MINERAL ASSET VALUATION OF KIMBERLEY MINE FOR DIVESTMENT PURPOSES

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Declaration

I declare that this research report is my own unaided work. It is being submitted to the Degree of Masters of Science in Engineering to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

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Signed CJ van Zyl

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Date

Abstract

Divestment is always an option for each and every mining operation. It only becomes a viable option if in the hands of the current owner when a point is reached where the life of mine is limited and continued depletion of the remaining mineral resources cannot be achieved due to economic considerations.

Kimberley Mine, a diamond mine, is finding itself in this situation. The research study was focused on determining a divestment range where divestment can be considered by the current owner, to handover the going concern to a new owner. The new owner will be able to extend the life of mine through the adoption of a different operating model to enable economic extraction of the current marginal and sub economic mineral resources.

The long term analysis of supply and demand of diamonds indicates an opportunity associated with the predicted long-term gap between declining supply and demand growth. This gap will enable diamond producers to take advantage of future pricing increases. It is envisaged that this in turn will impact on the viability of existing marginal and sub economical diamond mineral resources and operations, such as Kimberley Mine, whether it be in the hands of De Beers Consolidated Mines Proprietary Limited (DBCM) or an envisaged new owner. The study also determined that the Kimberley Mine operational entity is a current going concern with a good business case in the hands of a potential new owner prepared to make material operational cost adjustments. It is logistically well located, with very good supporting infrastructure both at municipal and provincial level. The Tailings Mineral Resource (TMR) operational complexity is comparatively low in relation to underground operations and is well equipped with industry aligned best practice equipment, machinery, and human capital.

Based on the literature review of the main valuation methods and research conducted on historical comparable transactions, there is value for a new investor in Kimberley Mine. The asset package as envisaged offers a very attractive revenue stream between 2017 and 2018. The economic viability of TMR 29 has been demonstrated through the adoption of a “small miner” fit for purpose

operating cost model and could extend the life of mine to 2030. This will enable the economic extraction of an estimated 4.5 million carats from the remaining TMR’s.

Based on the comparable transaction methodology for TMR operations the divestment value that could result in a suitable positive outcome for both the current owner and the potential future owner resides in the range ZAR 287 million to ZAR 527 million. The discounted cash flow analysis proved that the new owner models can deliver a positive net present value with asset acquisition prices ranging between ZAR 324 million and ZAR 527 million. Lastly, the Monte Carlo simulation results reflect a medium to high probability of success for the “small miner” new owner scenario and return on investment. The study concluded that the current owner must target a divestment price commencing at ZAR 527 million for negotiation purposes.

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1. INTRODUCTION

1.1. Chapter Overview

Diamonds have always been special and treasured as gemstones, due to their beauty, value or uniqueness. Throughout the history of humankind there has always been a certain sense of intrigue associated with diamonds and the mystique of the industry has been widely captured and recorded by numerous authors and writers in both technical and fictional terms.

Records indicate that diamonds were first recovered in India, but the Kimberley discovery of diamonds in South Africa is generally recognised as kick-starting the diamond mining industry. The popularity of diamonds has risen steadily since the 19^{th} century because of increased supply, improved cutting and polishing techniques, growth in the world economy and successful advertising campaigns, particularly by the South African De Beers Diamond Mining Company (Wilson & Anhaeusser, 1998). Since 1882 diamond production has increased to a maximum historical output in 2005/2006 that exceeded 170 million carats per year.

Kimberley mines under the ownership of De Beers Consolidated Mines Proprietary Limited (DBCM) are constrained in terms of increasing the existing life of mine beyond 2018. This has necessitated a business decision where divestment from Kimberley Mine is considered to create an opportunity for an alternative owner or investor, operating under a different business model, to take over the operation and extend its life to beyond 2018.

The significance of this report is to identify the drivers associated with the divestment decision and to assist with the quantification of the envisaged divestment valuation ranges for consideration by the current owners. Divestment is a complex and sensitive consideration where the interests of all stakeholders must be considered to ensure that the end result is acceptable to all.

1.2. Background

The first recorded diamond finds were in India with reference to Wilson & Anhaeusser (1998). Diamonds were considered so unique that only kings wore diamonds as a symbol of strength, courage and invincibility. However in 1477 a key event occurred when Archduke Maximillian of Austria gave a diamond ring to Mary of Burgundy which sparked the tradition of the diamond engagement ring. Approximately two hundred years later diamonds were also discovered in Borneo and Brazil. The first diamond find in South Africa occurred in 1866 when a certain Erasmus Jacobs, a fifteen-year-old boy, picked up a shiny stone on the banks of the Orange River near Hopetown. Two years later a shepherd named Swartbooi picked up an 83.5 carat diamond which later became known as "The Star of South Africa". It was this find that triggered the first diamond-rush and is regarded as the cornerstone of the future development of the subcontinent through the attraction of mining and prospecting expertise which led to the discovery and exploitation of numerous other mineral deposits (Wilson & Anhaeusser, 1998).

In terms of diamonds the initial focus was on the diamondiferous gravels along the banks of the Orange and Vaal Rivers. Continued exploration led to the discovery of the Jagersfontein kimberlitic pipe in 1870. A month later another kimberlitic pipe was found on the farm Dorstfontein which was later known as Dutoitspan, the first kimberlitic pipe discovery in Kimberley. In 1871 more diamonds were found on the adjoining farm, Bultfontein. The De Beers and Kimberley pipes were discovered in 1871 on the farm Vooruitzicht, adjacent to Dutoitspan and Bultfontein. The fifth kimberlitic pipe in Kimberley, named Wesselton, was discovered in 1890. A key event occurred in 1888 when Cecil John Rhodes succeeded to merge all of the diggings in and around Kimberley under the umbrella of De Beers Consolidated Mines (Wilson & Anhaeusser, 1998).

The current Kimberley mining activities no longer include mining of primary kimberlite deposits by DBCM. In August 2005 a decision was sanctioned by the DBCM Board to cease all mining activities at the three remaining underground operations, namely: Dutoitspan Mine, Bultfontein Mine and Wesselton Mine. The official sale of the underground workings and associated infrastructure was finalised on the 19^{th} of May 2010 to Petra Diamonds Ltd.

TMRs currently mined were derived from the mining and processing of the primary kimberlite pipes of Bultfontein, Dutoitspan, Wesselton, Kimberley and De Beers Mine. These TMRs are diamondiferous and owe their mineralization to the historic inefficient processing techniques. Historic diamond recovery inefficiencies associated with suboptimal diamond liberation unit processes, primitive pan plant concentration processes and grease belt recovery processes resulted in suboptimal overall diamond recovery efficiencies. The resultant coarse residues contained value and were classified as Tailings Mineral Resources (TMRs). Due to improvements in technology, recovery efficiency, and diamond prices some TMR's have become economic to enable continued operation of the DBCM Kimberley Mine. Today, 100% of DBCM Kimberley Mine feed comes from these resources.

Currently DBCM Kimberley Mine is a TMR reclamation operation that has TMRs located on various farm areas within the Magisterial/Administrative District of Kimberley and Boshof measuring 3 981 hectares in extent. Kimberley Mines is a dozing, load and hauling operation where TMR material is hauled to the treatment facility and treated at a 1.15 mm resource bottom cut-off. The processing facility has a nameplate capacity of between 6.0 to 7.2 million tonnes per annum after taking into consideration the maintenance plan, overall up-time, mining mix and treatability considerations. However, through streamlining of the treatment facility by optimising of the process flow there is an estimated 20% upside on the current capacity range.

The total DBCM base case life of mine carats, in the hands of the current owner for the life of mine planned until 2018, is estimated at 2.41 million carats of factorised inferred resources in plan. Kimberley Mines TMRs are at an inferred classification category and as such are not converted into reserves, and some TMRs are classified as deposits due to limited availability of information (Msibi & Dludla, 2014). Kimberley Mines is located in the Northern Cape Province of the

Republic of South Africa (Figure 1.1) and is at an elevation of 1227 metres above mean sea level.

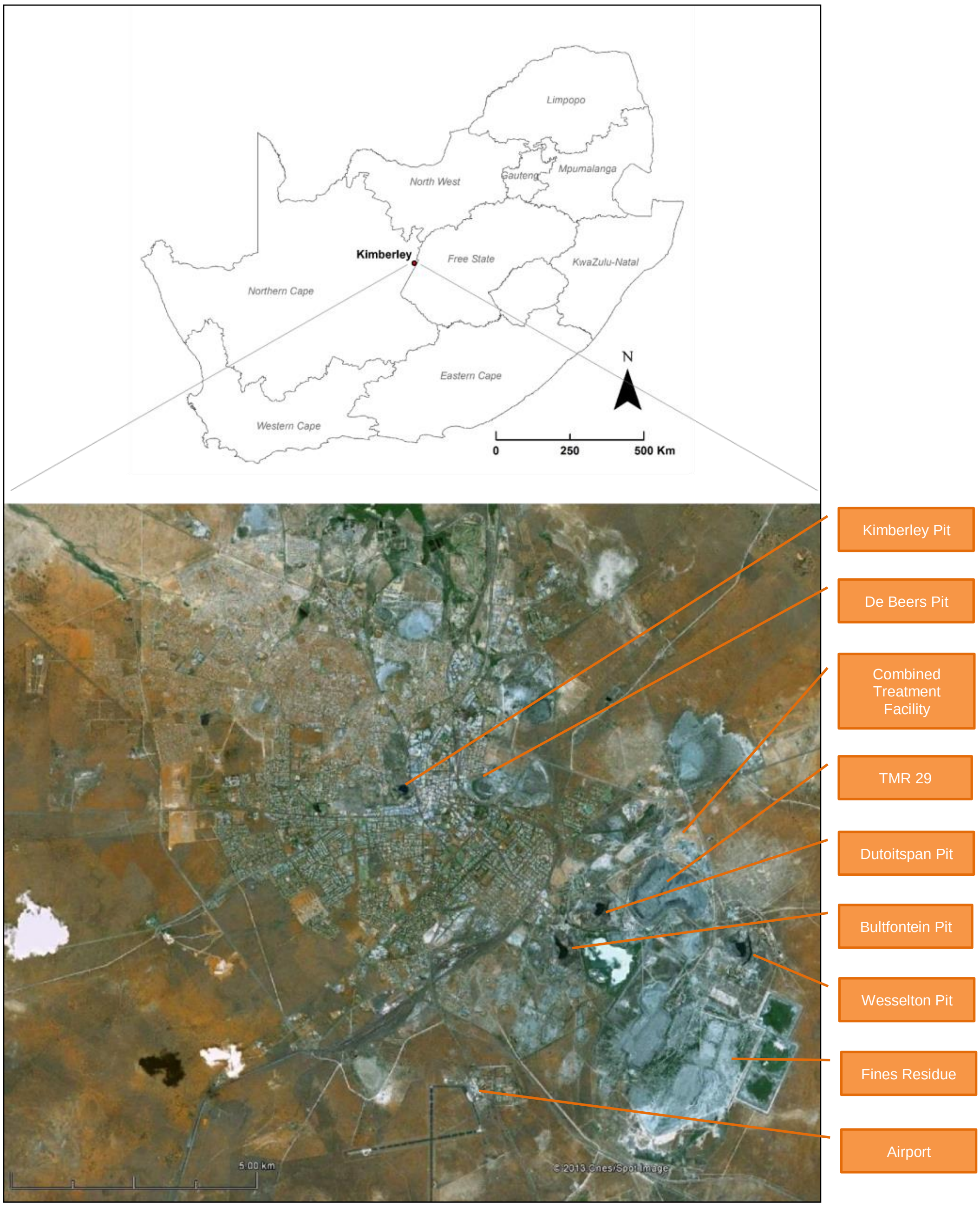


Figure 1.1 Kimberley Mine Location in the South African context (Source: Msibi & Dludla, 2014)

1.3. Problem Statement

DBCM Kimberley Mine is approaching the end of its economic life of mine from a DBCM point of view. The current approved and assured Business Plan reflects a life of mine to 2018. However, this is true from a DBCM perspective, but not necessarily so, if a different operating model is adopted.

The problem statement is to assess DBCM Kimberley Mine worth as an operating entity, as part of the DBCM portfolio, and as part of the greater De Beers Global entity. From a divestment perspective the aim would be to model the worth of the operation taking into account a different or alternative operating model, with a different owner or investor, to extend the life of mine beyond 2018. With this in mind, potential divestment value ranges must be determined in the best interest of DBCM Kimberley Mine, the DBCM Business Unit and the De Beers Group. The research question therefore is, *"if a different operating model is adopted for Kimberley Mine, can the life of mine be extended beyond 2018 and what will be the divestment value associated with the different operating model?"*

1.4. Relevance or Significance of Research

The significance of this research is associated with the fact that each and every mining operation is faced with the challenge of a finite mineral resource. The exact economic life of mine is however a function of many factors, one of them being the limitations of the existing owners' business model. Although the mineral resources at Kimberley Mine might be becoming marginal, and almost being sub-economical to the current owner, it does present an opportunity to an alternative owner or investor to invest in the operation. A prerequisite however will be to adopt a more cost effective business model to capitalize on the remaining TMRs that are available for economic processing to extend and maximise the life of mine. This envisaged divestment will have a very significant impact on the existing operational personnel, the local community, township and the provincial mining industry as the life of mine can be extended beyond 2018.

1.5. Structure of Report

Chapter 1 aimed at providing context for the research report in terms of the background specific to Kimberley Mine, justification for the research work and defined the problem statement.

Chapter 2 presents a literature survey of background information and concepts relevant to this research. It starts by assessing the diamond industry supply and demand outlook and opportunity for a potential diamond mining industry investor. Then it expands to cover the justification for divestment and the reasoning behind it.

Chapter 3 is a continuation of the literature survey but focusing on valuation codes. The chapter covers the three main valuation codes, namely The South African Code for the Reporting of Mineral Asset Valuation (The SAMVAL Code), The Canadian Institute of Mining, Metallurgy and Petroleum on Valuation of Mineral Properties (The CIMVAL Code) and The Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports (The VALMIN Code). The chapter concludes by assessing the main valuation methods and techniques.

Chapter 4 focuses on the data collection and industry assessment to support the mine valuation exercise for Kimberley Mine. A key outcome of Chapter 3 was to determine which of the mine valuation methods and techniques are applicable and to support these an analysis is required of the data inputs required for the valuation exercise to be finalized. Chapter 4 continues to outline the valuation exercise that was conducted based on the selected methods and techniques as discussed in Chapter 3.

Chapter 5 concludes the research report. It highlights what has been achieved by this research, assesses the limitations of the mine valuation exercise and finally, formal recommendations are made. The report structure is reflected in Figure 1.2.

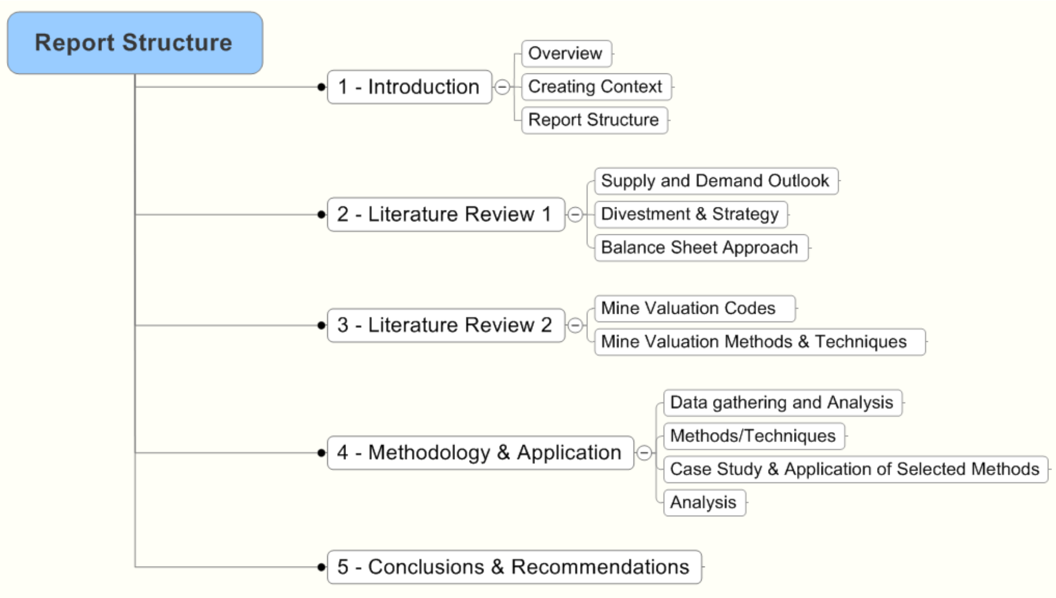


Figure 1.2: Report Structure

2. LITERATURE REVIEW – DIAMOND MINING INDUSTRY OUTLOOK AND STRATEGY

2.1. Chapter Overview

Chapter 2 provides a review of the literature on the diamond mining industry outlook and strategy. The chapter starts by assessing the supply and demand dynamics specific to the diamond mining industry. The subsequent sections then look at the divestment justifications and strategy considerations. These are critical considerations as the ultimate goal is to deliver an outcome that will be in the best interest of the current owner, a potential investor, the employees, the greater community and other stakeholders.

2.2. Supply and Demand Analysis

2.2.1. Supply and Demand Outlook

The diamond industry derives a significant proportion of its value from consumers' demand for diamond jewellery, thus the outlook for the diamond mining industry is inherently linked to consumer demand. Even under scenarios of volatile or weaker global economic growth, demand for diamonds is expected to show positive real growth. Positive demand growth for diamonds will almost certainly outstrip carat production at the current trends, given the lack of major new discoveries in the last decade and the projected production slowdown in several existing mines that are maturing rapidly (Diamond Insight Report, 2014; Spektorov, et al, 2013).

The Diamond Insight Report (2014) stated that consumer demand for diamonds has shown positive nominal growth in the last five years leading up to 2014, with compound annual growth in diamond value just under five percent from 2008 to 2013. Growth was driven mainly by the emerging economies of China and India, as well as the mature economy of the United States of America, while the sluggish economies of Japan and the main European markets exhibited below average growth trends based on the analysis of the recorded data.

Rough diamond production was estimated to total 146 million carats in 2013, well below the 2005 peak of over 176 million carats mined (Figure 2.1). Overall diamond supply is expected to increase moderately in the next few years. This expectation is based on the current estimated output levels from exiting diamond producing mines and new projects coming on-stream in the short to medium term. By 2020, when many existing mature mines will begin to see declining outputs, overall supply is expected to plateau and, unless major new discoveries are made in the coming years, supply can be expected to decline gradually from 2020 onwards due to maturing current producing mines.

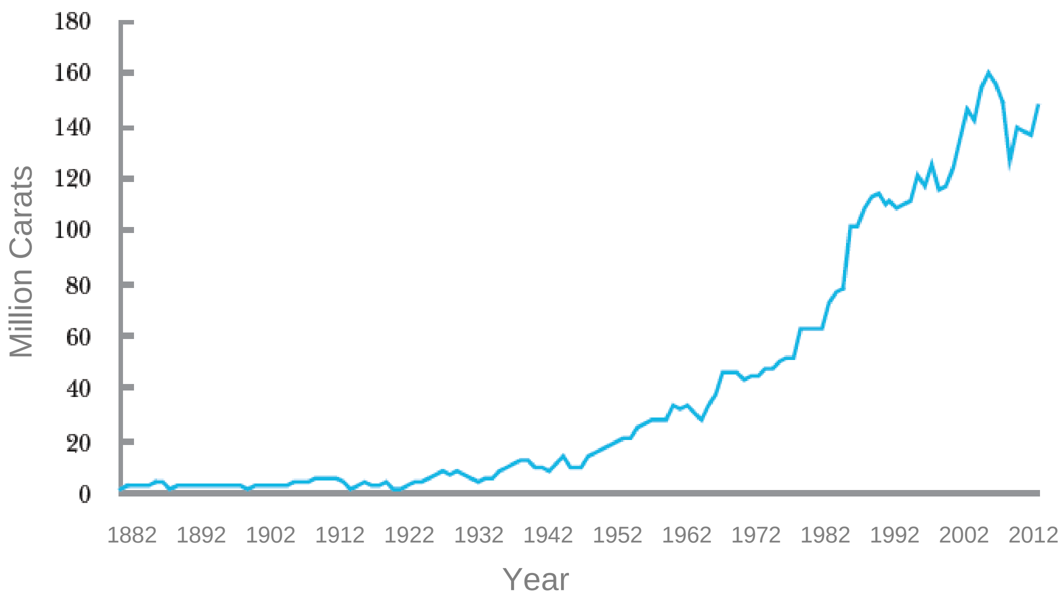


Figure 2.1 – Global Production Volume from 1882 to 2013 (Source: Diamond Insight Report, 2014)

De Beers has undertaken some modelling of potential rough diamond supply and demand based on McKinsey's 'Diamonds are Forever' scenario, and the relative supply and demand curves are shown in Figure 2.2 (Diamond Insight Report, 2014). The opportunity associated with the envisaged gap between supply and demand is that diamond producers will in the long term be able to take advantage of pricing assumptions, which in turn will impact on the viability of existing marginal and sub economical mineral resources and projects in early stages of development.

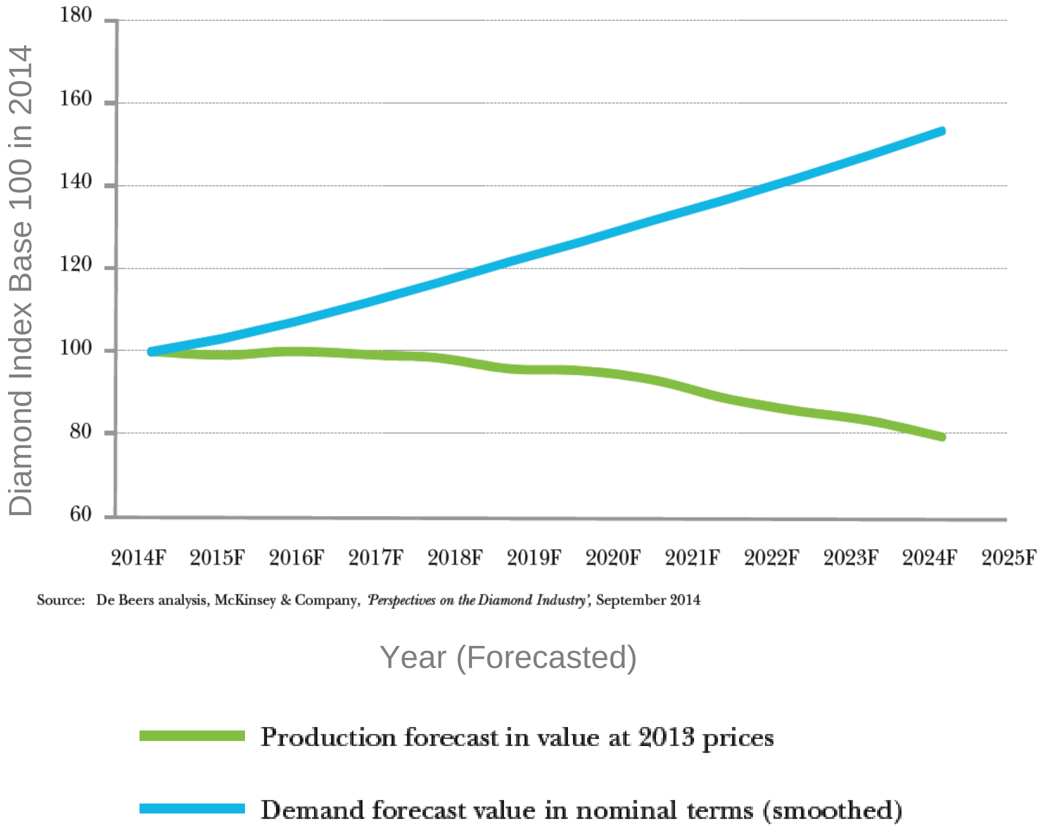
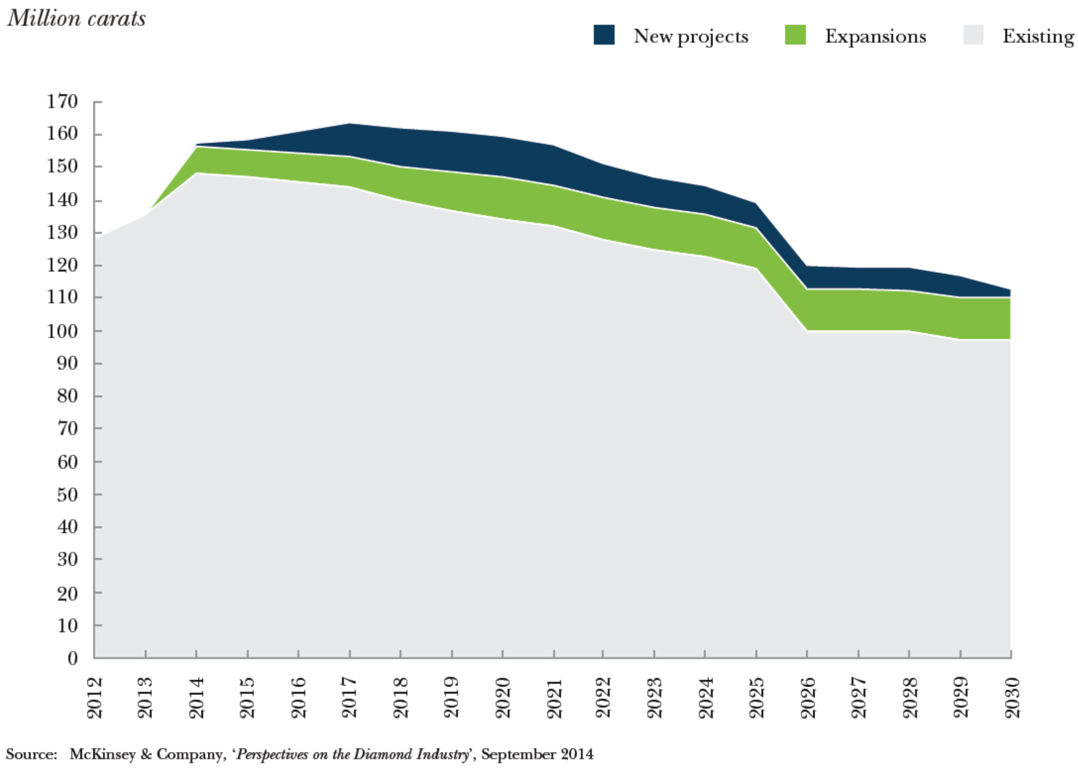


Figure 2.2 - Supply and Demand Curve (Source: Diamond Insight Report, 2014)

2.2.2. The Diamond Industry Outlook

Positive demand growth for diamonds will almost certainly outstrip growth in carat production in the next 10 years, given the lack of major new discoveries in the last decade and the projected decrease in production output at several existing mature mines. Leaders in the industry such as De Beers, Rio Tinto, Petra and Elrosa, supported by several industry analysts such as McKinsey & Company, Royal Bank of Canada, Bain & Company predict that even under scenarios of volatile or weaker global economic growth, demand for diamonds is expected to show positive real growth in the next decade. It is imperative when assessing the holistic outlook to consider the cyclical nature of both the global economy as well as the diamond market. It is acknowledged that across the value chain, companies that are able to innovate and differentiate themselves from competitors and competing goods or commodities will be best positioned to capture the opportunities created by this supply demand dynamic specific to the diamond industry (Diamond Insight Report, 2014; Spektorov, et al, 2013).

A number of projects are under way to expand diamond production. By 2020, about 25 percent of global carat production will come from projects currently under development i.e. the Star Orion Project in Canada, the Bunder Project in India and the Gahcho Kue Project in Canada, just to name a few. However a significant portion of this increase in output is projected to be from expansion projects at existing mines as shown in Figure 2.3, i.e. the Venetia Mine Underground Project in South Africa and the Jwaneng Cut 8 Project in Botswana.



Year

Figure 2.3 – Projected Global Rough Diamond Production (Source: Diamond Insight Report, 2014)

In the long-term, in other words beyond 2020, there is a risk that diamond production levels will begin to decline as portrayed in Figure 2.3. Unless major new discoveries are made in the short to medium term, which is the next five years, and rapidly developed to offset the envisaged decline. However, with reference to historic diamond exploration successes, the reality is that the likelihood of large economically viable discoveries is low, and so supply can be expected to decline gradually. In order to make a material difference to global rough diamond supply, any discovery would have to be substantial, i.e. it needs to be similar to existing tier one operations such as Jwaneng, Orapa and Venetia Mine. Even if new discoveries are made, the impact of such discoveries on production levels would in all likelihood only be reflected in the long-term window. From 1950 to today, it took an average of 14 years between the discovery of an economic diamond deposit and the start of production with reference to DBCM and the De Beers Group historical records.

2.2.3. The Opportunity Associated with the Diamond Industry Outlook

Finding, developing and mining kimberlite pipes in some of the world's most challenging environments and places are recognised as very good examples of engineering and human ingenuity as acknowledged by mining industry leaders. Each kimberlitic pipe requires substantial monetary investments in exploration, project development, infrastructure, mine equipment and human capital. The cost and capital intensity of diamond mining projects are rising, for three main reasons (Diamond Insight Report, 2014).

Firstly, global demand for capital goods has driven price increases in equipment. At the same time, operating costs in some of the major mining geographies have increased significantly over the last few years due to the cost of human capital, consumable cost escalation and energy related costs. Secondly, as the mines are maturing, diamond miners are developing deeper and more remote parts of existing deposits. Lastly, new projects are further away, in more hostile natural environments such as the Arctic. Such operations are inherently more complex to run and involve greater infrastructure investments (Diamond Insight Report, 2014).

Miners go to extraordinary lengths to bring diamonds to market. This has always been the case and supply will continue to increase while growth in demand is likely to outstrip supply as mentioned in Section 2.2.2. However, this cannot happen without substantial effort and investment. The cost and complexity of mining diamonds will continue to increase, and diamonds will remain one of the most coveted of earth’s natural products.

2.2.4. Supply and Demand Conclusion

The rough-diamond market is expected to remain balanced in the medium term, i.e. the five year window (2015 to 2020), with a growing gap between supply and demand in the longer-term, i.e. post the five year window as existing mines mature and get depleted and no major new deposits come online. With this in mind global supply is expected to decline, falling behind predicted demand growth from China, India and the United States of America. Over the next 10-year period it is foreseen that the supply demand outlook will bring different dynamics for industry players at different points along the diamond value chain, which will impact on business decisions and strategic initiatives over the medium and long term windows (Spektorov, et al, 2013).

In terms of upstream diamond industry dynamics, the focus will remain on operational excellence, strengthening the asset portfolio and adjusting the development pipeline as the impact of improved economics is felt. With stable market conditions foreseen in the medium term, mining companies are likely to focus on maintaining healthy financials, managing operational excellence and investing in technology to improve productivity and efficiency. It is anticipated that the positive outlook in terms of the supply-demand balance will drive diamond mining companies to carefully review strategic development pipelines to identify the opportunities that promise the highest returns (Spektorov, et al, 2013).

As supply from existing mines decreases, mining will become increasingly complex and remote, and increasingly costly as a result. Investment in production to drive innovation and productivity in diamond supply will be key to ensure that the industry remains viable and lucrative in the years to come. The projected shortfall will present opportunities for existing and new diamond producers to capitalize on this forecast by maximizing the future price escalation and economic drivers associated with the diamond industry. There could even be a tendency towards monopolistic behaviourism by suppliers and dealers in rough diamonds as demand increases and supply becomes constrained. The impact of stock or inventory levels on price and diamond pipeline management will be exploited to its full capacity in terms of price elasticity factors and drivers (Van Zyl, 2012).

2.3. Divestment Justification and Strategy Considerations

The justification for divestment requires proper understanding and assessment by the executives and shareholders of any organization globally. This is to ensure that it is done for the right reasons and with a reasonably well defined outcome that delivers the desired end result as expected. Quite often there is a very definite need to break-up large businesses to unlock economic value, or focus on growth opportunities for the business (Bassi, et al, 2012). That being said, it is critical for senior executives to ensure that the divestment requirement is clearly understood and supported by the shareholders.

The divestment from an operating mining entity has an impact at both the operational value assessment as well as at the enterprise level. It is imperative for this divestment strategy to be assessed and quantified in terms of the envisaged impact on all levels in the company. Through the process, the company should consider all strategies and structures possible (Bassi, et al, 2012). The risk, both at enterprise and operational risk level, must be fully considered for each option, to make an informed recommendation to the shareholders.

From a divestment perspective, the value of the operation under investigation also requires assessment from the perspective of a potential buyer (Bassi, et al, 2012). There is a need to understand the motives for each potential buyer to ensure that the envisaged long-term life of mine is not compromised through a short-term investment strategy that would be counterproductive to the safety and sustainability (economic, environmental and social impact) of the community in which it operates. The demonstrated ability of the prospective buyer is of key concern to ensure that the socio-economic end result of the divestment process is acceptable to all stakeholders, i.e. the shareholders, employees, community, and interested and affected parties.

Proper preparation and planning for divestment is key to the success of a divestment strategy. The asset package requires proper assessment beforehand to define the boundaries associated with the envisaged package or packages (Bassi, et al, 2012). It is critical to the success of the divestment plan to define the packages to ensure that all parties understand the interaction at an operational, legal and financial level.

Another key consideration when divesting is consideration for balancing control of the divestment exercise with speed of the process (Bassi, et al, 2012). The control component requires front-end loading by the seller to retain control over the process and leverage value for the shareholder. The speed of the transaction can be set by ensuring that the divestment process and plan are well defined, with all supporting structures in place to pull the interested buyers with the divestment process and plan.

2.4. Chapter Summary

This chapter assessed the supply and demand outlook for the diamond mining industry. The literature review highlighted the fact that the rough-diamond market is expected to remain balanced in the medium term with a growing gap between supply and demand in the longer-term. The diamond industry downstreams main challenge will be ensuring security of supply as diamond production is projected to decline slowly after 2020 with low likelihood of large, economically viable new finds in the short term. This projected shortfall will present opportunities for existing and new diamond producers to capitalize on this forecast by maximising the future price escalation and economic drivers associated with the diamond industry.

The justification for divestment requires proper understanding and assessment by the executives of any organization to ensure that it is done for the right reasons and with a reasonably well defined outcome that deliver's the desired end result. This concept was researched to better understand the divestment strategy to be assessed and quantified. From a divestment perspective it is imperative to value the operation under investigation from a potential buyer perspective as this would be the ultimate end state from an owner's perspective.

The next chapter has two sections. The first section covers the applicable mine valuation codes to examine the key concepts associated with each. The second section looks at the mine valuation methods and techniques and assesses the applicability to the Kimberley Mine divestment exercise.

3. LITERATURE REVIEW – VALUATION CODES AND METHODS

3.1. Chapter Overview

This chapter is divided into two sections. The first section focusses on the three main mine valuation codes, namely, The South African Code for the Reporting of Mineral Asset Valuation (SAMVAL), The Canadian Institute of Mining, Metallurgy and Petroleum on Valuation of Mineral Properties (CIMVAL) and The Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports (VALMIN). These codes provide a basic guideline to all valuators to comply with to address the key aspects of materiality, transparency and competency.

The second section in Chapter 3 looks at the mine valuation methods and techniques. The main valuation guiding principles in terms of income, market and cost approaches are assessed with the aim of better understanding the particular valuation methods and techniques to select the most applicable for application in the valuation exercise of Kimberley Mine for divestment purposes. Chapter 3 also includes a section that focusses on the balance sheet approach. Simplistically to determine the worth of the operation, the valuation process needs to quantify the asset value, i.e. the revenue stream, less all liabilities applicable to the operation.

3.2. Mine Valuation: Codes Assessment

Currently there are three main mineral asset valuation codes, namely the South African SAMVAL code, the Canadian CIMVAL code and the Australasian VALMIN code. These three codes are very similar in content and have overarching guiding philosophy, best practices in terms of valuation of mineral assets and formal independent expert reporting requirements. Key aspects with reference to the three codes will be assessed and considered for the purposes of the research report, as set out.

3.2.1. Overview of the SAMVAL Code

The SAMVAL code sets out minimum standards and guidelines for Public Reporting of Mineral Asset Valuation in South Africa. The code is applicable to the reporting of all styles of solid mineralization or mineral asset. The guiding philosophy and intent of the code is that mineral asset valuation should be carried out by appropriately qualified persons and all relevant information is fully disclosed. The code is based on best practices of the minerals industry and allows for professional judgement in certain instances (SAMVAL, 2009).

The SAMVAL code specifically excludes oil and gas which is included in the VALMIN code. The SAMVAL code is silent on the valuation of securities or mining corporations (Njowa, et al, 2013). This approach could be considered appropriate taking into consideration that for the valuation of securities and corporations a different set of rules apply with reference to regulatory guidelines, corporate law, licences and valuator experience and membership. A further aspect for consideration is that the SAMVAL code defines value as "*value relates to future expectations and is the present value of all future benefits expected to be received*". An assessment of the valuation codes by Njowa, et al, (2013) concluded that the CIMVAL and VALMIN codes share a common high level standard of value; however from a SAMVAL point of view, fair market value does not exist, hence it should be either market value or fair value.

The SAMVAL code highlights the three guiding principles that should be considered for the application of the code, namely (SAMVAL, 2009:70):

- *"Materiality, i.e. a Public Report contains all the relevant information that investors and their professional advisors would reasonably require, and expect to find, for the purpose of making a reasoned and balanced judgement regarding the Mineral Asset Valuation;*
- *Transparency, i.e. the reader of a Public Report must be provided with sufficient information, the presentation of which is clear and unambiguous, to understand the report and not be misled;*
- *Competency, i.e. the Public Report is based on work that is the responsibility of suitably qualified and experienced persons who are subject to an enforceable Professional Code of Ethics."*

The SAMVAL code does not refer to independence, included in both the CIMVAL and VALMIN codes, and reasonableness, included in the CIMVAL code, as guiding principles. An assessment of the codes reflects that the guiding principle of independence should be dealt with at the regulatory body (Njowa, et al, 2013). The CIMVAL guiding principle of reasonableness is excluded but it could be argued that if the guiding principles of materiality, transparency and competence are adhered to, it would be a reasonable assumption that other qualified and experienced valuators with access to the same information would have valued the mineral asset in the same range.

The SAMVAL code also refers to three generally accepted approaches to mineral asset valuation when assessing assets at different development stages such as Exploration, Development, Production, Dormant and Defunct properties, namely (SAMVAL, 2009:70):

- "*Cash Flow Approach which relies on the 'value-in-use' principle and requires determination of the present value of future cash flows over the useful life of the mineral asset;*
- *Market Approach which relies on the principle of 'willing buyer, willing seller' and requires that the amount obtainable from the sale of the mineral asset is determined as if in an arm's-length transaction;*
- *Cost Approach which relies on historical and/or future amounts spent on the mineral asset."*

The SAMVAL code summarized the applicability of the valuation approaches as reflected in Table 3.1. The code also stipulates that the valuator must apply at least two valuation approaches or methods and the results from these must be weighed and reconciled into a concluding opinion of value for the mineral assets under review with supporting reasons for assigning higher weight to one approach or method over the other.

Table 3.1 - Relationship between Stages of Development and Valuation Approaches for Mineral Properties (Source: SAMVAL, 2009)

Valuation Approach	Exploration Properties	Development Properties	Production Properties	Dormant Properties		Defunct Properties
				Economically Viable	Not Viable	
Cash Flow	Not generally used	Widely used	Widely used	Widely used	Not generally used	Not generally used
Market	Widely used	Less widely used	Quite widely used	Quite widely used	Widely used	Widely used
Cost	Quite widely used	Not generally used	Not generally used	Not generally used	Less widely used	Quite widely used

The overview of the SAMVAL code accentuated the following specific aspects related to the research, namely:

- The three guiding principles that should be considered for the application of the code, namely materiality, transparency and competency;
- And the relationship between the stages of development and valuation approaches for mineral properties that are most applicable to the operation under investigation with reference to Table 3.1.

3.2.2. Overview of the CIMVAL Code

The CIMVAL code is arguably more structured and has very specific standards and guidelines which are organised into two parts. The standards section is specific to general rules that are mandatory in the valuation of mineral properties. The second part contains guidelines which elaborate on the standards and, while not mandatory, provide guidance and best practices which are highly recommended to be followed in the mineral properties valuation process.

The guiding philosophy and intent of the CIMVAL standards and guidelines is that mineral property valuations be carried out by appropriately qualified individuals and that all relevant information be fully disclosed. The standards and guidelines are based on industry best practices and allow for professional judgement in certain instances. For purposes of clarification, valuation in the CIMVAL standards and guidelines is concerned with the value or worth of a mineral property as opposed to "evaluation" where the key objective is an economic assessment or determination of the economic merit of a property (CIMVAL, 2003).

The CIMVAL code highlights the guiding principles, as mentioned under the SAMVAL code, that should be considered for the application of the code, namely materiality, transparency and competency, but goes on to include two additional guiding principles, namely independence and reasonableness. In the context of the CIMVAL code the two additional guiding principles that should be considered for the application of the code carry the following meaning (CIMVAL, 2003:9;12):

- *"Independence or Independent means that, other than professional fees and disbursements received or to be received in connection with the valuation concerned, the qualified valuator, has no pecuniary or beneficial interest in any of the Mineral Properties being valued, nor has any association with the Commissioning Entity or any holder(s) of any rights in Mineral Properties which are the subject of the Valuation, which is likely to create an apprehension of bias.*
- *Reasonableness means that other appropriately qualified and experienced valuators with access to the same information would value the property at approximately the same range. A Reasonableness test serves to identify Valuations which may be out of step with industry standards and industry norms."*

The CIMVAL code, similar to the SAMVAL code, also refers to three generally accepted approaches to mineral asset valuation, namely (CIMVAL, 2003:21):

- *"Income Approach, which is based on the principle of anticipation of benefits and includes all methods that are based on the income or cash flow generation potential of the mineral property;*
- *Market Approach which is based primarily on the principle of substitution and is also called the sales comparison approach. The mineral property being valued is compared with the transaction value of similar mineral*

properties, transacted in an open market. Methods include comparable transactions and option or farm-in agreements;

- *Cost Approach that is based on the principle of contribution to value. The appraised value method is one commonly used method where exploration expenditures are analysed for their contribution to the exploration potential of the mineral property."*

The CIMVAL code states, with reference to Table 3.2, that each valuation approach has subsets of valuation methods. All these valuation methods are not considered equal in the minerals and mining industry, as some methods are more generally acceptable as industry practice than others. To define this better, the CIMVAL code added ranking to each method. The ranking is split very simply into primary and secondary, with methods with no ranking being considered unreliable or not widely accepted.

Table 3.2 - Valuation Methods for Mineral Properties (Source: CIMVAL, 2003)

Valuation Approach	Valuation Method	Method Ranking	Comments
Income	Discounted Cash Flow (DCF)	Primary	Very widely used. Generally accepted in Canada as the preferred method.
Income	Monte Carlo Analysis	Primary	Less widely used, but gaining in acceptance
Income	Option Pricing	Primary	Not widely used and not widely understood but gaining in acceptance
Income	Probabilistic Methods	Secondary	Not widely used, not much accepted
Market	Comparable Transactions	Primary	Widely used with variations
Market	Option Agreement Terms	Primary	Widely used but option aspect commonly not discounted, as it should be
Market	Gross "in situ" Metal Value	Secondary	Not acceptable
Market	Net Metal Value or Value per unit of metal	Secondary	Widely used rule of thumb
Market	Value per Unit Area	Secondary	Used for large Exploration Properties
Market	Market Capitalization	Secondary	More applicable to Valuation of single property asset junior companies than to properties
Cost	Appraised Value	Primary	Widely used but not accepted by all regulators
Cost	Multiple of Exploration Expenditure	Primary	Similar to the Appraised Value Method but includes a multiplier factor. More commonly used in Australia
Cost	Geoscience Factor	Secondary	Not widely used

The CIMVAL code does reference specific valuation principles which are key considerations when valuing an asset, namely (CIMVAL, 2003:20-21):

- *“Value relates to a specific point in time. Valuation opinions must be given as at the valuation date;*
- *Value relates to current and future expectations;*
- *The value of assets is based on, or directly related to, what they can earn;*
- *If rights additional to mineral rights or mining rights are attached to the Mineral Property, the principle of “highest and best use” should be considered;*
- *Hindsight is, in general, inadmissible in reaching valuation conclusions;*
- *The market dictates the required rate of return.”*

The overview of the CIMVAL code accentuated the following specific aspects related to the research, namely:

- The guiding principle of independence where the qualified valuator, has no pecuniary or beneficial interest in the mineral property being valued which is likely to create an apprehension of bias;
- The guiding principle of reasonableness which means that other appropriately qualified and experienced valuators with access to the same information would value the property at approximately the same range;
- And that each valuation approach has subsets of valuation methods for mineral properties that were assessed for applicability to the operation under investigation with reference to Table 3.2.

3.2.3. Overview of the VALMIN Code

The purpose of the VALMIN code (VALMIN, 2005:5) is to *“provide a set of fundamental principles and supporting recommendations regarding good professional practice to assist those involved in the preparation of Independent Expert Reports that are public and required for the assessment and/or valuation of Mineral and Petroleum Assets and Securities so that the resulting reports will be reliable, thorough, understandable and include all the material information* *required by investors and their advisers when making investment decisions.*" The VALMIN code is the only code that specifically includes in the purpose petroleum assets and securities. The guiding philosophy and intent of the VALMIN code is to provide a set of principles and supporting recommendations regarding acceptable professional practice to assist and guide valuators through both the commercial and technical assessments.

The VALMIN code highlights guiding principles, as mentioned under the SAMVAL and CIMVAL codes that should be considered for the application of the code, namely materiality, transparency and competency, and independence. Similar to the SAMVAL code, the CIMVAL guiding principle of reasonableness is excluded but it could be argued that if the guiding principles of materiality, transparency and competence are adhered to, it would be a reasonable assumption that other qualified and experienced valuators with access to the same information would have valued the mineral asset in the same valuation range (Njowa, et al, 2013).

The VALMIN code is very similar to the CIMVAL and SAMVAL codes, but is the only code that specifically references risk and uncertainty as factors for consideration, although it could be implied that risk management is essential to the process by default and hence is part of all the codes. The VALMIN code specifically mentions the following risks and uncertainty which can arise with respect to the availability and quality of data and other information concerning (VALMIN, 2005:17):

- *"Geology of mineral deposits and the dependent estimates of grade, resources and reserves;*
- *Geological prospectivity and the possibility that further exploration may fail to demonstrate any economic mineralisation (in the case of projects without defined reserves);*
- *Ore processing and the variability of metallurgical variables such as recovery rates, process plant availability and the ability of new processes to be financed and to live up to expectations;*

- *Construction, including unforeseen foundation conditions, weather and industrial disputes, all of which may affect both capital costs and completion date;*
- *Production of marketable commodities in terms of quality and price;*
- *"Country risk" involving social, political, environmental, cultural and security factors which cannot be controlled by operators."*

The overview of the VALMIN code placed specific importance on the aspects of risk and uncertainty which is related to the research and will be incorporated into the valuation process. This was explored using the appropriate probabilistic method for quantification of risk and uncertainty.

3.3. Mine Valuation: Methods and Techniques

Mine financial valuation has been a topic of research for many decades. There are numerous articles, books, research reports, etc. covering this issue for research and reference purposes.

Both the SAMVAL and the CIMVAL codes have included tables that summarise valuation methods and deliver very high-level indications of what is generally "widely used" to "not generally used" with specific reference to the valuation approach and the various stages of development of the project or mining operation. These methods will be further investigated to assess the various income, market and cost methods used for mine valuation purposes with specific focus on a divestment strategy (VALMIN, 2005; SAMVAL, 2009; CIMVAL, 2003; Eves, 2013).

The income methods investigated cover the discounted cash flow (DCF) method delivering a net present value (NPV), internal rate of return (IRR) and payback period (Roberts, 2006). These relatively standard income methods could be linked to probabilistic assessments that serve two important functions, namely, to provide a mechanism for accounting for risk and uncertainty as well as delivering a range of outputs for decision making purposes (Runge, 1998; Rudenno, 2010;

Ellis,1995). Monte Carlo simulation analysis could also be used to deliver a range of valuation outcomes based on the probabilities that the risk is modelled, to account for it in a quantitative analysis for decision making purposes. For completeness, sensitivity models could be incorporated to cover the “what if” questions typically associated with the revenue stream, operational cost component and capital cost estimates (Rudenno, 2010; Baurens, 2010).

Some additional key aspects that require assessment in terms of the income methods relates to the required return on capital to be used, generally referred to as the discount rate. Another aspect to be assessed is the revenue generators that drive the income stream, these typically include the pricing assumptions, the exchange rate assumptions, financial instruments, fixed asset values and salvage values.

The market methods will be covered, seeing that from a divestment perspective, most of the methods listed in the valuation codes are relevant and require consideration. These include the comparable transaction, option agreement term, gross in-situ value, value per unit of mineral/metal, value per unit area, and market capitalization methods (CIMVAL, 2003; Lilford & Minnitt, 2005).

The cost methods, although less favoured from an operating mine divestment perspective, can be considered, especially if there is or was exploration activity that might be used to assist with adding value to the previous methods. Cost methods listed include appraised value, multiple of exploration expenditure and geoscience factor methods (CIMVAL, 2003).

3.3.1. Income Approach: Discounted Cash Flow Method

A DCF analysis involves a financial simulation of what is expected or predicted to happen at the mine over time. It is thus considered a forward-looking cash flow simulation based on a set of defendable assumptions that take into consideration the envisaged revenue steam minus the capital expenditure and operation expenses. The value of each yearly simulated cash flow generated over the life of a project can be adjusted for the time value of money. This is done by discounting the simulated future value of a cash flow by an appropriate discount rate as determined by the valuator; and time period to determine the present value of the future value. The sum of the discounted yearly cash flows gives the NPV of the entire simulated income stream (Torries, 1998).

DCF analysis has been a prominent technique for performing valuations and is based on envisaged or simulated future cash flows. The DCF technique is easily understood by both accounting, technical and management personnel and has assisted with the decision making process over many decades. The DCF method must not be seen as being perfect and hence as an evaluation tool has some limitations that the valuator must consider. A typical example is the degree to which values in the later years of a cash flow simulation affect a DCF analysis depends on the discount rate and the project life expectancy. The fact that the values of cash flows in the first few years are considered more important on a present value basis than the later cash flows has several consequences for the valuator to consider. Torries stated that from a forecasting point of view, the lesser importance of future values is fortunate, since long-term forecasts have significantly more risk associated and therefor inherently must be considered by the valuator to be less accurate. Torries continues to say that giving near-term forecasts higher weight may make sense, however discounting may underestimate important longer-term liabilities as well as undervalue long-term projects. This is because the worth of the later benefits may be understated and the impact on the valuation diminishes to a level where the possibility of incorrect decision making might occur.

Inflation presents a particular set of problems in using DCF analysis for the valuator. Good financial modelling practices dictate that if inflation is assumed to be zero, all costs, prices, interest rates, and discount rates must be in constant money terms. This is very seldom the case as inflation is factual and therefore all values must be in current money terms. Another limitation the valuator must deal with is that the DCF analysis is static and is constrained to account for uncertainty. Torries also stated that a DCF analysis does not recognize the possibility of changing operations to react to changing future economic conditions and industry drivers, whereas the mining industry can and do change according to economic and industry changes that require adjustment (Torries, 1998).

Torries continued by stating that in addition to the challenges in developing the yearly cash flows, DCF analysis also poses problems in choosing the appropriate discount rate to be used. A number of possible discount rates that are commonly used in DCF analysis are listed and include: opportunity cost of capital, risk-free alternative, cost of debt, weighted average cost of capital (WACC), historical rate of return, risk-adjusted rate of return, hurdle rate, social rate of return, varying discount rate over time and varying discount rate by cash flow line item. Although each has merit for application, some have more credibility than others. Of the discount rates identified, the opportunity cost of capital is theoretically the most correct choice, since investors have limited availability of capital and in most cases cannot undertake all projects in the portfolio. By comparing the returns of a potential project with those of the next best investment alternative, industry management and executives will be better informed for decision making purposes.

There are alternatives on how to deal with the opportunity cost of capital and the capital asset pricing model (CAPM) suggests that the WACC might be the most appropriate discount rate. The principle of WACC recognizes that there is a cost of equity just as there is a cost of debt and that the debt:equity ratios of firms may vary. WACC recognizes and accounts for the fact that inherent to any decision and transaction that there is risk that requires consideration and therefore the WACC is a risk adjusted discount rate (Torries, 1998).

"*Mining industry investment traditionally demands a higher return because of the higher perceived risk*" (Runge, 1998:200). The higher the perceived risk, the higher the risk-adjusted discount rate that should be applied during the valuation process. The amount the discount rate should be adjusted for risk is often chosen in a highly subjective manner, which may lead to incorrect conclusions. Nonetheless, adjusting the discount rate for risk is the primary method used in DCF analysis to account for uncertainty. Runge made the point that adopting a higher threshold rate does not resolve the issue in cases where investment alternatives are subject to different risk profiles. It is therefore considered more correct over the long-term that the threshold expected return on a particular investment project to be greater than or equal to the cost of capital for that project plus premiums for (Runge, 1998;200):

- *"The cost of exploring for and evaluating new projects to ultimately replace the economic reserves being depleted by this specific project;*
- *The cost of maintaining the company "knowledge" base and other intangible company assets to actually deliver operational capability on this and any (future) replacement projects;*
- *Additional risk associated with the project until it starts performing with sufficient consistency so that it can be assessed by the marketplace."*

NPV and IRR are the two basic measures of feasibility of a specific project for use in DCF analysis. NPV is a measure of value, whereas IRR is a measure of the efficiency of capital. Both NPV and IRR are used to indicate and assess project feasibility.

3.3.1.1. Net Present Value

NPV is the sum of the present values of all yearly cash flows less the initial investment. NPV reflects the perceived value a project appears to provide given a specific set of assumptions with reference to discount rate and a set of future cash flow projections. NPV is a measure of an investment's worth and is used for decision making concerning investment potential (Torries, 1998).

As an evaluation tool, NPV has many advantages. It takes into account the time value of money, and it gives a single project value for a given discount rate and set of cash flow assumptions that is used for decision making purposes. It is generally accepted that the higher the NPV, the better and more attractive for the investors to undertake the project. Torries continues to emphasise that the NPVs of individual projects can be compared to determine comparative worth, provided each NPV is generated in a consistent manner to enable fair and objective comparisons and trade-offs. Torries (1998:39) made this very clear by stating that *“this means that each NPV to be compared must be determined using the same variables, such as price assumptions, appropriately adjusted discount rates, taxation rates and consistent handling of externalities, as well as appropriate adjustments for inflation, unequal lengths of service lives and risk.”*

3.3.1.2. Internal Rate of Return

As the discount rate increases for a specific cash flow, the NPV of the cash flow decreases. IRR may be defined as that discount rate at which NPV equals zero. Alternatively, IRR may be defined as that rate that equates the initial investment with the future value of the resulting cash flows. The higher the IRR, the more profitable the project is in terms of return on invested capital. The difference between the discount rate and IRR is that the investor chooses the discount rate, whereas the characteristics of the cash flow determine the IRR (Torries, 1998).

While NPV and the maximisation of wealth are the theoretically correct investment-ranking criteria, NPV does not indicate the return per invested unit of capital. IRR on the other hand, does give indications of the return per invested unit of capital. This makes IRR one of the mining industry's most popular investment-assessment criteria.

With reference to the CIMVAL code, DCF is widely used, understood and preferred as a valuation method. Hence a DCF analysis linked to a NPV and IRR analysis will be considered further for the Kimberley Mine valuation.

3.3.1.3. Payback Period

In addition to the criteria of NPV and IRR, a supporting assessment tool used for decision making is the payback period. The payback period is the time it takes a project to return to the investor the money that is invested into the venture or project. The shorter the payback, the less time that the owner's investment is at risk. Calculation of the payback period is quite straightforward once a discounted cash flow has been prepared. The cash flows are simply plotted in cumulative form starting from zero expenditure before project commitment. Initial cash flows are invariably cash outflows, i.e. negative cash flows. The payback period is the time it takes for the cumulative cash flow to again become positive (Runge, 1998).

The analysis of the payback period must be seen as a supporting tool to the commercially more astute NPV and IRR investment assessment tools. Hence as a supporting assessment tool to the DFC analysis, the payback period will be used as further support for the Kimberley Mine valuation exercise.

3.3.2. Income Approach: Sensitivity Analysis

Sensitivity analysis is simply the process of varying one or more factors to see what the variance does to the value of the project. The three most common factors that are assessed through a sensitivity analysis are the revenue, operating cost and capital investment streams. While sensitivity analysis contributes to understanding the effects of uncertainty thorough direct manipulation of key variables, it does not give a project value adjusted for the perceived uncertainty. One of the great values of sensitivity analysis is that it identifies those factors that have the greatest effect on a project's economics or return which allows evaluators and project management to gather additional data in a more efficient and focused manner to assess the perceived level of understanding to ultimately ensure that the best investment decision is made (Torries, 1998).

The project’s sensitivity to the revenue, capital and operating cost streams must be seen as a supporting tool to the NPV and IRR analysis. As a supporting assessment tool to the DFC analysis, the sensitivity analysis will be used as further support for the Kimberley Mine valuation exercise.

3.3.3. Income Approach: Probabilistic Assessments and Monte Carlo Simulation

Monte Carlo simulation is defined as a problem solving technique used to approximate the probability of certain outcomes by running multiple trial runs, called simulations, using random variables. The Monte Carlo simulation is a computerized mathematical technique that allows valuators to account for risk in quantitative analysis and decision making by executives. Monte Carlo simulations furnish both the valuator and the decision-maker with a range of possible outcomes and the probabilities that they might occur for any choice of action. It shows the extreme possibilities, i.e. the outcomes of going for an aggressive approach or decision and for the most conservative approach or decision, along with all possible financial consequences for middle-of-the-road decisions (Palisade, n.d.).

Probabilistic methods, like a Monte Carlo Simulation, fulfil two important functions that cannot be addressed easily in any other way (Runge, 1998:217):

- "*They provide a mechanism for personnel who understand any element of uncertainty to quantify this element. Individual subjective or objective assessments can be separately defined but collectively analysed. The discipline imposed on individual skilled team members to consider uncertainties in their area of knowledge frequently results in substantial changes and improvements in the robustness of plans. This knowledge often cannot be drawn out and assimilated in any other way.*
- *There are certain elements that are incorrectly portrayed in any deterministic analysis. Using a deterministic variable is equivalent to assuming no variability, which ultimately will lead to systematic errors. Even an assumed underlying stochastic characterization will commonly yield more reliable results than a deterministic assessment that assumes no such variability."*

Runge (1998) further stated that the ultimate test of any evaluation technique is the value of the results that it provides. The value of the Monte Carlo simulation is in its treatment of the interrelationships among input variables. The simulation of interrelationships primarily requires variables to change; it is less important whether their variability is characterized by a normal distribution, lognormal distribution, or any other type of distribution. The Monte Carlo simulation simultaneously models all the variables that the valuator considers central to the project, and it is possible to use the model itself to determine whether the results are sensitive to the characteristics of the input. The model itself is an invaluable guide to understanding which parts of the underlying plan translate most into uncertainty in the result as these are the parts that need to be understood. The second and perhaps primary value from probabilistic analysis is the value from understanding the project or opportunity better.

With reference to the CIMVAL code, Monte Carlo simulation is less widely used but is gaining acceptance as a valuation method. Hence a Monte Carlo simulation will be considered further for the Kimberley Mine valuation.

3.3.4. Income Approach: Scenario Analysis

The problem the valuator and ultimately the decision maker faces, is caused by insufficient information to make an informed decision. One way to identify and quantify these unknowns is to construct scenarios involving the expected ranges of input variables that will result in three scenarios showing the perceived optimistic, base case, and pessimistic outcomes, also commonly referred to as the best case, most likely and worst case, respectively. Torries (1998) captured the need for scenario analysis very concisely as the need for decision makers to understand the uncertainty created by multiple combinations of factor values. It is considered advantageous to demonstrate the results of scenarios in which combinations of variables are changed, as the combined influence might be key to understand when it comes to decision making time.

The base case is constructed from the "best" estimates of the project or operational parameters, and the resulting NPV is often communicated as the "expected value" of the project or operation under investigation. The pessimistic case shows the results of what happens when there is significant negative deviation from the plan affecting the project, and the optimistic case shows what happens when expectations and projections are exceeded.

Torries (1998) warned decision makers by stating that they need to be very careful with scenario analysis as it makes no sense to base business decisions on the occurrence of events that are highly unlikely to happen. Even if all values for each of the scenarios are associated with similar probabilities, the results of the analysis could still be misleading and the wrong decision could be made. Scenario analysis is widely used but potentially a dangerous tool for both the valuator and the decision maker. The NPVs for each of the scenarios are mathematically consistent, which gives a sense of repeatability to the process, but the conclusions a valuator and decision maker might reach from these results may well be providing a false sense of understanding. However the scenario analysis can still be useful but decision makers must be cautious not to base decisions purely on this method and as such must be used as a supportive method.

Scenario analysis is less widely used but does offer some insights into the extremes of the valuation exercise. Hence a scenario analysis is considered very useful from a current owner perspective for scenario flexing purposes, but will not be considered further for the Kimberley Mine valuation as a supporting tool.

3.3.5. Income Approach: Option Pricing

Option pricing is explained as options that are derivative contracts that give the holder the right, but not the obligation, to buy or sell the underlying instrument at a specified price on or before a specified future date. Although the holder, also called the buyer of the option, is not obligated to exercise the option, the option writer, known as the seller, has an obligation to buy or sell the underlying instrument if the option is exercised. Depending on the strategy, option trading can provide a variety of benefits including the security of limited risk and the advantage of leverage. Options can protect or enhance an investor's portfolio in rising, falling and neutral markets. Regardless of the reasons for trading options or the strategy employed, it is important to understand the factors that determine the value of an option (Folger & Leibfarth, 2007).

With reference to the CIMVAL code, option pricing is not widely used or understood in mine valuation, but is gaining acceptance. Option pricing will not be considered further for the Kimberley Mine valuation since the key issue to resolve is the valuation of the operation and underlying assets, and not the mechanism or contractual agreement to deliver a 'willing buyer willing seller' outcome.

3.3.6. Market Approach: Comparable Transactions

Comparable methods allow the value estimated for a mining project to be benchmarked against mining project values established in the market. Comparable methods are a key tool for ensuring value estimates are consistent with what the market would actually pay. The comparable transaction method uses the transaction price of comparable mining projects to establish a value for the operation under assessment (Baurens, 2010).

Roberts (2006:7) highlighted the following sources from which the market value of mining projects can be derived, namely:

- *"The value paid in a direct asset transaction has the advantage that it provides a direct measurement of project value, since there are no corporate considerations to impact value. Unfortunately for the valuator, most transactions are at the corporate level, particularly those for which value data is publicly disclosed. Also, as with all transaction data, it is applicable to a particular point in time, and is likely to have diminished validity if market conditions have changed from the date of the transaction.*
- *The value paid in a corporate acquisition transaction can be almost equivalent to a direct asset transaction in the case of the acquisition of a junior company holding a single significant asset, where the dominant interest of the acquirer is this single asset.*
- *Value implied in a merger transaction between an acquisition and a merger transaction is grey, and many of the comments above regarding project values derived from transaction values apply here as well. In merger transactions, corporate issues may play an even greater role in determining transaction value.*
- *Current trading value of a company presents two key advantages, namely that the market value estimates so derived represent current market value, and the amount of data is greater, with all public mining companies being continually valued in the market through their share price. Disadvantages*

include the fact that a current share price represents a marginal market value, which may differ significantly from the total value that would be realised in a full project transaction."

With reference to the CIMVAL code, comparable transactions is a widely used method and understood for valuation exercises. Comparable transactions will be considered further for the Kimberley Mine valuation exercise.

3.3.7. Market Approach: Option Agreement

An option agreement is defined as an agreement between two parties that provides one of the parties with the right but not the obligation to buy, sell or obtain a specific asset at an agreed upon price at some time in the future. This agreement can be used to formally agree on specific sets of conditions to be met to enable the one party to buy, or have the first right to purchase, an asset at a specific price at some point in the future.

With reference to the CIMVAL code, option agreements are widely used, but again this specific approach is more aimed at the mechanism or contractual agreement to deliver a 'willing buyer willing seller' outcome, similar to the option pricing method discussed earlier. The option agreement method will not be considered further for the Kimberley Mine valuation since the key issue to resolve is the valuation of the operation and underlying assets.

3.3.8. Market Approach: Gross In-situ Value of Metal or Mineral

Gross in-situ valuation is a straight forward method of valuating a mining operation. In essence it is simply the value of all mineral resources, i.e. all mineral deposits, resources and reserves specific to the operation that a mining company owns (Moneyterms, n.d.).

Gross in-situ valuation has many flaws that renders it not acceptable from an official mine valuation perspective. Gross in-situ valuation does not take into account factors that affect the value of the company, as opposed to its resources, most importantly its other assets and liabilities. It does not even take into account whether the deposits and resources are economically viable i.e. the cost of mining. Due to these flaws, this approach will not be utilised for the valuation process of the operation under investigation.

3.3.9. Market Approach: Net Metal/Mineral Value

The net metal value, or in this case the net mineral value, is based on the concept that assets are valued by applying the fundamental prices observed in the market by the quantity of mineral resource available for production or in place (Domingo, et al, 2007).

There are very definite advantages to this approach with reference to official mineral resource and reserve statements signed off by competent persons. Based on the official competent person signed-off mineral resource and reserve statement data available the valuator will be able to apply accurate price, quantity and cost data as obtained from the markets to determine potential value.

With reference to the CIMVAL code, net mineral value is considered a secondary method and must be seen as a rule of thumb. The net mineral value method will therefore not be considered further for the Kimberley Mine valuation as it is a secondary method.

3.3.10. Market Approach: Value per Unit Area

The value per unit area method of valuing mineral rights is recommended where insufficient geological and related techno-economic information governing a mineral property exists. The value per unit area method has been developed specifically for use within the mining industry and continues to be refined over time as new transactions are completed (Lilford & Minnitt, 2005). The method considers four key input parameters attributable to the mineral property in question, namely:

- The depth of mineralization below surface;

- The mineral category;
- The mineral grade and
- Its proximity to existing infrastructure.

With reference to the CIMVAL code, value per unit area valuation is widely used for large exploration properties. Due to the fact that the operation under investigation not being classified as a large exploration property, the value per unit area valuation will not be considered further for Kimberley Mine valuation.

3.3.11. Cost Approach: Appraised Value

The appraised value method for mine valuation is well summarized by Domingo & Lopez-Dee (2007). They stated that the appraised value method is based on the premise that the real value of an exploration property or a marginal development property lies in its potential for the existence and discovery of an economic mineral deposit. The basic tenet of the appraised value method is that an exploration property is worth the meaningful past exploration expenditures plus warranted future cost. An important element of this method is that only those past expenditures which are considered reasonable and productive are retained as value. Productive means that the results of the work give sufficient encouragement to warrant further work by identifying potential for the existence and discovery of an economic mineral deposit. Warranted future costs comprise a reasonable exploration budget to test the identified potential or promising showings or mineralized zones already identified. If exploration work downgrades potential, it is not productive and its cost should not be retained as value or should be reduced. Obviously, if the property is considered to have negligible exploration potential, it has little or no value. Usually little of the expenditures more than five years prior to the effective valuation date are retained.

With reference to the CIMVAL code, the appraised value method is widely used but not accepted by all regulators. It is however a valuation method specific to an exploration property or a marginal development property. Due to the fact that the operation under investigation is not being classified as a large exploration property, or a marginal development property, the value per unit area valuation will not be considered further for Kimberley Mine valuation.

3.3.12. Cost Approach: Multiple of Exploration Expenditure

The multiple of exploration expenditure is based on the appraised value method for mine valuation. It is also a valuation method that is more specifically used in the exploration phase of a project or mineral resource. The multiple of exploration expenditure value is determined by how much was spent on exploration in the past plus future expenditures. The total figure is adjusted by a factor related to the prospectivity of the area. This factor is commonly known in the industry as the prospectivity enhancement factor.

Schodde (2002) noted that only those past expenditures that are reasonable and productive can be included in the valuation. Schodde further went on to state that for the valuation process, the valuator can only count future expenditures which are committed to the project, and lastly that the valuator can only use a high prospectively enhancement factor if the exploration results are compelling.

Schodde (2002) went on to state that the prospectivity enhancement factor can range from 0 to 5 but is usually in the range 0.5 to 3 .0, with the industry average being ~1.8. Table 3.3 shows a range of multipliers with brief explanatory comments for consideration. What is of importance for every valuator to acknowledge is that the application of the multiplier is subjective in nature and hence the reason why, similar to the appraised value, it is not accepted by all regulators.

Table 3.3 - Prospectivity Enhancement Factor (Source: Schodde, 2002)

Multiplier	Explanatory Comment
x0.5	Previous exploration indicates that the area has limited potential for a major discovery
x1.0	Existing data is sufficient to warrant further exploration
x1.5	Have direct evidence of an interesting target. Further work is warranted to evaluate the target
x2.0	The leases contain a defined drill target with significant geochemical intersections
x2.5	Exploration is well advanced and limited in-fill drilling is likely to define a resource
x3.0	Have already found a substantial resource (that is likely to lead to a mine). Further exploration is likely to lead to an increase in the size and quality of the resource

The multiple of exploration expenditure method is however a valuation method specific to an exploration property or project. Due to the fact that the operation under investigation is not being classified as an exploration property or project the multiple of exploration expenditure valuation will not be considered further for Kimberley Mine valuation.

3.3.13. Cost Approach: Geoscience Factor

The Kilburn (1990) geoscience factor method determines a base value per claim to arrive at an overall property value. This geological engineering method is based on four main characteristics of mineral properties, namely: location, inclusion of valuable mineralization, inclusion of geophysical and/or geochemical targets, and inclusion of geological targets. These are subdivided into 19 subcategories, which are used to determine the value of the property by assigned relative value factors of 1.3 to 10. The score is adjusted for local market conditions and then multiplied against a standard cost for a typical exploration project (Schodde, 2002).

With reference to the CIMVAL code, the Geoscience Factor method is not widely used in the greater mining industry for valuation purposes. Also, it is a valuation method specific to an exploration property and will not be considered further for Kimberley Mine valuation.

3.4. Mine Valuation: The Balance Sheet Approach

The balance sheet from an accounting perspective has two sides. On the one side of the balance sheet are assets, these assets are the things of value the mine owns. On the other side are the liabilities (the debt of the mine) and the capital (the owner’s share of the mine). The balance sheet is described by a very simple equation, which stipulates that assets are equal to liabilities plus capital.

Every entry into or out of one part of the balance sheet must be balanced by a corresponding entry in another part of the balance sheet. This ensures that the bottom totals will remain in balance, hence it is possible to see the business’, in this case the mine’s financial position at a specific point in time and must be viewed as a financial snapshot of the mine at the end or beginning of an specific accounting period.

Mining economics continue to evolve and the impact that this is having on mine valuation requires continuous monitoring and adjustment. The balance sheet of a company serves several purposes, the main being (Leeds Metropolitan University, n.d.:1):

- *“For reporting purposes (limited company's annual accounts);*
- *Helps interested parties to assess the worth of a business at a given moment - such as investors, creditors or shareholders;*

- *Helps one to analyse and improve the management of a business."*

It has become imperative for mine valuation to take the full balance sheet approach when addressing the value of a mining entity or operation, to fully understand both the value associated with the potential "asset" as well as the "liability" component (Roberts, 2006). The value to be assessed for divestment or investment purposes is the equity component, which in essence is the value of the mining entity or operation to the shareholder or prospective investor.

The valuation approach followed in this analysis differs from the pure accounting approach as the intent is to determine the worth of the mine, not from the current owner's perspective, although it is important for comparative purposes, but to get a valuation of the mining asset in the hands of a new owner or investor. Mine valuation requires a detailed analysis of the revenue stream and cost components associated with the entity under consideration. It also requires the valuation to be considered at both operational/project level and at enterprise level.

Hence in terms of the assets the valuation will focus on many aspects, but primarily driven by, inventory, seen in this analysis as the valuation of the mineral resource, the fixed assets, seen in this analysis as the infrastructure in place to enable mining and processing to continue, and lastly the accounting aspects such as cash, accounts receivable, stock inventory, etc. The valuation of intangible assets, i.e. not physical objects but aspects that add value to the mine such as the people or employee know-how, the systems, the contractors and service providers, etc. will be attempted as a subjective score, as there is value associated with it and it is real. The intent is not to be over optimistic with the valuation of the intangibles, but rather to place a value on these assets as they are real and in the business environment there needs to be acknowledgement of value (Follett, 2012).

There is also a requirement to focus on some other important value drivers that are becoming more accepted in terms of the valuation process. Typical examples of value drivers include the going concern concept, the variability around estimates, the accuracy of the assured and reviewed financial report and lastly the accounting for concealed assets that might have a material impact on value (Follett, 2012).

Follet (2012) stated that in terms of the going concern, the financial reports are based on the assumption that the company will keep on operating in the future with no dramatic shifts or changes. Working on the assumption that this is true, the numbers in financial reports are likely to be much more meaningful or relevant for valuation and ultimately decision making purposes. The alternative is true as well, if this assumption is incorrect, the numbers on financial reports are likely to be much less meaningful. The deduction that Follet reaches is that a going concern has value and this value has to be maintained going forward to ensure the investment delivers continued value to the investor.

With reference to the financial estimates, financial reports are based on many estimates and assumptions. Some of these numbers can be applied with high confidence, but significant portions are estimates with varying degrees of accuracy. If the estimates are inaccurate, the financial reports will be inaccurate which will complicate the decision making process. However, normally there is a trend for the estimates to lean more towards the conservative and hence might present opportunity for improvement in projected future financial performance (Follett, 2012).

Follett (2012) emphasised the point that it is also critical in a valuation exercise to acknowledge that there is no one "true" and accurate financial report for all purposes and perspectives. The same company for the same period can show different profits, different asset values, and different net worth, depending on how the financial reports are prepared. It is in instances like this where valuation and reporting regulations and codes are key in setting standards and ensuring that the guiding principles of materiality, transparency, competence and independence is adhered to, thereby ensuring that the valuation outcome is consistent and defendable. Equally important, the purpose for which the financial or valuation report is prepared affects the numbers. Hence in this instance it is almost a given that from a valuation perspective the number be assessed in terms of formal scenario planning options to determine a best case, most likely and worst case scenario, i.e. a range of values.

Follett (2012) stated that concealed assets are sometimes very important value additions that are not reflected in financial statements and reports. Financial reports can never show all the important facts about a company that drive value and hence there are always concealed assets. Factors such as the quality of the staff (typically referred to as human capital), market share, potential new technology or research and development capacity, competition, impending government regulations, and so forth are not shown on official financial statements but can have a profound impact on a company's value.

In terms of the liabilities component it is important to have a good understanding of the amounts owed to other companies, individuals and regulatory institutions and the agreements in place regarding repayment conditions. The following principal liabilities are key to the balance sheet analysis, namely, the notes payable, current portion of the long-term debt due for payment, accounts payable and accruals to be paid at the end of the accounting period. For the valuation exercise, specific to the operation under review, the biggest liability to be accounted for with reference to the applicable regulatory requirements is the premature closure liability which is a function of disturbance and approved environmental management plan. The premature closure being defined in this instance as the financial provision required and intended to cover two types of costs, namely the costs of undertaking the agreed environmental rehabilitation work programmes and the costs of rehabilitating the mining area or disturbed area to agreed levels (Van Zyl, et al, 2012). Typically this would be classified as noncurrent liabilities, including the long-term debt and other debts owed to outside parties and due over periods of many years.

3.5. Chapter Summary

This chapter assessed the three main mine valuation codes, namely, SAMVAL, CIMVAL and VALMIN. These codes provide basic guidelines to valuators to comply with when conducting a valuation exercise. From the literature review conducted it is clear that there is good alignment between these codes in terms of the guiding principles that a valuator must adhere to. Of particular interest, as an acceptable guiding document, is the CIMVAL valuation methods for mineral properties table, which was used to assess the applicability and practicality to the Kimberley Mine valuation exercise.

The second section in Chapter 3 looked at the mine valuation methods and techniques. As an outcome of the literature review the main valuation methods were assessed. The following methods were not used in the assessment for the reasons mentioned in the respective sections, namely: option pricing, option agreement, gross in-situ value of mineral, net mineral value, value per unit area, appraised value and multiple of exploration expenditure. It was concluded that the DCF, linked to an NPV and IRR analysis would be used. As supporting techniques the payback period, sensitivity analysis and scenario analysis were considered as well. The Monte Carlo analysis method would be applied to the Kimberley Mine valuation exercise as a probabilistic analysis method. Lastly, the comparable transactions method would be utilized as well.

4. DATA COLLECTION AND INDUSTRY ASSESSMENT

4.1. Chapter Overview

The focus of Chapter 4 is on the data collection and industry assessment to enable a valuation exercise on Kimberley Mine. The practical application focused on the comparable transaction, DCF and Monte Carlo simulation mine valuation methodologies.

The comparable transaction analysis focused on three broad operational comparisons, namely pure TMR operation transactional comparisons as well as historical underground and surface operation transactions. The DCF methodology was further expanded on to also look at payback period estimates and sensitivity analysis over and above the normal NPV and IRR estimates. The Monte Carlo simulation analysis used the DCF models as the base inputs to conduct the simulations as required.

4.2. Comparable Transactions

With reference to Section 3.3.6, comparable methods allow the value estimated for a mineral or mining project to be benchmarked against mining project values established in the market. For the Kimberley Mine valuation the comparable transactions method is considered a key tool for ensuring value estimates are consistent with what the market would consider paying with reference to the fair value or market value concept as per the SAMVAL, CIMVAL and VALMIN codes.

Due to the comparable transaction method using the transaction price of comparable mining projects to establish a value for the operation under assessment, it is important to understand the value that was paid during these transactions. For this purpose the research conducted focused primarily on transactions that occurred in South Africa. The research identified three main types of divestment or investment transactions, namely transactions associated with TMRs, underground and surface operations. Furthermore with reference to the values of these transactions it is important that these be escalated to current year estimates, or money terms, for comparison purposes. There is still a fair amount of subjectivity; however the important comparison in terms of ZAR per carat needs to be at least from a transaction value perspective in current year terms.

This valuation method has several advantages, as discussed in Section 3.3.6, but the main being that it is a direct measure of project value due to the simplicity associated with it. Normally the market is relatively accurate at reporting the transactional value and date; hence the escalation to current year value terms is straight forward.

Unfortunately there are also some downsides that require consideration. Arguably the most important consideration revolves around the conditions and market assumptions that were used in the historical analysis for determining fair value at the specific point in time. The transactional value also in most cases reflects the corporate value which is not fully transparent for application on the current operation under review.

The methodology applied in comparable transaction valuations is captured in five steps:

- Step 1 requires data collection.
- Step 2 is focused on grouping of the data into broad, logical sets.
- Step 3 requires the escalation of historical transactional values to current day values for comparative purposes.
- Step 4 entails the calculation of divestment value on a per tonne and carat basis.
- Step 5 is the application, in this case the ZAR per carat divestment price to the operation under investigation.

4.2.1. Comparable Transactions - Tailings Mineral Resources

Research on comparable transactions in the South African mining industry with specific focus on diamond mining transactions associated with TMR's yielded results as reflected in Table 4.1. The results reflect an average divestment price on a per carat basis of ZAR 124.73, with values ranging from ZAR 66.76 to ZAR 158.00 per carat.

Table 4.1 - Comparable Transactions - Tailings Mineral Resources

Comparable Transaction	Transactional Tonnes	Transactional Carats	Divestment Price (ZAR in 2015 Money Terms)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)
TMR Transaction 1	50 019 692	2 838 896	349 931 694	7.00	123.26
TMR Transaction 2	14 896 000	968 088	152 962 578	10.27	158.00
TMR Transaction 3	7 448 000	484 044	32 313 600	4.34	66.76
Totals / Average	**72 363 692**	**4 291 028**	**535 207 872**	**7.40**	**124.73**

The results of the comparable TMR transactions was used to calculate an indicative Kimberley Mine value based on the carats estimated to be part of the divestment package. Based on this methodology the indicative value of Kimberley Mine ranges between ZAR 303 million and ZAR 718 million with an average value estimated to be ZAR 527 million (refer to Table 4.2).

Table 4.2 - Tailings Mineral Resources Comparable Transactions - Kimberley Mine Application

Comparable Transaction	Transaction Grade (cpht)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)	Indicative Value Kimberley (ZAR)
TMR Transaction 1	5.68	7.00	123.26	559 466 756
TMR Transaction 2	6.50	10.27	158.00	717 151 467
TMR Transaction 3	6.50	4.34	66.76	302 998 890
Average	**5.93**	**7.40**	**124.73**	**526 539 037**

4.2.2. Comparable Transactions - Underground Operations

Research on comparable transactions in the South African mining industry with specific focus on diamond mining transactions associated with underground operations yielded results as reflected in Table 4.3. The results reflect an average divestment price on a per carat basis of ZAR 14.93, with values ranging from ZAR 7.55 to ZAR 48.14 per carat.

Table 4.3 - Comparable Transactions - Underground Operations

Comparable Transaction	Transactional Tonnes	Transactional Carats	Divestment Price (ZAR in 2015 Money Terms)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)
Underground Operation Transaction 1	59 265 000	6 984 000	121 196 884	2.04	17.35
Underground Operation Transaction 2	97 539 000	43 661 000	2 101 928 375	21.55	48.14
Underground Operation Transaction 3	436 124 000	204 556 000	1 543 909 348	3.54	7.55
Underground Operation Transaction 4	139 000 000	5 964 000	131 474 227	0.95	22.04
Totals / Average	**731 928 000**	**261 165 000**	**3 898 508 834**	**5.33**	**14.93**

The results of the comparable underground transactions was used to calculate an indicative Kimberley Mine value based on the carats estimated to be part of the divestment package. Based on this methodology the indicative value of Kimberley Mine ranges between ZAR 34 million and ZAR 219 million with an average value estimated to be ZAR 108 million (refer to Table 4.4).

Table 4.4 - Underground Operation Comparable Transactions - Kimberley Mine Application

Comparable Transaction	Transaction Grade (cpht)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)	Indicative Value Kimberley (ZAR)
Underground Operation Transaction 1	11.78	2.04	17.35	78 763 999
Underground Operation Transaction 2	44.76	21.55	48.14	218 506 705
Underground Operation Transaction 3	46.90	3.54	7.55	34 257 062
Underground Operation Transaction 4	4.29	0.95	22.04	100 056 089
Totals	**35.68**	**5.33**	**14.93**	**107 895 964**

4.2.3. Comparable Transactions - Surface Operations

Research on comparable transactions in the South African mining industry with specific focus on diamond mining transactions associated with surface operations yielded results as reflected in Table 4.5. The results reflect an average divestment price on a per carat basis of ZAR 15.87, with values ranging from ZAR 10.37 to ZAR 2094.69 per carat.

Table 4.5 - Comparable Transactions - Surface Operations

Comparable Transaction	Transactional Tonnes	Transactional Carats	Divestment Price (ZAR in 2015 Money Terms)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)
Surface Operation Transaction 1	11 504 000	42 414	88 844 282	7.72	2 094.69
Surface Operation Transaction 2	401 992 000	16 042 000	166 400 000	0.41	10.37
Totals / Average	**413 496 000**	**16 084 414**	**255 244 282**	**0.62**	**15.87**

The results of the comparable surface operation transactions was used to calculate an indicative Kimberley Mine value based on the carats estimated to be part of the divestment package. Based on this methodology the indicative value of Kimberley Mine ranges between ZAR 47 million and ZAR 9 507 million with an average value estimated to be ZAR 4 777 million (refer to Table 4.6).

Table 4.6 - Surface Operation Comparable Transactions - Kimberley Mine Application

Comparable Transaction	Transaction Grade (cpht)	Divestment Price (ZAR/tonne)	Divestment Price (ZAR/carat)	Indicative Value Kimberley (ZAR)
Surface Operation Transaction 1	0.37	7.72	2 094.69	9 507 378 511
Surface Operation Transaction 2	3.99	0.41	10.37	47 079 880
Total	**3.89**	**0.62**	**15.87**	**4 777 229 195**

4.2.4. Comparable Transactions - Outcomes

The comparable transaction analysis, as analysed above under TMR, underground and surface operations, reflects a very wide theoretical range of values for the Kimberley Mine divestment package. It is imperative for valuation analysis to be sanitized in terms of applicability to the operation under review. For this reason the following valuation considerations were noted:

- From the valuation analysis it is evident that the TMR comparative transactions reflect a considerably higher average price per carat compared to the underground comparative transactions. From this it is evident that the perceived value per in-situ carat for TMR's carries significantly less cost of extraction and assist with value adding due to decreased project investment risk. It is this differentiator that assists with adding value to the TMR transactions.
- Generally underground operations also require significant capital investment as opposed to TMR operations that are less capital intensive.

- The surface operation comparative transaction analysis yielded a very wide range of valuations for the operation under investigation. The key differentiator in this instance is the mineral resource, being primarily alluvial in nature for the surface operations, which in general reflects very low grade estimates with upside of very high average price per carat revenue models. For this reason, the surface operation comparative transactions analyses were not considered further.

The comparative transaction analysis reflects an operational value for the project under investigation of between ZAR 108 million, the average of the underground operation comparative transaction, to ZAR 527 million, the average of the TMR comparative transactions analysis. The average value taking both the TMR and underground operational comparative transactions into consideration reflects a value for the operation under consideration of ZAR 287 million. This value is considered to be comparatively conservative due to the negative impact of the underground operational transactions on the value estimation of the TMR operation under review.

4.3. Discounted Cash Flow Analysis

The DCF methodology employed for the construction of the financial models for Kimberley Mine is based on an escalated / de-escalated discounted cash flow model. This methodology ensures accurate evaluation of future revenues and costs for the shareholders and the investors to consider for decision making purposes.

The advantage of using an escalated / de-escalated model allows the valuator to better take into account issues specific to forecasts of exchange rate movements relative to the US Dollar currency in which diamonds are sold. It also uses the forecasts of diamond revenue increases in excess of inflation to model a more accurate revenue stream for the operation under consideration. Another advantage for the model is more reliable representation of the effect of local inflation on wages, operating and capital costs.

The financial models constructed for Kimberley Mine were used to estimate the revenues stream based on using the base dollar per carat value, which was escalated by the projected diamond price growth in nominal terms. All operating and capital costs were inserted in constant money terms and escalated by the appropriate escalation rate applicable to the working cost or capital escalation in the planning indices. The resultant cash flows were de-escalated by the inflation rate to produce real numbers from which real NPV and IRR calculations were performed.

The following items are discussed in more detail in subsequent sections to create context for the DCF analysis:

- Discount rate logic;
- Inputs associated with the models and key assumptions;
- Production scenarios and
- Commercial terms.

4.3.1. Discount Rate

The hurdle rate is the rate of return that shareholders or investors require from an investment in order to cover the cost of capital, as well as compensate for the risk that the shareholders or investors will be exposed to by investing in the particular project. The hurdle rate that was decided on for the financial modelling analysis consists of the sum of three components, namely the WACC, a technical risk premium and a country risk premium.

The DBCM WACC is the cost to the company of its total debt and equity funding. The WACC is quoted in real terms and is applied to post-tax net cash flows. Although the company's WACC calculation changes from time to time, the DBCM WACC recommended as the basis for setting project hurdle rates is 10% nominal and 8% real. In addition the project requires the addition of a technical risk premium to account for project specific technical risk. Currently De Beers prescribes a premium of 2% for green-fields and 1% for brown-fields projects. Seeing that Kimberley Mine is a going concern, the technical risk premium applied is aligned with the brown fields 1% premium. In addition, the project requires the addition of a country risk premium to capture the risk associated with operating within a specific country. The current country risk premium applicable to the Republic of South Africa is 3% (Source: De Beers Investment Evaluation Guidelines, 2011).

The hurdle rate applicable to a new owner is subjective in nature, but for the purposes of this valuation a small miner WACC of 6% real is recommended. To account for project specific technical risk, a technical risk premium of 2% is deemed risk appropriate seeing that Kimberley Mine is a going concern with detailed historical performance records. No country risk premium is recommended as a small miner will not have a large portfolio of projects and operations spanning multiple countries.

The hurdle rate applied for the DCF financial modelling analysis consists of the sum of the DBCM WACC of 8%, a technical risk premium of 1% and a country risk premium of 3%. Although several arguments can be formulated to increase or decrease the rate, it is important for the analysis to be consistent in the application of the rate to establish accurate comparisons.

4.3.2. Inputs Review

The inputs for the financial model are critical to the valuation exercise. These inputs provide surety to the financial model by adding a level of comfort that the end results are not overstated nor understated by over discounting or overstating the revenue and cost streams. The inputs for the Kimberley Mine valuation exercise holistically consist of the mineral resource and reserve factors, the mining factors, the ore processing factors and the pricing factors.

The official operational mineral resource and reserve statement is the kick-off point for the model input parameters. The model incorporated the current reviewed and signed off resource and reserve statement by the appointed competent persons for on mine resources and reserves. The official operational mineral resource and reserve statement was constructed in accordance with the minimum standards, recommendations and guidelines for public reporting of Exploration Results, Mineral Resources and Mineral Reserves in South Africa as per The South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (The SAMREC Code).

The Kimberley Mine operational mineral resource and reserve statement state resources and reserves at a very strict operational bottom cut-off of 1.15 mm. It is also important to note that all deposits, resources and reserves have been assessed by an officially appointed Mineral Resources and Reserves Classification Committee which rated and signed-off in terms of the five key classification criteria or models, namely; the geological, volume, grade, density and revenue models.

The SAMREC code defines a reserve as economically mine-able where the "*extraction of the mineral reserve has been demonstrated to be viable and justifiable under a defined set of realistically assumed modifying factors*" (SAMREC, 2009:2). The interpretation of "realistically assumed" will vary with the type of deposit, the level of study that has been carried out and the financial criteria of the reporting entity. The definition requires that both the geo-scientific knowledge and "reasonable prospects for economic extraction" be considered.

Kimberley Mines does not have reserves in its portfolio as all resources fail the conversion process.

Although the operation does not have indicated resources, techno-economic studies and trade-offs demonstrate economic viability, however reserves cannot be reported. The business case for Kimberley Mines is consequently based on the extraction of “factorized inferred resources” and deposit category material. In line with Clause 40 of the SAMREC Code, Kimberley Mines has declared inferred resources where sufficient sampling has taken place. Some of the resources or part of the resource will remain at deposit category based on the low levels of geo-scientific confidence, or not remaining positive after evaluating for reasonable prospects of eventual economic extraction.

For the conversion to factorized inferred resources for the model construction the following techno-economic studies and modifying factors were applied:

- Geology factors, details of which are described with reference to the official mine resource and reserve report.
- Governmental factors, of which there are no concerns that affect the resource and reserve statements at present which may put the continued operation at risk.
- Environmental factors, of which there are no factors that might affect the resource and reserve statements overall which may put the continued operation at risk.
- Legal factors, such as legal disputes or unresolved matters that are of a legal nature or that have potential legal repercussions. The mining license tenure covers the duration of life of mine including the blue sky scenario which is in alignment with the approved Mine Works Program (MWP).
- Social factors, of which currently all social issues that could impact on the continued operation are under control. DBCM regards the sustainable transformation of the mining industry as an imperative to the business and in this regard, the development of the communities in which it operates and to make a real and lasting contribution. To this effect an approved Social and Labour Plan is in place.

Mining activities are conducted in partnership with a contractual load and haul service provider. The mining method is a dozing, loading and hauling operation where ore is hauled to the processing facility called the Combined Treatment Plant (CTP). The TMRs are mined in 100m x 100m blocks and are sequenced to allow drainage during rainy seasons. Due to the nature of the TMR's, a decision was taken to use dozers instead of excavators in order to break down the material so that it can flow better through the processing facility. This method ensures that the material is broken down and dried prior to transportation to the CTP. The mining philosophy is governed by mining three resources simultaneously to ensure optimum blend to the plant to mitigate treatability challenges, to optimise grade mix and revenue blend. Three dozers are used with each dozer matched up with a front-end loader (FEL). Each FEL loads a maximum of six haul trucks depending on the mining areas, which have different haul distances.

Kimberley Mines TMR's have no prominent geological features that can impact the resource performance significantly since it is an inferred resource due to grade variability and uncertainty. However, density and moisture are not well understood. External dilution results from the mixing of barren material with diamondiferous ore during mining. This form of dilution leads to an increase in tonnage and a decrease in mean grade, relative to the resource estimate. In the Kimberley Mines context, external dilution could result from mining beyond the resource boundary both laterally and vertically. The external dilution has not been modelled for the mine due to relative low risk of occurrence and the effect of subsiding on the larger TMR's. Internal dilution refers to the presence of waste rock, i.e. non-kimberlitic country rock, within the TMR's. Resource modifying factors for mining accounts for 3% and take into account internal dilution, density, and moisture factors (Source: Kimberley Mine LoM Plan Report Section C, 2014).

The annual treatment rate is a function of engineering availability, metallurgical utilisation, mining utilisation, and on the TMR blend that is being planned. TMR material is currently processed through the CTP at a planned rate of 6.4 million tonnes per annum. However the processing facility has a nameplate capacity of

6.0 to 7.2 million tonnes per annum after taking into consideration the maintenance plan, overall up-time and mining mix taking into account treatability considerations. The current CTP throughput rate is planned to be 950 tonnes per hour taking into account the planned head feed blend of material, but can be optimised to a sustainable 1200 tonnes per hour. This will enable the metallurgical facility to treat the modelled 8.0 million tonnes per annum through process flow optimisation aimed at the elimination of all recirculating streams in the current process flow design. The recirculating streams are primarily aimed at maximising diamond liberation and recovery efficiency, but erode head feed capacity as a consequence. This envisaged ramp-up is supported by process flow simulations that demonstrate that future operational success is linked to the economic optimisation of revenue per hour generation.

The CTP recovery factor, commonly referred to as the Process Recovery Factor (PRF), is estimated to be 91.0 %. The PRF is a function of the screening factor, the liberation factor, the Dense Medium Separation (DMS) efficiency factor and the Recovery factor. The screening factor takes into account the losses that occur when material is misplaced, i.e. oversize in the undersize or alternatively undersize in the oversize fraction. This factor was determined through historical screening performance monitoring of the various streams in the facility, and is currently estimated to be 97.0%. A liberation factor of 98.6% is applied based on historical test work and granulometric assessment of the CTP coarse residue stream. The DMS efficiency factor of 95.0% is calculated based on audit results obtained over several years. The Recovery efficiency factor has been estimated to be 99.3%. This factor is based on the audits conducted over many years as well as taking into consideration the process flow of the facility (Source: Kimberley Mine LoM Plan Report Section C, 2014).

The factorised resource carat ratio is thus a function of the mining resource factor (3% adjustment) and the CTP PRF (9% adjustment) equating to an 88% overall factor. This overall resource factor has been tested historically and can be viewed with a high degree of confidence.

The diamond price inputs used for the financial models are based on the official 2015 De Beers Diamond Value budget price book as received from De Beers Group Mineral Resource Management. Appropriate views on price growth are critical to the evaluation of all diamond mining projects. The De Beers Group's view on the price growth forecast varies from time to time and is provided to the different Business Units for usage quarterly.

The following factors are worth noting with reference to the financial models constructed when the revenue forecast was determined:

- It is imperative to apply the appropriate revenue for the processing facility cut-off size that the facility has been designed for, in Kimberley mines case the 1.15 mm as per the Resource and Reserve statement. However for financial modelling the revenue associated with the incidental fraction has also been accounted for, i.e. the incidental diamond recovery below the 1.15 mm bottom cut-off. Although of lower value, it is deemed appropriate to use it as the percentage incidental diamonds per TMR resource is well understood and applied;
- Applying the revenue per TMR resource as opposed to the average revenue per carat produced for the operation. This practice assists with the delivery of more accurate revenue outputs as the effect of blending and changes in the head feed mix is accounted for;
- Ensuring the revenue is based on the De Beers Group Sightholder Sales (DBGSS) price index stated in the mandatory planning indices note;
- Applying the correct and applicable percentage of revenue to the financial models as this differs between DBCM and possible alternative future owners.

In the financial modelling process DBCM would typically only receive 90% of the revenue per TMR resource, whereas the new owner models applied a 100% of revenue per TMR resource due to differences in corporate structure and the sales and marketing functions. This inconsistency is due to DBCM allocating 10% of revenue to the DBSSSA and DBGSS function to address the post mining operation component of the diamond value chain, typically referred to as the "downstream" part of the business or value chain. The last factor for noting is applying the price growth forecast as stated in the planning indices to reflect nominal revenue to eliminate the possibility of confusing real and nominal figures and growth rates.

4.3.3. Production Scenarios

The base case scenario assumes that operations will continue at 6.4 million tonnes for the next two years, with ramp down in 2017 and 2018 at 5.3 million and 4.0 million tonnes respectively as the economically mineable resources are depleted. By 2016, the off-mine resources will be depleted thus reducing the footprint as well as rehabilitation liability from a DBCM perspective. The last two years (2017 and 2018) have reduced throughput due to reduced blending flexibility which results in treatability considerations at the CTP. The 2014 Kimberley life of mine case model is designed to maximise NPV of the operation by maintaining the operational risks at a manageable level and preserving sustainability of the operation. The planned annual carat production in the base case plan is balanced with the blending requirements to enable planned throughput at the CTP. The scenarios as described above will be referred to as "Scenario 1" in the DCF analysis.

The mining and treatment operation for the "Most Likely scenario" are the same as for the Scenario 1, however, in this scenario divestment is executed at the end of 2016 meaning operations by DBCM at Kimberley Mines will cease with associated handover to a new operator effective beginning 2017. The scenarios as described above will be referred to as "Scenario 2" in the DCF analysis.

In terms of the new owner alternatives three scenarios were formulated. The first new owner scenario is based on a lower operating cost model compared to the existing high confidence DBCM operating cost model. The new owner operating cost is based on a large player in the diamond mining industry in South Africa. Another key assumption that has been incorporated into the model was the inclusion of a specific TMR, known as TMR 29, which comprises an estimated 93 million tonnes containing an estimated 3.6 million carats. This assumption is imperative in the envisaged life of mine extension as most of all the other TMR resources have been accounted for in the exiting Scenario 1 option. The scenario as described above will be referred to as "Scenario 3" in the DCF analysis.

The second new owner scenario is based on a very aggressive operating cost model, i.e. very low overheads and lean support structures with the focus on only key operating activities, compared to the existing high confidence DBCM operating cost model. The second new owner operating cost is based on a small miner business model as per the existing players in the diamond mining industry in Kimberley and the surrounding areas. Another key assumption that has been incorporated into the model was the inclusion of TMR 29 as explained in Scenario 3. The scenario as described above will be referred to as "Scenario 4" in the DCF analysis.

The third new owner scenario is based on a medium aggressive operating cost model, i.e. lower overheads and support structures with a focus on only key operating activities, compared to the existing high confidence DBCM operating cost model. The third new owner operating cost is based on a medium sized player in the diamond mining industry in South Africa. Another key assumption that has been incorporated into the model was the inclusion of TMR 29 as explained in scenario 3. The scenario as described above will be referred to as "Scenario 5" in the DCF analysis.

4.3.4. Commercial Terms

Kimberley Mine markets its entire production of rough diamonds through the DBSSSA cleaning, sorting and valuation office based in Kimberley. DBCM, via DBGSS, offers 10% of its run of mine production to the State Diamond Trader who sells the diamonds to the secondary industry in South Africa to the smaller beneficiators as part of the local development plan and beneficiation commitment. The remaining 90% is sold through the De Beers rough diamond distribution channels managed by DBGSS.

In South Africa the corporate tax rate applicable to companies is 28% of taxable income. DBCM, as a mining company is allowed to deduct 100% of its qualifying capital expenditure against its mining taxable income subject to ring-fencing provisions. One of the provisions is that the capital expenditure deduction per mine is limited to the mining income derived from that mine. Non-mining taxable income and capital gains tax are calculated separately from mining taxable income. The same logic has been applied to the new owner's models.

Royalties are payable on a mineral resource extracted within South Africa. Diamonds are classified as an unrefined mineral resource under the Act. The royalty formula is calculated as a percentage of Earnings Before Interest and Taxes (EBIT) over gross diamond sales. The resultant percentage must be a minimum of 0.5% and a maximum of 7%. This percentage is applied to gross sales to determine the royalties payable. Current DBCM mining activities at Kimberley Mine relate to extraction of ore prior to the commencement of the Mineral and Petroleum Resources Royalty Act, and is therefore exempted from the royalties' calculation since Kimberley Mine only treats TMR's. The same logic has been applied to the new owner's models.

Capital costs in the financial models cater for the capital investments required primarily for mining, treatment, infrastructure and equipment. The logic of the inputs are described below with reference to each line item:

- Direct Capital Mining – Expansion: this cost line caters for the expansion capital component associated with the acquisition price for Kimberley Mine from an alternative owner perspective. It is thus the capital expenditure required to support the extension of LOM beyond 2018. Seeing that the new owners will have access to new factorised inferred resources the capital investment is classified as expansionary.
- Direct Capital Mining – Stay in business: This cost line caters for capital provision for major equipment replacement or rebuild of individual assets or system of equipment that has reached the end of its useful economic life based on expected depreciation or maintenance schedule. As discussed the mining function is outsourced to a contractor. Any expense related to capital replacements is worked into the contractual rate which is

based on per tonne delivered to the CTP processing facility. It is assumed that a similar agreement will be adopted for the new owner's scenarios.

- Direct Capital Treatment – Stay in business: This cost line caters for capital provision for major equipment replacement or rebuild of individual assets or system of equipment that has reached the end of its useful economic life based on expected depreciation or maintenance schedule. Typical examples of this category that was included in the financial model include scrubber shell replacement, high pressure roll crusher replacements, etc. Business improvement provision was also included where the primary rationale is to improve operational effectiveness or efficiency within the structural volume boundaries of the operation. Asset optimisation capital was included in this category. Typical examples that were included in the financial model include recovery area x-ray machine upgrades and replacements. Business continuity capital is another focus area to prevent disruption to modelled production in the short term or to ensure security of supply. Typical examples of this category that was included in the financial model include control system upgrades i.e. Programmable Logic Controllers (PLC) and Supervisory Control and Data Acquisition (Scada) control systems. Provision must also be made for upgrades associated with the residue facilities i.e. the coarse residue facility extension of spreaders and conveying systems, electrical reticulation, etc. The level of confidence associated with the modelled stay in business estimate is considered high. This estimate is based on historical capital investments and unit process replacements. It is also important to take into account that the CTP facility was commissioned in 2002 and will only be 16 years old in 2018. With the foreseen life of mine extension the life of the metallurgical facility could be extended to an estimated 28 years, still within the original 30-year life of facility design criteria.
- Direct Capital Treatment - Infrastructure and Equipment: this cost line was not populated as the treatment line was utilised fully.

Operational costs in the financial models cater for the day to day costs required for continued operation primarily for mining, treatment and services. These costs were split into a variable component, an overhead or fixed cost component and a general overheads component. The logic of the inputs are described below with reference to each line item:

- Direct Variable Working Costs - Mining: this line item caters for the mining variable cost per tonne multiplied by the tonnes mined. This cost per tonne provision caters for the cost associated with the load and haul contractor.
- Direct Variable Working Costs - Treatment: this line item caters for the treatment variable cost per tonne multiplied by the tonnes treated. This cost per tonne provision caters specifically for the CTP processing cost and is based on historical cost performance, thus must be viewed with a high degree of accuracy.
- Production Overheads - Mining: this line item caters for the mining fixed cost specific to Kimberley Mine to manage the load and haul contractor.
- Production Overheads - Treatment: this line item caters specifically for the labour component associated directly with the CTP ore processing facility. This includes the operational shifts, engineering workshops, etc.
- General Overhead Costs - Support Services: includes all costs associated with the indirect labour to support the direct labour with reference to mining and treatment cost lines. Typically under support services the provision for security, human resources, safety, health and environmental management, senior operational management, mineral resource management, technical support services, etc. are accounted for. Support services also include the mining consulting costs paid to the De Beers Group of companies.
- Social & Labour Plan Provision - Human Resource Development: this line item caters for group training costs to continuously develop and train all levels of employees.
- Downscaling provision fund: not applied in the financial models as this is catered for at Central Headquarters (CHQ) level with the acknowledgement that the DBCM business unit will incur further future costs on a continuing basis. From a new owner perspective this line item will be of very low significance, and has been left blank.
- Local Economic Development programme: not applied in the financial models as this is catered for at CHQ level, driven by a dedicated entity

that assists with small business start-ups. From a new owner perspective this line item will be of very low significance, and has been left blank.

- Environmental Management Programme Costs: entails environmental rehabilitation closure cost expenditure per year to drive as much as possible the concurrent rehabilitation of disturbed historical land and depleted TMR's.
- Closure Provision Premium: not applied in the De Beers financial models as this is catered for at CHQ level in the form of bank guarantees; however the new owner scenarios catered for the provision, predominantly as concurrent rehabilitation expenditure followed by two years of post-closure rehabilitation expenditure.
- Depreciation Stay-in-Business - Treatment: this line item caters for the depreciation of ore processing equipment.
- Depreciation Stay-in-Business - Mining: this line item caters for the depreciation of mining equipment. Due to this function being provided by an outsourced service provider, no depreciation is applicable. The assumption was also made that in all future alternative owners' scenarios this arrangement will continue.
- Retrenchment costs: this line item provided provision of retrenchment cost to effect proper closure.
- Off mine costs Shipping & Sorting: the shipping and sorting cost is the component of the revenue stream that is allocated to DBSSSA to do the final cleaning, sorting, valuation and marketing of the diamonds.
- Off mine costs Outsourced costs: not applied in the financial models as this practice is not currently employed at the operation.
- Asset and catastrophe insurance: not applied in the financial models as this is catered for at business unit level.
- General Capital Recoupment: this line item was only applied in the DBCM specific divestment model and reflects the inflow of funds in the divestment financial model.

4.4. Discounted Cash Flow Results

The results of the DCF analysis are presented in the succeeding sections. With reference to the production scenarios as discussed in Section 4.3.3, there are two current owner scenarios, namely a "base case" which entail running till end 2018 followed by closure and a "most likely" option that assess divestment. These are followed by three new owner scenarios.

4.4.1. Scenario 1 – DBCM Kimberley Mine Base Case

The Scenario 1 NPV analysis is reflected in Table 4.7. The NPV has been estimated to be ZAR 82 million at a 12% discount rate. Due to the fact that the operation is a going concern, no IRR or payback period is relevant for the base case scenario.

Table 4.7 - Scenario 1 NPV

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Post-tax Net Present Values at:	8%	71 956
On Mine Post-tax Net Present Values at:	11%	80 055
On Mine Post-tax Net Present Values at:	12%	82 337

The Scenario 1 production profile for both tonnes treated and carats recovered is reflected in Figure 4.1. The production profile reflects a life of mine to 2018 based on Scenario 1 input assumptions. The scenario assumes that operations will continue at 6.4 million tonnes for the next two years, with ramp down in 2017 and 2018 at 5.3 million tonnes and 4.0 million tonnes respectively as the economically mineable resources are depleted.

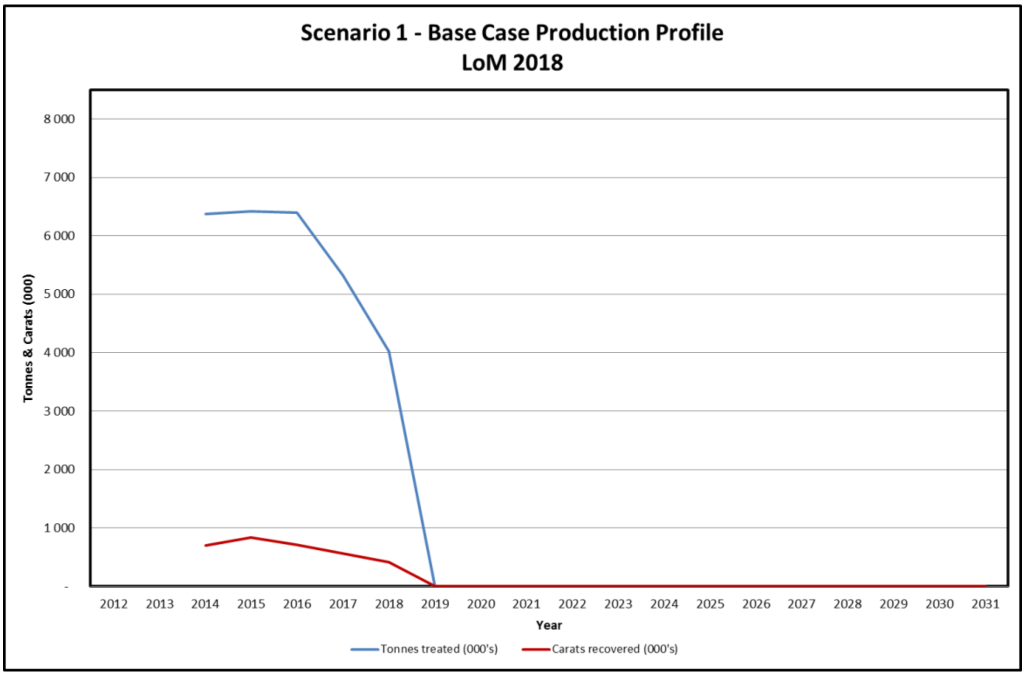


Figure 4.1 - Scenario 1 Life of Mine Production Profile

The Scenario 1 cash flow profile is reflected in Figure 4.2 in both nominal and real values post tax as well as in cumulative nominal and real values post tax terms. The cash flow illustrates that the operation will transition to negative cash flow from 2018 onwards as operations will cease and post closure rehabilitation activities commences from 2019 to 2021.

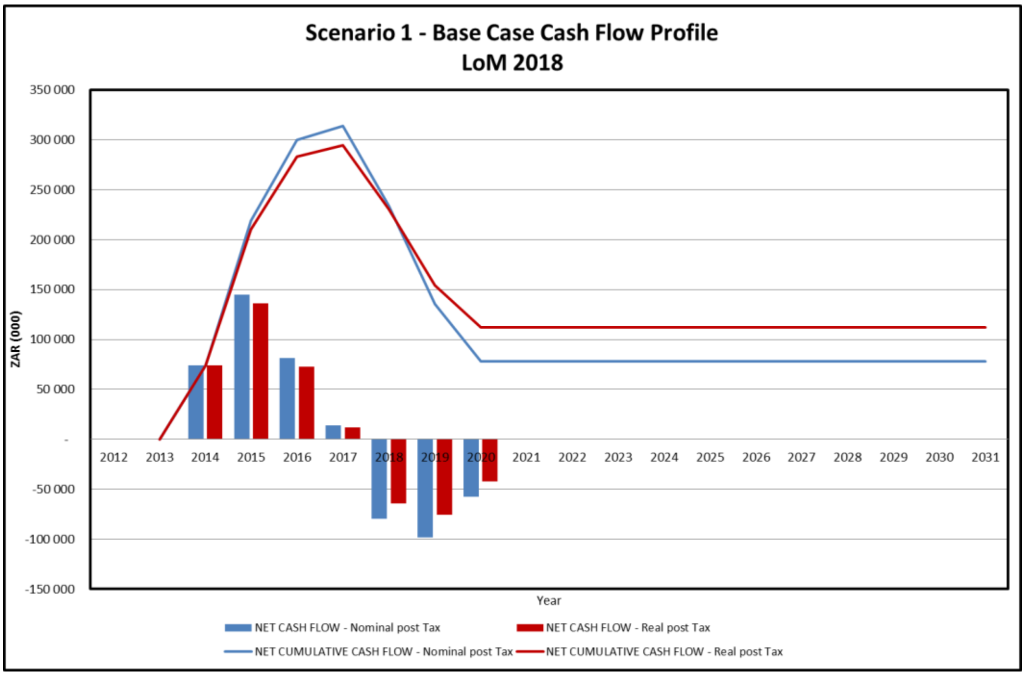


Figure 4.2 - Scenario 1 Cash Flow Profile

The Scenario 1 sensitivity analysis is reflected in Figure 4.3. The scenario revenue stream, operational cost and capital expenditure were flexed both positive and negative by twenty percent. The results indicate that Scenario 1 is revenue sensitive, followed by a low sensitivity to operating expenditure and very low sensitivity towards capital expenditure. The high revenue sensitivity illustrates the nature of the business and the impact of price fluctuations, grade variability and rate of exchange on financial performance. The low sensitivity to operating cost demonstrates that the primary lever for improvement resides with volume and bringing the future revenue forward. The very low sensitivity to capital expenditure is expected as expenditure tapers down considerably towards the end of life of mine.

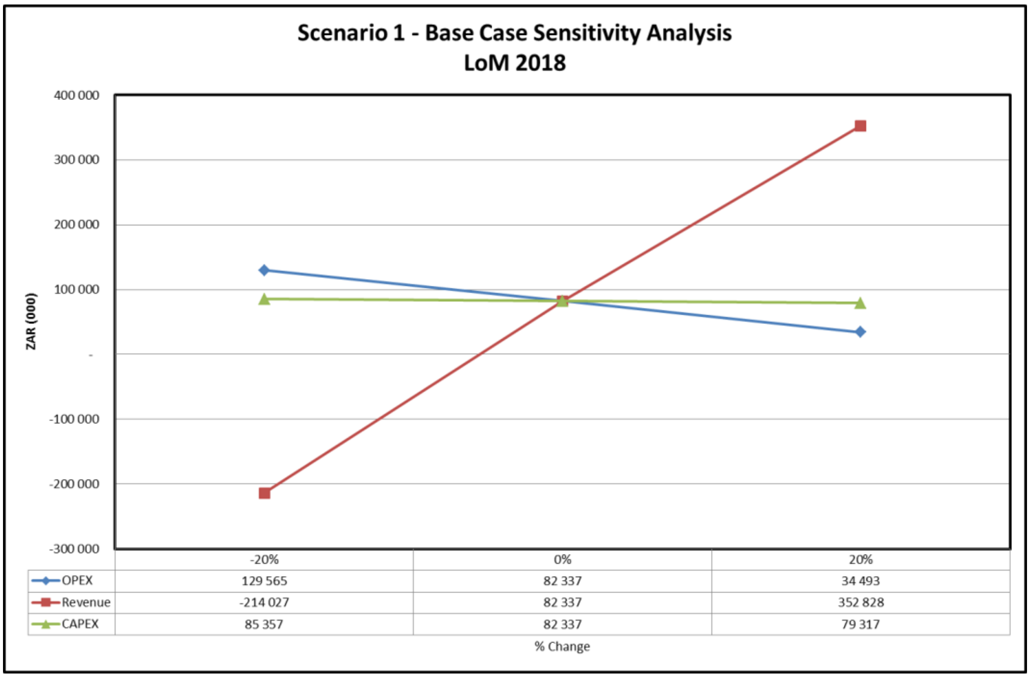


Figure 4.3 - Scenario 1 Sensitivity Analysis

4.4.2. Scenario 2 – DBCM Kimberley Mine Divestment

The Scenario 2 NPV analysis is reflected in Table 4.8. The NPV has been estimated to be ZAR 327 million at a 12% discount rate. A key assumption that impacted on this valuation is the cash inflow from a DBCM perspective at the divestment point end of 2016 but reflected in 2017. The divestment value assumed for Scenario 2 DCF analysis is the average comparative transaction value for the TMR transactions established to be ZAR 527 million less the premature closure liability for the operation estimated to be ZAR 197 million. Due to the fact that the operation is a going concern, no IRR or payback period is relevant for the divestment scenario.

Table 4.8 - Scenario 2 NPV

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Post-tax Net Present Values at:	8%	353 301
On Mine Post-tax Net Present Values at:	11%	333 556
On Mine Post-tax Net Present Values at:	12%	327 380

The Scenario 2 production profile for both tonnes treated and carats recovered is reflected in Figure 4.4. The production profile reflects a life of mine to 2016 based on Scenario 1 production assumptions until end of 2016 followed by the divestment scenario event.

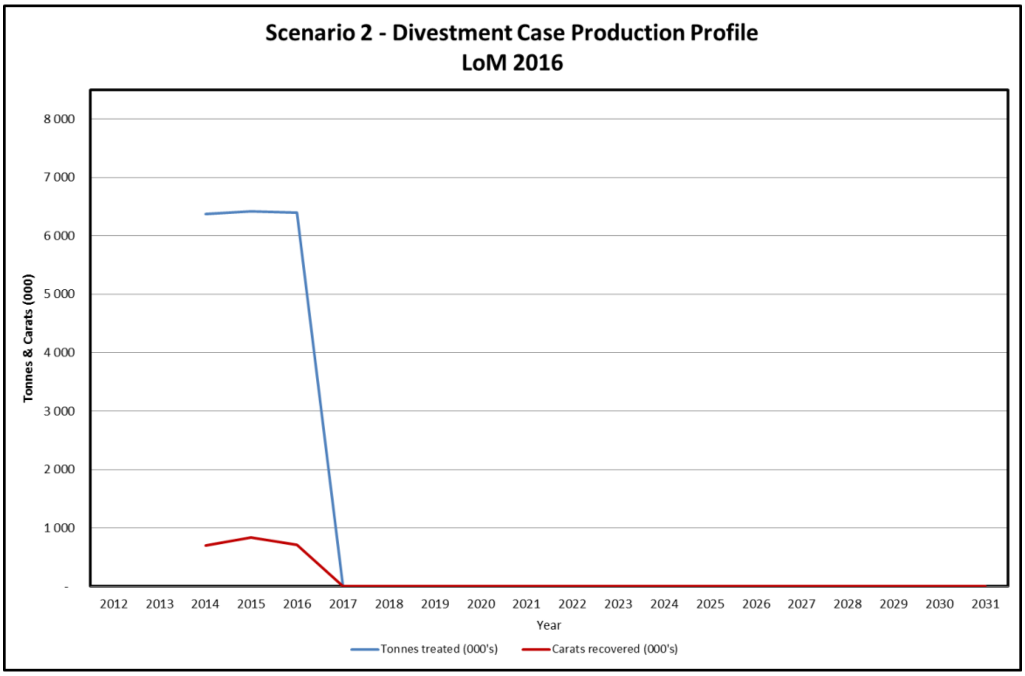


Figure 4.4 - Scenario 2 Life of Mine Production Profile

The Scenario 2 cash flow profile is reflected in Figure 4.5 in both nominal and real values post tax as well as in cumulative nominal and real values post tax terms. The cash flow is similar to Scenario 1 until 2016 followed by the cash inflow associated with the divestment scenario reflected in 2017.

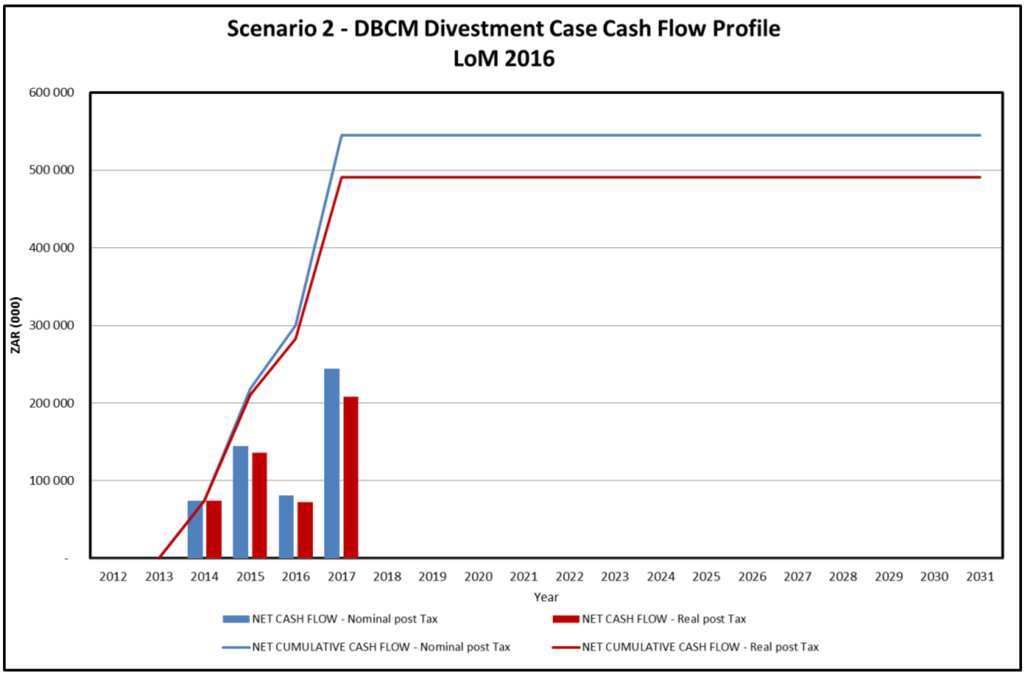


Figure 4.5 - Scenario 2 Cash Flow Profile

The Scenario 2 sensitivity analysis is reflected in Figure 4.6. The scenario revenue stream, operational cost and capital expenditure were flexed both positive and negative by twenty percent. The results indicate that Scenario 2 sensitivity is similar to Scenario 1 as discussed in Section 4.4.1.

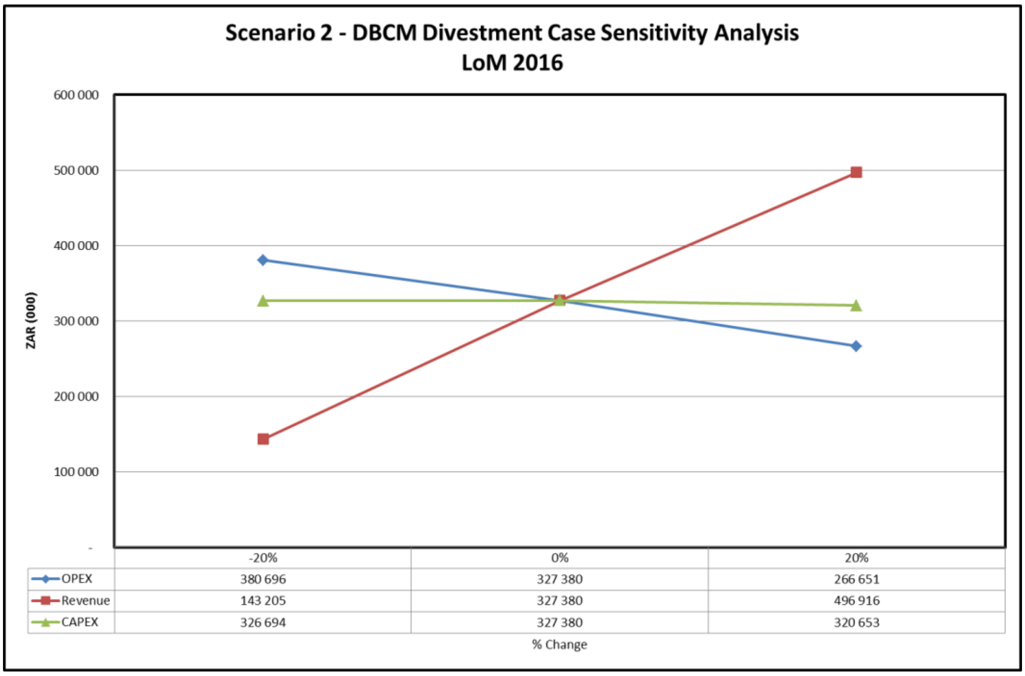


Figure 4.6 - Scenario 2 Sensitivity Analysis

4.4.3. Scenario 3 – Kimberley Mine Alternative Owner 1

The Scenario 3 NPV analysis is reflected in Table 4.9. The NPV is estimated to be negative ZAR 165 million at a 12% discount rate. The investment value assumed for the Scenario 3 DCF analysis is the average comparative transaction value for the TMR transactions established to be ZAR 527 million less the premature closure liability for the operation estimated to be ZAR 197 million. If the acquisition price is adjusted to enable a positive NPV result, it requires a decrease in the transaction price from ZAR 527 million to ZAR 324 million. With reference to Table 4.2 this adjusted transactional value still falls within the spread of the TMR operations transactional values.

Table 4.9 - Scenario 3 NPV

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Post-tax Net Present Values at:	8%	-191 451
On Mine Post-tax Net Present Values at:	11%	-170 704
On Mine Post-tax Net Present Values at:	12%	-164 801

The Scenario 3 production profile for both tonnes treated and carats recovered is reflected in Figure 4.7. The production profile reflects a life of mine to 2030 based on Scenario 3 assumptions. As discussed in Section 4.3.3 it was assumed that TMR 29, which comprises an estimated 93 million tonnes containing an estimated 3.6 million carats, is incorporated in to the mine plan for the new owner scenarios.

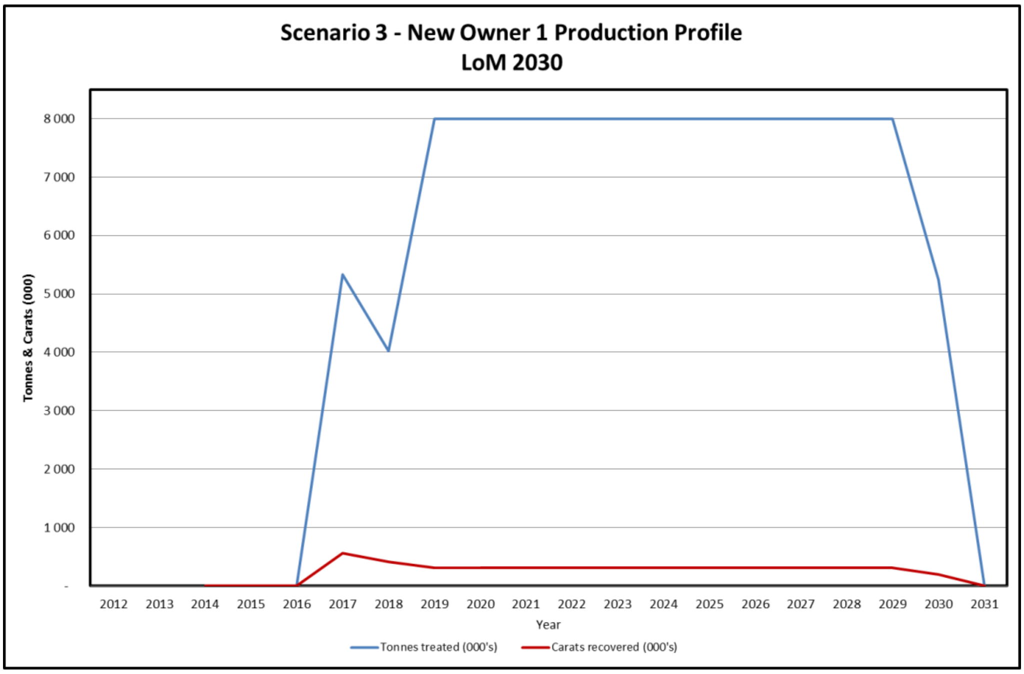


Figure 4.7 - Scenario 3 Life of Mine Production Profile

The Scenario 3 cash flow profile is reflected in Figure 4.8 in both nominal and real values post tax as well as in cumulative nominal and real values post tax terms. The cash flow in 2016 reflects the investment followed by 2 years of solid performance based on the assumptions incorporated. In 2019 however the scenario reflects negative cash flows when TMR 29 is incorporated in the mine plan. Only in 2026 does the projected cash flow becomes positive until 2029. From 2030 until 2032 closure activities to effect certification for closure absorbs cash with the net result that the scenario ends on a negative NPV of ZAR 165 million.

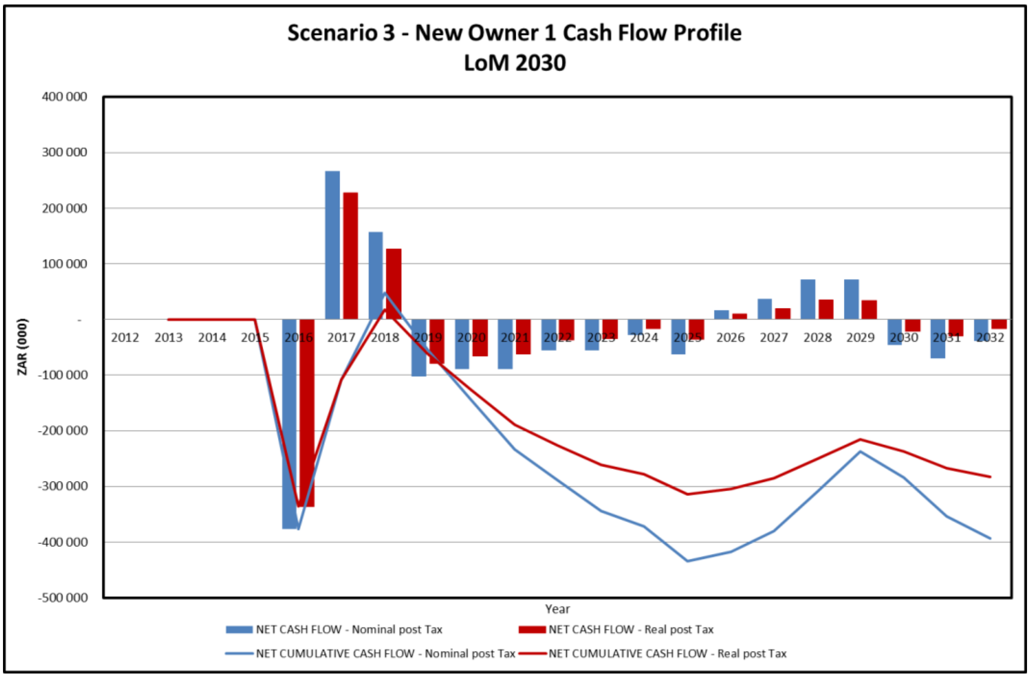


Figure 4.8 - Scenario 3 Cash Flow Profile

The Scenario 3 sensitivity analysis is reflected in Figure 4.9. The scenario revenue stream, operational cost and capital expenditure were flexed both positive and negative by twenty percent. The results indicate that Scenario 3 is revenue sensitive, followed by an almost equal sensitivity to operating expenditure and low sensitivity towards capital expenditure. The high revenue sensitivity illustrates the nature of the business and the impact of price fluctuations, grade variability and rate of exchange on financial performance. The increased sensitivity towards operating expenditure is expected as this is a critical lever in the new owner scenarios to facilitate successful economic mining and processing of TMR 29. The continued low sensitivity in terms of capital expenditure is supportive of the fact that TMR operations are not capital intensive and even with all the capital assumptions incorporated, to enable effective and efficient operations through to 2030, the DCF sensitivity remain low.

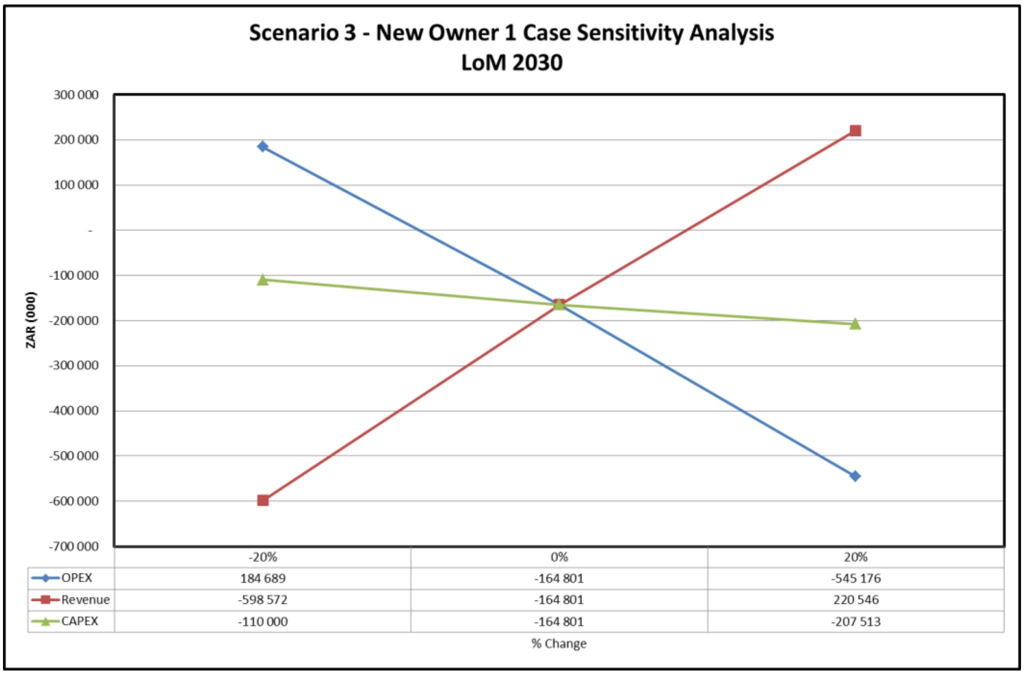


Figure 4.9 - Scenario 3 Sensitivity Analysis

4.4.4. Scenario 4 – Kimberley Mine Alternative Owner 2

The Scenario 4 NPV analysis is reflected in Table 4.10. The NPV is estimated to be ZAR 57 million at a 12% discount rate and ZAR 103 million at an 8% small miner discount rate. The investment value assumed for the DCF analysis is the average comparative transaction value for the TMR transactions established to be ZAR 527 million less the premature closure liability for the operation estimated to be ZAR 197 million. The scenario IRR was calculated to be 21.00% with an estimated payback period of less than 2 years.

Table 4.10 - Scenario 4 NPV

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Post-tax Net Present Values at:	8%	102 734
On Mine Post-tax Net Present Values at:	11%	66 460
On Mine Post-tax Net Present Values at:	12%	56 623

The Scenario 4 production profile for both tonnes treated and carats recovered is reflected in Figure 4.10. The production profile reflects a life of mine to 2030 based on Scenario 4 assumptions. As discussed in Section 4.3.3 it is assumed that TMR 29, which comprises an estimated 93 million tonnes containing an estimated 3.6 million carats, is incorporated in to the mine plan.

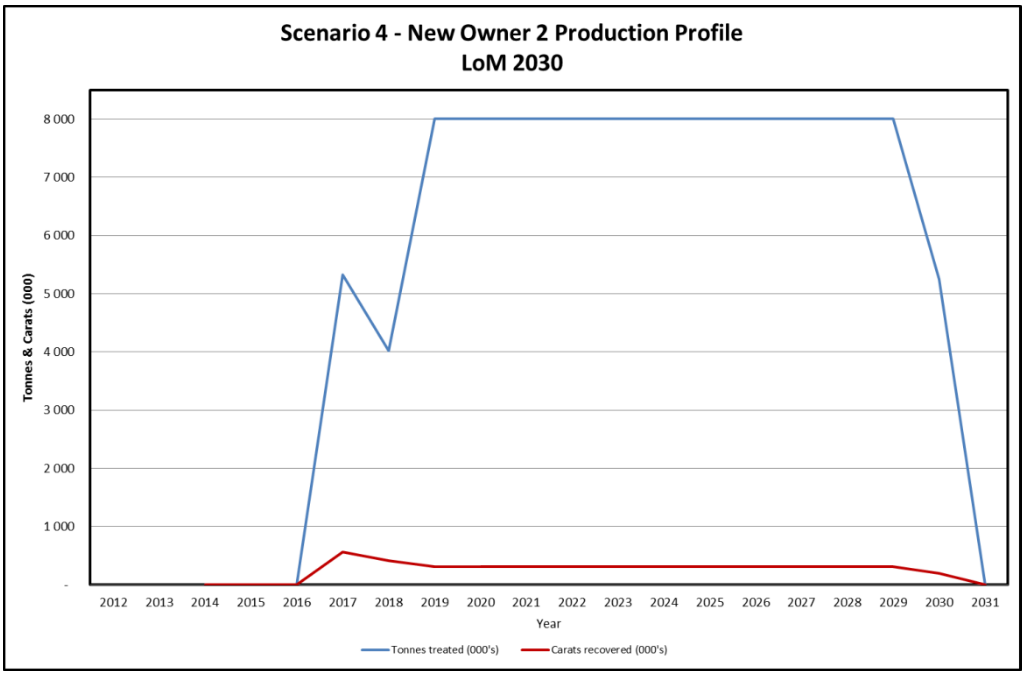


Figure 4.10 - Scenario 4 Life of Mine Production Profile

The Scenario 4 cash flow profile is reflected in Figure 4.11 in both nominal and real values post tax as well as in cumulative nominal and real values post tax terms. The cash flow in 2016 reflects the investment followed by 2 years of solid performance based on the assumptions incorporated. In 2019 however the scenario reflects negative cash flows when TMR 29 is incorporated in the mine plan. Only in 2022 will the projected cash flow become positive until 2030. From 2031 until 2032 closure activities to effect certification for closure absorb cash. Scenario 4 however ends with a projected positive NPV of ZAR 57 million.

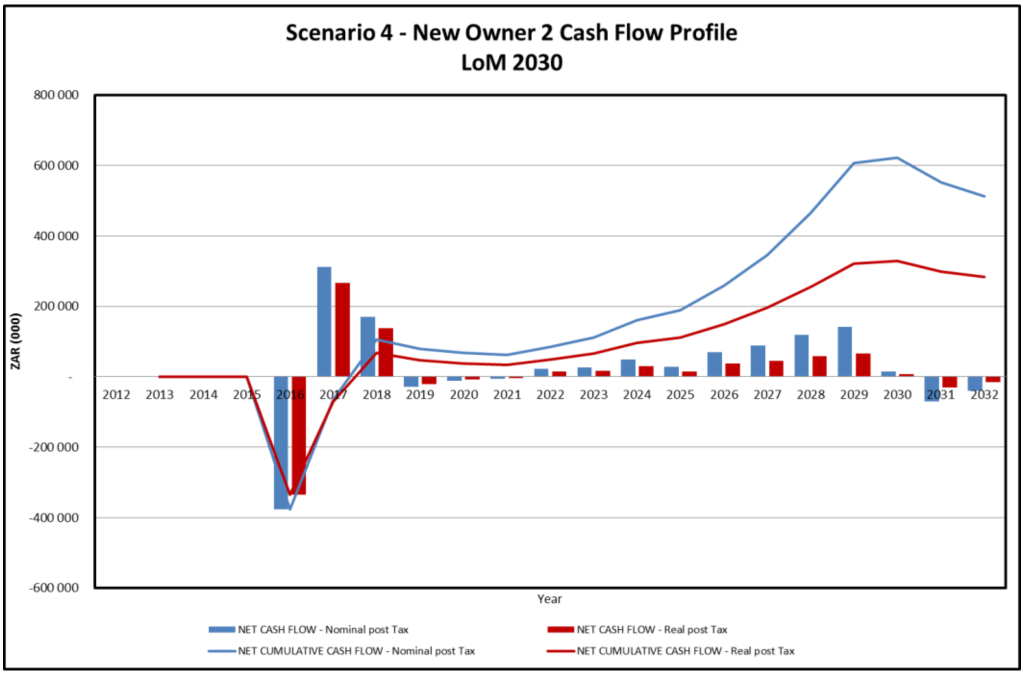


Figure 4.11 - Scenario 4 Cash Flow Profile

The Scenario 4 sensitivity analysis is reflected in Figure 4.12. The scenario revenue stream, operational cost and capital expenditure were flexed both positive and negative by twenty percent. The results indicate that Scenario 4 sensitivity is very similar to Scenario 3 as discussed in Section 4.4.3.

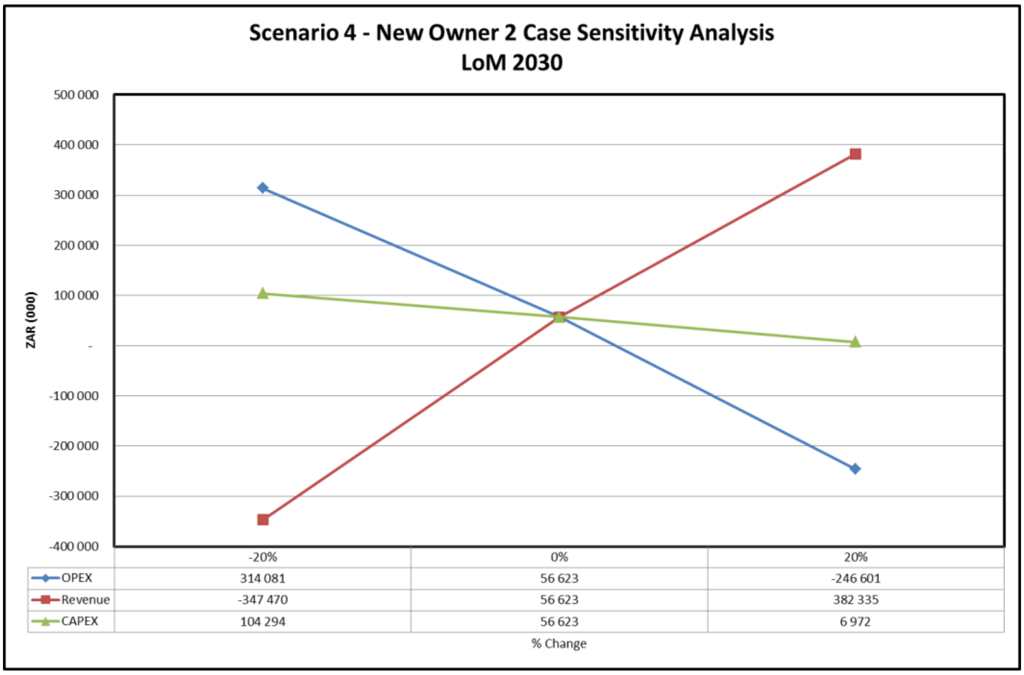


Figure 4.12 - Scenario 4 Sensitivity Analysis

4.4.5. Scenario 5 – Kimberley Mine Alternative Owner 3

The Scenario 5 NPV analysis is reflected in Table 4.11. The NPV is estimated to be negative ZAR 112 million at a 12% discount rate. The investment value assumed for the DCF analysis is the average comparative transaction value for the TMR transactions established to be ZAR 527 million less the premature closure liability for the operation estimated to be ZAR 197 million. If the acquisition price is adjusted to enable a positive NPV result, it requires a decrease in the transaction price from ZAR 527 million to ZAR 376 million. With reference to Table 4.2 this adjusted transactional value still falls within the spread of the TMR operations transactional values.

Table 4.11 - Scenario 5 NPV

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Post-tax Net Present Values at:	8%	-120 736
On Mine Post-tax Net Present Values at:	11%	-114 349
On Mine Post-tax Net Present Values at:	12%	-112 379

The Scenario 5 production profile for both tonnes treated and carats recovered is reflected in Figure 4.13. The production profile reflects a life of mine to 2030 based on Scenario 5 assumptions. As discussed in Section 4.3.3 it is assumed that TMR 29, which comprises an estimated 93 million tonnes containing an estimated 3.6 million carats, is incorporated into the mine plan.

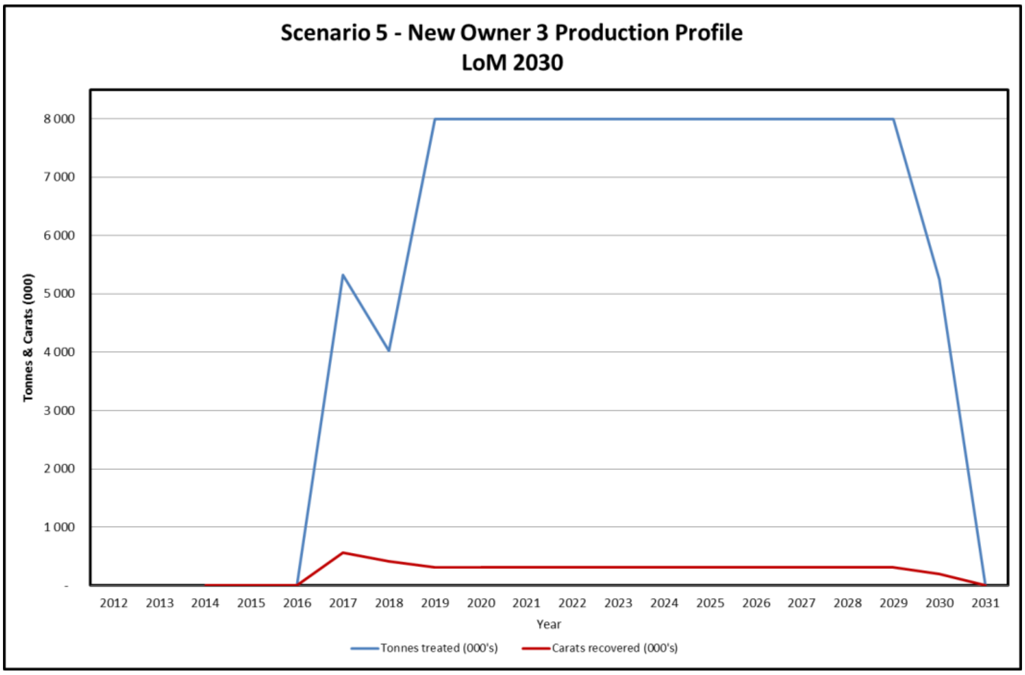


Figure 4.13 - Scenario 5 Life of Mine Production Profile

The Scenario 5 cash flow profile is reflected in Figure 4.14 in both nominal and real values post tax as well as in cumulative nominal and real values post tax terms. The cash flow in 2016 reflects the investment followed by 2 years of solid performance based on the assumptions incorporated. In 2019 however the scenario reflects negative cash flows when TMR 29 is incorporated in the mine plan. Only in 2026 was the projected cash flow become positive until 2029. From 2030 until 2032 closure activities to effect certification for closure absorb cash with the net result that the scenario ends on a negative NPV of ZAR 112 million.

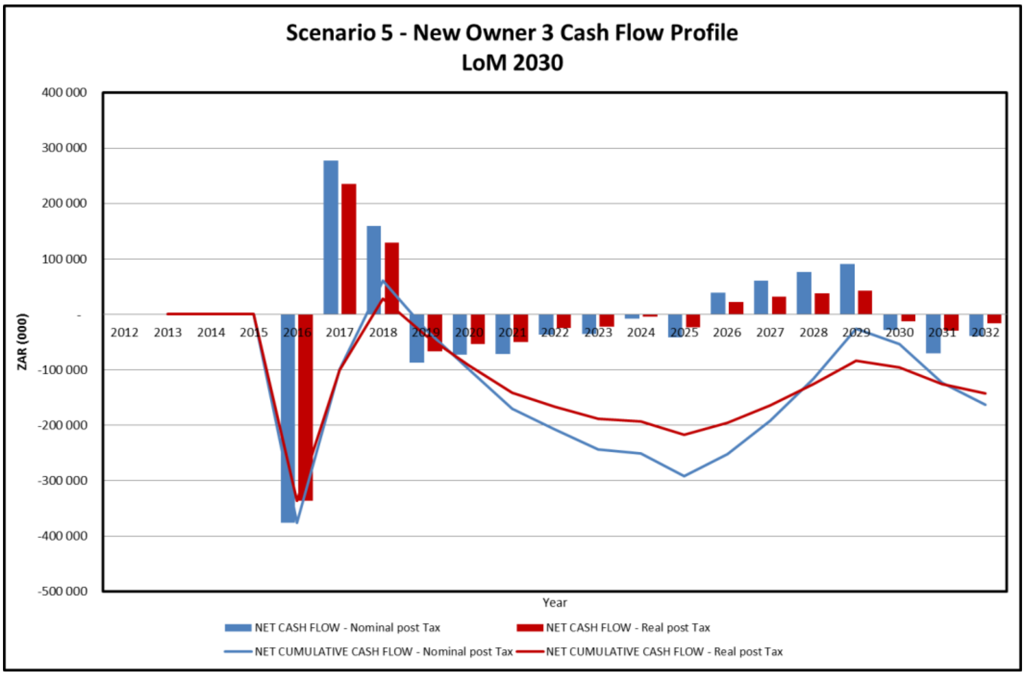
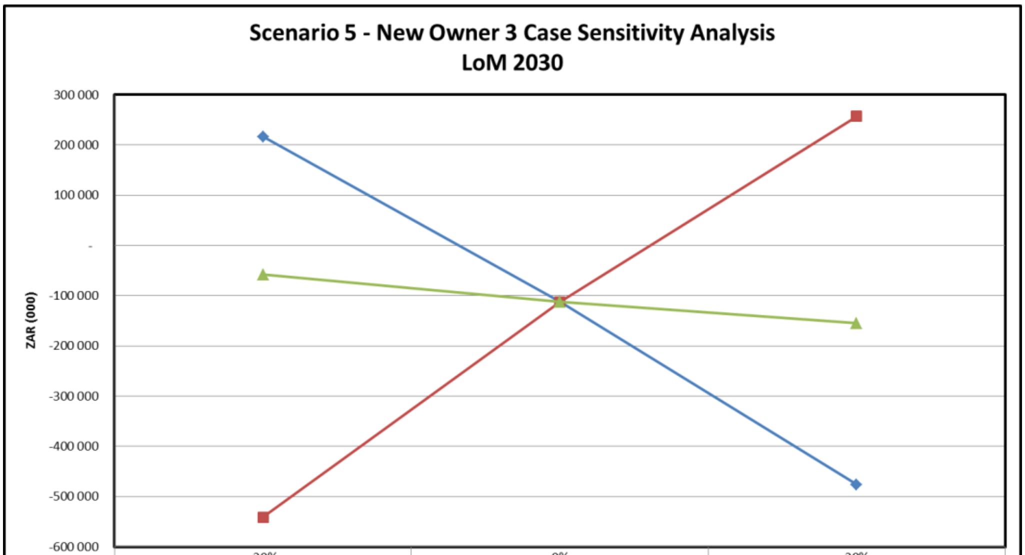


Figure 4.14 - Scenario 5 Cash Flow Profile

The Scenario 5 sensitivity analysis is reflected in Figure 4.15. The scenario revenue stream, operational cost and capital expenditure were flexed both positive and negative by twenty percent. The results indicate that Scenario 5 has a similar sensitivity compared to Scenario 3 and 4.



	-20%	0%	20%
OPEX	216 388	-112 379	-476 103
Revenue	-541 011	-112 379	257 009
CAPEX	-57 981	-112 379	-155 013

Figure 4.15 - Scenario 5 Sensitivity Analysis

4.4.6. Discounted Cash Flow Outcomes

The DCF analysis of the selected scenarios was completed. Based on the results projected the following scenario outcomes need consideration:

- Scenario 1 reflects a positive NPV for the current going concern. Although the NPV is positive over the full life of mine, projected to 2018, significant erosion of the NPV occurs from 2018 onwards as post closure environmental rehabilitation costs will be incurred until 2020. Assessing current trends in the South African mining industry, the likelihood of obtaining closure certification by then is slim and in all likelihood further costs will be incurred going forward post 2020. An important takeaway from Scenario 1 is that there is value in the remaining mineral resources currently in the base case mine plan and economic extraction is definite.
- Scenario 2 reflects a positive NPV for the current going concern. The cash injection into the DCF analysis with the divestment planned at the end of 2016 has a significant positive impact on the finances.
- Scenario 3 is the first of the new owner models. Although the NPV is negative based on the set of assumptions incorporated into the model, it has been demonstrated that with adjustment of the envisaged transaction

price, the resultant NPV can enable a positive outcome for the new owner. This will be further assessed in the following section during the Monte Carlo simulation. However the economic viability of TMR 29 is considered low in Scenario 3 as the new owner 1 operating cost reduction assumptions applied in the analysis were not sufficient to demonstrate a potential return on investment.

- Scenario 4, the second of the new owner models, reflects a positive NPV and is considered highly plausible as the preferred future scenario. The differentiating factor for this DCF analysis resides in the operating cost assumptions. It is based on the principle of a lean operational cost model aligned with the small miner philosophy to enable specifically the economic extraction of the mineral resource from TMR 29, the high tonnage and low grade TMR that is crucial to the envisaged life of mine extension to 2030. The scenario 4 cash flow schedule is attached in Table 4.12 for reference.
- Scenario 5, the third of the new owner models, reflects a negative NPV. Although the NPV is negative based on the set of assumptions incorporated into the model, similar to Scenario 3, it has been demonstrated that with adjustment of the envisaged transaction price, the resultant NPV can enable a positive outcome for the new owner. However the economic viability of TMR 29 is considered low in Scenario 5 as the new owner 3 operating cost reduction assumptions applied in the analysis were not sufficiently lower to demonstrate a potential return on investment. This was further assessed in the following section during the Monte Carlo simulation.

Table 4.12 - Scenario 4 Cash Flow Schedule

Ore body/Plant/Mine — **Kimberley Mines**
Case/Project — **Alternative Owner - Scenario 4**

YEAR	Total/Ave		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Production																			
Waste tonnes	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Development tonnes	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ore tonnes mined	102 589		-	5 328	4 017	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	5 243	-	-
Tonnes treated/Area mined (Marine operations)	102 589		-	5 328	4 017	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	8 000	5 243	-	-
Recovered Grade (cpht; cts/m² Marine operations)	4.42		-	10.53	10.33	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	3.82	-	-
Average stone size	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bottom cut-off				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Carats recovered	4 539		-	561	415	306	306	306	306	306	306	306	306	306	306	306	200	-	-
Revenue																			
RV percentage	100%																		
Revenue per carat (US$ - RV)			-	98	96	127	132	138	144	151	158	165	172	180	187	196	205	-	-
Revenue per carat (Local Currency - RV)			-	1 149	1 206	1 629	1 748	1 875	2 012	2 159	2 317	2 486	2 667	2 862	3 071	3 295	3 536	-	-
Notional Revenue (LC)	**9 838 219**		**-**	**644 191**	**500 283**	**497 902**	**534 255**	**573 263**	**615 119**	**660 031**	**708 223**	**759 933**	**815 418**	**874 955**	**938 839**	**1 007 387**	**708 421**	**-**	**-**
Royalties																			
Government royalty	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Export duty	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Additional royalty	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diamond Board levies	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total royalties	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating costs																			
Direct Variable Operating Costs																			
Mining	2 117 365		-	77 948	61 710	129 028	135 480	142 254	149 366	156 835	164 676	172 910	181 556	190 633	200 165	210 173	144 629	-	-
Treatment	2 763 528		-	101 736	80 543	168 404	176 824	185 666	194 949	204 696	214 931	225 678	236 962	248 810	261 250	274 313	188 767	-	-
	4 880 892		-	179 684	142 253	297 432	312 304	327 919	344 315	361 531	379 608	398 588	418 517	439 443	461 415	484 486	333 396	-	-
Production Overheads																			
Mining	154 712		-	5 696	4 509	9 428	9 899	10 394	10 914	11 460	12 033	12 634	13 266	13 929	14 626	15 357	10 568	-	-
Treatment	1 637 081		-	60 267	47 713	99 761	104 749	109 986	115 485	121 260	127 323	133 689	140 373	147 392	154 762	162 500	111 823	-	-
	1 791 793		-	65 963	52 222	109 188	114 648	120 380	126 399	132 719	139 355	146 323	153 639	161 321	169 387	177 857	122 391	-	-
General Overhead Costs																			
General and Administrative Mine/Project Overhead Costs	1 153 052		-	58 833	61 775	64 864	68 107	71 512	75 088	78 842	82 784	86 924	91 270	95 833	100 625	105 656	110 939	-	-
Sampling/Drilling/Exploration expenditure	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project studies	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Social & Labour Plan Provision	57 653		-	2 942	3 089	3 243	3 405	3 576	3 754	3 942	4 139	4 346	4 563	4 792	5 031	5 283	5 547	-	-
Environmental Management Programme	184 921		-	3 872	4 066	4 269	4 483	4 707	4 942	5 189	5 449	5 721	6 007	6 307	6 623	6 954	7 302	69 892	39 139
Depreciation	329 539		-	17 116	12 905	25 698	25 698	25 698	25 698	25 698	25 698	25 698	25 698	25 698	25 698	25 698	16 842	-	-
Retrenchment costs	87 244		-	-	-	-	-	-	-	-	-	-	-	-	-	-	87 244	-	-
Off mine costs																			
Diamond Insurance	3 935		-	258	200	199	214	229	246	264	283	304	326	350	376	403	283	-	-
Shipping & sorting	44 272		-	2 899	2 251	2 241	2 404	2 580	2 768	2 970	3 187	3 420	3 669	3 937	4 225	4 533	3 188	-	-
	1 860 615		-	85 920	84 286	100 514	104 310	108 301	112 496	116 905	121 540	126 412	131 534	136 917	142 577	148 527	231 344	69 892	39 139
Total Operating Cost	**8 533 301**		**-**	**331 567**	**278 760**	**507 134**	**531 262**	**556 601**	**583 211**	**611 156**	**640 503**	**671 323**	**703 690**	**737 682**	**773 380**	**810 870**	**687 131**	**69 892**	**39 139**
Capital																			
Non-expansion capital																			
Direct capital - Non-expansion																			
Waste/Overburden Stripping	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Development	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Infrastructure and Equipment - Mining	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Infrastructure and Equipment - Treatment	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stay-in-business (Equipment Replacement) - Mining	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stay-in-business (Equipment Replacement) - Treatment	156 422		-	-	9 824	18 390	13 588	22 528	-	12 419	-	50 202	14 376	15 095	-	-	-	-	-
	156 422		-	-	9 824	18 390	13 588	22 528	-	12 419	-	50 202	14 376	15 095	-	-	-	-	-
General capital - Non-expansion																			
Infrastructure and Equipment - General	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stay-in-business (Equipment Replacement) - General	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Non-expansion capital	156 422		-	-	9 824	18 390	13 588	22 528	-	12 419	-	50 202	14 376	15 095	-	-	-	-	-
Expansion capital																			
Direct capital - Expansion																			
Waste/Overburden Stripping	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Development	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Infrastructure and Equipment - Mining	376 162		376 162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Infrastructure and Equipment - Treatment	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	376 162		376 162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General capital - Expansion																			
Infrastructure and Equipment - General	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Expansion capital	376 162		376 162	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total capital	**532 584**		**376 162**	**-**	**9 824**	**18 390**	**13 588**	**22 528**	**-**	**12 419**	**-**	**50 202**	**14 376**	**15 095**	**-**	**-**	**-**	**-**	**-**
Capital recoupment																			
Direct Capital Recoupment	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General Capital Recoupment	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Capital recoupment	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NET CASH FLOW - Nominal	**772 335**	**-**	**-376 162**	**312 624**	**211 699**	**-27 623**	**-10 596**	**-5 866**	**31 909**	**36 457**	**67 720**	**38 407**	**97 352**	**122 178**	**165 459**	**196 517**	**21 290**	**-69 892**	**-39 139**
NET CASH FLOW - Real	**431 184**	**-**	**-335 924**	**265 686**	**171 347**	**-21 293**	**-7 779**	**-4 101**	**21 247**	**23 120**	**40 901**	**22 093**	**53 332**	**63 745**	**82 216**	**92 998**	**9 595**	**-30 000**	**-16 000**

On Mine Pre-tax Net Present Values at:		
On Mine Pre-tax Net Present Values at:	8%	**171 148**
On Mine Pre-tax Net Present Values at:	11%	**119 840**
On Mine Pre-tax Net Present Values at:	12%	**105 995**

	Total/Ave		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET CASH FLOW - Nominal post Tax	**772 335**	**-**	**-376 162**	**312 624**	**170 214**	**-27 623**	**-10 596**	**-5 866**	**22 974**	**26 249**	**48 758**	**27 653**	**70 093**	**87 968**	**119 130**	**141 492**	**15 329**	**-69 892**	**-39 139**
NET CASH FLOW - Real post Tax	**283 017**	**-**	**-335 924**	**265 686**	**137 769**	**-21 293**	**-7 779**	**-4 101**	**15 298**	**16 647**	**29 449**	**15 907**	**38 399**	**45 897**	**59 195**	**66 959**	**6 909**	**-30 000**	**-16 000**

On Mine Post-tax Net Present Values at:	Discount Rate	ZAR NPV (000)
On Mine Pre-tax Net Present Values at:	8%	**102 734**
On Mine Pre-tax Net Present Values at:	11%	**66 460**
On Mine Pre-tax Net Present Values at:	12%	**56 623**

4.5. Monte Carlo Simulation

In Monte Carlo simulations, variables are changed multiple times to reflect the probability distributions of their values, producing a probability distribution of the outcomes. This is the most transparent and rigorous approach to risk evaluation, however, care needs to be taken to ensure that the inputs are reasonable and are supported by relevant distributions.

The methodology was customised for the scenarios selected for the operation under review. The DCF models as discussed in Section 4.4 formed the foundation of the Monte Carlo simulations which was conducted using @RISK software from Palisade. For each scenario the most applicable variables were selected and minimum, mean and maximum values assigned based on criteria determined and evaluated to be of importance. The results of the simulations are discussed in the following sections.

4.5.1. Scenario 1 – DBCM Kimberley Mine Base Case

The selected inputs for the Scenario 1 Monte Carlo simulation are reflected in Table 4.13. With Scenario 1 being the base case option for the operation under investigation, limited variables will significantly impact on the financial model in the remaining life of mine. Due to this logic two operating cost variables and a capital variable were flexed.

Table 4.13 - Scenario 1 Monte Carlo Simulation Inputs

Input Parameter	Unit	Min	Mean	Max	Comments
OPEX - Mining Production Cost	ZAR/t	17.72	19.69	21.66	Mean based on scenario input. Min and max flexed by 10%.
OPEX - Plant Treatment Fixed Cost	ZAR/t	17.30	19.23	21.15	Mean based on scenario input. Min and max flexed by 10%.
CAPEX SIB - Major Equipment Replacement	ZAR	R 38 850	R 43 166	R 47 483	Capital only caters for treatment facility related needs.

The simulated NPV result is reflected in Figure 4.16. The simulation result reflects an NPV range at a 90% confidence limit of between ZAR 58 million and

ZAR 107 million. The minimum simulation NPV generated was ZAR 37 million and the maximum at ZAR 128 million with a standard deviation of ZAR 15 million. It is simulated that 100% of the results were positive, indicating a high probability of a return on investment at a 12 % discount rate.

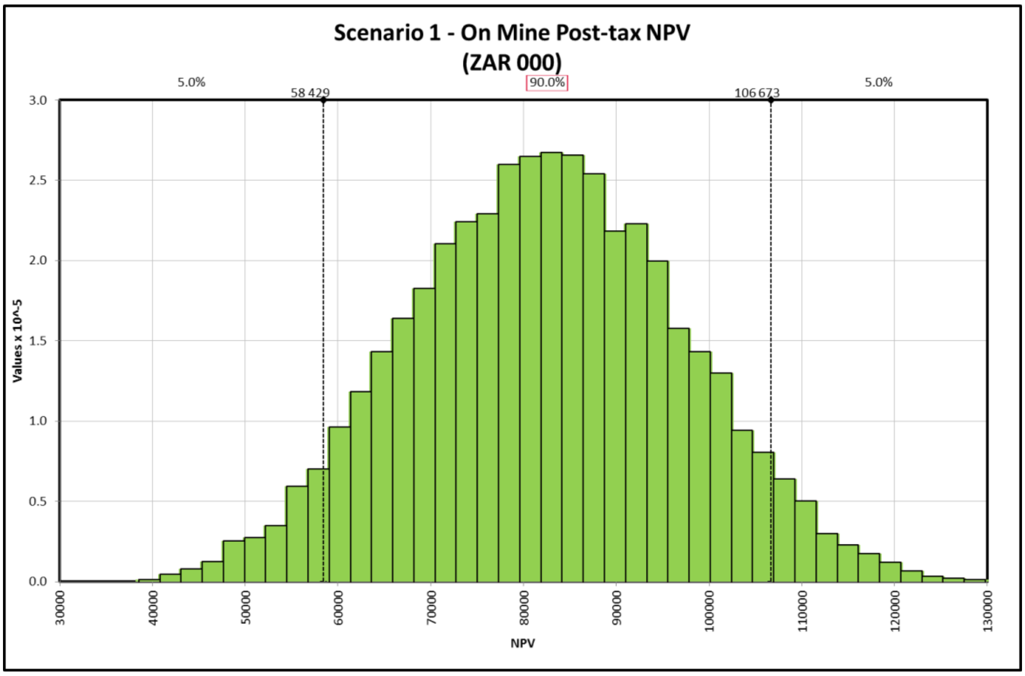


Figure 4.16 - Scenario 1 Monte Carlo Simulation NPV

The inputs ranked by effect on mean NPV is reflected in Figure 4.17. Only the two operating cost variables, namely the mining production cost and the treatment fixed cost, will be expected to have any significant impact on the scenario base NPV.

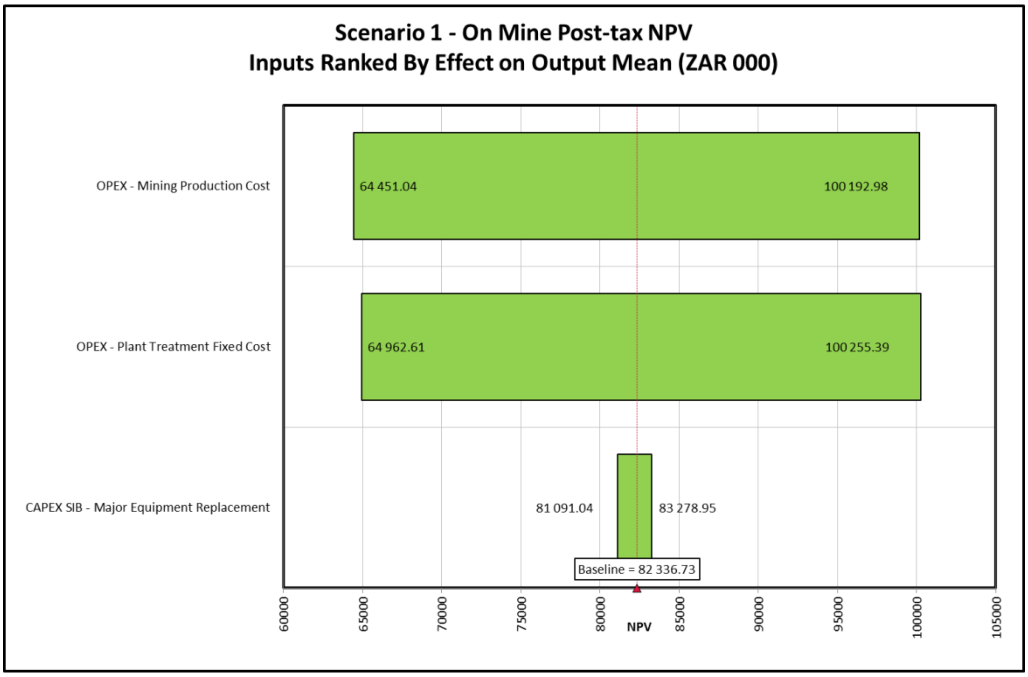


Figure 4.17 - Scenario 1 Monte Carlo NPV Inputs Ranking

4.5.2. Scenario 2 – DBCM Kimberley Mine Divestment

The selected inputs for the Scenario 2 Monte Carlo simulation are reflected in Table 4.14. With Scenario 2 being the divestment option for the operation under investigation, limited cost or revenue variables will significantly impact on the financial model in the remaining life of mine except for the transactional value. Due to this logic the transactional value variable were added to the two operating cost variables and a capital variable that was flexed in Scenario 1.

Table 4.14 - Scenario 2 Monte Carlo Simulation Inputs

Input Parameter	Unit	Min	Mean	Max	Comments
OPEX - Mining Production Cost	ZAR/t	17.72	19.69	21.66	Mean based on scenario input. Min and max flexed by 10%.
OPEX - Plant Treatment Fixed Cost	ZAR/t	17.30	19.23	21.15	Mean based on scenario input. Min and max flexed by 10%.
CAPEX SIB - Major Equipment Replacement	ZAR	R 38 850	R 43 166	R 47 483	CAPEX only caters for treatment facility related CAPEX.
Operational Investment/Divestment Price	ZAR	R 287 314 424	R 526 539 037	R 717 151 467	Mean is based on average of TMR operational precedent transaction values. Max is based on TMR operational maximum precedent transaction values. Min is based on the average of TMR and underground precedent transaction values.

The simulated NPV result is reflected in Figure 4.18. The simulation result reflects a NPV range at a 90% confidence limit of between ZAR 240 million and ZAR 394 million. The minimum simulation NPV generated was ZAR 190 million and the maximum at ZAR 433 million with a standard deviation of ZAR 46 million. It is simulated that 100% of the results were positive, indicating a high probability of a return on investment at a 12 % discount rate.

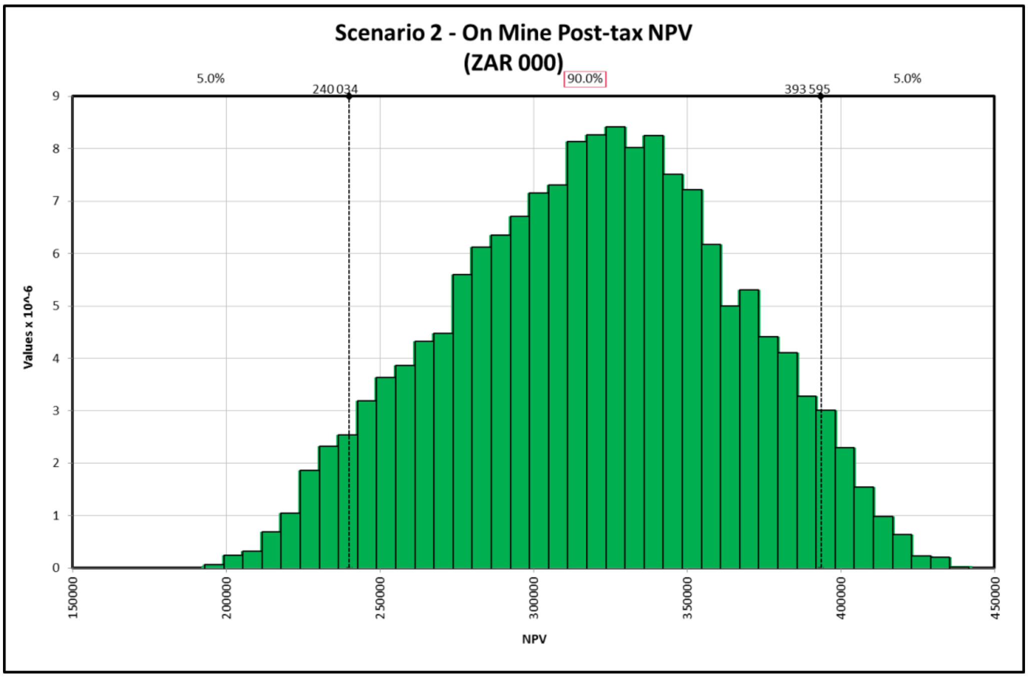


Figure 4.18 - Scenario 2 Monte Carlo Simulation NPV

The inputs ranked by effect on mean NPV is reflected in Figure 4.19. The tornado diagram demonstrates the range associated with the transactional price, having a lower value of ZAR 240 million and an upper value of ZAR 394 million. The effect of the two operating cost variables is significantly less and the capital variable impact being close to insignificant.

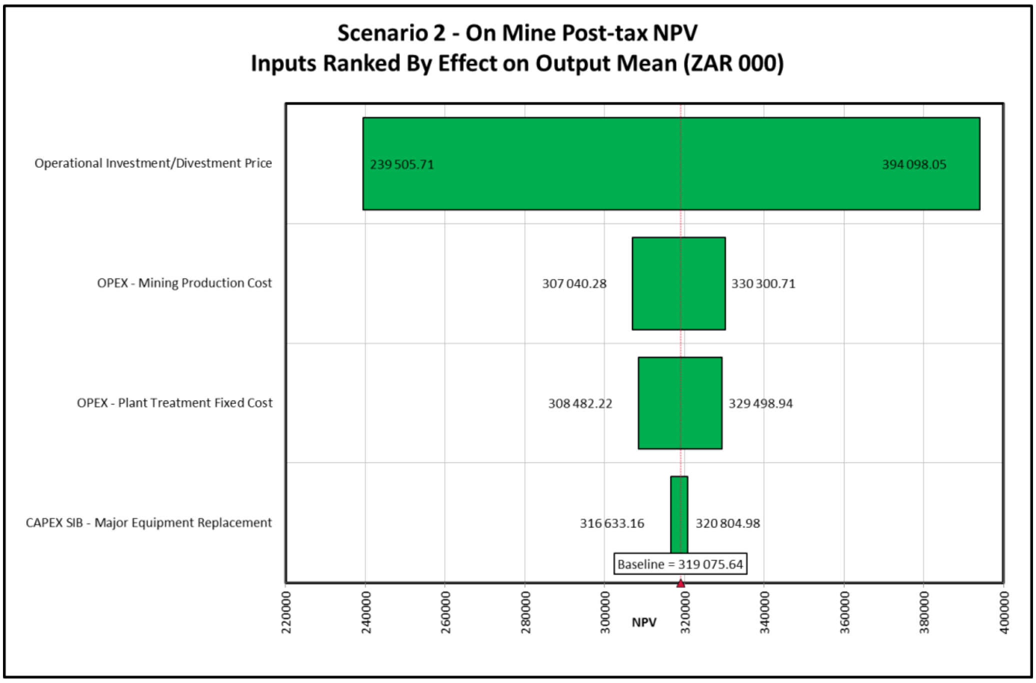


Figure 4.19 - Scenario 2 Monte Carlo NPV Inputs Ranking

4.5.3. Scenario 3 – Kimberley Mine Alternative Owner 1

The selected inputs for the Scenario 3 Monte Carlo simulation are reflected in Table 4.15. With Scenario 3 being the first of the new owner options, specific variables related to TMR 29 were added, namely the TMR grade and diamond price. As a carryover from previous scenarios the transactional value variable as well as the two operating cost variables and a capital variable were flexed in the Scenario 3 Monte Carlo simulation.

Table 4.15 - Scenario 3 Monte Carlo Simulation Inputs

Input Parameter	Unit	Min	Mean	Max	Comments
TMR 29 Chrono Facies Recovered Grade	cpht	3.08	3.82	4.04	Grade variability remains a key risk to historical TMR's. In-situ grade x 88% PRF adjustment.
OPEX - Mining Production Cost	ZAR/t	17.72	19.69	21.66	Mean based on scenario input. Min and max flexed by 10%.
OPEX - Plant Treatment Fixed Cost	ZAR/t	8.65	9.61	10.57	Mean based on scenario input. Min and max flexed by 10%.
TMR 29 Price Carat	US$/ct	103.58	109.03	119.93	Mean is based on current DBCM assortment model. The min reflects a 5% downside, and the max a 10% upside.
CAPEX SIB - Major Equipment Replacement	ZAR	R 86 015	R 95 572	R 105 130	CAPEX only caters for treatment facility related CAPEX. It is assumed that in-pit deposition into Bultfontein will be permitted.
Operational Investment/Divestment Price	ZAR	R 287 314 424	R 526 539 037	R 717 151 467	Mean is based on average of TMR operational precedent transaction values. Max is based on TMR operational maximum precedent transaction values. Min is based on the average of TMR and underground precedent transaction values.

The simulated NPV result is reflected in Figure 4.20. The simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 421 million and ZAR 5 million. The minimum simulation NPV generated was negative ZAR 627 million and the maximum at ZAR 220 million with a standard deviation of ZAR 128 million. It is simulated that only 5% of the results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate.

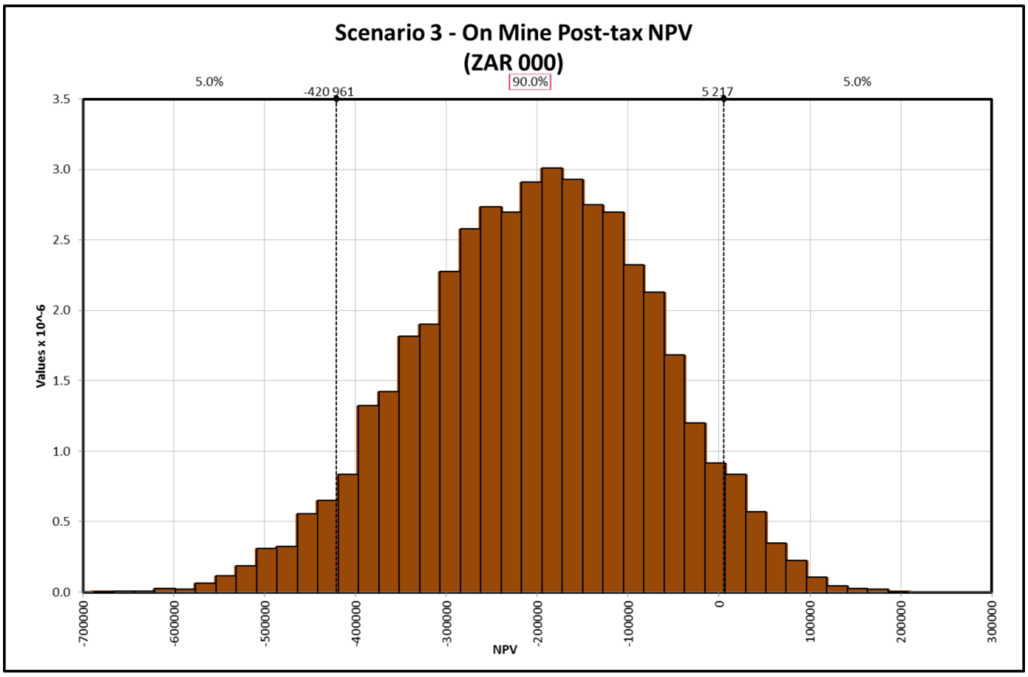


Figure 4.20 - Scenario 3 Monte Carlo Simulation NPV

The inputs ranked by effect on mean NPV is reflected in Figure 4.21. The tornado diagram demonstrates the ranges associated with the TMR recovered grade, transactional price, and TMR diamond price. The effect of the two operating cost variables is significantly less and the capital variable impact being close to insignificant.

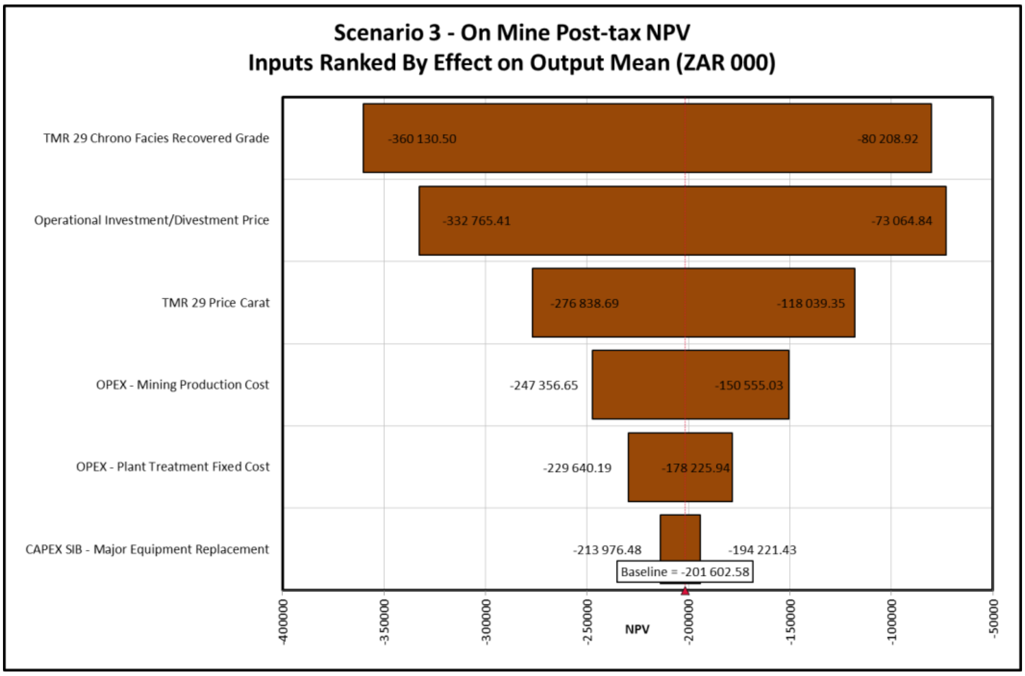


Figure 4.21 - Scenario 3 Monte Carlo NPV Inputs Ranking

The sensitivities associated with the Monte Carlo inputs are reflected in Figure 4.22. The sensitivity analysis reflects the risks associated with the TMR 29 diamond price, grade and the transaction value.

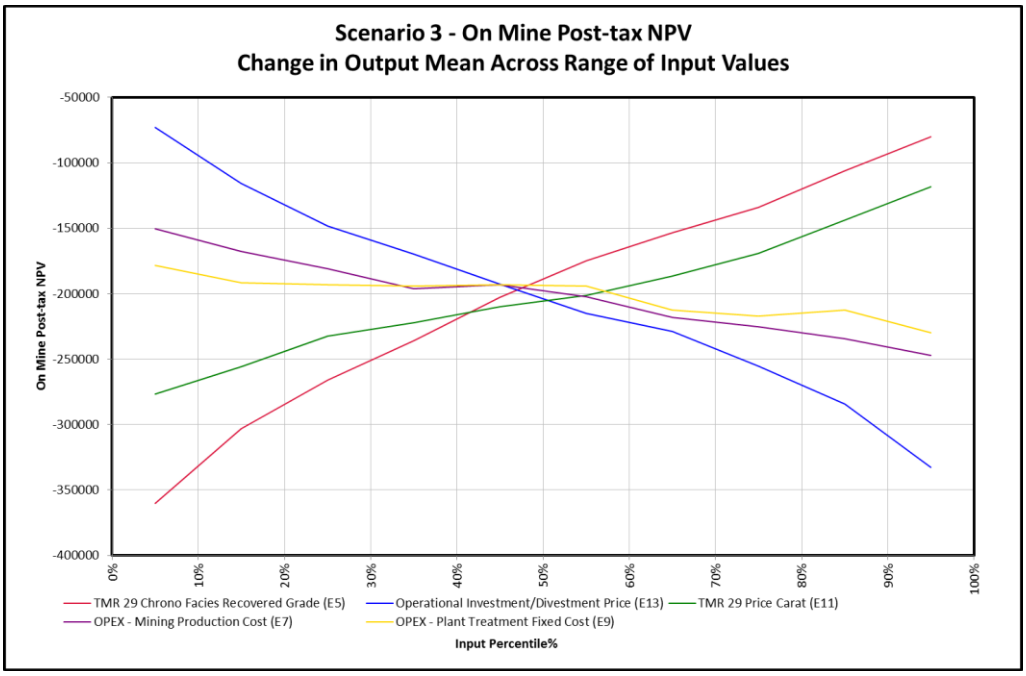


Figure 4.22 - Scenario 3 Monte Carlo NPV Inputs Sensitivity

The simulated IRR result is reflected in Figure 4.23. The simulation result reflects an IRR range at a 90% confidence limit of between -14% and 67%. The minimum IRR generated from the simulation was -30% and the maximum was 129% with a standard deviation of 25%. It is simulated that only 60% of the results were positive, indicating medium probability of a return on investment. With reference to the figure, the shape of the curve indicates a tendency towards a lognormal distribution. The shape of the curve is the outcome of the simulation, and specifically the impact of the operational investment price on the IRR simulation caused the perceived lognormal distribution with reference to Figure 4.24.

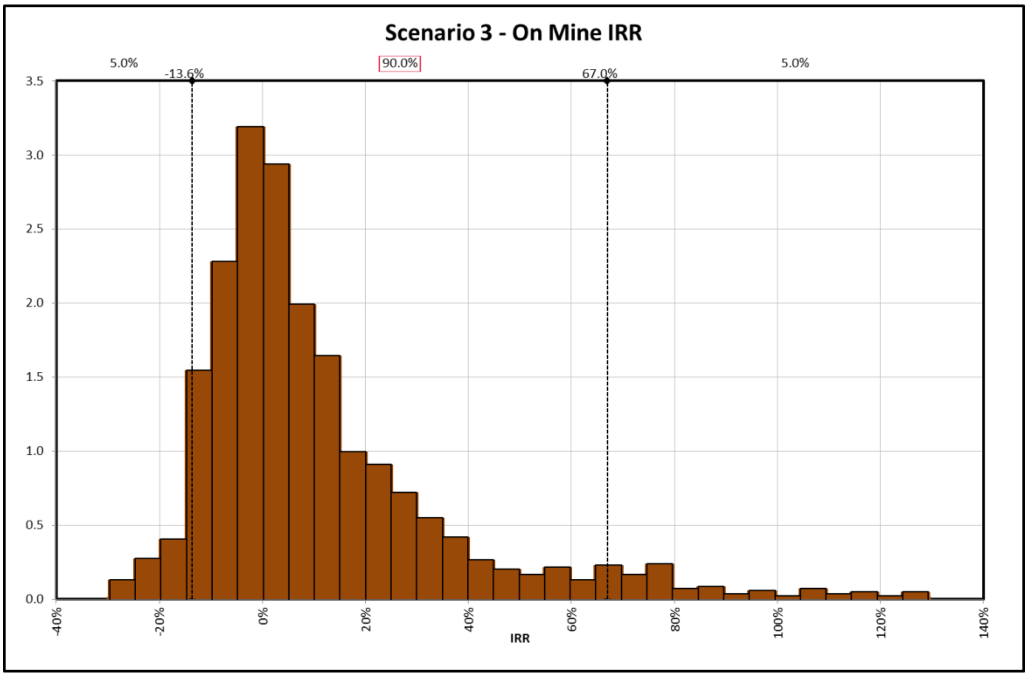


Figure 4.23 - Scenario 3 Monte Carlo Simulation IRR

The inputs ranked by effect on the mean IRR are reflected in Figure 4.24. The tornado diagram demonstrates that the single biggest effect on the IRR is associated with the transactional value.

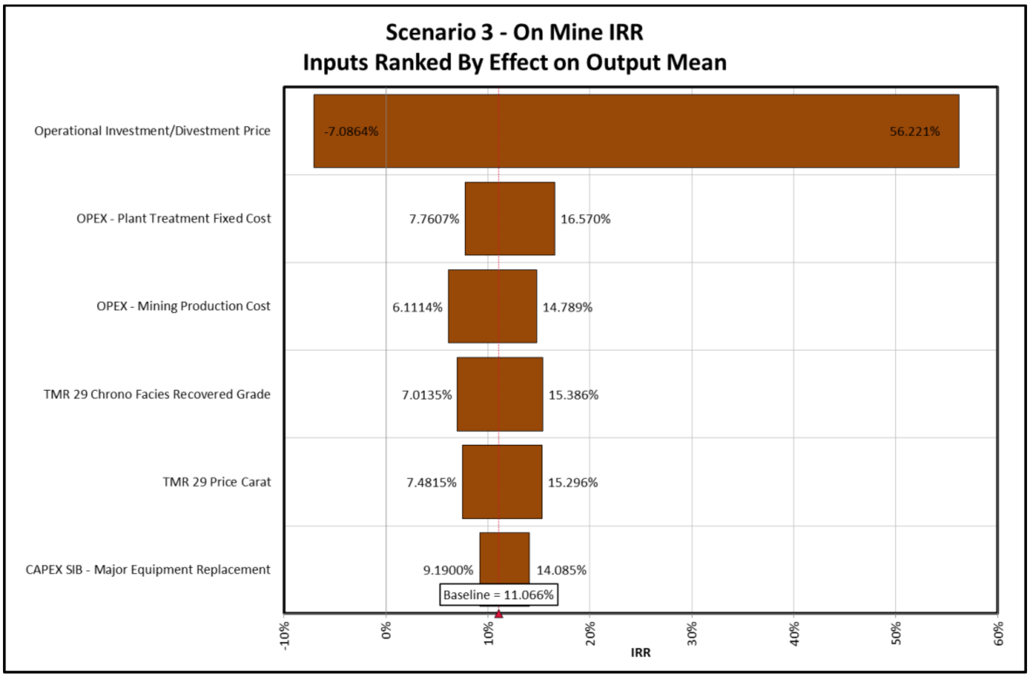


Figure 4.24 - Scenario 3 Monte Carlo IRR Inputs Ranking

4.5.4. Scenario 4 – Kimberley Mine Alternative Owner 2

The selected inputs for the Scenario 4 Monte Carlo simulation are reflected in Table 4.16. With Scenario 4 being the second of the new owner options, specific variables related to TMR 29 were added, namely the TMR grade and diamond price. As a carryover from previous scenarios the transactional value variable as well as the two operating cost variables and a capital variable were flexed in the Scenario 4 Monte Carlo simulation.

Table 4.16 - Scenario 4 Monte Carlo Simulation Inputs

Input Parameter	Unit	Min	Mean	Max	Comments
Mineral Resource Recovered Grade	cpht	3.08	3.82	4.04	Grade variability remains a key risk to historical TMR's. In-situ grade x 88% PRF adjustment.
OPEX - Mining Production Cost	ZAR/t	11.19	12.43	13.68	Mean based on scenario input. Min and max flexed by 10%.
OPEX - Plant Treatment Fixed Cost	ZAR/t	8.65	9.61	10.57	Mean based on scenario input. Min and max flexed by 10%.
Mineral Resource Price per Carat	US$/ct	103.58	109.03	119.93	Mean is based on current owners assortment model. The min reflects a 5% downside, and the max a 10% upside.
CAPEX SIB - Major Equipment Replacement	ZAR	R 86 015	R 95 572	R 105 129	CAPEX only caters for treatment facility related needs. It is assumed that in-pit deposition into Bultfontein will be permitted.
Operational Investment/Divestment Price	ZAR	R 287 314 424	R 526 539 037	R 717 151 467	Mean is based on average of TMR operational precedent transaction values. Max is based on TMR operational maximum precedent transaction values. Min is based on the average of TMR and underground precedent transaction values.

The simulated NPV result is reflected in Figure 4.25. The simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 158 million and ZAR 202 million. The minimum simulation NPV generated was negative ZAR 367 million and the maximum at ZAR 338 million with a standard deviation of ZAR 110 million. It is simulated that 60% of the results were positive, indicating a medium probability of a positive return on investment at a 12 % discount rate.

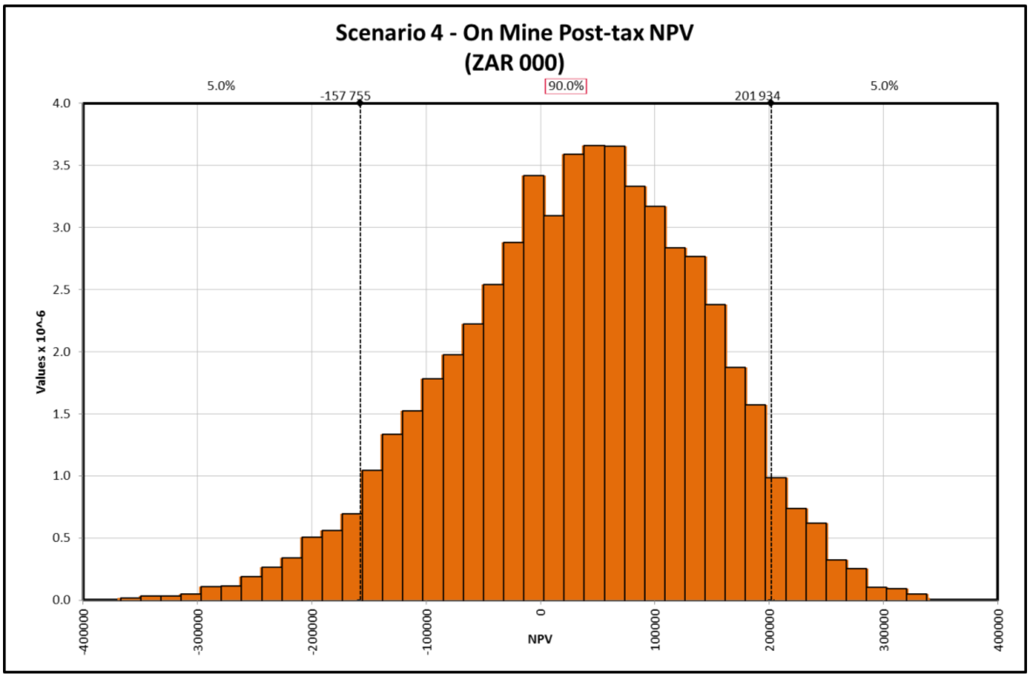


Figure 4.25 - Scenario 4 Monte Carlo Simulation NPV

The inputs ranked by effect on mean NPV is reflected in Figure 4.26. The tornado diagram demonstrates the ranges associated with the TMR recovered grade, transactional price, and TMR diamond price. The effect of the two operating cost variables is significantly less and the capital variable impact is close to insignificant.

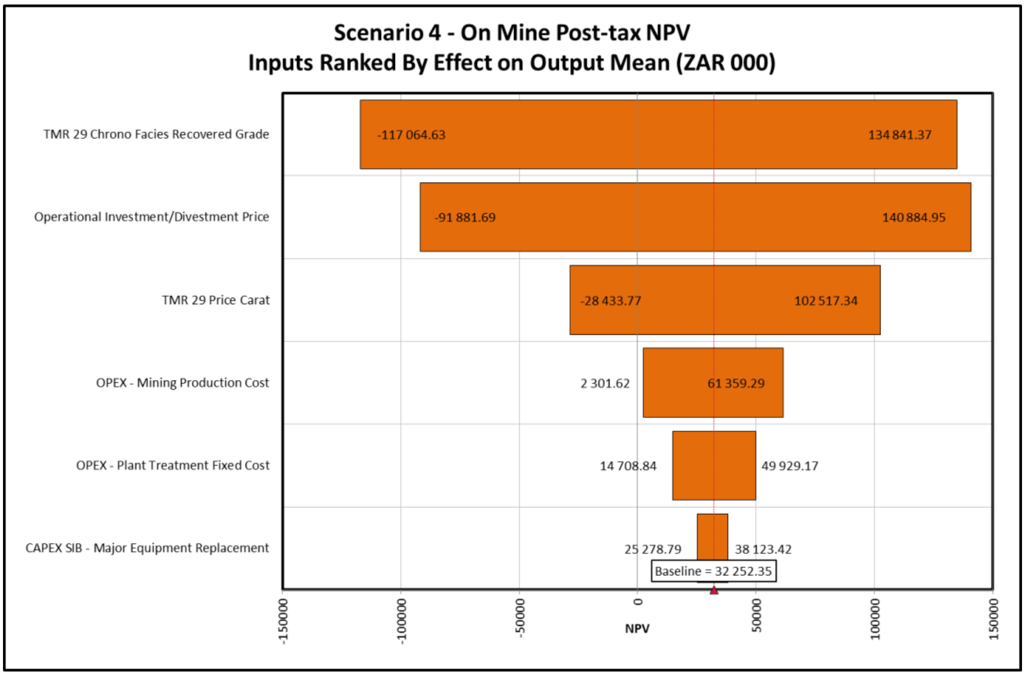


Figure 4.26 - Scenario 4 Monte Carlo NPV Inputs Ranking

The sensitivities associated with the Monte Carlo inputs are reflected in Figure 4.27. The sensitivity analysis reflects the risks associated with the TMR 29 diamond price, grade and the transaction value.

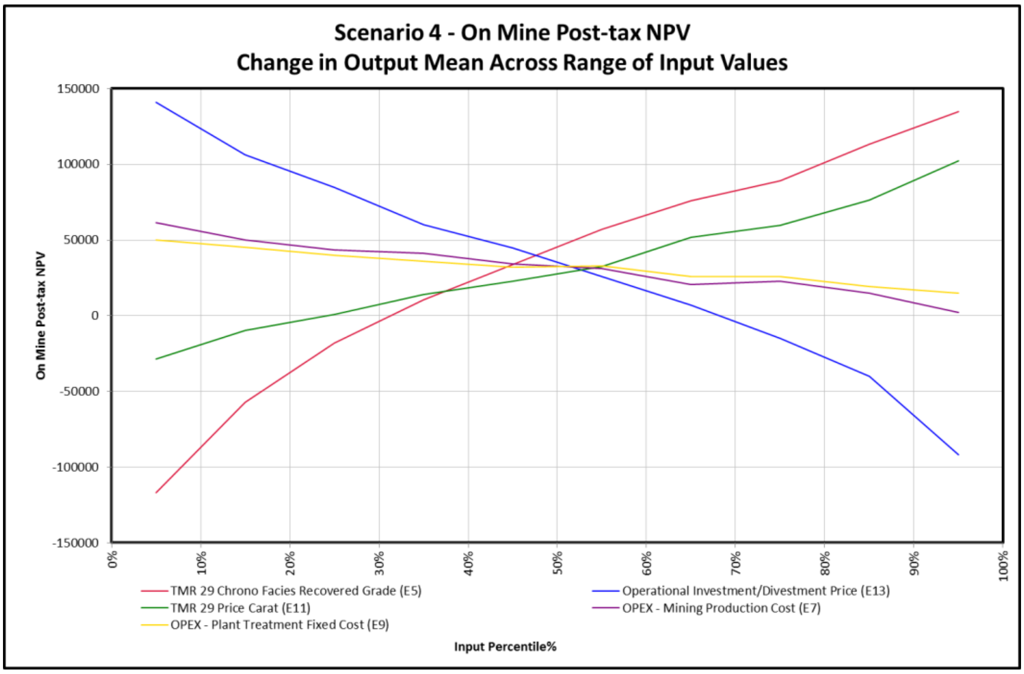


Figure 4.27 - Scenario 4 Monte Carlo NPV Inputs Sensitivity

The simulated IRR result is reflected in Figure 4.28. The simulation result reflects an IRR range at a 90% confidence limit of between -1% and 78%. The minimum simulation IRR generated was -27% and the maximum at 168% with a standard deviation of 25%. It is simulated that 90% of the results were positive, indicating high probability of a return on investment. With reference to the shape of the curve which tends to lean towards a lognormal distribution, similar to Scenario 3, the impact of the operational investment price on the IRR simulation caused the perceived lognormal distribution.

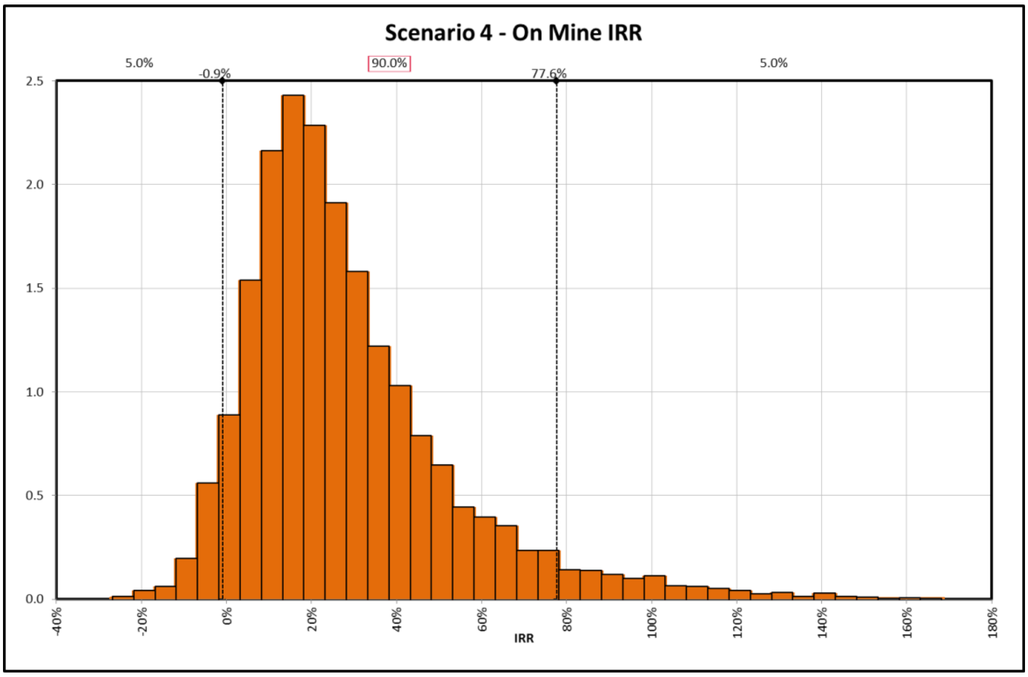


Figure 4.28 - Scenario 4 Monte Carlo Simulation IRR

The inputs ranked by effect on the mean IRR are reflected in Figure 4.29. The tornado diagram demonstrates that the single biggest effect on the IRR is associated with the transactional value.

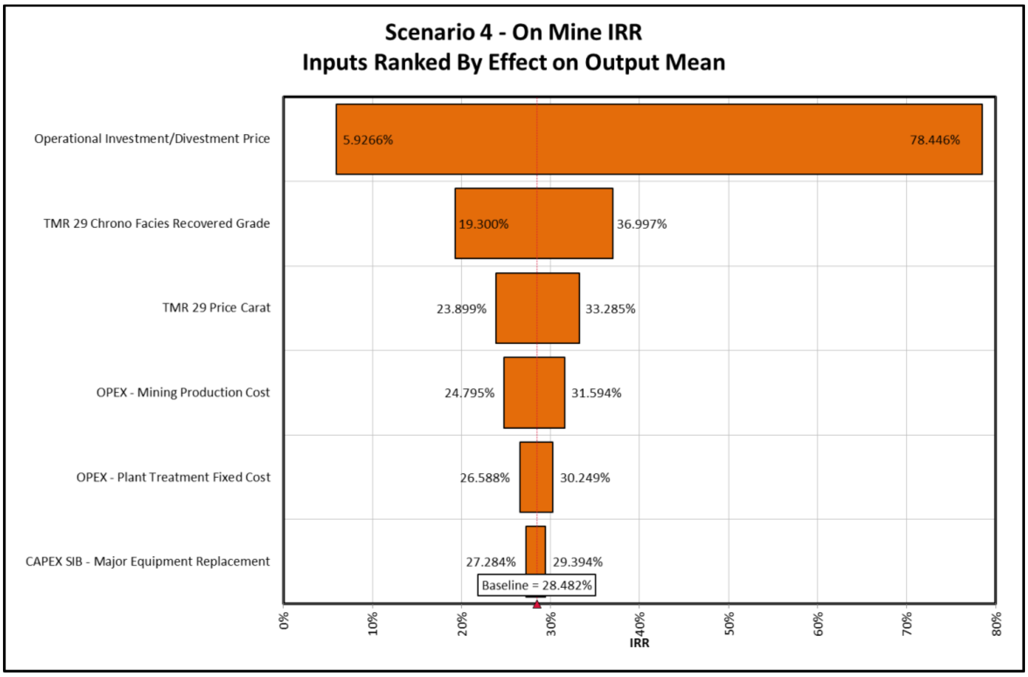


Figure 4.29 - Scenario 4 Monte Carlo IRR Inputs Ranking

4.5.5. Scenario 5 – Kimberley Mine Alternative Owner 3

The selected inputs for the Scenario 5 Monte Carlo simulation are reflected in Table 4.17. With Scenario 5 being the third of the new owner options, specific variables related to TMR 29 were added, namely the TMR grade and diamond price. As a carryover from previous scenarios the transactional value variable as well as the two operating cost variables and a capital variable were flexed in the Scenario 5 Monte Carlo simulation.

Table 4.17 - Scenario 5 Monte Carlo Simulation Inputs

Input Parameter	Unit	Min	Mean	Max	Comments
TMR 29 Chrono Facies Recovered Grade	cpht	3.08	3.82	4.04	Grade variability remains a key risk to historical TMR's. In-situ grade x 88% PRF adjustment.
OPEX - Mining Production Cost	ZAR/t	11.19	12.43	13.68	Mean based on scenario input. Min and max flexed by 10%.
OPEX - Plant Treatment Fixed Cost	ZAR/t	12.98	14.42	15.86	Mean based on scenario input. Min and max flexed by 10%.
TMR 29 Price Carat	US$/ct	103.58	109.03	119.93	Mean is based on current owners assortment model. The min reflects a 5% downside, and the max a 10% upside.
CAPEX SIB - Major Equipment Replacement	ZAR	R 86 015	R 95 572	R 105 130	CAPEX only cater for treatment facility related needs. It is assumed that in-pit deposition into Bultfontein will be permitted.
Operational Investment/Divestment Price	ZAR	R 287 314 424	R 526 539 037	R 717 151 467	Mean is based on average of TMR operational precedent transaction values. Max is based on TMR operational maximum precedent transaction values. Min is based on the average of TMR and underground precedent transaction values.

The simulated NPV result is reflected in Figure 4.30. The simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 358 million and ZAR 45 million. The minimum simulation NPV generated was negative ZAR 607 million and the maximum at ZAR 204 million with a standard deviation of ZAR 123 million. It is simulated that only 10% of the results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate.

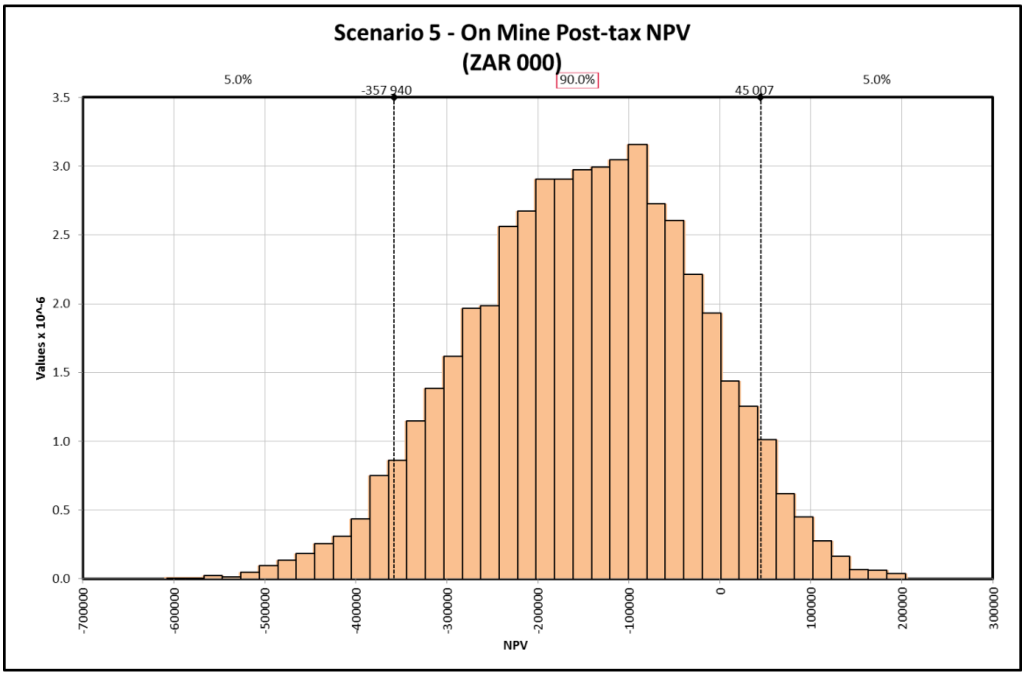


Figure 4.30 - Scenario 5 Monte Carlo Simulation NPV

The inputs ranked by effect on NPV mean is reflected in Figure 4.31. The tornado diagram demonstrates the ranges associated with the TMR recovered grade, transactional price, and TMR diamond price. The effect of the two operating cost variables is significantly less and the capital variable impact is close to insignificant.

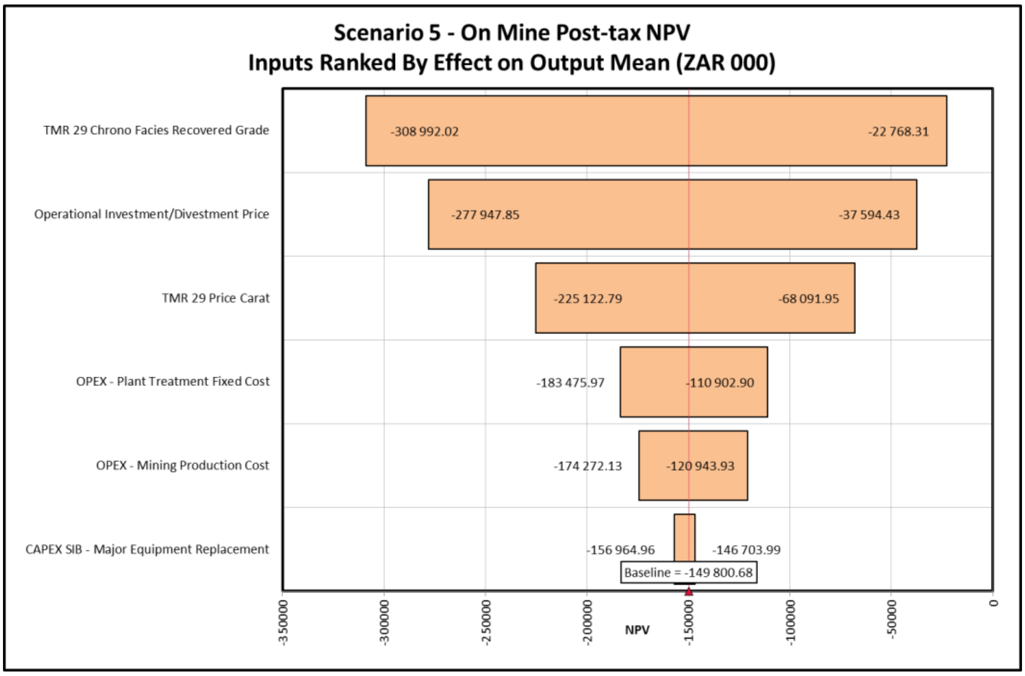


Figure 4.31 - Scenario 5 Monte Carlo NPV Inputs Ranking

The sensitivities associated with the Monte Carlo inputs are reflected in Figure 4.32. The sensitivity analysis reflects the risks associated with the TMR 29 diamond price, grade and the transaction value.

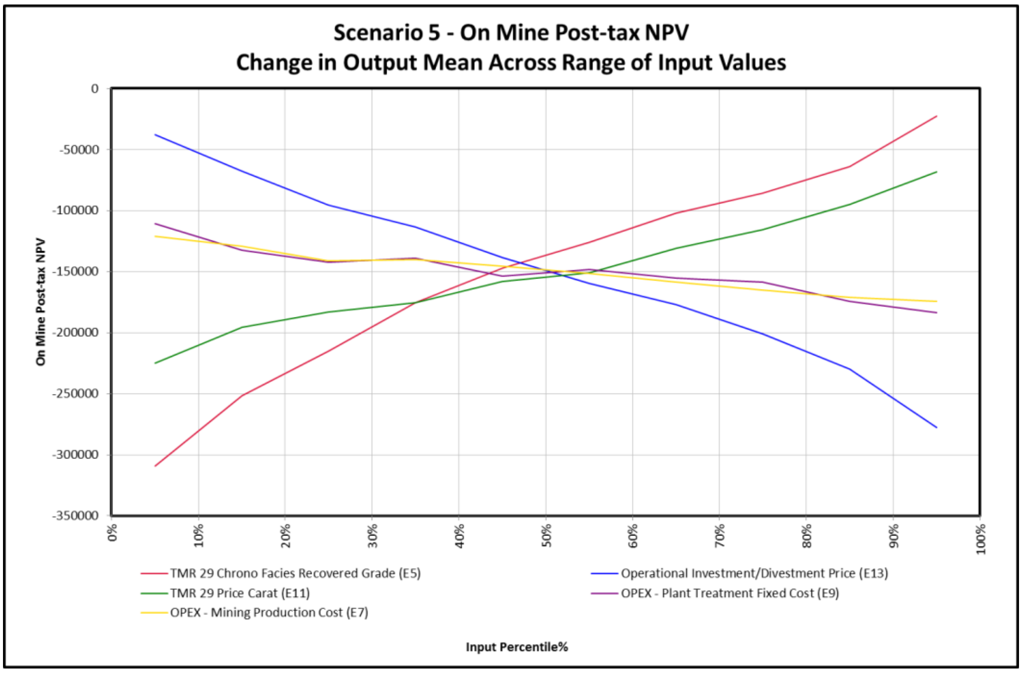


Figure 4.32 - Scenario 5 Monte Carlo NPV Inputs Sensitivity

The simulated IRR result is reflected in Figure 4.33. The simulation result reflects an IRR range at a 90% confidence limit of between -12% and 54%. The minimum simulation IRR generated was -30% and the maximum was 131% with a standard deviation of 21%. It is simulated that 70% of the results were positive, indicating medium to high probability of a return on investment. With reference to the shape of the curve which tends to lean towards a lognormal distribution, similar to Scenario 3 and 4, the impact of the operational investment price on the IRR simulation caused the perceived lognormal distribution.

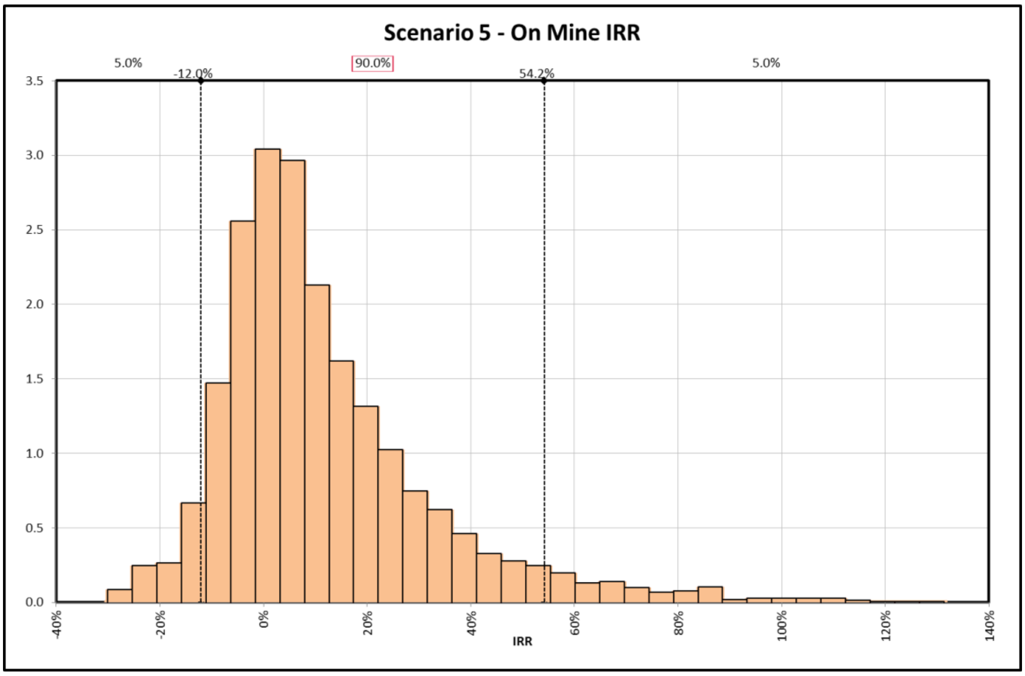


Figure 4.33 - Scenario 5 Monte Carlo Simulation IRR

The inputs ranked by effect on the IRR mean are reflected in Figure 4.34. The tornado diagram demonstrates that the single biggest effect on the IRR is associated with the transactional value.

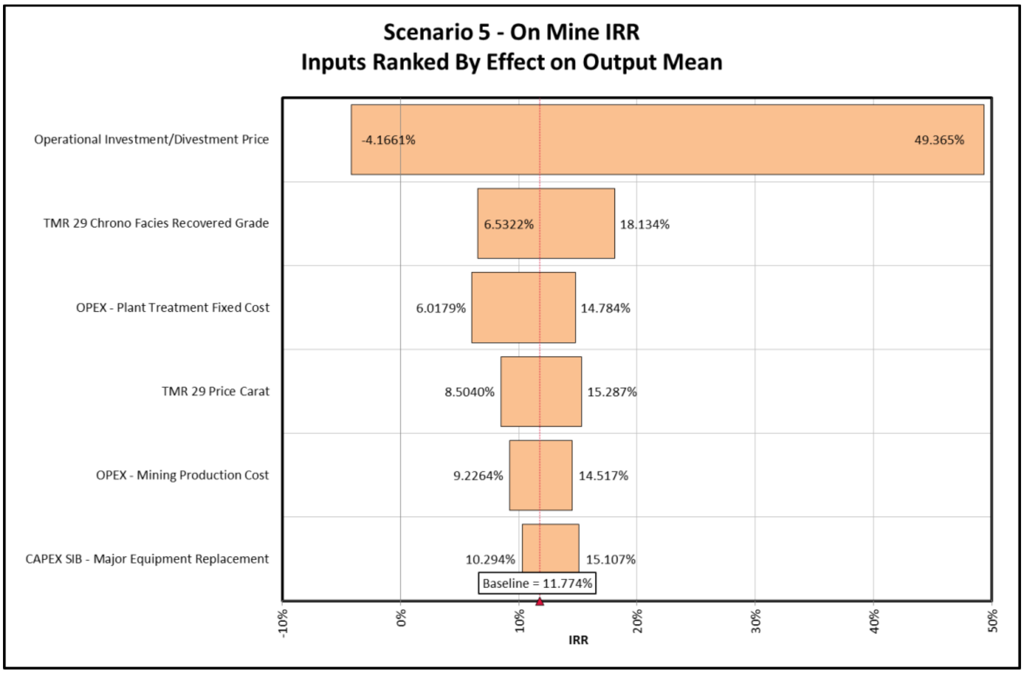


Figure 4.34 - Scenario 5 Monte Carlo IRR Inputs Ranking

4.6. Monte Carlo Simulation Outcomes

The Monte Carlo simulation of the selected scenarios was completed. Based on the results simulated the following scenario outcomes need consideration:

- Scenario 1 simulation result reflects a NPV range at a 90% confidence limit of between ZAR 58 million and ZAR 107 million. It is simulated that 100% of the NPV results were positive, indicating a high probability of a return on investment at a 12 % discount rate.
- Scenario 2 simulation result reflects a NPV range at a 90% confidence limit of between ZAR 240 million and ZAR 394 million. It is simulated that 100% of the NPV results were positive, indicating a high probability of a return on investment at a 12 % discount rate.
- Scenario 3 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 421 million and ZAR 5 million. It is simulated that only 5% of the NPV results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate.
- Scenario 4 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 158 million and ZAR 202 million. It is simulated that 60% of the NPV results were positive, indicating a medium probability of a positive return on investment at a 12 % discount rate.
- Scenario 5 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 358 million and ZAR 45 million. It is simulated that only 10% of the NPV results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate.

4.7. Chapter Summary

This chapter assessed and applied the three valuation methodologies considered most applicable to the operation under review. The comparable transaction methodology focussed on three broad operational transactions, namely TMR, underground, and surface operations. The analysis indicated that based on historical transactions, there is a tendency for TMR operations to be valued higher on a per carat basis compared to underground operations. This apparent discrepancy is primarily linked to the cost of extraction, as TMR operations are significantly less operating and capital cost intensive compared to underground operations.

Surface operations proved to be very subjective in nature, which is attributed to the mineralization of the deposits and the valuation on a per carat basis of diamonds. This implies that the impact of carat average stone size, colour and clarity brings significant valuation discrepancies and hence clouds the valuation compared to normal commodities such as gold, platinum, copper, etc. on a per unit extracted or sold basis. The comparable transactions results were used to estimate a value for the operation under investigation, which was used as an input into the DCF scenarios.

The DCF methodology was explained along with the critical input logic required for the financial modelling and valuation exercise. The DCF analysis was applied to the selected five scenarios, namely the base case scenario and the divestment scenario specific to DBCM, as well as the three new owner scenarios. The DCF results indicate that both the base case and the divestment scenario have the potential to generate positive returns for DBCM. The new owner scenarios have incorporated TMR 29 into the planned life of mine to enable the envisaged life extension beyond 2018. The DCF analysis subsequently reflected that a very aggressive operating cost model, i.e. low overheads with a focus on only key operating activities, will generate high likelihood of success, linked to long-term diamond market real growth and opportunities associated with the envisaged supply and demand curves divergence.

The DCF models formed the basis of the Monte Carlo simulations. The Monte Carlo models inputs specifically focused on variables linked to operating cost and capital expenditure, as these are important levers for the potential future new owner. The key inputs from a mineral resource management perspective around TMR 29 were also assessed due to the techno-economic risk around these variables. Lastly the envisaged transactional value was modelled and flexed as a key input into the Monte Carlo simulation. The results from the simulations indicated a very wide range of probabilities primarily influenced by the envisaged transaction value and the TMR 29 resource grade.

A summary table of the scenarios covering the main variables of the respective cash flows is reflected in Table 4.18. The table covers the key resource, production, constant money cost variables and economic outcomes for each of the scenarios assessed and discussed in the chapter.

Table 4.18 – Summary Table of Main Cash Flow Variables

Category	Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Resource	Resource tonnes (t)	28 545 408	19 199 616	102 588 791	102 588 791	102 588 791
	Resource carats (ct)	3 211 093	2 235 396	4 538 795	4 538 795	4 538 795
	Average resource grade (cpht)	11.25	11.64	4.42	4.42	4.42
Production	Average throughput (t/yr)	5 709 082	6 399 872	7 327 771	7 327 771	7 327 771
	Average recovered carats (ct/yr)	642 219	745 132	324 200	324 200	324 200
	Total revenue (ZAR million)	3 265	2 332	5 070	5 070	5 070
Costs	Capital - Purchase Price (ZAR million)	N/A	N/A	527	527	527
	Capital - Stay in business (ZAR million)	43	43	96	96	96
	Opex mining (ZAR/t)	21.50	21.50	20.60	13.34	14.25
	Opex treatment (ZAR/t)	35.45	35.45	25.84	25.84	30.65
	Overheads (ZAR/t)	26.08	22.09	8.69	8.69	8.69
Economic	Comparable transactions (ZAR million)	N/A	N/A	287	287	287
	DCF NPV (ZAR million)	82	327	-165	57	-112
	Payback period (years)	N/A	N/A	N/A	1.5	N/A
	Monte Carlo Simulation 90% value range (ZAR million)	58 to 107	240 to 394	-421 to 5	-158 to 202	-358 to 45

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Chapter Overview

Kimberley mines under the ownership of DBCM are constrained in terms of extending the current life of mine beyond 2018. This has necessitated a business decision where divestment from Kimberley is considered to create an opportunity for an alternative owner or investor, operating under a different business model, to take over the operation and extend the operational life of mine to beyond 2018.

From a divestment perspective the aim was to model the worth of the operation taking into account an alternative operating model, with potentially a different owner or investor, to extend the life of mine beyond 2018. With this in mind, potential divestment value ranges were determined to facilitate a suitable positive outcome for both the current owner and the potential future owner.

5.2. Concluding Remarks

The literature review has highlighted the opportunity associated with the envisioned long-term gap between supply and demand which might enable diamond producers to take advantage of pricing assumptions in the long-term. It is envisaged that this in turn will impact again on the viability of existing marginal and sub economical mineral resources and operations, such as Kimberley Mine, whether it be in the hands of DBCM or the envisaged new owner.

It was also demonstrated that the likelihood of large economically viable discoveries were very low and that bringing any possible future discoveries into production will take in excess of a decade. This further assists with adding value to the Kimberley Mine entity as it is a current going concern with a good business case in the hands of a new owner prepared to make material operational cost adjustments.

The literature review also highlighted that the cost and capital intensity of diamond mining projects are rising rapidly due to three main reasons. Firstly, the global demand for capital goods has driven price increases in equipment upwards and operating costs have increased significantly over the last few years. Secondly, existing diamond mines are maturing adding to the cost base. Lastly, current new projects are located in remote locations adding to the overall cost of the projects and the operations. Kimberley on the other hand is logistically well located, with very good supporting infrastructure both at municipal and provincial level.

The TMR operation complexity is comparatively low in relation to underground operations and the Kimberley Mine facility is well equipped with industry aligned best practice equipment, machinery, and human capital. These valuations of both tangible and intangible assets, assist with the escalation of value add to the operation. The projected shortfall of diamond supply, linked to the opportunity of investing in the Kimberley Mine will present opportunities for existing and new diamond producers to capitalize on this forecast by maximising the future price escalation and economic drivers associated with the diamond industry

With reference to the valuation codes, it is critical for the valuator to comply with the guiding principles. The first principle refers to materiality where the report must contain all the relevant information that investors would reasonably require to make a reasoned and balanced judgement regarding the asset; secondly transparency where sufficient information is presented in a clear and unambiguous manner, and thirdly competency where the report is based on work that is the responsibility of suitably qualified and experienced persons who are subject to an enforceable Professional Code of Ethics. The codes also stipulates that the valuator must apply at least two valuation approaches or methods and the results from these must be weighed and reconciled into a concluding opinion of value for the asset under review with supporting reasons for assigning higher weight to one approach or method over another.

As an outcome of the literature review the main valuation methods were assessed. The following methods were not used in the assessment for the reasons mentioned in the respective sections, namely: option pricing, option agreement, gross in situ value of mineral, net mineral value, value per unit area, appraised value and multiple of exploration expenditure. It was concluded that for the operation under review, the comparable transactions method would be utilized supported by the DCF method, linked to an NPV and IRR analysis. As supporting techniques the payback period and sensitivity analysis were applied. The Monte Carlo simulation method was applied to the Kimberley Mine valuation exercise as a probabilistic analysis method using the DCF models as the base inputs. Throughout the process the balance sheet approach was used to ensure that all assets and liabilities were accounted for to enable a realistic outcome.

The comparative transaction analysis reflects an operational value for the project under investigation of between ZAR 108 million, the average of the underground operation comparative transactions, to ZAR 527 million, the average of the TMR comparative transactions analysis. The average value taking both the TMR and underground operational comparative transactions into consideration reflects a value for the operation under consideration of ZAR 287 million. This value is considered to be comparatively conservative due to the negative impact of the underground operational transactions on the value estimation of the TMR operation under review; hence as an input into the DCF analysis the ZAR 527 million value was used.

The DCF analysis of the selected new owner scenarios was completed. Scenario 3 is the first of the new owner models. Although the NPV is negative based on the set of assumptions incorporated into the model, it has been demonstrated that with adjustment of the envisaged transaction price, from ZAR 527 million to ZAR 324, the resultant NPV can enable a positive outcome for the new owner. However the economic viability of TMR 29 is questioned as the operating cost assumptions were not sufficiently aggressive, i.e. low overheads with a focus on only key operating activities, to demonstrate economic viability.

Scenario 4, the second of the new owner models, reflects a positive NPV. The differentiating factor for this DCF analysis resides in the operating cost assumptions. It is based on the principle of a lean operational cost model aligned with the small miner philosophy to enable specifically the economic extraction of the mineral resource from TMR 29, the high tonnage and low grade TMR that is crucial to the envisaged life of mine extension to 2030.

Scenario 5, the third of the new owner models, reflects a negative NPV. Although the NPV is negative based on the set of assumptions incorporated into the model, similar to Scenario 3, it was demonstrated that with adjustment of the envisaged transaction price from ZAR 527 million to ZAR 376 million, the resultant NPV can enable a positive outcome for the new owner. However the economic viability of TMR 29 is still questionable.

The Monte Carlo simulation of the selected new owner scenarios was completed. Scenario 3 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 421 million and ZAR 5 million. It is simulated that only 5% of the NPV results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate. The Scenario 4 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 158 million and ZAR 202 million. It is simulated that 60% of the NPV results were positive, indicating a medium probability of a positive return on investment at a 12% discount rate. Lastly, Scenario 5 simulation result reflects a NPV range at a 90% confidence limit of between negative ZAR 358 million and ZAR 45 million. It is simulated that only 10% of the NPV results were positive, indicating a low probability of a positive return on investment at a 12 % discount rate

5.3. Recommendations

Based on the literature review of the main valuation methods and research conducted on historical comparable transactions, there is value for an investor in Kimberley Mine. The asset package as envisaged offers an attractive revenue stream between 2017 and 2018. The economic viability of TMR 29 has been demonstrated through the adoption of a “small miner” operating cost model and could extend the life of mine to 2030.

Based on the comparable transaction methodology for TMR operations the divestment value that could result in a suitable positive outcome for both the current owner and the potential future owner resides between ZAR 287 million, the low point, and ZAR 527 million, the average of the method. With reference to the DCF analysis it has been proven that all three new owner models can deliver a positive NPV with asset acquisition prices of ZAR 324 million for Scenario 3, ZAR 376 million for Scenario 5 and ZAR 527 million for Scenario 4.

Lastly the Monte Carlo simulation results reflect a low probability of success for both Scenarios 3 and 5, but medium to high probability of success for Scenario 4. The simulated NPV result for Scenario 4, at a 90% confidence limit, ranges between negative ZAR 158 million and ZAR 202 million, with 60% of the results being positive, indicating a medium probability of a positive return on investment at a 12 % discount rate. The simulated IRR result reflects an IRR range at a 90% confidence limit of between -1% and 78% with a mean of 28.48%, where 90% of the results were positive, indicating high probability of a return on investment.

5.4. Future Research Work

Venmyn Deloitte has over recent years developed a proprietary platinum group elements mineral asset valuation curve for use as a tool when conducting mineral asset valuations of mineral assets. This mineral asset valuation curve takes into account the general individual characteristics of each mineral asset and was developed based upon the comparative value per unit of attributable platinum group elements ounces. Based on the analysis done it provides general guidance in terms of a range of transaction values for the mineral asset under investigation (Njowa, et al, 2010).

The research conducted as part of this report in terms of comparable transactions focused primarily on transactions that occurred in South Africa, as comparable methods allow the value estimated for a mineral or mining project to be benchmarked against mining project values established in the market. Since the comparable transaction method uses the transaction price of comparable mining projects to establish a value for the operation under assessment, it is important to understand the value per unit that was paid during the transactions.

The development of a mineral asset valuation curve for the diamond industry is recommended for future work. The intent is to use the curve as a tool when conducting mineral asset valuations of diamond mineral assets. The curve will assist with providing guidance to valuators in terms of a range of transaction values for diamond mineral assets under investigation and validation thereof. It is envisaged that the mineral asset valuation curve for the diamond industry will enable the incorporation of the added complexity associated with diamonds taking into account the four C's namely, carat, clarity, colour and cut, which differentiate one diamond asset from another from a valuation perspective.

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