The impact of modifying factors and the use of Inferred Mineral Resources in the income approach as part of the Mineral Asset Valuation process

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Agenda

1. Introduction
2. SAMREC definitions and guidelines overview
3. SAMVAL definitions and guidelines overview
4. **Case Study 1:** Modifying factors related to infrastructure and ESG
5. **Case Study 2:** The combined impact of economic and physical modifying factors and the use of Inferred Mineral Resources
6. **Case Study 3:** The result of relatively small changes in revenue-related modifying factors
7. **Case Study 4:** The use of Inferred Mineral Resources
8. Key learnings

Introduction

- In this presentation, we examine the impact on the economic evaluation of mining projects as applied in technical studies using the Income approach (or Discounted Cash Flow method) of:
  - The application of modifying factors
  - The use of Inferred Mineral Resources
- Through several case studies synthesised from public reports and Ukwazi projects in which contentious issues are addressed, we demonstrate the influence of modifying factors and the use of Inferred Mineral Resources as part of the Mineral Asset Valuation process
- We will be using the SAMREC/SAMVAL guidelines as the basis for this presentation. This should be reconcilable with other codes used in different jurisdictions.

SAMREC guidance and definitions

- Public Reports are prepared ***to inform investors or potential investors and their advisers*** on Exploration Results, Mineral Resources or Mineral Reserves
- **Modifying factors** "*include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors". They are the subject of several technical papers and the focus of technical studies to achieve the practical production performance and product quality requirements of mining projects*
- Guidance and definitions related to the use of Inferred Mineral Resources are provided in SAMREC
  - SAMREC definition: *"It is reasonably expected that **the majority of** Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration"*
  - SAMREC compulsory ***cautionary statement*** for scoping studies
  - SAMREC ***Table 1*** requirement
  - SAMREC ***Table 2*** guidance (only scoping studies)
- Significant focus is placed on **reconciliation and comparison** of previous Mineral Reserve estimates, generally focusing on historic reliability of production rates, performance parameters, assumptions and modifying factors and historic trends
  - SAMREC section 41
  - JSE listing requirements, Section 12.13 (iii) (Minimum contents of annual report)
  - CPR under 9. Mineral Reserve estimates
  - Table 1: 6.1 (iii) and 6.3 (iv)
  - Various publications and presentations are available as further guidance (Ruprecht, various).

SAMVAL guidance and definitions

- Evaluation: A broad physical, technical, legal, economic and other assessment, ***generally sought for an investment decision***. Evaluations include Feasibility Studies, Prefeasibility Studies, and Scoping Studies
- Valuation: Valuation is the estimation of the value of a Mineral Asset in money or monetary equivalent. *The word 'valuation' can be used to refer to the estimated value (the valuation conclusion) or to refer to the preparation of the estimated Value (the act of valuing)* (IVS Framework 9).
- In contrast to SAMREC, SAMVAL reference is only required on **reconciliation or comparison** with previous (generally 2 years) economic evaluations or Mineral Asset Valuations. Internationally, this is either embedded in the code or in the SX listing requirements
  - **T1.11** *The valuation shall refer to all available and relevant previous valuations of the Mineral Asset that have been performed in at least the previous two years, and explain any material differences between these and the present valuation*
- Reliance on the judgment and justification from the Competent Valuator plays a material role in the Mineral asset Valuation and relevant disclosures.

Case study 1

Excluding wetland/ pans or infrastructure

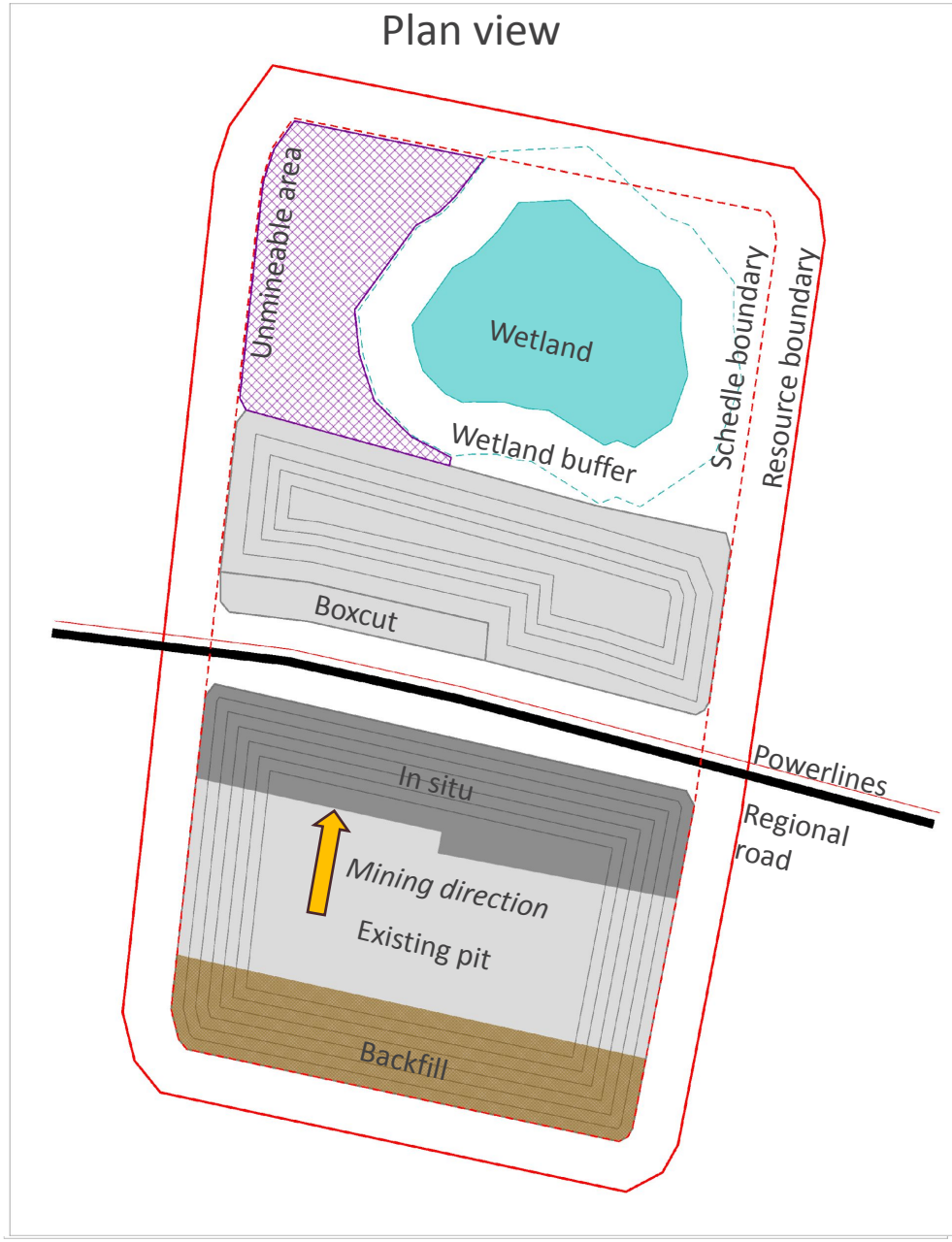
An Mpumalanga coal mine updated an existing LOM plan, based on the diversion of regional infrastructure and mining through a wetland, in accordance with an assumed environmental offset strategy.

Based on further investigation, it became clear that the cost of diversion would be higher than expected, and more importantly, it would not be available in time.

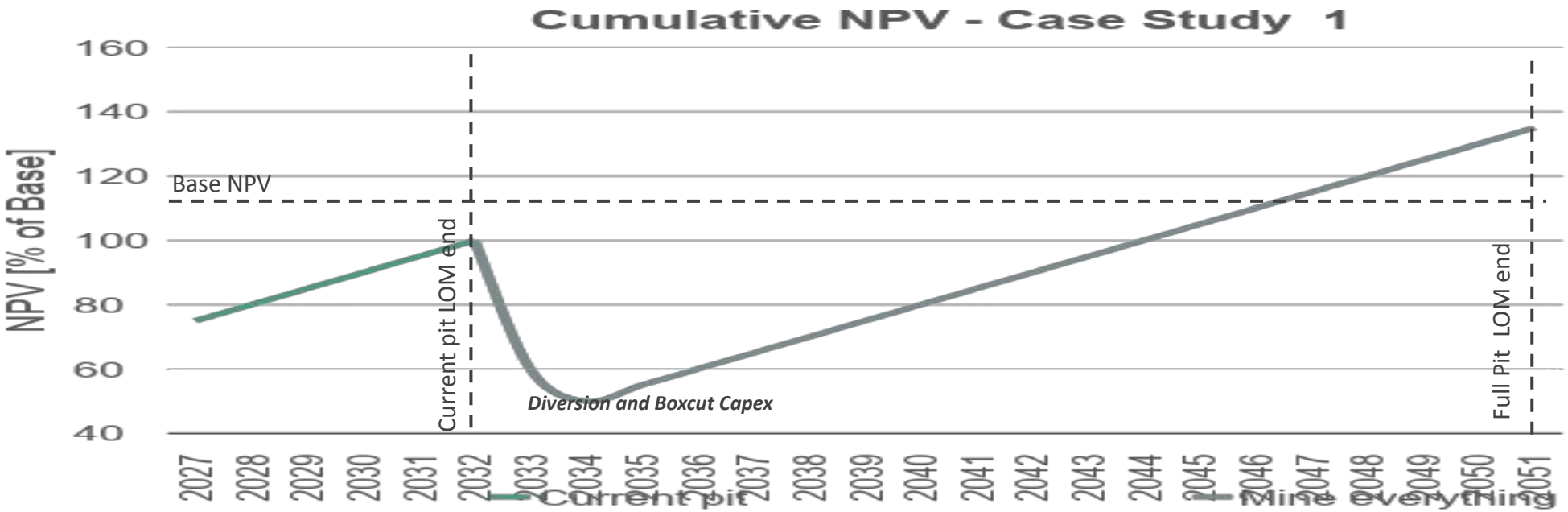
Typical factors that could affect the proposed mining of a wetland or pan:

- IWUL to mine through the wetland/ pan
  - Not approved in legislated timeframe
  - Specialist studies are in progress
  - No/ limited specialist studies were undertaken
- The wetland/ pan was classified as
  - Critical biodiversity area
  - High ecological support importance and sensitivity
  - High present ecological state
  - High level of stakeholder objection
  - Limited offset opportunities

Excluding the wetland/ pan or servitudes can significantly impact the capital requirement, mining method (cost) and product quality (revenue).

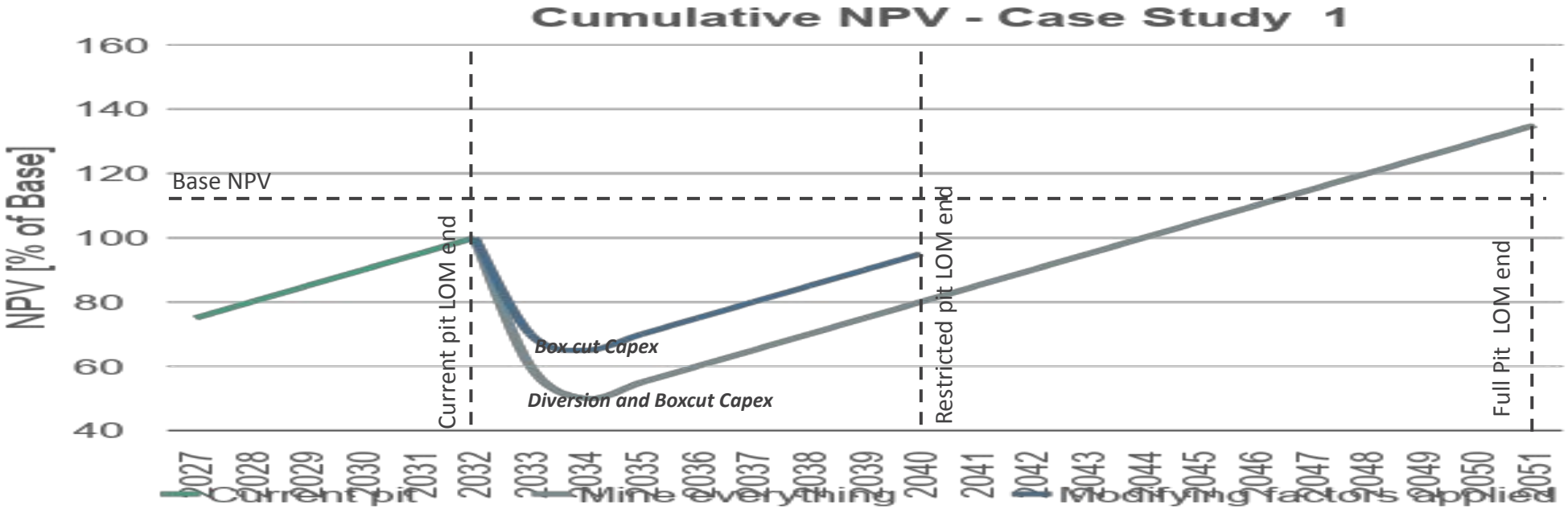


Case study 1: Financial performance



- Diversion and mining through the wetland would significantly increase the life and the economic evaluation using the Income approach

Case study 1: Financial performance



- Diversion and mining through the wetland would significantly increase the life and the economic evaluation using the Income approach
- If neither is feasible or permitted (the base case), then the capital development required and the limited life of the target project would result in a negative return, and the decision would be to stop mining at the depletion of the existing pit.

Case study 2a

Including marginal target areas

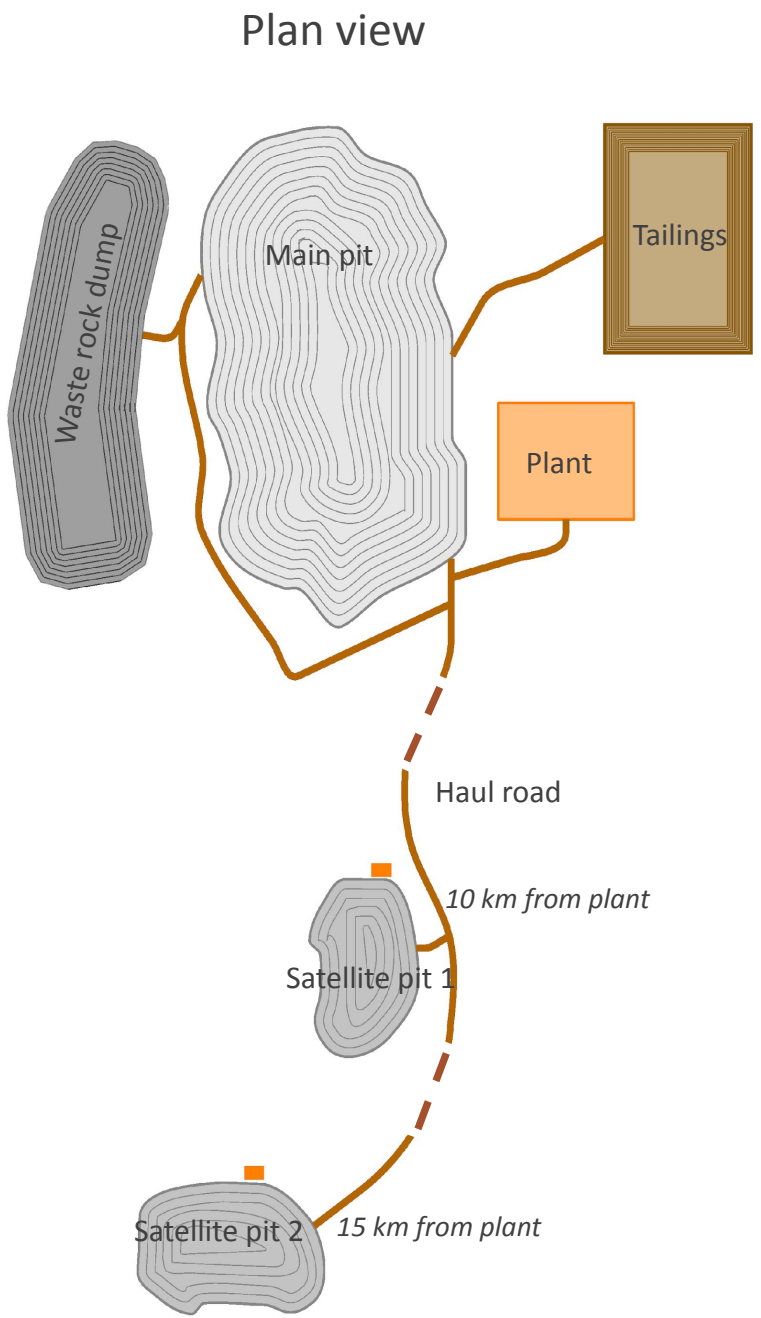
A PEA was concluded for an African uranium project based on a main pit and two satellite pits. A feasibility study followed this.

As part of the study, detailed pricing was developed for the stockpiling, blending, and hauling of the satellite mineralised material to a central processing facility. Due to the hauling cost over excessive distances, alternatives were considered.

Pre-concentration was considered based on the results of appropriate test work. Due to the pre-concentration performance, additional infrastructure requirements and excessive distances, the satellite areas were marginal in terms of financial performance.

Based on this, the satellite target areas were excluded from the Mineral Reserve and from the economic evaluation using the Income approach. The mining strategy was adjusted accordingly.

The satellite pits could be considered towards the end of the operation if the modifying factors (technology, cost or commodity price forecast) change in future.



Case study 2b

Equipment selection

The standardisation of mining equipment in terms of OEM and units has advantages in terms of operational cost and equipment maintainability.

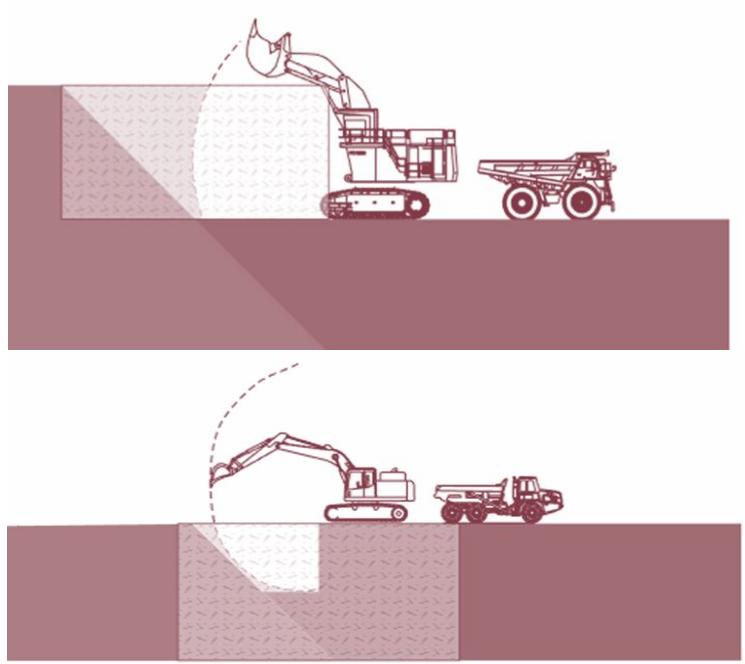
Based on the mining configuration of satellite pits and a main pit, an equipment fleet was selected that would perform well in both the smaller, more remote satellite pits and the high-production-rate pits with longer face lengths.

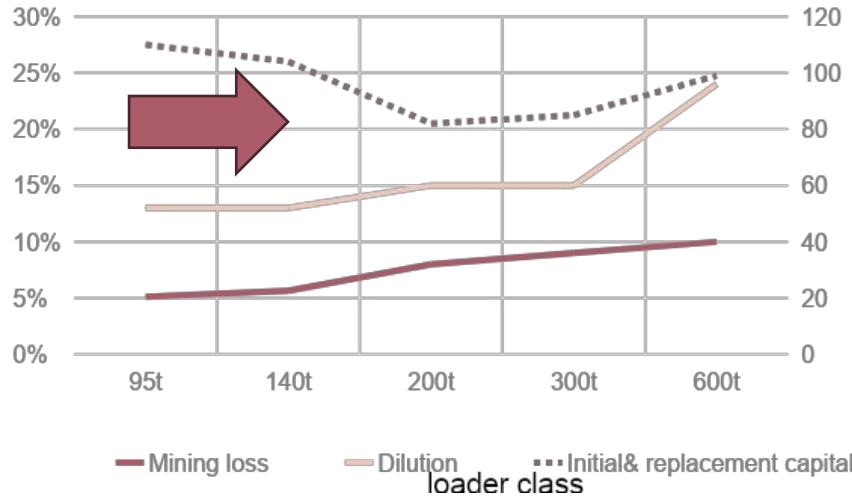
With the exclusion of the satellite pits, larger equipment was considered.

Due to the project's sensitivity to dilution and losses (in this case), the decrease in capital was insufficient for an optimum increase in equipment class beyond the 140t class loaders.

The selection of equipment can impact the modifying factors, production performance, and cost profile of the target project.

Section view





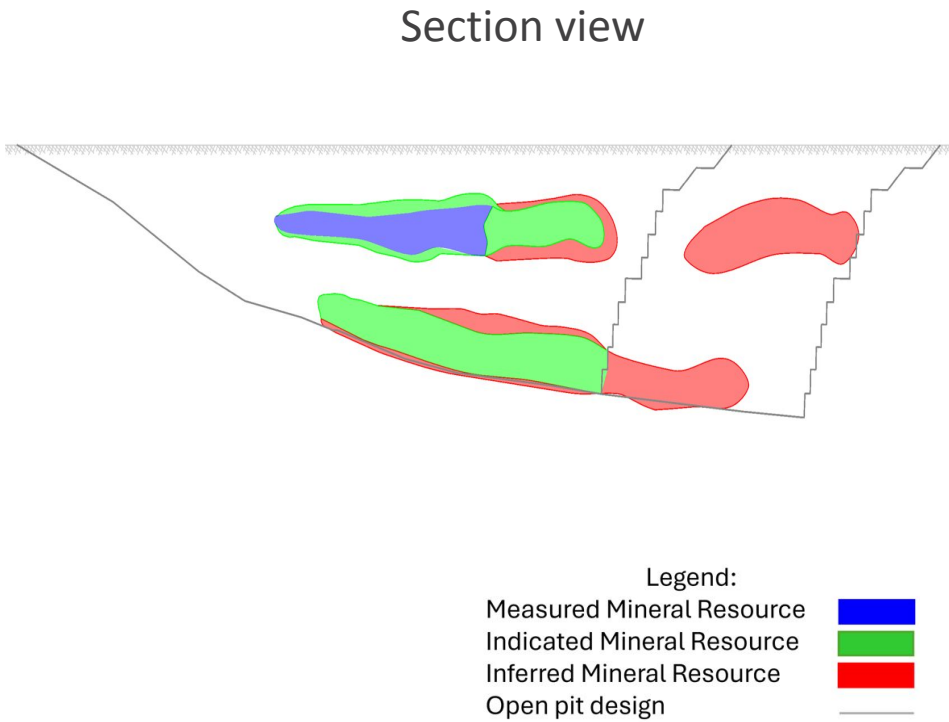
Case study 2c

Including Inferred Mineral Resources

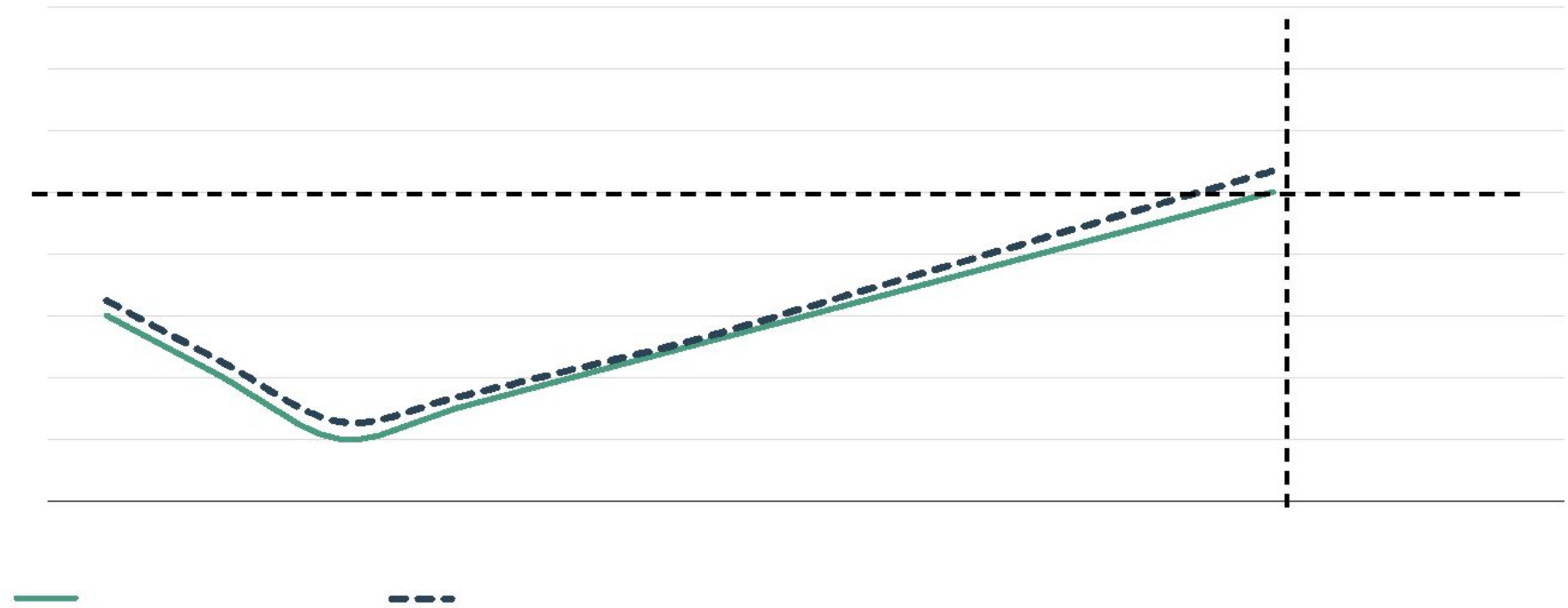
The techno-economic limit of the pits was determined by considering only Measured and Indicated Mineral Resources. Mineralised material from Inferred Mineral Resources within the techno-economic pit limits were scheduled to waste dumps.

If it can be reasonably assumed that most of the modelled Inferred could be converted to Measured or Indicated Mineral Resources (based on additional exploration activities), an additional 15% of ROM would be scheduled at a lower strip ratio (and cost profile), and the LOM will be extended by another 25%.

In this case, the inclusion of Inferred Mineral Resources will have a material impact on the project's cost profile, production rate, and overall efficiency, due to the lower strip ratio, increased face length, and longer life.

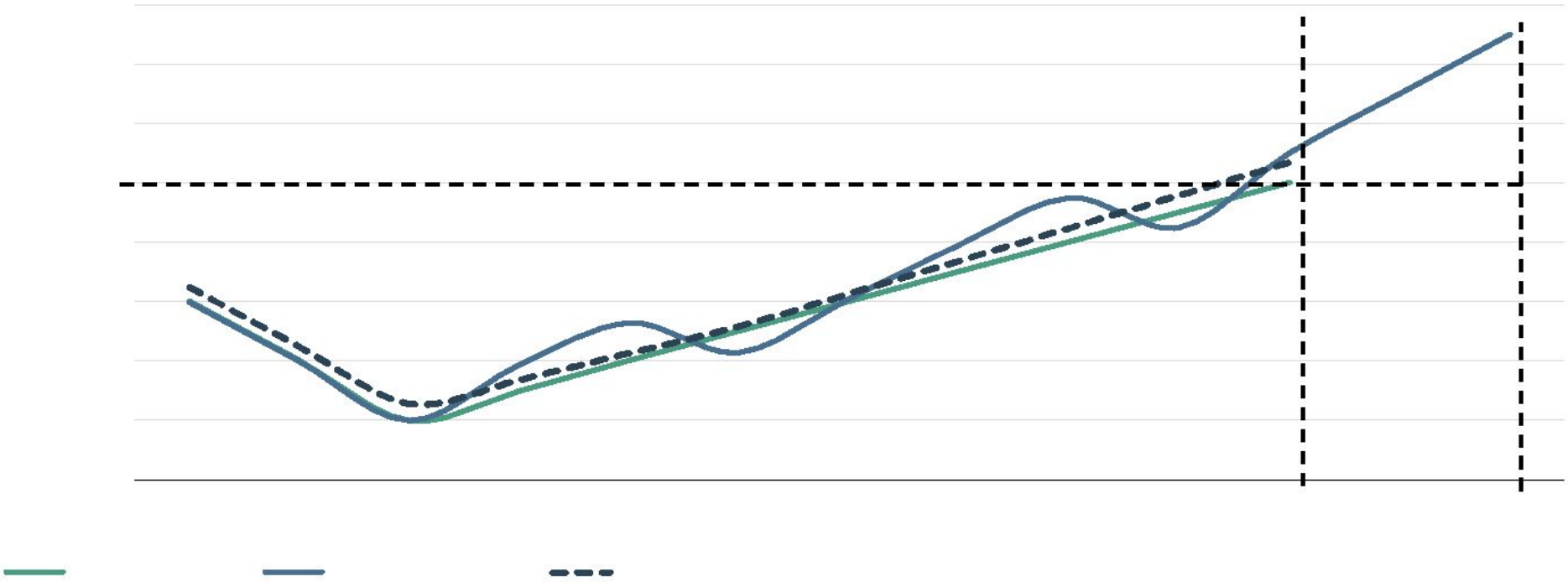


Case study 2: Financial performance



- Significantly larger equipment in the main pit case has a lower capital cost and opex, but increased mining modifying factors (dilution and losses) somewhat offset this, resulting in small increase in value as part of the economic evaluation using the Income approach

Case study 2: Financial performance



- The larger equipment allows a higher rate of production
- If it can be assumed that most of the Inferred Mineral Resources will be converted to Indicated Mineral Resources (per SAMREC definition), the pits will become larger for an increased value due to a lower cost profile and longer life.

Case study 3

Change in revenue parameters

The PGM/ base metal open-pit project is located on the great dyke in Zimbabwe.

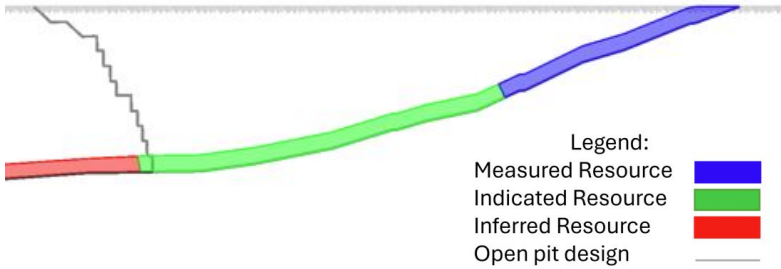
The preferential royalty rates expected for the respective minerals in terms of an agreement with the Govt reverted to standard rates as the agreement was cancelled during the study's progress.

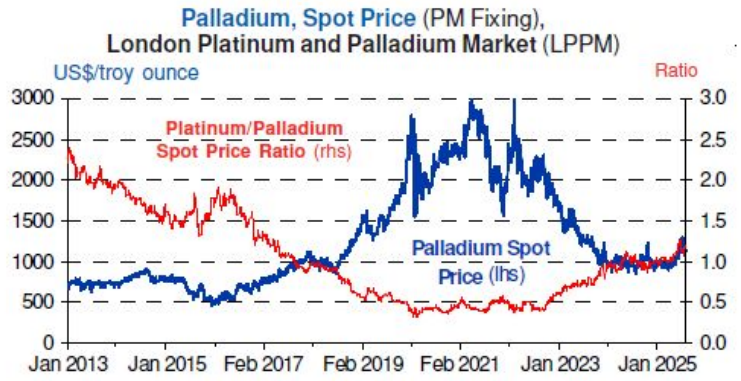
The process recoveries were lowered from the initial numbers, based on new representative metallurgical test work. The results generally showed lower-than-expected PGM recoveries and similar base metal recoveries.

As the study progressed, the palladium price forecast continued its downward trend, halving in less than three years.

While none of these factors had a material impact on the project's financial performance, their cumulative effect did.

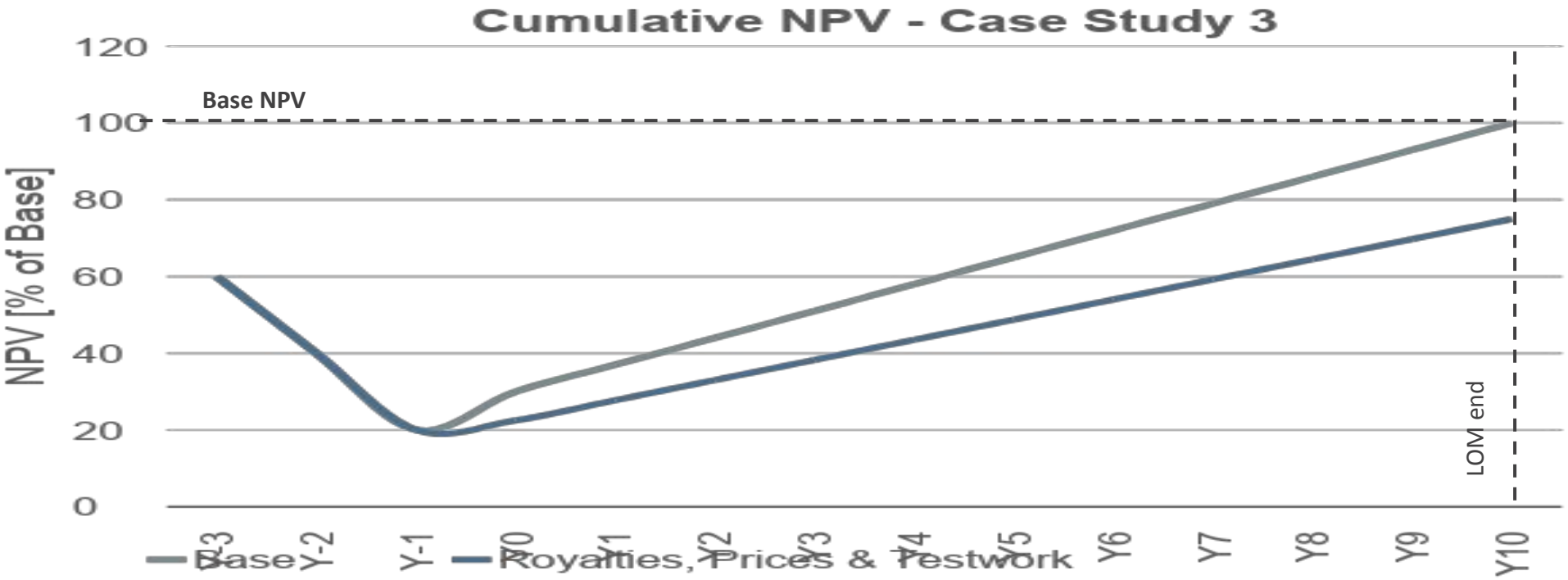
Section view





**Courtesy: Consensus Economics Inc.*

Case study 3: Financial performance



- Three key modifying factors changed during the study
- Each of these had a small impact, but the overall effect was a material decrease in the value of the economic assessment using the Income approach.

Case study 4

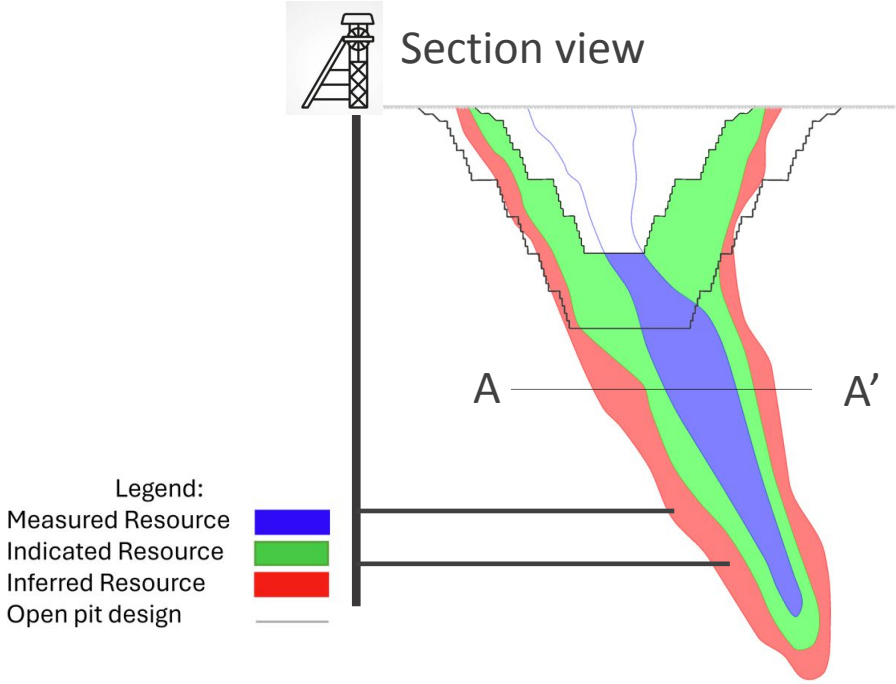
Excluding Inferred Mineral Resources

Steep dipping metal mines are generally defined by open mineralisation at depth, with significant effort required to minimise Inferred Mineral Resources in the target mining zones. Some of these deposits were formed based on complex volcanic successions within structural corridors or breccia pipes such as:

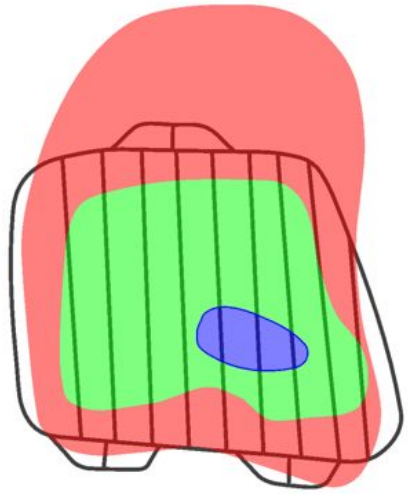
- Granny Smith, Gold Fields, gold mine
- Ernest Henry, Evolution, copper/ gold mine

These deep, high-production-rate underground mines often employ geotechnically controlled, medium to low selectivity sublevel stoping or caving methods, depending on a wide range of criteria. This means that the ore extracted from the production level is dependent mainly on the production level above and the mineralised material in the footwall and surrounding rock. This mineralisation, in some cases, have soft boundaries, meaning that the Inferred Mineral Resource and dilution contributes to revenue.

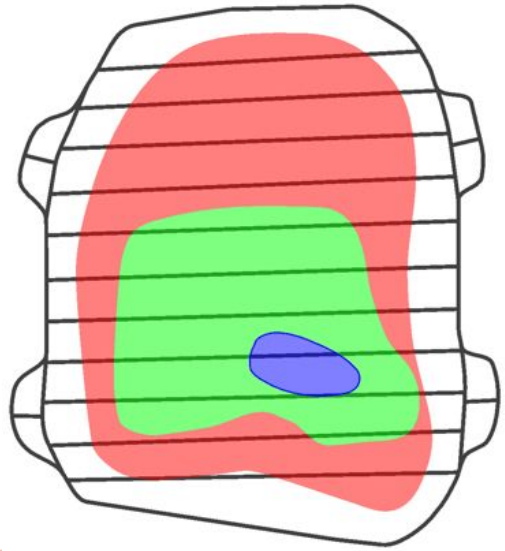
In some cases, mining layouts without Inferred Mineral Resources are theoretical and do not reasonably represent the on-level mining footprint, production rate or revenue potential of active mines or projects.



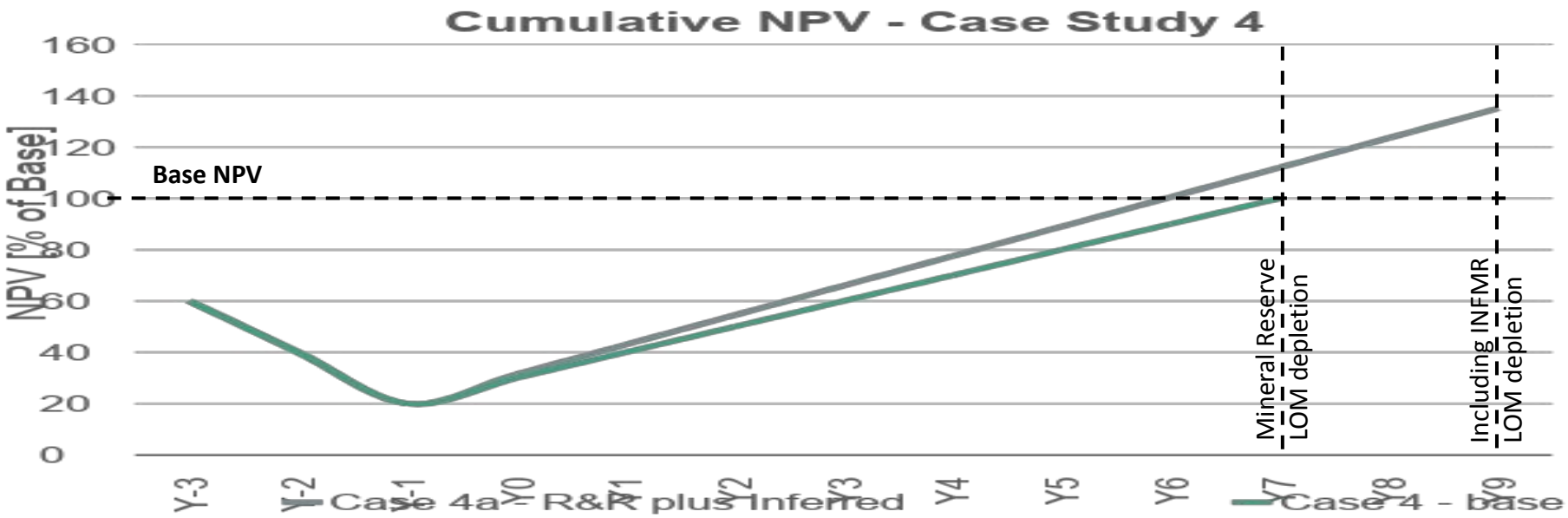
Section A-A' plan view:
SLC plan layout excl. INFMR



Section A-A' plan view:
SLC plan layout incl. INFMR



Case study 4: Financial performance



- For a wide range of massive mining projects, the physical location of the Inferred Mineral Resources is such that it cannot be practically delayed to the end of the life of the mine
- When including mineralised material from Inferred Mineral Resource as part of the mine design and schedule, the physical production level footprint increases:
  - For a lower development ratio and lower operating cost profile
  - And a higher production rate and increased infrastructure efficiency
- This can have a material impact on the mining method selected, the access strategy, the design capacity and the economic evaluation using the Income approach
- This can result in projects being implemented based on combined PEAs and feasibility studies or significantly different public and internal plans that introduce unintended implementation risks.

Lessons learnt

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  - ***Fair and reasonable*** based on their professional judgement and what they will be able to justify to their peers.

Thank you

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