Introduction to the Draft Glossary of Terms Used in Metal Leaching and Acid Rock Drainage Work

Clearly understood definitions and accepted meanings are critical to the development of any field of scientific inquiry. Clear definitions allow unambiguous testing of the existing concepts and theories, and provide the foundation for future development. Entities and processes may be defined according to their composition, form of action, or contextually according to their relative properties or performance.

Clear definitions are especially critical in metal leaching and acid rock drainage (ML/ARD) work due to the public and international nature of the work. ML/ARD work is now being carried out by mines throughout the world and many jurisdictions and organizations are sponsoring research programs. Effective communication will help avoid unnecessary duplication of effort and repetition of errors and facilitate the review of methods, theories, data and methods of data interpretation. Presently there is little consistency in terminology even between practitioners within the same jurisdiction. Even larger differences exist between different geographical areas. Obstacles to effective communication include the lack of standard definitions for much of the terminology, the multidisciplinary nature of the subject, the complexity of concepts such as neutralization potential, the large amount of jargon and acronyms, the difficulty in measuring key parameters such as mineralogy, and the presence of vague or misleading terms such as paste pH.

To address the problems listed above INAP have provided a draft glossary. This draft glossary was derived in large part from that developed by William A. Price, Kevin Morin and Nora Hutt for the British Columbia Ministry of Energy and Mines. The glossary borrows heavily from and/or adapts terms from various fields of study, a reflection of the multidisciplinary nature of ML/ARD. The glossary was produced to assist companies, regulators, INAP Members and members of the public who are interested in carrying out or reviewing ML/ARD work. It is hoped this work will promote a greater understanding of ML/ARD issues and contribute to the identification of gaps in the knowledge base.

Readers should note that the objective here is not to produce a dictionary. Wherever possible only one definition is given. Where there is more than one definition, as is the case for terms like *earth* or *fabric*, practitioners should clearly specify which definition is being used.

Clear consistent terminology requires an increase in the precision of ML/ARD terminology. Part of the reason for the large number of definitions ascribed to ML/ARD terms has been the lack of clarity regarding many of the key concepts. More accurate and precise terminology requires the provision of different terms:

- for different phenomena (for example, the distinction between *acid generation* and *acid rock drainage generation*),

- for measurements determined on entirely different sample types (for example, paste pH versus rinse pH) or with different laboratory procedures (for example, the various forms of acid potential), and
- to distinguish laboratory measurements from the phenomena in the field that may or may not be used to predict.

An example of this is the provision of separate terms and definitions for *effective field neutralization potential*, *unavailable neutralization potential* and the various laboratory *neutralization potential* measurements. An obvious disadvantage of the increased precision in ML/ARD terminology is the proliferation of cumbersome prefixes. To some degree this is an unavoidable consequence of increased understanding and recognition of the large number of complicating factors. Possible measures to reduce the size of terms include the use of acronyms like NP and ARD or the creation of new terms. Common ML/ARD acronyms and units of measure are outlined in separate attached documents.

A good example of an entity for which various disciplines have different names and slightly different definitions is "The unconsolidated inorganic and organic matrices produced by *weathering*, *sediment* deposition, biological accumulation, human or volcanic activity and occurring on the planet earth's surface." Existing terms include "Quaternary *sediments*", "surficial materials" and "unconsolidated materials" (*geology*), "*soil*" and "*earth*" (engineering), and "*overburden*" (*soil* science). The term selected for the glossary is *non-lithified materials*. The term surficial material was not selected because it emphasizes position rather than composition, creating possible confusion regarding the classification of *bedrock* outcrops and exposed mine walls. The term *overburden* creates similar confusion and is used in coal mining to describe both *bedrock* and *non-lithified materials* overlying a coal seam. The term *sediment* has a depositional component to its definition, and is used in the glossary as a subset of *non-lithified materials*. A wide range of definitions is possible for the term soil. In the glossary the term *soil* is given its *soil science* definition rather than the definition used in *geotechnical engineering*.

Where possible definitions should include criteria which distinguish the term from other similar terms. This is especially important where categories exist along a continuum. While a number of definitions include quantitative criteria and boundary conditions (for example, *water table*: the elevation at which the fluid pressure is equal to atmospheric pressure), many do not. From their definitions it is difficult to draw a line between *bedrock* and *non-lithified material*. At present there are no quantifiable distinguishing criteria. *Bedrock* includes porous, *clay*-rich materials lacking strength and hardness and readily *slaking* in water. *Non-lithified material* includes compact, strongly cemented, fluvial materials which resist slaking and are both strong and hard.

The problem of where to set boundaries is also encountered in defining various forms of hydrothermal alteration. Traditional qualitative definitions are provided for prefixes such as phyllic and propylitic in a separate hydrothermal alteration section at the end of the glossary. However, the glossary supports the recommendations of Thompson and Thompson (1996) that hydrothermal alteration should be primarily defined by the mineral assemblage. Any description

of mineralogy such as hydrothermal alteration should include an outline of the methods used in mineral identification.

In a number of cases, terms commonly used in ML/ARD prediction and prevention lacked standard definitions. Where no standard definition was available, one was created from the accepted meaning and common practice (often from British Columbia). The glossary has avoided providing definitions for the various categories of ore reserves. The various degrees of confidence in ore reserves and the required predictive information is presently the subject of considerable debate.

A number of documents have been attached; the glossary itself, acronyms, some useful formulae, measurement units and symbols, and references used for compiling the glossary documents. Comments on the draft metal leaching and ARD glossary should be submitted to Mandy Agnew (mandy.agnew@riotinto.com).