Initiative for Responsible Mining Assurance

Excerpt from the DRAFT Standard for Responsible Mining and Mineral Processing 2.0

Chapter 4.1 – Waste and Materials Management

Context & Disclaimer on IRMA DRAFT Standard 2.0

IRMA DRAFT Standard for Responsible Mining and Minerals Processing 2.0 is being released for public consultation, inviting the world to join in a conversation around expectations that drive value for greater environmental and social responsibility in mining and mineral processing.

This draft document invites a global conversation to improve and update the 2018 IRMA Standard for Responsible Mining Version 1.0. It is not a finished document, nor seeking final review, but rather is structured to invite a full range of questions, comments and recommendations to improve the IRMA Standard.

This IRMA DRAFT Standard for Responsible Mining and Minerals Processing (v.2.0) has been prepared and updated by the IRMA Secretariat based on learnings from the implementation of the Standard (v.1.0), experience from the first mines independently audited, evolving expectations for best practices in mining to reduce harm, comments and recommendations received from stakeholders and Indigenous rights holders, and the input of subject-specific expert Working Groups convened by IRMA in 2022.

IRMA's Standard has a global reputation for comprehensive in-depth coverage addressing the range of impacts, as well as opportunities for improved benefit sharing, associated with industrial scale mining. This consultation draft proposes a number of new requirements; some may wonder whether IRMA's Standard already includes too many requirements. The proposed additions are suggested for a range of reasons (explained in the text following), including improving auditability by separating multiple expectations that were previously bundled into a single requirement, addressing issues that previously weren't sufficiently covered (e.g. gender, greenhouse gas emissions), and providing more opportunities for mining companies to receive recognition for efforts to improve social and environmental protection.

Please note, expert Working Groups were created to catalyze suggestions for solutions on issues we knew most needed attention in this update process. They were not tasked to come to consensus nor make formal recommendations. Their expertise has made this consultation document wiser and more focused, but work still lies ahead to resolve challenging issues. We encourage all readers to share perspectives to improve how the IRMA system can serve as a tool to promote greater environmental and social responsibility, and create value for improved practices, where mining and minerals processing happens.

The DRAFT Standard 2.0 is thus shared in its current form to begin to catalyze global conversation and stakeholder input. It does not represent content that has been endorsed by IRMA's multistakeholder Board of Directors. IRMA's Board leaders seek the wisdom and guidance of all readers to answer the questions in this document and inform this opportunity to improve the IRMA Standard for Responsible Mining.

IRMA is dedicated to a participatory process including public consultation with a wide range of affected people globally and seeks feedback, comments, questions, and recommendations for improvement of this Standard. IRMA believes that diverse participation and input is a crucial and determining factor in the effectiveness of a Standard that is used to improve environmental and social performance in a sector. To this end, every submission received will be reviewed and considered.

The DRAFT Standard 2.0 is based on content already in practice in the IRMA Standard for Responsible Mining Version 1.0 (2018) for mines in production, combined with the content drafted in the IRMA Standard for Responsible Mineral Development and Exploration (the 'IRMA-Ready' Standard – Draft v1.0 December 2021) and in the IRMA Standard for Responsible Minerals Processing (Draft v1.0 June 2021).

Chapter Structure

BACKGROUND

Each chapter has a short introduction to the issue covered in the chapter, which may include an explanation of why the issue is important, a description of key issues of concern, and the identification of key aspects of recognized or emerging best practice that the standard aims to reflect.

TERMS USED IN THIS CHAPTER

This is a list of the terms used in the chapter ■ Each term is separated with ■

Terms listed here are identified in the chapter with a dashed underline. And they are defined in the Glossary of Terms at the end of the chapter.

OBJECTIVES/INTENT STATEMENT

A description of the key objectives that the chapter is intended to contribute to or meet.

SCOPE OF APPLICATION

A description of the conditions under which the chapter may or may not be relevant for particular mines or mineral processing sites. If the entity can provide evidence that a chapter is not relevant, that chapter will not need to be included in the scope of the IRMA assessment. A requirement is 'not relevant' if the issue to which a requirement relates is not applicable at the site. For example, requirements related to the use of cyanide would not be relevant at a site at which cyanide is never used.

Chapter Requirements

X.X.X. These are criteria headings

X.X.X.X. And these are the requirements that must be met for an IRMA assessment to be issued and subsequently maintained by a site. Most criteria have more than one requirement. All requirements must be met in order to comply fully with the criterion.

a. Some requirements consist of hierarchical elements:
    i. At more than one level.
    ii. Operations may be required to meet all elements in a list, or one or more of the elements of such a list, as specified.

NOTES

Any additional notes related to the chapter and its requirements are explained here.

GLOSSARY OF TERMS USED IN THIS CHAPTER

Terms used in the chapter are defined here.

ANNEXES AND TABLES

Annexes or Tables are found here.

IRMA Critical Requirements

The 2018 IRMA Standard for Responsible Mining v. 1.0 includes a set of requirements identified as being critical requirements. Operations being audited in the IRMA system must at least substantially meet these critical requirements in order to be recognized as achieving the achievement level of IRMA 50 and higher, and any critical requirements not fully met would need to have a corrective action plan in place describing how the requirement will be fully met within specified time frames.

The 2023 updates to the 2018 Standard may edit some critical requirements in the process of revising and therefore there will be a further review specific to the language and implications of critical requirements that follows the overall Standard review.

Associated Documents

This document is an extract of the full DRAFT IRMA FOR RESPONSIBLE MINING AND MINERAL PROCESSING (Version 2.0) – DRAFT VERSION 1.0, released in October 2023 for a public-comment period. The English-language full version should be taken as the definitive version. IRMA reserves the right to publish corrigenda on its web page, and readers of this document should consult the corresponding web page for corrections or clarifications.

Readers should note that in addition to the DRAFT Standard, there are additional policies and guidance materials maintained in other IRMA documents, such as IRMA's Principles of Engagement and Membership Principles, IRMA Guidance Documents for the Standard or specific chapters in the Standard, IRMA Claims and Communications Policy and other resources. These can be found on the IRMA website in the Resources section. Learn more at responsiblemining.net

Comment on the IRMA Standard

> Comments on the IRMA Standard and system are always welcome.
>
> They may be emailed to IRMA at: comments@responsiblemining.net

Additional information about IRMA is available on our website: responsiblemining.net

Chapter 4.1
Waste and Materials Management

NOTES ON THIS CHAPTER: We are proposing a NEW APPROACH to this chapter. In the 2018 Mining Standard, the primary emphasis was on 'mine waste,' which included tailings, waste rock, spent ore from heap leaches, and wastes generated during mineral processing (e.g., residues and used processing fluids, wastes from thermal processing). Much less attention was paid to understanding risks and managing risks from chemicals that were used in the processing, or the chemical constituents of brines, or other substances like fuels, etc. Also, there was little attention paid to the management of non-mine wastes, which can be generated in considerable volumes at industrial-scale mines and processing facilities, and, depending on the wastes, can pose varying degrees of environmental and health hazards.

Proposed additions and changes:

We are proposing to separate the aspects of waste management into two chapters: this Chapter (4.1) will be focused the management of the chemicals and the potential pollution-related aspects of wastes, and a new Chapter 4.X- 'Management of Physical Stability,' currently inserted after Chapter 4.2, has been designed to evaluate the physical stability risks related to mine waste (and other) facilities.

Because the waste issues are now split between two chapters, we have not included criterion 4.1.1 from the 2018 Mining Standard, which required a waste policy, and have opted to focus more on waste assessment and management processes and procedures. Also, most other environmental chapters do not require policies.

We are proposing that this chapter now focus on systems to better understand the hazardous properties of materials and wastes. We are proposing to present requirements according to three categories of materials and wastes (see 'Scope of Application' section, below for more details):

- **Materials and chemicals brought to the site**;
- **Materials that are produced** (or extracted) as part of the mining and mineral processing processes; and
- **Wastes that are produced** (wastes generated by the mining/mineral processing processes, and wastes generated as a result of using the materials and chemicals that are brought to the site).

One of the challenges with having a chapter on wastes and materials management is that there is a considerable overlap with a number of other chapters in the IRMA Standard. Depending on the characteristics and volumes of materials and wastes, as well as treatment and disposal methods, materials/chemicals and wastes have the potential to adversely impact: workers (occupational health and safety), community health and safety, cultural heritage, water quality, air quality, soil quality, biodiversity and ecosystem services, human rights, and Indigenous Peoples' rights.

Thus, we have added numerous cross references to other chapters when information gained through the requirements in 4.1 can be integrated into other chapters. For example, we have retained requirements to characterize the potential contaminants in ore, concentrates and waste rock in this chapter. If contaminants of concern are identified, the risks from those contaminants can be evaluated alongside other risks in the air, water and soil chapters, and then mitigated/managed accordingly.

Other changes:

- We are proposing some management-related requirements, for example, that there be some evidence that efforts are made to reduce the volume of hazardous materials and wastes (using the waste mitigation hierarchy), and that procedures be put in place to ensure safe handling, storage, treatment and disposal of hazardous materials and wastes, and emergency response procedures for accidental releases of the materials.
- Reporting requirements have been updated to be more consistent with other IRMA chapters. (see criterion 4.1.9)

Glossary:

- We are proposing other new/revised definitions for several glossary terms. The 'Terms Used In This Chapter' box shows which terms are new, and the proposed definitions can be found in the glossary at the end of the chapter requirements (and before the Annexes). Feedback on definitions is welcome.

BACKGROUND

Mineral exploration projects, mines and mineral processing operations use various materials and create wastes and products and by-products that, if poorly managed, create risks to human health, safety and the environment. The range of materials and wastes with hazardous characteristics varies significantly from one site to the next, based on the commodity, throughput, processing method, and other factors.

Materials brought to a site that may have hazardous properties include chemicals and reagents used during beneficiation, mineral processing, or wastewater treatment; drilling muds; explosives used in both surface and underground mining; fuels including coal and petroleum products; solvents and lubricants associated with the use and maintenance of machinery; construction fill; and cement.

Also, some materials extracted/produced as a result of exploration, mining and mineral processing operations, such as ores, brines and concentrates, may contain constituents that create ecological or human health hazards if released to the natural environment.

Wastes produced at a site that may have hazardous properties include residues from beneficiation, mineral processing (e.g., tailings, slag) and by-product waste streams from those processes (e.g., mercury from gold recovery/refining); waste rock; spent ores from leaching operations; laboratory wastes; used equipment and batteries; and others. Mining-related operations may also create waste as a result of mitigation or remediation activities such as water treatment residuals or spill cleanup. Additionally, both solid and liquid wastes (e.g., garbage, sewage) are produced at all mining and mineral processing sites.

There are proven technologies and practices to prevent and greatly reduce the potential for materials and wastes to impact human health, safety and the environment. This includes identification of the potential hazards, elimination of the hazards where possible, the use of appropriate design criteria and engineering controls to otherwise minimize risks, regular inspection and maintenance of facilities and equipment, and spill response plans, and appropriate training of workers who transport, handle and work with hazardous materials and wastes.

TERMS USED IN THIS CHAPTER

Acid Rock Drainage (ARD) ■ Affected Communities ■ Artisanal and Small-Scale Mining ■ Associated Facilities ■ Biodiversity ■ Brine NEW ■ Closure ■ Contaminants of Potential Concern (COPCs) NEW ■ Contractors ■ Control ■ Ecosystem Services ■ Entity NEW ■ Exploration NEW ■ Facility NEW ■ Hazard ■ Hazardous Material NEW ■ Hazardous Waste NEW ■ Mercury Emission Control System ■ Mercury Waste ■ Metals Leaching (ML) ■ Mine-Influenced Water ■ Mineral Processing NEW ■ Mining NEW ■ Mitigation ■ Operation NEW ■ Pollution NEW ■ Process Water ■ Project NEW ■ Post-Closure ■ Release ■ Safety Data Sheets NEW ■ Secondary Containment ■ Site NEW ■ Soil Remediation NEW ■ Stakeholder ■ Stormwater ■ Tailings ■ Water Quality Criteria ■ Waste Mitigation Hierarchy NEW ■ Workers ■ Worker Health and Safety Representatives ■

These terms appear in the text with a dashed underline. For definitions see the Glossary of Terms at the end of the chapter.

OBJECTIVES/INTENT OF THIS CHAPTER

To transport, handle, store, treat and dispose of materials and wastes in a manner that protects worker and community health and safety, and the environment.

NOTE ON OBJECTIVES: REVISED. Now references management life cycle (transport, handle, store, treat and dispose), and removed references to physical and chemical risks.

SCOPE OF APPLICATION

RELEVANCE: This chapter is applicable to all exploration, mining, and mineral processing projects and operations that use or produce the materials or create the wastes listed below.

Materials and chemicals transported to the site that may have hazardous properties

- Fuel including petroleum products, coal, etc.
- Solvents, lubricants and anti-freeze used in equipment, machine shops and vehicles
- Explosives used in mining including solid, gel, ammonium nitrate/fuel oil mixtures, detonators and caps
- Mineral beneficiation and processing reagents including chemicals used in flotation, leaching (e.g., cyanide, acids, bases) or other process (e.g., solvent extraction and electrowinning SX/EW, smelting fluxes)
- Ores, concentrates, scrap, or recycled materials purchased/**brought to the site as feedstock** for mineral processing
- Treatment plant chemicals
- Construction fill
- Cement
- Drilling chemicals/mud
- Instrumentation such as weighing gauges (which may contain radioactive elements/radionuclides)

Materials that are produced (or extracted) at the site that may have hazardous properties

- Ore
- Brines
- Concentrate

Wastes produced at the site that may have hazardous properties

- Tailings
- Waste rock (which may be a material considered as a construction material at some sites)
- Overburden
- Spent ore (from heap and dump leach operations)
- Mine-influenced water (e.g., from dewatering of underground or open pit operations, tailings supernatant, industrial stormwater, pregnant and barren solution pond water, seepage from mine facilities, acid mine drainage, treatment plant surge pond water)
- Mineral processing wastes (e.g., slag from iron, copper, lead, zinc or other processing, red and brown muds from bauxite refining, dross from aluminum production, wastes from solvent extraction and electrowinning (SX/EW), refractory lining/bricks, spent pot linings, wet scrubber sludges, baghouse dusts and other residues from thermal processes, wastewaters from various processes, etc.)
- Laboratory waste including chemical and solid waste (e.g., assay crucibles and cupels)
- Equipment and machine shop waste including solvents, waste oil and grease and anti-freeze
- Used batteries, used tires, electronics, etc.
- Unrepairable equipment and machinery, including broken instrumentation such as weighing gauges (which may contain radioactive elements/radionuclides)
- Construction wastes
- Wastes generated during spill cleanup
- Water treatment sludge, residue and materials (e.g., filters)
- Human-generated waste including garbage and sewage produced at sites, accommodations and camps.

NOTE ON SCOPE OF APPLICATION: This proposed version of the IRMA Standard is meant to apply to exploration, mining, and mineral processing projects and operations (see definitions of project and operation), but not all requirements will be relevant in all cases. We have provided some high-level information below, but the IRMA Secretariat will produce a detailed Scope of Application for each chapter that will indicate relevancy on a requirement-by-requirement basis (and will provide some normative language where the expectations may slightly differ for proposed projects versus operations, or for mining versus mineral processing, etc.).

CONSULTATION QUESTION 4.1-1: Can you suggest other materials or wastes that you believe should be included in the list above, or recommend that any of the materials or wastes in the list be removed? Please provide your rationale for suggested inclusions/exclusions.

CRITICAL REQUIREMENTS IN THIS CHAPTER

Mine wastes are not disposed of in rivers, lakes or marine environments (4.1.6.3).[1]

NOTE ON CRITICAL REQUIREMENTS: The 2018 IRMA Standard includes a set of requirements identified as being critical. Projects/operations being audited in the IRMA system must at least substantially meet all critical requirements in order to be recognized at the achievement level of IRMA 50 and higher, and any critical requirements not fully met need a corrective action plan for meeting them within specified time frames.

INPUT WELCOME: The proposed revisions to the 2018 Standard have led to new content, as well as edits of some critical requirements in the process. Therefore, there will be a further review of the language and implications of critical requirements prior to the release of a final v.2.0 of the IRMA Standard. During this consultation period we welcome input on any existing critical requirement, as well as suggestions for others you think should be deemed critical. A rationale for any suggested changes or additions would be appreciated.

Waste and Materials Management Requirements

4.1.1. Identification and Characterization of Materials and Wastes

NOTE FOR 4.1.1: In 4.1.1.3 and 4.1.1.4, below, we use the terms "hazardous material" and "hazardous waste." We recognize that in some jurisdictions these terms may have a regulatory definition. We are not proposing to adopt any one jurisdiction's definition, but rather, use the term hazardous more generally, as in "creating a danger or a risk."

Thus, we are proposing the following definitions:

Hazardous Materials

Chemicals and materials with properties or characteristics that make them a physical, health or environmental hazard.

Hazardous Wastes

Wastes with properties or characteristics that make them a physical, health or environmental hazard.

4.1.1.1. The entity identifies:

a. All chemicals and materials that are transported to the site and associated facilities, including, if relevant, ores, concentrates or other materials from third-parties used as feed materials for mineral processing operations;[2]

b. All solid and semi-solid materials/products that are produced (e.g., ore, concentrates) and wastes that are produced (e.g., tailings or other residues, waste rock, overburden, slag or mineral processing wastes, etc.) as a result of mining-related activities at the site and associated facilities;[3] and

c. All liquid materials/products that are produced (e.g., brines) and liquid wastes that are produced (e.g., mine-influenced waters stored in pregnant and barren solution ponds, tailings supernatant ponds, industrial stormwater ponds, treatment plant surge ponds, etc.) as a result of mining-related activities at the site and associated facilities; and

[1] "Mine waste" include tailings, waste rock, spent ore from heap leaches, wastes generated during mineral processing (e.g., residues and used processing fluids, wastes from thermal processing).

[2] 4.1.1.1.a applies if mineral processing operations purchase feed materials from third parties. However, if the processing operation is integrated with a mining operation that is being assessed, then the ores or concentrates being processed could be considered as being produced as a result of mining-related activities at the site or associated facilities (as per 4.1.1.1.b).

[3] Note that this could include mine waste materials that get re-used or re-purposed, for example as road-bed or construction fill.

d. All wastes that are produced at the site and associated facilities that are not derived from mining or processing activities (e.g., spent equipment, used materials, used containers, garbage, sewage, construction waste, etc.).

NOTE FOR 4.1.1.1: NEW. The results of this requirement feed into 4.1.1.2, below.

We have started a list of potential materials and wastes that may contain chemicals or substances that make them potential hazards. (See the Scope of Application section, above) These can be included in an Annex or in Guidance.

4.1.1.2. For each chemical and material transported to the site or associated facilities (see 4.1.1.1.a), including ores, concentrates or other materials from third-parties used as feed materials for mineral processing operations, the entity:

a. Determines if it has characteristics or properties that make it dangerous or capable of having a harmful effect on human health or safety, the environment, or communities;

b. If relevant, identifies contaminants of potential concern (COPCs) in feed materials purchased for mineral processing operations;[4] and

c. Documents the hazardous properties or characteristics, and the related potential health, safety, environmental or community impacts.

NOTE FOR 4.1.1.2: REVISED. 4.1.1.2.a was previously 4.1.2.1.a in the 2018 Mining Standard.

Re: 4.1.1.2.a, in guidance note we can elaborate on methods that could be used to identify chemicals, materials and wastes that pose hazards.[5]

And we can add more guidance on what sorts of chemicals and materials might pose physical, health or environmental hazards. For example, the UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS) elaborates on chemicals and physical, health and environmental hazards.[6]

4.1.1.2.b is NEW. This information will feed into risk assessments in 4.1.3.1.

CONSULTATION QUESTION 4.1-2

Background: We are not proposing to require that mineral processing entities carry out a chemical characterization of purchased ore, concentrates or other feed materials from third-party suppliers, as we are assuming that elements present at concentrations in the feed with the potential to impact human health or the environment would be disclosed as part of the contract with the supplier. However, this is an assumption,

[4] For materials coming from third parties to be used as feedstock for mineral processing operations, if the supplier does not disclose to the entity detailed information on the principal components and contaminants that are considered likely to be routinely or periodically present in feed materials, the entity will need to carry out some sort of characterization to determine this for themselves.

[5] For example, hazardous properties of chemicals and some materials being used (or that will end up as wastes) can be found in Material Safety Data Sheets (also referred to as Safety Data Sheets) provided by chemical manufacturers, and also on International Chemical Safety Cards (International Labour Organization/World Health Organization International Chemical Safety Cards (ICSCs) available at: https://www.ilo.org/safework/info/publications/WCMS_113134/lang--en/index.htm)

[6] The United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS) lists properties of chemicals, including: Chemicals posing physical hazards (e.g., explosives, flammable gases, aerosols and chemicals under pressure, oxidizing gases, gases under pressure, flammable liquids, flammable solids, self-reactive substances and mixtures, pyrophoric liquids, pyrophoric solids, self-heating substances and mixtures, substances and mixtures that emit flammable gases when in contact with water, oxidizing liquids, oxidizing solids, organic peroxides, corrosive to metals, desensitized explosives).

For health hazards the properties include acute toxicity, skin corrosion/irritation, serious eye damage/irritation, respiratory or skin sensitization, germ cell mutagenicity, carcinogenicity, reproductive toxicity, specific target organ toxicity (single or repeated exposure) and aspiration hazard.

For environmental hazards, properties include being hazardous to the aquatic environment or hazardous to the ozone layer. (EDITORIAL NOTE: Others would likely go beyond these factors to include not only hazards to aquatic but also terrestrial environment, including any living organizations within those environments).

(Source: United Nations. Globally Harmonized System of Classification and Labelling of Chemicals (GHS). 9th revised edition. 2021. https://unece.org/transport/standards/transport/dangerous-goods/ghs-rev9-2021)

and we are not clear if all elements that may pose a hazard to humans or the environment are disclosed, or if only those that interfere with or affect the efficiency of the mineral processing are included.

As a result, we have added a footnote for 4.1.1.2.b, that if information from the supplier on feed constituents is not comprehensive, then the mineral processor would need to carry out a characterization in order to credibly predict potentially hazardous emissions and develop strategies to address them.

Question: Do you agree with this approach? Is it reasonable to expect that if supplier information is not sufficient that mineral processors do a thorough analysis of all feed materials in order to fully understand the range and concentrations of potential contaminants that may be emitted to air or present in effluent? If not, then how else can the mineral processor demonstrate to auditors that they fully understand the range of containments that may be released (and that have adequate controls in place to address them)?

4.1.1.3. For each solid or semi-solid material and waste produced as a result of mining-related activities (as identified in 4.1.1.1.b), a chemical characterization, using industry best practice, is carried out to determine the potential for acid rock drainage (ARD), and the potential for contaminant or metals leaching (ML), including, as relevant:

a. Analysis of petrology, mineralogy, and mineralization;
b. Identification of geochemical test units or representative ranges of chemical composition;
c. Estimation of an appropriate number of samples for each geochemical test unit or range of material compositions;
b. Performance of comprehensive geochemical testing on all samples from each geochemical test unit, or, for solid wastes for which geochemical test units are not relevant (e.g., mineral sands), on samples representative of the range of compositions;[7] and
c. Identification of COPCs for each material.[8]

NOTE ON 4.1.1.3: REVISED. This requirement was 4.1.3.2 in the 2018 Mining Standard.

The requirement now has more detail, as it was unclear that both the potential for acid rock drainage (ARD) and the potential for metal/contaminant leaching from materials need to be evaluated. Depending on the ore and waste mineralogy, some mines can have a low ARD potential but still leach metals, sulfate, and other contaminants of concern at circumneutral pH or higher. For example, Price (2009) reports that "Circumneutral drainage can contain relatively high dissolved concentrations of trace elements such as nickel, cobalt, zinc, molybdenum, arsenic, and antimony. Concentrations of molybdenum, arsenic, and antimony, in particular, may remain elevated even as pH increases above 7."[9]

Additionally, we have elaborated in a footnote that "comprehensive geochemical testing" of solids should include tests for radioactivity, as this is a concern for worker exposure at some mining operations and may also show up in the mined ores or wastes. An example is the Lisbon Valley Copper Mine, an active, open pit, heap leach copper mine in southeastern Utah, USA, that has identified uranium as a constituent of concern and is located near uranium deposits.[10]

[7] Comprehensive testing would include determining ARD potential, metal/contaminant leaching potential, and an estimate of radioactivity for relevant solids materials using a gamma or scintillation counter or similar instrumentation.

[8] COPCs are identified using the results of laboratory short-term and long-term (kinetic) leach tests or results of chemical analysis of extracted brines and liquid wastes. If laboratory leachate, brine or liquid waste concentrations exceed numeric IRMA water quality criteria (Tables 4.2.a – 4.2.h), those constituents are identified as COPCs. A risk assessment will be conducted to determine final COCs (see 4.1.3.1.b).

[9] Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December, 579 pages. https://mend-nedem.org/wp-content/uploads/1.20.1_PredictionManual.pdf

[10] See Lisbon Valley Mining Company, 2022. Notice of intent to commence large mining operations & modification of plan of operations. https://eplanning.blm.gov/public_projects/2023385/200544401/20073334/250079516/2022%2010%2024%20LVMC_Proposed%20Plan%20of%20Operations%20Modification%20UTU-72499.pdf

4.1.1.4. For each liquid material and waste produced as a result of mining-related activities (as identified in 4.1.1.1.c), chemical characterization is carried out as follows:

a. Full chemical characterization of the liquids and brines for constituents identified in the IRMA water quality criteria (see Tables 4.2.a – 4.2.h in Chapter 4.2); and

b. Identification of the COPCs for each liquid and brine.

NOTE ON 4.1.1.4: NEW. This requirement has been added to ensure that contaminants of potential concern are also identified for mineral processing operations, given that we are proposing that this version of the IRMA Standard also applies to standalone processing facilities. The first audits of lithium operations also identified chemical characterization of brines as something that needed more elaboration.

We can add more detail on tests that can be conducted to determine if wastes have potentially dangerous or harmful characteristics.[11]

4.1.1.5. Chemical characterization of solid, semi-solid and liquid materials/products and wastes produced as a result of mining-related activities are updated regularly to account for variability in properties and processing.

NOTE ON 4.1.1.5: This requirement aligns with 4.1.3.4 in the 2018 Mining Standard.

4.1.1.6. For each waste material not derived from mining or processing activities (as identified in 4.1.1.1.d), the entity:

a. Determines if the waste has characteristics or properties that make it dangerous or capable of having a harmful effect on human health, safety or the environment; and

b. Documents the hazardous properties or characteristics, and any related potential health, safety or environmental impacts.

NOTE ON 4.1.1.6: NEW. This was a gap identified through early audits. Previously, there was no specific requirement to identify (and therefore, no expectations to manage) waste facilities containing hazardous or harmful substances unrelated to mining or processing activities that could be released to the environment.

We can add more detail on tests that can be conducted to determine if wastes have potentially dangerous or harmful characteristics.

4.1.2. Material and Waste Reduction and Mitigation

NOTE FOR 4.1.2: NEW. This is a new criterion, and all of the requirements within are new.

Other standards refer to the waste mitigation hierarchy, and we have incorporated that concept here. This hierarchy differs from the mitigation hierarchy referred to in other chapters, but like the general mitigation hierarchy the waste mitigation hierarchy sets out a priority of actions that should be taken in managing wastes, moving in order of highest priority to lowest as follows: Prevention, reduction/minimization, re-use, recycling, energy recovery and disposal.

The proposed definition for **waste mitigation hierarchy** is:

> A ranking of waste management options according to what is best for the environment. The priority order is to prevention, reduction, reuse, recycling (including composting), recovery (e.g., of energy from waste) and disposal, with prevention being the most preferred option and the disposal at a landfill being the least preferred option.

[11] For example, the U.S. EPA has information on tests that can undertaken to determine hazardous characteristics of wastes, such as test methods for ignitability (e.g., Pensky-Martens Closed-Cup Method for Determining Ignitability), use of pH values to identify corrosivity (e.g., aqueous wastes with a pH of less than or equal to 2, a pH greater than or equal to 12.5), and Toxicity Characteristic Leaching Procedure (TCLP) to determine toxicity of leachate from wastes. (U.S. Environmental Protection Agency website. "Defining Hazardous Waste." https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes#characteristic)

CONSULTATION QUESTION 4.1-3

Background: There are some who believe that the step of energy recovery from waste (also known as waste-to-energy) should not be part of the hierarchy because waste incineration can lead to toxic air emissions, contribute to climate change, destroy resources that could otherwise be re-used or recycled, and the ash by-product still requires landfilling and management for toxic leachate. Opponents of waste-to-energy argue that it is outdated concept, and cite that some European financial institutions are beginning to exclude the practice from financial support.[12] Others argue that with more efficient incineration technology, the emissions are minimal, and that combustion of wastes results in lower greenhouse gas emissions because landfills generate and release methane, which is a powerful greenhouse gas. And the waste ash can be used, for example in road building, rather than disposed of in a landfill.[13]

Question: Do you think energy recovery from waste is still considered an acceptable practice in terms of human health, safety or environment? Should IRMA include it in the list of waste mitigation hierarchy options?

CONSULTATION QUESTION 4.1-4

Background: The top tiers of the mitigation hierarchy approach (prevention, minimization, re-use, recycling) fits in with the concept of circularity, which was a topic of discussion in one of IRMA's Expert Working Groups in 2022. For example, the top priority in the mitigation hierarchy is to prevent generation of waste in the first place, which aligns with the circularity-based idea of designing and using durable products so that the generation of waste is prevented (rather than using products that by design will be obsolete and thrown away in a short period of time). Circularity also stresses the re-use and repurposing of materials, which is also a high priority in the mitigation hierarchy.

Both mining and mineral processing offer opportunities for re-use/repurposing of waste streams. For example, tailings can be "re-mined" to extract minerals/metals, and mineral processing operations can include recycled content in their processes so that the products are not solely from newly mined materials. However, these opportunities may not exist at every site, or there may be technical, environmental, safety or climate implications that create obstacles or barriers to implementation.

As a result, in this revised chapter we have stopped short of requiring that entities demonstrate that they are integrating circularity concepts, but in requirements 4.1.2.2 and 4.1.2.3 we are proposing that entities at least document a rationale as to why they cannot successfully achieve the higher levels of the mitigation hierarchy such as prevention/reduction and re-use. It is hoped that at least this will get companies exploring circularity concepts.

Question: Should IRMA go further to integrate concepts of circularity into this chapter? For example, rewarding (i.e., give higher ratings to) entities that demonstrate a higher proportion of waste products that are being recycled/re-used/remined than those who clearly are not prioritizing those circularity-type strategies? We'd be interested in your input on this suggestion, or other suggestions for how IRMA might integrate circularly concepts into this chapter or others in the Standard (see also Chapter 2.1, where we are proposing additional circularity requirements - Note for 2.1.3.3, and CONSULTATION QUESTION 2.1-4).

4.1.2.1. For each chemical or material with hazardous properties or characteristics (hereafter referred to as "hazardous material") the entity:

a. Investigates and implements measures to eliminate the use of the hazardous material;
b. Investigates and implements measures to substitute with a material that poses lower physical, health and/or environmental risks, if elimination is not possible; and
c. If elimination or substitution are not possible, carries out a risk assessment to determine the level of risk that the material poses to human health or safety, the environment or communities (see 4.1.3.1).

NOTE ON 4.1.2.1: This requirement doesn't follow the waste mitigation hierarchy, but rather something called the hierarchy of controls, which is applied in the workplace to prevent exposures to hazards. It includes,

[12] For example, see: Zero Waste Europe. "The EU is clear: Waste-To-Energy incineration has no place in the sustainability agenda," https://zerowasteeurope.eu/2021/05/wte-incineration-no-place-sustainability-agenda/

[13] For example, see: "Cooled by Controversy in the U.S., Trash Incinerators are Firing Up in Europe," https://www.wbur.org/hereandnow/2019/05/03/copenhagen-trash-incinerator

in order of priority: elimination, substitution, engineering controls, administrative controls and personal protective equipment.[14]

4.1.2.2. For each waste with hazardous properties or characteristics (hereafter referred to as "hazardous waste"), the entity:

a. Investigates and implements measures to mitigate risks in a manner that aligns with the waste mitigation hierarchy, taking into consideration the potential human health, safety and environmental impacts of each option.[15] Options are evaluated in the following order of priority:
    i. Prevent generation of the hazardous waste;
    ii. Reduce the generation of the hazardous waste;
    iii. Re-use (or remine) hazardous wastes;
    iv. Recycle hazardous wastes;
    v. Recover energy from the wastes; and
    vi. Dispose of any remaining hazardous waste;
b. Documents the rationale for any decisions that do not conform with the waste mitigation hierarchy; and
c. Carries out risk assessment(s) to determine the level of risk to human health, safety and the environment associated with all selected mitigation strategies for the hazardous waste (see 4.1.3.1).

NOTE ON 4.1.2.2: As mentioned in the Note for 4.1.2, this requirement uses the waste mitigation hierarchy. The reason we are proposing that a risk assessment still be done after applying the hierarchy is that there will be associated risks with any of the hierarchy steps below prevention. For example, even if the generation of hazardous waste is reduced, there will still be some hazardous waste that will present a risk. Similarly, even the recycling of hazardous wastes will come with risks that need to be managed.

We have added the caveat in 4.1.2.2.a that in evaluating options according to the waste mitigation hierarchy, entities should be "taking into consideration the potential health, safety and environmental impacts of each option." This is added because it may be the case that a higher-priority option may have greater health, safety or environmental impacts. Therefore, options should be evaluated with all potential impacts in mind.

4.1.2.3. For each non-hazardous waste, the entity:

a. Develops and implements measures in a manner that aligns with the waste mitigation hierarchy, taking into consideration the potential health, safety and environmental impacts of each option.[16] Options are evaluated in the following order of priority:
    i. Prevent generation of non-hazardous waste;
    ii. Reduce generation of non-hazardous waste;
    iii. Re-use the waste products;
    iv. Recycle wastes (or compost food or organic wastes);
    v. Recover energy from the waste; and
    vi. Dispose of any remaining waste;

[14] Centers for Disease Control and Prevention web site. "Hierarchy of Controls." https://www.cdc.gov/niosh/topics/hierarchy/default.html

[15] When considering the waste hierarchy, the highest option in the priority order should be chosen wherever possible, however, impact considerations must be taken into account. This may result in a lower option in the hierarchy being chosen but results in a better overall environmental outcome. (See, e.g., Guidance on Applying the Waste Mitigation Hierarchy to Hazardous Waste. UK Department for Environment, Food and Rural Affairs and Llywodraeth Cymru Welsh Government." 2011. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69457/pb13687-hazardous-waste-hierarchy-111202.pdf)

[16] Ibid. For more information on the non-hazardous waste management hierarchy, see: https://ec.europa.eu/environment/green-growth/waste-prevention-and-management/index_en.htm; or U.S. EPA. Sustainable Materials Management: Non-Hazardous Materials and Waste Management Hierarchy. https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy

b. Documents the rationale for any decisions that do not conform with the waste mitigation hierarchy; and

c. If prevention, reduction, re-use and recycling are not possible or do not entirely eliminate the waste, the entity determines if remaining treatment and/or disposal methods may adversely affect human health, safety or the environment. If there are potential risks associated with the selected method the entity assesses the risks as per 4.1.3.1.

NOTE FOR 4.1.2.3: Because the objective of many IRMA's chapters, including this one, includes the protection of human health, safety and the environment, our approach has been that materials and wastes with hazardous properties should be the primary focus of this chapter, as they pose the most material risks. However, there can be risks from non-hazardous wastes as well, which is why requirement 4.1.2.3 is being proposed. For example, even if wastes do not contain hazardous elements, per se, the disposal method may create hazards (e.g., improperly managed sewage or garbage can lead to impacts on water, aquatic ecosystems and human health, and the inefficient incineration of garbage or waste materials can lead to impacts on air quality and human health).

It is not clear, however, how much emphasis, if any, should be given to applying the mitigation hierarchy to non-hazardous materials, such reducing the use of office supplies or construction materials, or re-using equipment that could be repaired rather than replaced, substituting certain materials with ones that are produced in a more socially or environmentally responsible manner, etc.

CONSULTATION QUESTION 4.1-5: Currently, while we have some limited requirements for non-hazardous wastes, we have not included requirements related to non-hazardous materials, such as materials used in construction of buildings. Do you agree with this approach, or do you think IRMA should include requirements for non-hazardous materials? If you believe there should be requirements, what would you suggest would be appropriate expectations regarding non-hazardous materials? And are there particular types of non-hazardous materials that warrant a greater focus than others?

CONSULTATION QUESTION 4.1-6: Regarding non-hazardous wastes, would it be reasonable to limit this requirement to the non-hazardous wastes that are most likely to have associated environmental and health risks (e.g., wastes like garbage dumps/landfills and sewage). Or should all non-hazardous wastes be evaluated? Also, are there additional requirements for non-hazardous wastes that should be added? For example, currently we do not require procedures or management plans for non-hazardous waste facilities, based on the assumption that any significant risks and subsequent mitigation measures (e.g., to control seepage or air emissions) would be incorporated into the plans in those chapters.

4.1.3. Assessment of Hazardous Materials and Hazardous Wastes

4.1.3.1. The risks posed to human health or safety, the environment, or communities from hazardous materials, hazardous wastes and, if relevant, non-hazardous wastes[17] that are extracted, used or produced by the project/operation, are assessed as follows:

a. The entity maps the existing or planned locations where hazardous materials, hazardous wastes and, if relevant, non-hazardous wastes are transported to, stored, used, treated and/or disposed on-site, at associated facilities, or off-site; and

b. Information on the materials and wastes (e.g., known hazards, volumes, storage, usage, treatment and disposal locations, transport routes, etc.) is integrated into existing risk assessments, as relevant:[18]

   i. Environmental and social impact assessment (Chapter 2.1);

   ii. Emergency preparedness and response (Chapter 2.5);

[17] There can still be risks from non-hazardous wastes. Even if the waste materials themselves do not contain hazardous elements, per se, the disposal method may create risks. For example, depending on the contents, garbage can lead to impacts air quality and human health if incinerated.

[18] If risks are identified through those assessments, then mitigation, management, monitoring and reporting are carried out as required in the associated chapter.

iii. Worker occupational health and safety (Chapter 3.2);
iv. Community health and safety (Chapter 3.3);
v. Water (Chapter 4.2);
vi. Physical stability of facilities (proposed Chapter 4.X);
vii. Air (Chapter 4.3)
viii. Biodiversity and ecosystem services (Chapter 4.6); and
ix. Soil (proposed Chapter 4.XX).

NOTE FOR 4.1.3.1: REVISED. In the 2018 Mining Standard, 4.1.3.1 required the identification "mine waste facilities that have the potential to be associated with waste discharges or incidents [...] that could lead to impacts on human health, safety, the environment or communities". We have expanded the scope and clarified to align with the new approach proposed for this chapter: mapping of locations (a), and information on the materials and waste (b).

4.1.4. Management of Hazardous Materials

4.1.4.1. For each identified hazardous material, the entity develops and implements procedures for the safe transportation (to the site and associated facilities), handling and storage, as follows:

a. Storage container and conveyance materials are appropriate for the specific hazardous contents;
b. Engineering controls are implemented to prevent the release of the hazardous materials into the work or natural environment, including, but not limited to: [19]
    i. Constructing impermeable secondary containment in areas where hazardous material is unloaded, mixed, processed or stored, and for pipelines containing or solutions that have hazardous properties, including pipelines carrying process water/solutions that have a concentration of 0.5 mg/l weak acid dissociable (WAD) cyanide or greater;[20]
    ii. Secondary containment that holds at least 110% of the largest tank within the containment area plus additional capacity for the design storm event; and
    iii. Audible alarms, interlock systems, and/or sumps;
c. Appropriate protective equipment and clothing are provided to relevant workers;[21]
d. Appropriate hygiene practices are implemented in relevant work areas (e.g., locations and situations where eating, drinking, and/or smoking are prohibited); and
e. Occupational health and safety training aligns with requirements in Chapter 3.2, and includes instruction on:[22]
    i. Where to find safety data information (e.g., safety data sheets) and other relevant information related to the chemicals/materials of concern; and
    ii. Appropriate methods for transporting, handling, storing,[23] using and disposing of hazardous materials.

NOTE FOR 4.1.4.1: REVISED. In the 2018 Mining Standard, 4.1.2.1.b required entities to "Document and implement procedures for the safe transport, handling, storage and disposal of those materials, substances

[19] Other mitigation measures/controls to prevent environmental releases may be developed as part of the water management chapter (see Annex 4.2-B), and the physical stability management chapter (see Annex 4.X.A).

[20] For example, if pipelines are carrying process water/solutions that have a concentration of 0.5 mg/l WAD cyanide or greater.

[21] Guidance: Depending on the hazards and potential exposure routes, appropriate equipment may include eye, face, skin or respiratory protection, and there may be special requirements (e.g., a specific type of glove material, such as PVC or nitrile rubber gloves, depending on the breakthrough time of the glove material).

[22] See criterion 3.2.7 in Chapter 3.2 (Occupational Health and Safety).

[23] Guidance: e.g., ventilation, temperature, moisture, identification of incompatible materials, and other conditions for safe storage.

and wastes [that have the potential to cause impacts on human health, safety, the environment or communities]."

We have added more detail here, so that there can be consistency in what is evaluated by auditors.

4.1.4.1 does not include disposal, because that is covered in 4.1.4.2, below. Also, note that this requirement does not address the safe use of the hazardous materials, as that should be covered by the occupational health and safety (OHS) requirements in Chapter 3.2.

We recognize that a lot of this material overlaps with other chapters. For example:

- There are specific occupational health and safety elements included above (e.g., protective equipment and clothing, training to minimize health and safety risks to workers are covered in 4.1.3.1 (c), (d) and (e), while other requirements related to occupation health and safety are more generally covered in Chapter 3.2).
- The reference to engineering controls in 4.1.3.1 (a) and (b) would be mitigation measures to prevent or minimize risks to water or soil.

Our intention is that these procedures should be integrated into the management plans, training programs, etc., in other chapters. But we are proposing to include them here so that they will get specific attention during audits, and sites will get a performance rating on these elements. If they are not included here, then they will be one of many elements in the OHS, water, or soil chapters that need to be assessed, and as a result, could potentially be overlooked.

We are also aware that we do not want to either reward or penalize entities for the same action twice. To avoid "double-counting" we could add guidance for auditors on the appropriate way to audit this requirement. Or we could try to reorganize this material to integrate it into the relevant other chapters.

CONSULTATION QUESTION 4.1-7: Do you agree with the current approach in 4.1.3.1 (and 4.1.4.1) of including some specific elements, even though they overlap with other chapters? Or should we try to integrate the relevant requirements from this chapter into the chapters on OHS, water, or other relevant chapters?

4.1.4.2. The entity develops and implements a system to document information on hazardous materials, including at minimum:

a. The annual quantity of hazardous materials transported to the site and associated facilities, and the quantity produced at the site and associated facilities;[24]
b. The annual quantity used at the site and associated facilities, and the quantity transferred off-site;
c. The storage and usage locations on-site and at associated facilities; and
d. And shipping dates and supplier information for materials coming to the site and associated facilities, and shipping dates and receiver information for any hazardous materials (e.g., ores, concentrates, brines) transported off-site.

NOTE FOR 4.1.4.2: NEW. We have added two requirements related to the documentation of information on hazardous materials (4.1.4.2) and hazardous wastes (4.1.5.2). They include some quantitative metrics that are aligned with the Global Reporting Initiative Standards GRI 301:Materials and 306:Waste.

4.1.5. Management of Hazardous Wastes

[24] Hazardous materials transported to the site may include chemicals, fuels or other materials that have hazardous properties. They could also include ores or concentrates purchased from other sites.

Produced materials that may have hazardous properties/characteristics include ores, brines and concentrates.

4.1.5.1. For each identified hazardous waste, the entity develops and implements procedures for their safe handling, storage, re-use, recycling, treatment and disposal at the site and associated facilities, and, if relevant, procedures for safe transport (e.g., to off-site treatment, disposal, recycling or re-use facilities), as follows:

a. Disposal container or containment materials are appropriate for the specific hazardous contents;
b. Engineering controls are implemented to prevent the release of the hazardous wastes or their components into the environment including, as relevant:[25]
    i. A leachate/run-off collection system;
    i. Impermeable secondary containment for pipelines containing mine-influenced waters that have hazardous properties; and
    ii. Facility designs that incorporate safe freeboard levels;
c. Protective equipment and clothing are provided to relevant workers to prevent illness or injury from exposure to hazards;[26] and
d. Occupational health and safety training aligns with requirements in Chapter 3.2, and includes instruction on:[27]
    i. Where to locate safety data sheets and other relevant information related to the chemicals of concern; and
    ii. Appropriate transport, handling, storage, re-use, recycling, treatment and disposal methods to employ, including any special precautions and prohibitions.[28]

NOTE FOR 4.1.5.1: NEW. As with requirement 4.1.5.1, we recognize that a lot of the material in 4.1.4.1 overlaps with other chapters. Please see CONSULTATION QUESTION 4.1-7 in the note for 4.1.4.1.

CONSULTATION QUESTION 4.1-8: Currently, in engineering controls in 4.1.5.1.b, we are only including leachate/runoff collection system. Can you recommend other controls that should be implemented for on-site hazardous waste facilities?

4.1.5.2. The entity develops and implements a system for documenting information on the generation, transportation, treatment and disposal (on-site and off-site) of hazardous wastes, including, at minimum:

a. Waste volumes generated, including solids/liquids contents;
b. Engineering controls being used to prevent the release of hazardous wastes into the environment;
c. Waste treatment and disposal locations (on-site and off-site);
d. Waste transport, treatment, and disposal dates/periods; and
e. Regulatory authorization for any waste management vendors engaged by the company for transport, and off-site treatment or disposal.

NOTE FOR 4.1.5.2: NEW. We have added two requirements related to the documentation of information on hazardous materials (4.1.4.2) and hazardous wastes (4.1.5.2). They include some quantitative metrics that are aligned with the Global Reporting Initiative Standards GRI 301:Materials and 306:Waste.

4.1.6. Requirements to Address Specific Hazardous Materials and Hazardous Wastes

[25] Depending on the risks, other mitigation measures/controls or monitoring may need to be developed as part of the water management chapter (see Annex 4.2-B), and the physical stability management chapter (see Annex 4.X.A), for example monitoring of seismic, ground, or water level movement in areas near hazardous waste facilities.

[26] Guidance: such as appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure, and any special requirements and information (e.g., specific type of glove material, such as PVC or nitrile rubber gloves, and breakthrough time of the glove material.

[27] See criterion 3.2.7 in Chapter 3.2 (Occupational Health and Safety).

[28] For example, there may be special precautions to take for particular circumstances, or there may be practices like disposal of wastes into sewage systems or incineration that are prohibited. This information needs to be conveyed to workers.

4.1.6.1. If cyanide will be transported to and stored on-site in bags or bulk containers, or used as a chemical in any aspect of mining, beneficiation, or processing:

a. If the operation is eligible, it obtains certification of compliance with the International Cyanide Management Code (The Cyanide Code) in accordance with the verification requirements of the International Cyanide Management Institute (ICMI). If the operation is not eligible to be certified by the ICMI, the operation's cyanide management practices shall be:
    i. Assessed against the Cyanide Code's "Gold Mining Operation Verification Protocol" by auditors meeting ICMI requirements; and
    ii. Verified as meeting the Cyanide Code requirements; and
b. Cyanide producers and transporters supplying the operation are certified as meeting the "Cyanide Production and Transport Practices" of the Cyanide Code.

NOTE FOR 4.1.6.1: MOVED. This requirement combines the requirements from criterion 4.7.1 in Chapter 4.7 – 'Cyanide Management' of the 2018 Mining Standard. We are proposing to delete that chapter, as much of the content overlaps with other chapters. This requirement is one that is very specific to cyanide, however, and so we are proposing to include it here, given that cyanide is hazardous chemical.

Other requirements from Chapter 4.7 are now largely covered elsewhere (e.g., 4.7.2.1 is now covered in 4.1.4.1.b; 4.7.3.1 is covered in 4.2.4.5; 4.2.4.1 is covered in 4.2.1.1.a and 4.2.5.1; 4.2.4.1 is covered in 4.2.5.1; and 4.7.5.1 is covered in 4.2.7.2)

4.1.6.2. If mercury is present in ore, concentrates or waste materials:[29]

a. The entity performs, documents and annual updates a mercury mass balance based on the calculated amount of mercury in the ore and waste materials, and the amount of mercury that is:
    i. Released to air; [30]
    ii. Recovered (e.g., from mercury emissions control systems) or produced as a by-product (e.g., from gold and/or silver heap leach processes); [31] and
    iii. Resident in tailings impoundments, waste rock dumps, or processing waste facilities (on-site and/or off-site).
b. Mercury wastes from mercury emission control systems:
    i. Are sent to a regulated repository that accepts mercury wastes; or
    ii. Are stored on-site or disposed with tailings or with other materials, such as heap or dump leach materials during or after operations (on- or off-site) only if a risk-based evaluation of the storage or disposal of mercury waste demonstrates that the risk of long-term air or water pollution is low, and disposal occurs in fully lined facilities using synthetic liners that have a permeability of 10^{-9} cm/sec or less and a leachate collection system.
c. Mercury recovered from mercury emission control systems or produced as a by-product (e.g., from heap leach processes):
    i. Is only sold for an end use listed in Annex A (Products) or Annex B (Processes) of the Minamata Convention on Mercury, subject to the appropriate phase-out dates;[32] and
    ii. Is not sold or given away either directly or indirectly to an entity engaged in artisanal or small-scale mining.
d. If mercury is stored or disposed of with tailings or with other materials on-site (see 4.1.6.2.c.ii):

[29] This would be identified in the process outlined in 4.1.1.3.

[30] This information would be derived from the mercury air quality monitoring program in Chapter 4.3 (see 4.3.5.5.b)

[31] Some of this information would be derived from the mercury air quality monitoring program in Chapter 4.3 (see 4.3.5.5.b).

[32] Annex A and B also list phase out dates after which the manufacture, import or export of the product shall not be allowed. Companies are expected to comply with those phase-out dates. The Minamata Convention text and Annexes are at: https://mercuryconvention.org/en/about

i. Sampling for mercury in groundwater and surface water is integrated into the monitoring program for water in Chapter 4.2;[33] and mercury monitoring is included in the air monitoring program plan in Chapter 4.3; and

ii. The entity carries out environmental impacts monitoring (e.g., fish tissue and stream sediment mercury levels) in locations that are most likely to promote methylation, such as still waters, wetlands, and anaerobic sediment.

NOTE FOR 4.1.6.2: MOVED. This requirement used to be in Chapter 4.8 – Mercury Management. We are proposing to delete Chapter 4.8 – 'Mercury Management' and integrate the requirements into other relevant chapters so that auditors with specialty in water, air, soils, etc., are able to evaluate the requirements alongside other water, air and soil requirements (since the documentation being reviewed in those chapters should also contain mercury-related information, if they are relevant to the project/operation), rather than having a single auditor cross the different areas of expertise.

The characterization of mined material and products occurs in this chapter, and because mercury is a hazardous material that is toxic to people and the environment, we are proposing to include some mercury-specific requirements related to management and disposal in this chapter. Other requirements from Chapter 4.8 (such as monitoring) are now covered elsewhere (e.g., most of 4.8.3.2 and 4.8.3.3 are now covered in Chapter 4.3, and 4.8.3.2.b is now in 4.2.2.1.a.iv). We cross-reference with other chapters where additional mercury-related issues may need to be addressed.

We also REVISED some of the requirements from the 2018 Mining Standard.

- 4.1.6.2.a. Changed to require that the following sub-requirements occur any time mercury is present in ore, concentrates or waste materials. Previously it was only if there was a mercury control system, which is a limited circumstance, and so some sources of mercury could be overlooked (e.g., mercury in tailings, etc.).
- 4.1.6.2.a.ii. This requirement previously said "produced as by-product." At some operations, mercury by-product can be produced through a series of steps. For example, mercury occurs naturally in some gold and silver ore bodies. Because mercury has such a strong affinity for cyanide, mercury can be leached along with the gold and follow it through the gold refining steps (e.g., carbon adsorption and electrowinning or zinc cementation). If mercury retorts and other processes are used to separate mercury from the gold, then a mercury by-product can be produced. We added "recovered," as some mercury may also be recovered from emissions controls systems.
- 4.1.6.2.b.ii. Added that if disposal occurs there not only needs to be a liner, but also a leachate collection system, as it is important that any leachate that contains mercury be collected and managed appropriately.
- 4.1.6.2.c. Added "or produced as a by-product." As explained in the note for 4.1.6.2.a.ii, mercury can be recovered, but also produced as a by-product. Also added "subject to the appropriate phase-out dates," as some end uses in Annex A of the Minamata Convention have now been phased out.

4.1.6.3. (Critical Requirement)
Entities neither propose to nor actually dispose of mine wastes in natural water bodies (i.e., rivers, lakes or marine environments).[34]

NOTE FOR 4.1.6.3: This requirement was 4.1.8.1 in the 2018 Mining Standard. The wording has changed slightly, but the intent is the same.

[33] This would be incorporated into the water sampling and analysis plan (see 4.2.2.1.a.iv and the accompanying footnote).

[34] "Mine waste" include tailings, waste rock, spent ore from heap leaches, wastes generated during mineral processing (e.g., residues and used processing fluids, wastes from thermal processing).

CONSULTATION QUESTIONS 4.1-9

Background: The intent of this requirement is that responsible entities do not dispose of mine wastes (e.g., tailings, waste rock, mineral processing wastes, etc.) in natural water bodies, and if new projects are proposed that would require this form of disposal, then those projects should not go forward unless alternative disposal practices can be developed.

Question: Should IRMA consider expanding this requirement to include all hazardous wastes? Or all wastes (even if they are non-hazardous), since dumping of wastes into water bodies is not best practice for any type of waste?

CONSULTATION QUESTION 4.1-10

Background: There may be cases where riverine, lake, or marine disposal of tailings, waste rock, or other mine wastes was used in the past at a site, but the practice is no longer being used. Or where the practice was used but the site changed ownership and the new owner is wanting to do things better, and as a result, is using other disposal practices.

In such situations, it seems like providing some sort of remediation to address the impacts from past water-based-disposal practices, if possible, might lead to better outcomes than simply giving sites a 'does not meet' rating on this requirement.

Question: Should IRMA consider adding a remediation step to enable sites that are no longer using these practices but did so in the past to at least partially, or possibly even substantially, meet this requirement? Remediation for damage that has been done might include, for example, waste removal and ecosystem restoration, and/or some sort of offset to create an equivalent ecosystem or ecosystem services elsewhere, or providing other forms of compensation. This is the approach taken in Chapter 4.6 for historic soil pollution.

4.1.7. Spill Preparedness and Response Planning

NOTE ON 4.1.7: The requirements in 4.1.7, below, pertain to on-site spills of materials or wastes that may affect workers. If there are scenarios where spills might occur off-site (e.g., due to transportation accidents) and affect communities or natural resources, then those hazard scenarios would be included in Chapter 2.5 – 'Community Emergency Preparedness and Response.'

4.1.7.1. The entity develops spill response plans (or equivalent)[35] to manage off-site and on-site spills, leaks, or releases of identified hazardous materials and hazardous wastes, and trains relevant workers, contractors and emergency response providers on the following:[36]

a. Procedures, methods and materials used for containment, clean-up, decontamination, and remediation;[37]
b. Instructions for evacuations, if relevant;
c. Appropriate personal protective equipment and clothing for workers or contractors engaged in spill response;[38]
d. Any relevant fire-fighting measures, including:

[35] For example, this may be called a Spill Response Plan, or Spill Prevention and Response plan if combined with preventative procedures (e.g., those in 4.1.4.1 and 4.1.5.1)

[36] The plans or procedures may include different responses for large and small spills where the spill volume has a significant impact on the hazard. And the plans or procedures may be integrated into the OHS Emergency Response Plan (See 3.2.3.6), or may be standalone plans.

If spills might affect off-site communities, these hazards would need to be included in the risk assessment and procedures developed as per Chapter 2.5, which addresses Community Emergency Preparedness and Response Planning.

[37] Guidance: e.g., containment could include covering the drains and capping procedures, etc., and clean-up and decontamination could include techniques for neutralization, adsorbent materials, cleaning or vacuuming, etc.

Remediation of soil or groundwater may be necessary.

[38] Guidance: Use of personal precautions could include, for example, removing ignition sources or moving to an area with sufficient ventilation) and protective equipment and clothing may include respirators, safety glasses, gloves or other equipment to prevent skin, eyes.

i. Appropriate extinguishing equipment, and information about equipment that is not appropriate for a particular situation; and

ii. Special protective equipment or precautions related to hazardous combustion products;

e. Relevant first-aid instructions for exposures that may occur during spill response, including:

i. Instructions on where to locate safety data sheets and other relevant information related to the chemicals of concerns

ii. Instructions for all relevant routes of exposure for relevant chemicals (inhalation, skin and eye contact, and ingestion);

iii. Description of likely symptoms or effects related to exposure to relevant chemicals, including symptoms that are acute or delayed; and

iv. Instructions on any immediate medical care and treatment(s).

NOTE FOR 4.1.7.1: NEW. There were no specific spill response requirements in the 2018 Mining Standard.

Some entities may wish to combine these plans with spill prevention measures (which would be part of 4.1.3.1 or 4.1.4.1) into a Spill Prevention and Response Plan.

Similarly, some may wish to integrate workplace-specific spill-related procedures as part of their Emergency Preparedness and Response Plans prepared in Chapter 3.2, requirement 3.2.3.6.

If spills have the potential to affect off-site communities, these hazards would need to be included in the risk assessment and procedures developed as per Chapter 2.5, which addresses Community Emergency Preparedness and Response Planning.

Any approach is fine, as long as all of the relevant elements are covered in a plan(s) or set of procedures, and the appropriate people are trained in response procedures.

4.1.7.2. Spill response plans (or equivalent) related to hazardous materials and hazardous wastes are prepared in collaboration with relevant workers, contractors and/or worker health and safety representatives, and, if relevant, local first responders, communities and government agencies.[39]

NOTE FOR 4.1.7.2: NEW. There were no specific spill response requirements in the 2018 Mining Standard. This requirement aligns with requirements in Chapters 2.5 and 3.2, where the expectation is that those who will be intimately involved in or affected by emergency response procedures are also engaged in the preparation of those plans.

4.1.8. Inspections

4.1.8.1. Annually or more frequently the entity inspects:

a. The condition of areas where hazardous materials and hazardous wastes are handled, mixed, stored or disposed of on-site or at associated facilities;[40]

b. The condition of storage and conveyance structures, such as tanks, pipes/pipelines, valves flanges;

c. The integrity of secondary containment systems;

d. The functioning of alarms and sumps; and

e. The effectiveness of any other control or mitigation measures (engineered or others) meant to prevent the release of hazardous materials and hazardous wastes in the workplace or to the environment.

NOTE ON 4.1.8.1: REVISED. In the 2018 Mining Standard, sub-requirement 4.1.5.5.c and requirement 4.1.5.6 outlined inspection and monitoring requirements, but the requirements focused only on mine waste facilities

[39] If spills might affect off-site communities, these hazards would need to be included in the risk assessment and procedures developed as per Chapter 2.5, which addresses Community Emergency Preparedness and Response Planning.

[40] By associated facilities, we mean those that are under the control of the entity. If the wastes are being sent to off-site facilities that are run by independent entities, the expectation is that the entity would not carry out inspections of those facilities. See CONSULTATION QUESTION 4.1-13.

(e.g., tailings, waste rock). Specific inspections and surveillance related to physical stability issues at those facilities is now included in proposed Chapter 4.X (criteria 4.X.2 and 4.X.4).

This requirement now focuses on inspection of the facilities where hazardous materials and hazardous wastes are located, and inspection of the systems meant to control movement of those materials and wastes into the workplace or environment where they might cause harm.

CONSULTATION QUESTION 4.1-11: We are proposing annual inspections, but do you think that these types of inspections should occur at a much higher frequency (e.g., weekly, monthly)?

CONSULTATION QUESTION 4.1-12: There will be cases when entities send hazardous wastes to third-party disposal facilities. If those facilities are poorly managed, then it is possible that the entity would be contributing to impacts on human health or safety, or impacts on the environment or communities. Should there be either an up-front due diligence requirement to ensure that any third-party disposal facilities are well managed, adhere to certain standards, etc., and/or should there be any ongoing monitoring of those facilities by the entity?

4.1.8.2. Where waste or materials management procedures or engineering controls are not being effective, the following occurs:

a. If there is an imminent risk to human health or the environment, immediate actions are implemented to remedy the situation and, if necessary, to stop work in the area until the situation is remedied;
b. If risks to human health or the environment are not imminent, remedial actions are implemented as soon as possible, but no later than seven days after the inspection; and
c. The incidents are documented and feed into reviews and updates to hazardous materials management procedures (see 4.1.4), hazardous waste management procedures (see 4.1.5), and occupational health and safety, emergency response, water, air or soil management plans, as relevant.

NOTE FOR 4.1.8.2: NEW. This is similar to expectations in Chapter 3.2 – 'Occupational Health and Safety,' where work can be stopped if unsafe conditions are observed and report. See requirement 3.2.6.1.

4.1.9. Reporting and Disclosure

4.1.9.1. On an annual basis, the entity reports to affected communities on its management of hazardous materials and hazardous wastes.

NOTE FOR 4.1.9.1: REVISED. This was 4.1.7.4 in the 2018 Mining Standard. That requirement was to report to stakeholders, if requested, on mine waste facility management. This is similar to that expectation, except we are proposing that this reporting occur proactively (not be based on stakeholder request) and that reporting relates to hazardous materials and hazardous wastes more generally. The proposed approach is more aligned with other IRMA chapters, where proactive information on management practices is shared (e.g., Chapter 4.2 on water management).

4.1.9.2. An access to information (or equivalent) policy that allows stakeholders to access more detailed information on hazardous materials and hazardous wastes upon request is in place and shared with stakeholders.

NOTE FOR 4.1.9.2: NEW. In the 2018 Mining Standard there was a blanket requirement in Chapter 1.2-Community and Stakeholder Engagement, requirement 1.2.4.1, which states that, "Any information that relates to the mine's performance against the IRMA Standard shall be made available to relevant stakeholders upon request." We are adding this element into each chapter where there was not previously a reporting requirement, to make it clear that information related to the specific topic is included in the blanket requirement.

Note that the requirement for an access to information policy (or equivalent) is being proposed in Chapter 1.2 (see Note for requirement 1.2.4.3).

4.1.9.3. For all hazardous materials and hazardous wastes that may pose a risk to communities, workers or the environment if there were to be an incident or spill, the entity discloses to local authorities and emergency services relevant information on the hazardous properties and health and environmental effects of those materials and wastes.

NOTE FOR 4.1.9.3: NEW. This requirement is being proposed because the information on chemical and waste hazards should be provided to relevant emergency responders, so that they can be prepared for all potential emergency situations.

NOTES

To be developed.

CROSS REFERENCES TO OTHER CHAPTERS

This table will be added when the new content for all chapters is finalized and approved.

GLOSSARY OF TERMS USED IN THIS CHAPTER

PROPOSED NEW DEFINITIONS

Brine

Groundwater, surface water or sea water that contains valuable dissolved minerals at sufficient concentrations to be economically extractable.

Contaminant of Potential Concern (COPC)

Contaminants that may pose a risk to human health or non-human biological receptors (e.g., flora, fauna, fungi).

Entity

A company, corporation, partnership, individual, or other type of organization that is effectively in control of managing an exploration, mining or mineral processing project or operation.

Exploration

A process or range of activities undertaken to find commercially viable concentrations of minerals to mine and to define the available mineral reserve and resource. May occur concurrent with and on the same site as existing mining operations.

Hazard

A potentially dangerous phenomenon, substance, human activity or condition. It may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Source: International Federation of Red Cross and Red Crescent Societies. https://www.ifrc.org/document/hazard-definitions

Hazardous Materials

Chemicals and materials with properties or characteristics that make them a physical, health or environmental hazard.

Hazardous Wastes

Wastes with properties or characteristics that make them a physical, health, or environmental hazard.

Mineral Processing

Activities undertaken to separate valuable and non-valuable minerals and convert the former into an intermediate or final form required by downstream users. In IRMA this includes all forms of physical, chemical, biological and other processes used in the separation and purification of the minerals.

Mining

Activities undertaken to extract minerals, metals and other geologic materials from the earth. Includes extraction of minerals in solid (e.g., rock or ore) and liquid (e.g., brine or solution) forms.

Operation

The set of activities being undertaken for the purpose of extracting and/or processing mineral resources, including the running and management of facilities and infrastructure required to support the activities, and the ongoing legal, environmental, social and governance activities necessary to maintain the business endeavor.

Pollution

Contamination that results in or can result in adverse biological effects to human or ecosystem health. All pollutants are contaminants, but not all contaminants are pollutants. See also 'Contamination'.

Source: Chapman, P. 2006. "Determining when contamination is pollution," Environ. Int. https://doi.org/10.1016/j.envint.2006.09.001

Project

The development phases before a mining or mineral processing operation can begin (e.g., exploration, pre-feasibility, feasibility, conceptual design, planning, permitting). Includes all desk-top and field-based activities, including exploration activities, needed to inform and develop a project proposal, support the environmental and social impact assessment of a proposal, generate information necessary to fulfill regulatory and permitting requirements, engage with stakeholders and rights holders, and maintain the entity's business endeavor.

Release

An unintentional, unpermitted emission of mine-influenced water to the environment. See also 'Discharge'.

Safety Data Sheet

A document giving information on the properties of hazardous chemicals and how they affect health and safety in the workplace.

Source: RJC. https://www.responsiblejewellery.com/wp-content/uploads/RJC-COP-2019-V1.2-Standards.pdf

Secondary Containment

Containment and/or diversionary structures to prevent a release in quantities that may be harmful.

Site

An area that is owned, leased, or otherwise controlled by the entity and where mining-related activities are proposed or are taking place.

Soil Remediation

The treatment of polluted soils to remove contaminants or convert them to harmless products using physical, chemical and biological processes. Ex-situ and in-situ remediation of soils are both commonly applied methods. Soil remediation may also include removal and deposition in repository.

Waste Mitigation Hierarchy

A ranking of waste management options according to what is best for the environment. The priority order is prevention, reduction, reuse, recycling (including composting), recovery (e.g., of energy from waste) and disposal, with prevention being the most preferred option and the disposal at a landfill being the least preferred option.

Workers' Health and Safety Representative

A worker chosen to facilitate communication with senior management on matters related to occupational health and safety, and to participate in and/or have access to information on health and safety risk assessments, monitoring, inspections and investigations. A representative is selected by other workers, or in unionized facilities may be selected by recognized trade union.

EXISTING DEFINITIONS

Acid Rock Drainage (ARD)

The drainage produced when rocks with sulfide or other acid-producing minerals are under oxidizing conditions (exposed to water and oxygen) and generate an acidic water stream. Acid rock drainage generally contains elevated concentrations of metals, sulfate, and other constituents and has a pH < 6. The terms acid mine drainage and acid and metalliferous drainage (both AMD) are sometimes used as synonyms for ARD.

Affected Community

A community that is subject to risks or impacts from a project/operation.

REVISED. Changed wording from project to project/operation.

Artisanal and Small-Scale Mining (ASM)

Formal or informal operations with predominantly simplified forms of exploration, extraction, processing, and transportation. ASM is normally low capital intensive and uses high labor-intensive technology. ASM can include men and women working on an individual basis as well as those working in family groups, in partnership or as members of cooperatives or other types of legal associations and enterprises involving hundreds or thousands of miners. For example, it is common for work groups of 4-10 individuals, sometimes in family units, to share tasks at one single point of mineral extraction (e.g., excavating one tunnel). At the organizational level, groups of 30-300 miners are common, extracting jointly one mineral deposit (e.g., working in different tunnels), and sometimes sharing processing facilities.

Source: OECD. 2016. *OECD Due Diligence Guidance on Responsible Mineral Supply Chains from Conflict Affected and High Risk Areas.*

Associated Facility

Any facility owned or managed by the entity that would not have been constructed, expanded or acquired but for the project/operation and without which the project/operation would not be viable. Examples include but are not limited to stationary physical property such as power plants, port sites, roads, railroads, pipelines, borrow areas, fuel production or preparation facilities, parking areas, shops, offices, housing facilities, construction camps, storage facilities, etc. Associated facilities may be geographically separated from the area hosting the project/operation (i.e., the site). See also 'Facility'.

REVISED. Revised to indicate that a mineral processing facility could be an associated facility for a mining operation if not co-located with the mine.

Biodiversity/Biological Diversity

The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems.

Closure

Refers to the post-reclamation activities that are required to close and secure a site to maintain compliance with environmental and health and safety regulations. It includes interim fluid and site management in addition to post-reclamation monitoring and maintenance during the period when the success of reclamation measures to achieve site-safety, stability, revegetation, and water quality as well as other reclamation objectives is measured and maintained. The closure period is finite and typically no more than ten years in duration.

REVISED. Changed term from 'Mine Closure' to 'Closure', as the term can also apply to stand-alone mineral processing facilities, and some language changed to be less mining-specific.

Contractor

An individual, company, or other legal entity that carries out duties related to a project/operation that are subject to a contractual agreement that defines, for example, work, duties or services, pay, hours or timing, duration of agreement, and that remains independent for employment, tax, and other regulatory purposes. It also includes contracted workers hired through third party contractors (e.g., brokers, agents, or intermediaries) who are performing mining-related activities at the project/operation site or associated facilities at any point during the project/operational life cycle (including prior to or during construction phase). See also 'Mining-Related Activities.'

REVISED. Added contracted worker as a type of contractor. Changed wording from mining project to project/operation.

Control

An act, object (engineered), or system (combination of act and object) intended to prevent or mitigate an unwanted event.

Ecosystem Services

The benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling.

Mercury Emissions Control System

Any system that will limit mercury emissions (either designed specifically for mercury, or mercury capture is a co-benefit), including sorbent technologies that can remove mercury from the gas stream during processing, or oxidation technologies that will increase the percentage of particulate-bound mercury removed by particulate scrubbers.

Mercury Waste

Substances or objects consisting of mercury or mercury compounds, containing mercury or mercury compounds, or contaminated with mercury or mercury compounds, that are disposed of, are intended to be disposed of, or are required to be disposed of by provisions of national law or applicable conventions. Mercury waste does not include ores or waste rock that contain trace quantities of naturally occurring mercury or mercury compounds.

Metals Leaching

The release of metals by contact with solvents. Leaching may be natural or induced (e.g., related to mining operations). Mining commonly accelerates metal leaching. Metals leaching can also be referred to as "contaminant" leaching.

Mine-Influenced Water (MIW)

Any water whose chemical composition has been affected by mining or mineral processing. Also referred to as mining influenced waters or mine-impacted waters. Includes acid rock drainage (ARD), acid mine drainage or acid and metalliferous drainage (AMD), neutral mine drainage, saline drainage, and metallurgical process waters of potential concern. A key characteristic of most mining impacted waters (also known as mining influenced waters) is that they contain elevated metals that have leached from surrounding solids (e.g., waste rock, tailings, mine surfaces, or mineral surfaces in their pathways). This fact is commonly acknowledged by the phrase "metals leaching" (ML), frequently resulting in acronyms such as ARD/ML.

REVISED. Previously 'Mining Impacted Waters'. Now includes more examples of mine-influenced waters.

Mining-Related Activities

Any activities carried out during any phase of the mineral development life cycle for the purpose of locating, extracting and/or producing mineral or metal products. Includes physical activities (e.g., land disturbance and clearing, road building, sampling, drilling, airborne surveys, field studies, construction, ore removal, brine extraction, beneficiation, mineral or brine processing, transport of materials and wastes, waste management, monitoring, reclamation, etc.) and non-physical activities (e.g., project or operational planning, permitting, stakeholder engagement, etc.).

REVISED. Added reference to mineral development life cycle, project/operation, brine.

Post-Closure

The period after reclamation and closure activities have been completed, and long-term management activities (e.g., ongoing monitoring and maintenance, and, if necessary, water management and treatment) are occurring to ensure that a site remains stable and ecological restoration objectives continue to be achieved. This phase continues until final sign-off of site responsibility and relinquishment of post-closure financial assurance can be obtained from the regulator.

REVISED. Changed to be less focused on financial assurance and provide more description of the activities that are taking place.

Process Water

Water that is used to process ore using hydrometallurgical extraction techniques. It commonly contains process chemicals.

Stakeholders

Individuals or groups who are directly or indirectly affected by a project/operation, such as rights holders, as well as those who may have interests in a project/operation and/or the ability to influence its outcome, either positively or negatively.

REVISED. Changed wording from persons to individuals, and from project to project/operation.

Stormwater

Industrial stormwater (also known as contact water) is rainfall, snow or snowmelt runoff that has contacted mined or mineral processing materials (e.g., waste rock, tailings, mine openings, open pits, mineral processing facilities and associated mining roads). Non-industrial stormwater (also known as non-contact water) is rainfall, snow or snowmelt runoff from land and impervious surface areas that do not contain and are not affected by mined or mineral processing materials.

REVISED. Changed wording from persons to individuals, and from project to project/operation.

Tailings

The waste stream resulting from milling and mineral concentration processes that are applied to ground ore (i.e., washing, concentration, and/or treatment). Tailings are typically sand to clay-sized materials that are considered too low in mineral values to be treated further. They are usually discharged in slurry form to a final storage area commonly referred to as a tailings storage facility (TSF) or tailings management facility (TMF).

Water Quality Criteria

Numerical concentrations or a narrative statement recommended to support and maintain a designated water use. Criteria are based on scientific information about the effects of water pollutants on a specific water use.

Worker

All non-management personnel directly employed by the entity.

REVISED. Added that personnel are directly employed by the entity.