moisture content, bulk samples, etc.). Data sets with all relevant metadata, such as unique sample number, sample mass, collection date, spatial location, etc.</i>
		3.1.2	<i>The primary data elements (observations and measurements) used for the project and a description of the management and verification of these data or the database. Description of the following relevant processes: acquisition (capture or transfer), validation, integration, control, storage, retrieval, and backup processes. If data are not stored digitally, presentation of hand-printed tables with well-organized data and information.</i>
		3.1.3	<i>Acknowledgment and appraisal of data from other parties, and reference to all data and information used from other sources.</i>
		3.1.4	<i>Distinction between data / information from the mineral property under discussion and that derived from surrounding properties.</i>
		3.1.5	<i>The methods for collar and down-hole survey, techniques, and expected accuracies of data as well as the grid system used.</i>
		3.1.6	<i>Discussion on the sufficiency of the data spacing and distribution to establish the degree of geological and grade continuity appropriate for the estimation procedure(s) and classifications applied.</i>
		3.1.7	<i>Presentation of representative models and/or maps and cross sections or other two or three-dimensional illustrations of results showing location of samples, accurate drill hole collar positions, down-hole surveys, exploration pits, underground workings, relevant geological data, etc.</i>
		3.1.8	<i>The geometry of the mineralization with respect to the drill hole angle because of the importance of the relationships between mineralization widths and intercept lengths. Justification if only down-hole lengths are reported.</i>
3.2	Drilling Techniques	3.2.1	<i>Type of drilling undertaken (e.g., core, reverse circulation, open-hole hammer, rotary air blast, auger, Banka, sonic, etc.) and details (e.g., core diameter, triple or standard tube, depth of</i>

			<i>diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).</i>
		3.2.2	<i>The geological and geotechnical logging of core and chip samples relative to the level of detail required to support appropriate Mineral Resource estimation, mining studies, and metallurgical studies.</i>
		3.2.3	<i>The nature of logging (qualitative or quantitative) and the use of core photography (or costean, channel, etc.).</i>
		3.2.4	<i>The total length and percentage of the relevant intersections logged.</i>
		3.2.5	<i>Results of any down-hole surveys of the drill hole.</i>
3.3	Sample method, collection, capture, and storage	3.3.1	<i>A description of the nature and quality of sampling (e.g., cut channels, random chips, or specific specialized industry standard measurement tools appropriate to the minerals under investigation, such as down-hole gamma sondes, or handheld or fixed-position XRF instruments, etc.), without these examples limiting the broad meaning of sampling.</i>
		3.3.2	<i>A description of the sampling processes, including sub-sampling stages to maximize representativeness of samples, whether sample sizes are appropriate to the grain size of the material being sampled and any sample compositing.</i>
		3.3.3	<i>A description of each data set (e.g., geology, grade, density, quality, geo-metallurgical characteristics, etc.), sample type, sample-size selection, and collection methods.</i>
		3.3.4	<i>The nature of the geometry of the mineralization with respect to the drill hole angle (if known). The orientation of sampling to achieve unbiased sampling of possible structures, considering the mineral deposit type. The intersection angle. The down-hole lengths if the intersection angle is not known.</i>
		3.3.5	<i>A description of retention policy and storage of physical samples (e.g., core, sample reject, etc.)</i>
		3.3.6	<i>A description of the method of recording and assessing core and chip sample recoveries and the results assessed, measures taken to maximize sample recovery and ensure representative nature of the samples, whether a relationship exists between sample recovery and grade, and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.</i>
		3.3.7	<i>The cutting of a drill core sample, e.g., whether it was split or sawn and whether quarter, half or full core was submitted for analysis.</i>

			<p>Non-core sampling, e.g., whether the sample was riffled, tube sampled, rotary split, etc.; whether it was sampled wet or dry; the impact of water table or flow rates on recovery and introduction of sampling biases or contamination from above.</p> <p>The impact of variable hole diameters, e.g., by the use of a caliper tool.</p>
3.4	Sample Preparation and Analysis	3.4.1	<p>The identity of the laboratory(s) and its accreditation status.</p> <p>The steps taken by the Accredited Competent Person to ensure the results from a non-accredited laboratory are of an acceptable quality.</p>
		3.4.2	<p>The analytical method, its nature, the quality and appropriateness of the assaying and laboratory processes and procedures used, and whether the technique is considered partial or total.</p>
		3.4.3	<p>A description of the process and method used for sample preparation, sub-sampling and size reduction, and the likelihood of inadequate or non-representative samples (i.e., improper size reduction, contamination, screen sizes, granulometry, mass balance, etc.).</p>
3.5	Sampling Governance	3.5.1	<p>The governance of the sampling campaign and process, to ensure quality and representativeness of samples and data, such as sample recovery, high grading, selective losses or contamination, core/hole diameter, internal and external QA/QC, and any other factors that may have resulted in or identified sample bias.</p>
		3.5.2	<p>The measures taken to ensure sample security and the Chain of Custody.</p>
		3.5.3	<p>The validation procedures used to ensure the integrity of the data, e.g., transcription, input or other errors, between its initial collection and its future use for modeling (e.g., geology, grade, bulk density, etc.).</p>
		3.5.4	<p>The audit process and frequency (including dates of these audits) and disclose any material risks identified.</p>
3.6	Quality Control/ Quality Assurance	3.6.1	<p>The verification techniques (QA/QC) for field sampling process, e.g., the level of duplicates, blanks, reference material standards, process audits, analysis, etc.</p> <p>Indirect methods of measurement (e.g., geophysical methods), with attention given to the confidence of interpretation.</p> <p>Reference to measures taken to ensure sample representativeness and the appropriate calibration of any measurement tools or systems used.</p> <p>QA/QC procedures used to check databases augmented with 'new' data have not disturbed previous versions containing 'old' data.</p>

3.7	Bulk Density	3.7.1	<i>The method of bulk density determination with reference to the frequency of measurements, the size, nature, and representativeness of the samples.</i>	
		3.7.2	<i>Preliminary estimates or basis of assumptions made for bulk density.</i>	
		3.7.3	<i>The representativeness of bulk density samples.</i>	
		3.7.4	<i>The measurement of bulk density for bulk material using methods that adequately account for void spaces (vugs, porosity etc.), moisture, and differences between rock and alteration zones within the mineral deposit.</i>	
3.8	Bulk Sampling and/or trial-mining	3.8.1	<i>The location of individual samples (including map).</i>	
		3.8.2	<i>The size of samples, spacing/density of samples recovered, and whether sample sizes and distribution are appropriate to the grain size of the material being sampled.</i>	
		3.8.3	<i>The method of mining and treatment.</i>	
		3.8.4	<i>The degree to which the samples are representative of the various types and styles of mineralization and the mineral deposit as a whole.</i>	
Section 4: Estimation and Reporting of Exploration Results and Mineral Resources				
4.1	Geological model and interpretation	4.1.1	<i>The nature, detail, and reliability of geological information with which lithological, structural, mineralogical, alteration or other geological, geotechnical, and geo-metallurgical characteristics were recorded.</i>	
		4.1.2	<i>The geological model, construction technique, and assumptions that form the basis for the Exploration Results or Mineral Resource estimate. The sufficiency of data density to assure continuity of mineralization and geology, and provision of an adequate basis for the estimation and classification procedures applied.</i>	
		4.1.3	<i>Any obvious geological, mining, metallurgical, processing, environmental, social, infrastructural, legal, and economic factors that could have a significant effect on the prospects of any</i>	

			<i>possible Exploration Target or mineral deposit.</i>	
		4.1.4		<i>Geological data that could materially influence the estimated quantity and quality of the Mineral Resource or Mineral Reserve.</i>
		4.1.5		<i>Consideration given to alternative interpretations or models and their possible effect (or potential risk), if any, on the Mineral Resource estimate.</i>
		4.1.6		<i>Geological discounts (e.g., magnitude, per reef, domain, etc.), applied in the model, whether applied to mineralized and/or unmineralized material (e.g., potholes, faults, dikes, etc.).</i>
4.2	Estimation and modeling techniques	4.2.1	<i>A detailed description of the estimation techniques and assumptions used to determine the grade and tonnage ranges for Exploration Targets.</i>	<i>Histograms, statistical parameters, probability distributions of samples, and of block estimates. If geostatistics is done, must show variogram(s) and parameters (e.g., sill, range, nugget effect) depending on variogram type, sizes of estimation panels or blocks, assumed or known selective mining units.</i>
		4.2.2		<i>The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values (cutting or capping), compositing (including by length and/or density), domaining, sample spacing, estimation unit size (block size), selective mining units, interpolation parameters, and maximum distance of extrapolation from data points.</i>
		4.2.3		<i>Assumptions and justification of correlations made between variables.</i>
		4.2.4		<i>Any relevant specialized computer program (software) used (with the version number) together with the parameters used.</i>
		4.2.5		<i>The processes of checking and validation, the comparison of model information to sample data and use of reconciliation data, and whether the Mineral Resource estimate takes account of such information.</i>
		4.2.6		<i>The assumptions made regarding the estimation of any co-products, by-products or deleterious elements.</i>

4.3	Reasonable prospects for eventual economic extraction	4.3.1	<i>The geological parameters, including (but not be limited to) volume / tonnage, grade and value / quality estimates, cut-off grades, strip ratios, upper- and lower- screen sizes.</i>
		4.3.2	<i>The engineering parameters, including mining method, processing, geotechnical, hydrogeological, and metallurgical parameters, including assumptions made to mitigate the effect of deleterious elements. Dilution and mining recovery factors that might be applicable to convert in-situ Mineral Resources to Mineral Reserves.</i>
		4.3.3	<i>The infrastructure including, but not limited to, power, water, and site access.</i>
		4.3.4	<i>The legal, governmental, permitting, and statutory parameters.</i>
		4.3.5	<i>The environmental and social (or community) parameters.</i>
		4.3.6	<i>The marketing parameters.</i>
		4.3.7	<i>The economic assumptions and parameters, including, but not limited to, commodity prices, sales volumes, and potential capital and operating costs.</i>
		4.3.8	<i>Material risks, e.g., legal, environmental, climatic, etc.</i>
		4.3.9	<i>The parameters used to support the concept of 'eventual' in the case of Mineral Resources.</i>
4.4	Classification Criteria	4.4.1	<i>The criteria and methods used as the basis for the classification of the Mineral Resources into varying confidence categories.</i>
4.5	Discussion of relative accuracy/ confidence	4.5.1	<i>Where appropriate, a statement of the relative accuracy and confidence level in the Mineral Resource or Mineral Reserve estimate using an approach or procedure deemed appropriate by the Accredited Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the Mineral Resource or Mineral Reserve within stated confidence limits, or, if such an</i>

				<p><i>approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate. The statement should specify whether it relates to global or local estimates, and, if local, state the relative tonnages, which should be relevant to technical and economic evaluation. Documentation shall include assumptions made and the procedures used. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.</i></p>
4.6	Reporting	4.6.1	<i>Specific grades / qualities and widths.</i>	
		4.6.2	<i>The reporting of low- and high-grade intersections and corresponding widths, together with their spatial location to avoid misleading reporting of Exploration Results</i>	
		4.6.3	<i>A statement on whether grades are regional averages or if these are selected individual samples taken from the mineral property under discussion.</i>	
		4.6.4		<i>The detail of the surface or underground mine, residue stockpile, remnants, tailings, and existing pillars or other sources in a Mineral Resource statement.</i>
		4.6.5		<i>A comparison with the previous Mineral Resource estimates, with an explanation of the reason for material changes. A comment on any historical trends (e.g., global bias).</i>
		4.6.6		<i>The basis for the estimate and if not 100%, the attributable percentage relevant to the entity commissioning the Public Report.</i>

		4.6.7	<i>The basis of equivalent metal formulae, if relevant.</i>		
Section 5: Technical Studies					
5.1	Introduction	5.1.1	<i>Not applicable to Exploration Results or Exploration Targets</i>	<i>The level of study – Scoping, Pre-Feasibility, Feasibility or ongoing Life-of-Mine Plan.</i>	<i>The level of study – Pre-Feasibility, Feasibility or ongoing Life-of-Mine Plan.</i>
		5.1.2			<i>A summary table of the Modifying Factors used to convert the Mineral Resource to Mineral Reserve.</i>
5.2	Mining Design	5.2.1	<i>Not applicable to Exploration Results or Exploration Targets</i>	<i>Assumptions regarding mining methods and parameters when estimating Mineral Resources</i>	
		5.2.2		<i>All Modifying Factors and assumptions made regarding mining methods, minimum mining dimensions (or pit shell) and internal and, if applicable, external planned and unplanned mining dilution and mining losses used for the techno-economic study and signed-off, such as mining method, mine design criteria, infrastructure, capacities, production schedule, mining efficiencies, grade control, geotechnical and hydrological considerations,</i>	

					<i>closure plans, and personnel requirements.</i>	
		5.2.3	<i>Not applicable to Exploration Results or Exploration Targets</i>	<i>Mineral Resource models used in the study.</i>		
		5.2.4		<i>The basis of the cut-off grade(s).</i>	<i>The basis of (the adopted) cut-off grade(s) or quality parameters applied, including metal equivalents if relevant.</i>	
		5.2.5			<i>The mining method(s) to be used.</i>	
		5.2.6			<i>For open cut mines, a discussion of pit slopes, slope stability, and strip ratio.</i>	
		5.2.7			<i>For underground mines, a discussion of mining method, geotechnical considerations, mine design characteristics, and ventilation/cooling requirements.</i>	
		5.2.8			<i>Discussion of mining rate, equipment selected, grade control methods, geotechnical and hydrogeological considerations, health and safety of the workforce, staffing requirements, dilution, and recovery.</i>	
		5.2.9			<i>Optimization methods and software used in planning, including a discussion of the constraints.</i>	
5.3	Metallurgical Testworks	5.3.1		<i>Not applicable to Exploration Results or Exploration Targets</i>		<i>The source of the samples, the representativeness of the</i>

					potential feed and the techniques used to obtain the samples, laboratory and metallurgical testing techniques.
		5.3.2			The basis for assumptions or predictions regarding metallurgical amenability and any preliminary mineralogical test work should already be carried out.
		5.3.3		The possible processing methods and any processing factors that could have a material effect on the likelihood of eventual economic extraction. The appropriateness of the processing methods to the style of mineralization.	The processing method(s), equipment, plant capacity, efficiencies, and personnel requirements.
		5.3.4			The nature, amount, and representativeness of metallurgical test works undertaken and the recovery factors used. A detailed flow sheet / diagram and a mass balance, especially for multi-product operations from which the saleable materials are priced for different chemical and physical characteristics.
		5.3.5			Assumptions or allowances made for deleterious elements

					<i>and the existence of any bulk-sample or pilot-scale test work and the degree to which such samples are representative of the ore body as a whole.</i>
		5.3.6			<i>Disclosure of whether metallurgical process is well-tested technology or novel in nature and if novel, justification of its use in Mineral Reserve estimation.</i>
5.4	Infrastructure	5.4.1	<i>Not applicable to Exploration Results or Exploration Targets</i>	<i>Comment regarding the current state of infrastructure or the ease with which the infrastructure can be provided or accessed and its effect on reasonable prospects for eventual economic extraction</i>	
		5.4.2			<i>Demonstration that the necessary facilities have been allowed for (which may include, but not be limited to, processing plant, tailings dam, leaching facilities, waste dumps, road, pipeline, rail or port facilities, water and power supply, offices, housing, security, resource sterilization testing, etc.). Provision of detailed maps showing locations of facilities.</i>

		5.4.3			Statement showing that all necessary logistics have been considered.
5.5	Environmental and social	5.5.1	Confirmation that the company holding the tenement has addressed the host country's environmental legal compliance requirements and any mandatory and/or voluntary standards or guidelines to which the company subscribes.		
		5.5.2	Identification of the necessary permits that will be required and their status, and where not yet obtained, and confirmation that there is a reasonable basis to believe that all permits required for the project will be obtained in a timely manner.		
		5.5.3	Any sensitive areas that may affect the project as well as any other environmental factors including Interested and Affected Party (I&AP) and/or studies that could have a material effect on the likelihood of eventual economic extraction. Possible means of mitigation.		
		5.5.4	Legislated social management programs that may be required and content and status of these.		
		5.5.5	Material socio-economic and cultural impacts that need to be managed, and where appropriate the associated costs.		
5.6	Market Studies and Economic criteria	5.6.1		Technical and economic factors likely to influence the prospect of economic extraction. Refer to Clause 23.	Valuable and potentially valuable product(s) including suitability of products, co-products and by-products to market.
		5.6.2	Not applicable to Exploration Results or Exploration Targets		Product to be sold, customer specifications, testing, and acceptance requirements. Existence of a ready market for the product and whether contracts for the sale of the product are in place or expected to be readily obtained. Price and volume forecasts and the basis for the forecast.
		5.6.3			Economic criteria used for the study, such as capital and

					operating costs, exchange rates, revenue / price curves, royalties, and streaming agreements, cut-off grades, reserve pay limits.
		5.6.4			Summary description, source, and confidence of method used to estimate the commodity price/value profiles used for cut-off grade calculation, economic analysis and project valuation, including applicable taxes, inflation indices, discount rate, and exchange rates.
		5.6.5			Assumptions made concerning production cost including transportation, treatment, penalties, exchange rates, marketing, and other costs. Allowances should be made for the content of deleterious elements and the cost of penalties.
		5.6.6			Allowances made for royalties and streaming agreements payable, both to Government and private entities.
		5.6.7			Ownership, type, extent, and condition of plant and equipment that is significant to the existing operation(s).
		5.6.8			Environmental, social, and labor costs.

5.7	Risk Analysis	5.7.1	<i>An assessment of technical, environmental, social, economic, political, and other key risks to the project. Actions that will be taken to mitigate and/or manage the identified risks.</i>		
5.8	Economic Analysis	5.8.1	<i>Not applicable to Exploration Results or Exploration Targets</i>	<i>The basis on which reasonable prospects for eventual economic extraction has been determined. Any material assumptions made in determining the 'reasonable prospects for eventual economic extraction'.</i>	<i>The inclusion of any Inferred Mineral Resources is not allowed in the Pre-Feasibility and Feasibility Studies economic analysis.</i>
		5.8.2			<i>An economic analysis for the project that includes after tax Cash Flow forecast on an annual basis using Mineral Reserves or Mineral Resources or an annual production schedule for the life of the project, which has been used at the relevant level Pre-Feasibility or Feasibility Study. Accounting for royalties and streaming agreements.</i>
		5.8.3			<i>A discussion of net present value (NPV), internal rate of return (IRR) and payback period of capital.</i>
		5.8.4			<i>Sensitivity or other analysis using variants in commodity price, grade, capital and operating costs, or other significant parameters, as</i>

					appropriate and discuss the impact of the results.
Section 6: Estimation and Reporting of Mineral Reserves					
6.1	Estimation and modeling techniques	6.1.1			A description of the Mineral Resource estimate used as a basis for the conversion to a Mineral Reserve.
		6.1.2			A Mineral Reserve Statement in sufficient detail indicating if the mining is by surface or underground method plus the source and type of mineralization, domain or orebody, surface dumps, stockpiles, and all other sources.
		6.1.3			Reconciliation of historical reliability and reconciliation of the performance parameters, assumptions and modifying factors. A comparison with the previous Reserve quantity and qualities, if available. Where appropriate, any historical trends (e.g., global bias).
		6.1.4			Criteria and methods used as the basis for the classification of the Mineral Reserves into varying confidence categories, which should be based on the Mineral Resource category, and include consideration of the

					<i>confidence in all the Modifying Factors.</i>
6.2	Classification Criteria	6.2.1			<i>Criteria and methods used as the basis for the classification of the Mineral Reserves into varying confidence categories, which should be based on the Mineral Resource category, and include consideration of the confidence in all the Modifying Factors.</i>
6.3	Reporting	6.3.1			<i>The proportion of Probable Mineral Reserves, which have been derived from Measured Mineral Resources (if any), including the reason(s) thereof.</i>
		6.3.2			<i>The inclusion in a Mineral Reserve statement of the detail of the surface or underground mine, residue stockpile, remnants, tailings, and existing pillars or other sources</i>
		6.3.3			<i>A comparison with the previous Mineral Reserve estimates. Any historical trends (e.g., global bias).</i>
		6.3.4			<i>The inclusion or exclusion of Mineral Resources in Mineral Reserves.</i>
Section 7: Audits and Reviews					

7.1	Audits and Reviews	7.1.1	Type of review/audit (e.g., independent, external), area (e.g., laboratory, drilling, data, environmental compliance, etc.), date and name of the reviewer(s) together with their recognized professional qualifications. The level of review/audit (desk-top, on-site comparison with standard procedures, or endorsement where auditor/reviewer has checked the work to the extent they stand behind it as if it were their own work).
		7.1.2	The level and conclusions of relevant audits or reviews. Significant deficiencies and remedial actions required.
Section 8: Other Relevant information			
8.1	Other relevant information	8.1.1	Other relevant and material information not discussed elsewhere.
Section 9: Accredited Competent Person			
9.1	Qualification of Accredited Competent Person(s) and key technical staff	9.1.1	The full name of the Accredited Competent Person, profession, address, their PRC and Accredited Competent Person registration numbers and the name of the professional representative organization (or RPO), of which the Accredited Competent Person(s) is member. The relevant experience of the Accredited Competent Person(s) and other key technical staff who prepared and who are responsible for the Public Report.
		9.1.2	The Accredited Competent Person's relationship to the issuer of the Public Report, if any.
		9.1.3	The inclusion of the Accredited Competent Person's Consent Form (see Appendices 3 & 4). Such Consent Form should include the date of sign-off and the effective date of the Public Report.