

Mineral Development Process



An educational version is available in [Géologie pour tous](#) (in French only)

Stakeholders	Governments and college and university researchers		Prospectors, exploration companies and mining companies						
Phases	1. Surveys and geoscientific studies	2. Exploration			3. Deposit appraisal	4. Construction and commissioning	5. Extraction	6. Reclamation	
Main objectives	Acquire new geoscientific knowledge Understand the formation and evolution of the bedrock and surface deposits Identify mineral potential in Québec's territory	2.1 Mineral occurrence: Discovery of a new mineralized zone 2.2 Worked deposit: Characterization of the mineralized zone and determination of range, orientation and continuity 2.3 Deposit with estimated tonnage: Estimation of the mineral inventory of a worked deposit and assessment of its preliminary economic potential	2.1 Mineral occurrence	2.2 Worked deposit	2.3 Deposit with estimated tonnage	Techno-economic study: Define and expand the deposit, develop it by defining the parameters of the mining project and evaluate its profitability Authorization: Obtain authorizations for construction and operation Financing: Seeking financing for construction	Build the project infrastructure Start site operations	Extract and, as appropriate, process the ore and transform the concentrate Market the final product	Close, secure and reclaim the mine site Ensure post-reclamation follow-up
Methods	Compilation and appraisal of existing information and data Regional or local mapping, measurements of physical properties on the ground or airborne, surface sampling, geochemical analyses and dating Retrieval, processing, and synthesis of information	The methods in this phase also include those in the phase that precedes it. 2.1 Review, synthesis and valorization of available information, prospecting, property-scale mapping, surface sampling, chemical analyses, measurements of physical properties on the ground or airborne 2.2 Stripping, trench and drill sampling, measurements of physical properties in drilling 2.3 Bulk sampling, mineral resource estimation, laboratory-scale mineral and metallurgical testing, techno-economic analysis on exploration data			Study: The methods in this phase also include those in the phases that precedes and follows it. Ramp or exploration shaft construction and bulk sampling Scale-up of processes from pilot scale to demonstration plant through mineral and metallurgical testing Techno-economic analysis on confirmed data, analysis of environmental, societal, political, and financial risks and detailed engineering Authorization: Filing information necessary for government analyses Financing: Promotion of the project to partners and investors	Project and quality management Implementation plan and staff training Equipment commissioning Start-up of the site's operations	Production management for continuous improvement of quality, performance, and employee safety	Management of mine site closure and reclamation to achieve satisfactory condition	
Targeted results at the end of the phase	Dissemination of geoscientific data, maps, models, and reports to support mineral exploration Identification of areas suitable for mineral exploration	Preliminary economic assessment Proponent's decision whether to proceed to the next phase			Feasibility study Permits for construction and extraction Construction financing Proponent's decision whether to proceed to the next phase	Achieving commercial operation	Return on investment and profits Optimal extraction of the deposit	Reclaimed mine site that meets the requirements for mine reclamation in Québec	
Mineral inventory	Mineral potential		Mineral resources			Mineral reserves			

ESG best practices and legal obligations

Implement responsible practices that consider social, environmental, economic and governance issues.

The initiator of any activities having an impact on the environment or the territory must first comply with its obligations to communicate and exchange with the local and Indigenous communities concerned and obtain the necessary permits and authorizations.

The main permits and authorizations are presented in the document [« Cadre normatif s'appliquant au domaine minier »](#) (In French only) on the Department's website.

The government must respect its constitutional obligations to consult with Indigenous peoples and, where appropriate, to accommodate.

Glossary

Chemical analysis: Method of identifying the elements that make up a sample, usually rock or sediment. It can be qualitative, to identify the substances present, or quantitative, to determine their concentration.

Dating: Method used to age rocks or sediments, based on the analysis of isotopic systems.

Stripping or trenching: Excavation of soil to expose bedrock for analysis or sampling.

Bulk sample: Extraction of mineral substances to establish the characteristics of the ore. An authorization is required for a quantity greater than 50 metric tonnes under section 69 of the Mining Act.

Laboratory-scale tests: Tests conducted on a sample of a few kilograms of ore with equipment not representative of those used in industry.

Pilot-scale testing: Testing of a sample of a few tonnes of ore with equipment like that used in industry.

Mineralurgical testing: Testing that uses physical (mechanical) processes to separate valuable minerals from others in an ore (ore processing).

Metallurgical testing: Testing using chemical processes to produce metals, alloys, metal compounds, high-purity marketable industrial minerals, or other substances.

Resource estimation: Exercise to estimate the quantity and the grade, density, shape, and physical characteristics of the deposit according to established standards and best practices.

Geoscience study: An in-depth analysis of the geology of a region, usually focused on one or more geoscience disciplines, to better understand the distribution and formation of its features and their evolution.

Techno-economic study: Technical and economic study that aims to highlight all aspects of a mining project. There are three levels of studies. The **preliminary economic assessment**¹ that assesses the potential viability of mineral resources. The **prefeasibility study**² that evaluates the feasibility of realization and determines whether the mineral resources, or a portion of them, can be classified as mineral reserves. The **feasibility study**², which has the highest level of confidence, demonstrates that the operation is profitable. A promoter or financial institution can therefore reasonably rely on the results of the feasibility study to make a final decision about whether to proceed with the project or whether to finance it.

Commercial operation: When a mine whose production has reached 60% of the capacity listed in the last techno-economic study.

Drilling: Also known as boring. Boring of a small diameter hole using a mechanical device called a drill. Allows collecting samples of soil, rock, and groundwater, or placing explosives during mining operations.

Deposit with estimated tonnage: A mineralized, homogeneous, and defined cluster of some volume, but whose economic viability has not yet been demonstrated. A **mineral deposit** is a deposit for which it has been shown to be economically mined, and therefore mineral reserves have been estimated.

Mineral occurrence: Mineralized zone defined by one or more in-place rock samples containing one or more metals or mineral substances of economic interest. A **worked deposit** is a mineralized zone where work has demonstrated the continuity, extent and orientation of the orebody.

Detailed engineering: The set of activities consisting of defining the practical techniques and procedures necessary for the construction and commissioning of an industrial site.

Geoscientific survey: Cartographic representation of different geoscientific information characterizing the bedrock and surface deposits. The information may be geochemical (sediment or rock chemical composition), geological (grouping and arrangement of different rock types), quaternary (grouping and arrangement of different types of surface deposits) or geophysical (description of the site's geological structure based on indirect measurements of some of the subsoil's physical properties [gravity, magnetism, seismicity]).

Ore: Rock that contains one or many metals or mineral substances in a percentage sufficient to justify extraction.

Process scale-up: Steps in the development of a process. At each of them (scientific research, laboratory, pilot, and demonstration plant), the process is evaluated, tested, and optimized. Each stage of progression requires specific equipment.

Commissioning: Period during which each of the installed equipment is started and tested to ensure that it performs the functions intended by the manufacturer. This period is after construction and before start-up.

Mineral potential: Favorability of a territory, based on geoscientific knowledge, to host one or more metals or mineral substances and to be developed for its mineral resources.

Process: The method used to achieve a specific result. The processes used in the mining sector are of a mineralurgical or metallurgical nature. The **mineralurgical process** (ore processing) includes all the physical (mechanical) processes that make it possible to release, separate and agglomerate valuable minerals, minerals with no value (gangue) present in an ore. The **metallurgical process** (primary transformation) is a chemical process primarily used to produce metals or any adaptation of this process to produce other substances.

Exploration shaft and ramp: Mechanically dug access into the ground to reach a potential area of the deposit for exploration work.

Mineral reserves²: Economically mineable part of a measured or indicated mineral resources, as demonstrated by at least one prefeasibility study. Mineral reserves include dilution and allowances for losses, which may occur when the material is mined. Mineral reserves can be probable or proven according to the increasing order of geological confidence.

Mineral resources²: The concentration of a mineral substance, including metals, which shows such a grade that there are reasonable prospects for eventual economic extraction. Mineral resources can be inferred, indicated or measured according to the increasing order of geological confidence.

Start-up: Initial period during which a mining site's activities are started, adjusted, and optimized to reach 60% of the nominal production capacity. This period occurs after commissioning and lasts until commercial operating conditions.

Mine site: Area encompassing all infrastructure related to mining operations (mine, processing plant, power supply, tailings storage facility, service buildings, etc.).

Demonstration plant: A construction or facility whose equipment is representative of the proposed plant, but with a reduced capacity. The process is demonstrated in an operational environment and the manufactured product will be qualified to future buyers.

Mineralized zone: Accumulation (enrichment) of one or more metals or mineral substances hosted in bedrock.

¹ Term defined in National Instrument 43-101 Standards of Disclosure for Mineral Projects.

² A term defined in the "CIM Mineral Resources and Reserves Standards — Definitions and Guidelines" adopted by the Council of the Canadian Institute of Mining, Metallurgy and Petroleum.