**CROWN MINERALS ACT 1991**
MINERALS PROGRAMME FOR MINERALS (EXCLUDING PETROLEUM) 2013

# Guidance for the use of the terms scoping, pre-feasibility and feasibility studies

Determining the feasibility of mining is generally carried out as a staged, iterative series of technical, economic, environmental and risk studies. It is common to refer to the general levels of certainty reached as scoping, pre-feasibility and feasibility.

Administration of permits under the Crown Minerals Act (the "Act") requires NZP&M to consider the scope and content of these studies for evaluation of applications and work programme compliance.

## PURPOSE

There are two operational areas of the Act within which the concepts of feasibility studies are applied:

- **work programme obligations for exploration permits, and**
- **supporting information for mining permit applications.**

There are no simple, accepted definitions of scoping, pre-feasibility and feasibility studies. Regulators, stock exchanges, industry associations, companies, banks and engineering contractors each tend to apply their own definitions. There is no guidance in the Act or the Minerals Programme on how NZP&M considers the different levels of feasibility study, or how they are applies to good industry practice. In addition, there is no guidance in the Minerals Programme on the differences in scope of feasibility studies required for projects of different scale.

This guideline gives a general description of these terms as NZP&M applies them. The guideline explains how NZP&M will apply the terms scoping, pre-feasibility and feasibility studies for assessing work programme compliance when these studies are included as work programme obligations.

The guideline also explains what NZP&M's expectations are for mining applications. Mining feasibility studies are fundamental to most of the considerations for assessing a mining permit application (*Part 10.2 of the Minerals Programme*) and to considerations of good industry practice *(Part 1.3 (11) of the Minerals Programme*).

## LEGISLATIVE CONTEXT

There is a specific requirement to supply mining feasibility studies for an application for a mining permit under *Schedule 2 Part 3(6) of the Regulations*[1]. This Schedule lists minimum requirements for a mining feasibility study: mine design, scheduling and production, resource recovery and economic viability. The Schedule also lists other required information that would be expected to be covered by mining feasibility studies.

In addition, feasibility studies are directly mentioned in the Minerals Programme under *10.2(1)(e)* as one of the matters that may be considered to support the granting of a mining permit or in assessing any proposed work programme for a mining permit.

Lastly, although not embedded in legislation, feasibility studies are a common requirement of permit work programmes.

1 *Crown Minerals (Minerals Other Than Petroleum) Regulations (2007) amended 2013.*

## GENERAL DESCRIPTION OF SCOPING, PRE-FEASIBILITY AND FEASIBILITY STUDIES

These terms are not formal or defined in legislation, but are generic and indicative of the way NZP&M will consider the different levels of study for mining permit applications and work programme compliance.


### Scoping or conceptual studies

Scoping studies are an initial appraisal carried out early in the life of a resource project. They are based on initial drilling and informed assumptions, and commonly include an elementary mine plan. Scoping studies determine whether, and how much, further pre-development efforts are warranted. They are not accurate enough to carry out a meaningful assessment of the economic viability of a project, but should determine key project risks.

From the perspective of considering mining studies under the Act, scoping studies should establish the probable type of mining operation, assess the potential for the delineation of resources capable of supporting a mine, and, in the case of coal and industrial minerals, confirm likely markets.

### Prefeasibility studies

Prefeasibility studies are intended to determine whether a mineral resource is likely to support a viable mining project. Prefeasibility studies are more detailed than scoping studies and are the key intermediate step in the assessment of a mining project.

Prefeasibility studies preliminary mine planning and engineering evaluations based on the likely conversion of the mineral resources delineated during exploration into possible mining reserves. They are generally sufficiently accurate to allow a comparison of alternative project configurations and include preliminary capital and operating cost estimates.

The prefeasibility study phase may become a series of iterative evaluations that are progressively updated and modified as exploration and engineering design proceeds. A project may evolve considerably as a result of an initial prefeasibility study. During each iterative cycle of the study, additional work should allow the pre-development activities to advance to the stage where a full feasibility study is possible. Prefeasibility studies should identify the critical issues and risks to be resolved during final feasibility.

Prefeasibility studies should include, but are not limited:

- assessing reserves and saleable product from the delineated resources
- generic mine design
- non-detailed, staged life of mine planning and production scheduling
- assessing the mining methods, treatment routes and identifying cut-off factors, recoveries, dilution and losses in both mining and treatment
- outlining probable plant, infrastructure, services and other facilities
- producing a summary development structure and timetable
- determining capital and operating costs
- evaluating the specification and marketability of the commodity
- setting up the deterministic economic evaluation model
- determining financial viability.

### Feasibility studies

The objective of feasibility studies is to determine whether to proceed with a mining project into the detailed engineering and construction stage. Feasibility studies generally concentrate on one mine size and configuration, seeking to establish technical and economic feasibility within the accuracy limits of the available data. Full feasibility studies are significantly more expensive than the preceding studies, largely because of the associated engineering work.

Feasibility study deliverables will typically include, but are not limited to:

- establishing the proven and probable reserves
- assessing project alternatives and selecting the desired development route
- proving the technical viability of the mine and extraction methods
- defining the mine's plant, equipment and infrastructure requirements and capacities
- establishing resource consent and other legal/governmental conditions and requirements for approvals to proceed
- defining the management control and timing of the project development and construction
- defining the commissioning of the project, recruiting and training of the management team and crew and hand over at the conclusion of construction
- estimating the development, capital and operating costs of the mine over the economic life of the resource
- identifying the market for the commodity
- assessing project risk areas, economic sensitivity to those areas and action that may be used if the risk becomes a problem
- completing economic assessments of the selected project configurations
    - developing financial models
    - setting a framework for the implementation of the capital investment in the mine development phase.

## APPLICABLE GUIDELINES

### The scope of feasibility study topics for consideration under the Act

There are various definitions of scoping, pre-feasibility and feasibility studies (see below). Regardless of the variation in the level of accuracy between the different levels of study, each study generally encompasses the same topics, which include:

- geology
- mineral resources and reserves
- mining systems equipment selection and mine plan(s)
- processing systems, flow sheets, plant capital and operating costs
- infrastructure requirements and costs
- human resource requirements
- environmental consents and approvals, and land access
- markets and pricing for the product(s) produced
- mine capital and operating costs
- financial analysis
- risk analysis.

This range of studies is intended for industry and cover some factors that are not relevant to the purposes and provisions of the Act. The Act is primarily a legal framework for resource allocation. Industry feasibility studies are primarily a technical and financial framework for determining commercial viability.

The key principles of the Act against which the various levels of feasibility study are considered are:

- efficient allocation of rights
- certainty of resource delineation
- good industry practice
- efficient resource depletion (recovery)
- suitable mine development and operation
- appropriate levels of technical capability
- maximising recovery of resources
- project economics
- financial viability
- avoidance of operational risks, including health and safety.

Applicants need to ensure that their feasibility studies address these considerations at a level that is appropriate to the stage of investigation and the scale of the resource, whether this is for meeting work programme obligations or applying for a mining permit. This is explained further below.

All of these are related in various ways. In particular, there is no factor that feasibility studies address that does not affect project economics. The Act is not intended to cover commercial risk, but a project that NZP&M assesses as not financially viable is unlikely to meet the test of an applicant being able to give effect to the work programme.

### Feasibility studies in exploration work programmes

It is common for exploration permit work programmes to include scoping, pre-feasibility and feasibility studies as part of the permit conditions. These conditions generate compliance actions, against which the level of study attained is evaluated. Work programme conditions need to be drafted with care to ensure that the permit holder and NZP&M have a common understanding of expectations.

The latter exploration stages in a permit cycle, especially at the appraisal stage, will include a pre-feasibility or feasibility study as part of the work programme. These studies should be sufficient to meet the requirements for an application for a mining permit. However, it is not NZP&M's role to ensure that the scope of an exploration work programme or that compliance with a feasibility study in that programme will meet the requirements of an application for a mining permit.

Whether a scoping, pre-feasibility or feasibility study complies with the requirements of a work programme obligation does not require that a particular standard is reached on every aspect. An assessment is made on consideration of balance, and of key requirements in relation to the exploration objective and the scale of the resource.

### Feasibility studies in mining permit applications and work programmes

The consideration of mining feasibility studies in applications for mining permits does not define the level of study that should be reached, and does not rule out pre-feasibility studies as being sufficient. The use of the term "feasibility studies" in the Minerals Programme should be taken as a concept rather than as a particular level of study. What is important is evaluation of the findings of the studies against the key principles of the Act.

Again, whether a pre-feasibility or feasibility study meets the requirements of an application does not mean that a particular standard is reached on every aspect. An assessment is made on consideration of balance, and of key requirements and risks in relation to the scale of the proposed mining operation.

A scoping study would not be adequate support an application for a mining permit in almost any case.

On the other hand, feasibility level studies are an advanced stage of investigation and would normally represent considerable expenditure. Costs of feasibility studies for major projects could be several million dollars. There is tension between the regulatory requirements for grant of a mining permit and commercial risk of committing to these levels of expenditure without the certainty of a mining permit.

It is possible that a mining permit could be granted on the basis of a pre-feasibility study, and that a work programme for a mining permit could include a requirement for a full feasibility study.

Support of an application by an appropriate feasibility study does not mean that a mining permit will be granted. There are other considerations that need to be taken into account as well.

## Use of JORC[2] Code definitions

JORC Code criteria (and the other codes[3] recognised by Act) for different levels of feasibility study are a useful guide for what NZP&M might consider when assessing whether a particular level had been attained, either for compliance on a work programme obligation, or in relation to consideration of a mining permit application. There are also legislative requirements in the Act for resource and reserve reporting to a JORC Code standard, suggesting that further integration of the JORC Code to administration of the Act could be useful.

However, a key principle of the JORC Code is the concept of "modifying factors"[4] when considering the "qualified" relationship between resources and reserves. These require consideration of mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors. In turn, the JORC Code is designed for reporting resources and reserves to the investment sector. The JORC Code definitions of these study levels are not useful for considering work programme compliance and mining permit applications under the Act.

2 *Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia.*

3 *"Recognised resource classification code" means one of the following: the Canadian National Instrument 43-101 ("NI 43-101") standard of disclosure of minerals projects; the South African Code ("SAMREC") for the reporting of exploration results, mineral resources and mineral reserves (2007 edition as amended July 2009); the Joint Ore Reserves Committee ("JORC" code) (2012 edition).*

4 *Modifying Factors under the JORC Code are considerations used to convert resources to reserves.*

| STUDY LEVEL | JORC CODE REQUIREMENTS |
|---|---|
| **Scoping** | "is an order of magnitude technical and economic study of the potential viability of Mineral Resources. It includes appropriate assessments of realistically assumed Modifying Factors together with any other relevant operational factors that are necessary to demonstrate at the time of reporting that progress to a Pre-Feasibility level". |
| **Pre-Feasibility** | "is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient . . .to determine if all or part of the Mineral Resources may be converted to an Ore Reserve at the time of reporting". Basic designs are completed for most facilities. |
| **Feasibility** | "is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study". |

## References


The JORC Code 2012. Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia.

West, R. 2006. Preliminary, Prefeasibility and Feasibility studies. Australian Mineral Economics. AusIMM Monograph 24.





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As a government agency, we engage with Councils, iwi and communities about petroleum and minerals development and regulation of the industry. We manage compliance and revenue collection on behalf of the Crown and aim to maximise the return that these important industries deliver for the benefit of all New Zealanders.

We report to the New Zealand public through the Minister of Energy and Resources.