Economic Impact Assessment for the alternative closure and rehabilitation project at the Tshipi Borwa Mine

prepared for SLR Consulting (Africa) (Pty) Ltd in support of the Basic Assessment Process for

Tshipi e' Ntle Manganese Mining (Pty) Ltd

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Tshipi e' Ntle Manganese Mining (Pty) Ltd -

Economic Impact Assessment for the alternative closure and rehabilitation project at the Tshipi Borwa Mine

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TSHIPI E' NTLE MANGANESE MINING (PTY) LTD - ECONOMIC IMPACT ASSESSMENT FOR THE ALTERNATIVE CLOSURE AND REHABILITATION PROJECT AT THE TSHIPI BORWA MINE

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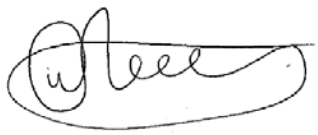
DECLARATION OF INDEPENDENCE

Mercury Financial Consultants (Pty) Ltd (Mercury) was established in 2013 and primarily undertakes economic impact assessments in support of environmental impact assessments. The company also provides business development and support services to SMMEs (Small, Medium and Micro-sized Enterprises). Mercury comprises of a small team of professionals which focusses on delivering strategic and sustainable solutions to its clients. Mercury in its dynamic approach to an ever changing business environment have established strategic partnerships with key environmental and social consultants.

Werner Neethling is a senior consultant at Mercury and is a qualified management accountant with over 17 years' experience. Werner Neethling, the primary author of this report, hereby declare that he is an independent economic assessment specialist. Werner Neethling CV is attached as Annexure A.

Mercury compiled this Economic Impact Assessment report for the proposed Tshipi Borwa Mine EMP Amendment project based on independent research and analysis. I hereby confirm that I have no business, financial, personal or other interest in the activity proceeding other than remuneration for work performed as defined under "independent" in Chapter 1 of the Environmental Impact Assessment Regulations, 2014.



WERNER NEETHLING (ACMA)

(Author)

ACRONYMS AND ABBREVIATIONS

Below a list of acronyms, abbreviations and definitions used in this report.

ACRONYMS / ABBREVIATIONS	DEFINITION
DMR	Department of Mineral Resources
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
LOM	Life of Mine
Mercury	Mercury Financial Consultants (Pty) Ltd
METS	Mineral Engineering Technical Services Pty Ltd,
MPRDA	Mineral and Petroleum Resources Development Act, Act 28 of 2002
NEMA	National Environmental Management Act, 107 of 1998
NPV	Net Present Value is difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyse the profitability of an investment or project.
PV	Present Value
SLP	Social and Labour Plan
SLR	SLR Consulting (South Africa) (Pty) Ltd
Tshipi	Tshipi é Ntle Manganese Mining (Pty) Ltd
Ukwazi	Ukwazi Mining Solutions (Pty) Ltd

TSHIPI E' NTLE MANGANESE MINING (PTY) LTD - ECONOMIC IMPACT ASSESSMENT FOR THE ALTERNATIVE CLOSURE AND REHABILITATION PROJECT AT THE TSHIPI BORWA MINE

1 INTRODUCTION

Tshipi é Ntle Manganese Mining (Pty) Ltd (Tshipi) currently operates the Tshipi Borwa open pit manganese mine located on the farms Mamatwan 331 and Moab 700, approximately 18 km south of Hotazel in the Joe Morolong Local Municipality and the John Taolo Gaetsewe District Municipality in the Northern Cape Province. Tshipi currently holds the following authorisations:

- A mining right (NC/30/5/1/2/2/0206MR) issued by the Department of Mineral Resources (DMR);
- An Environmental Management Programme report (EMPr) approved by the DMR;
- An environmental authorisation (NC/30/5/1/2/2/206/000083 EM) issued by the DMR; and
- A Water Use Licence (IWUL) (10/D41K/AGJ/1735) issued by the Department of Water and Sanitation (currently the Department of Human Settlement, Water and Sanitation).

Key mine infrastructure includes an open pit, haul roads, run-of mine ore tip, a primary crusher, a secondary crushing and screening plant, various stockpiles for crushed and product ore, a train load-out facility, a private siding, offices, workshops, warehouses and ancillary buildings, an access control facility, various access roads, diesel generator house, electrical reticulation, clean and dirty water storage dams, water reticulation pipelines and drains, topsoil stockpiles and waste rock dumps. The mine has an anticipated life of mine of approximately 25 years and has been operational since 2012.

The approved EMPr commits Tshipi to restore the surface to pre-mining state of wilderness and grazing and requires the open pit to be completely backfilled. Recent operation optimisation investigations indicate that when considering environmental, socio-economic, technical, commercial and legal factors, completely backfilling the open pit is sub-optimal. An alternative closure and rehabilitation strategy offers:

- The opportunities for enhanced biodiversity habitats with a different backfill approach particularly in terms of topographic variety and access to surface water;
- The opportunities for enhanced land use increase with access to surface water;

- An alternative closure option will allow for earlier rehabilitation of waste rock dumps; and

In addition to the above, completely backfilling the open pit is likely to sterilise an underground mineral resource located to the north of the current approved open pit. The associated loss of employment, procurement, taxes and foreign exchange earnings is significant and will be a material net loss to the region and the country.

Tshipi is therefore proposing to change the current closure commitment to achieve a more sustainable and optimised outcome. In this regard, the proposed project focusses on:

- Concurrent backfill only i.e. in-pit dumping during mining operations only;
- Sloping and rehabilitation of waste rock dumps remaining on surface, concurrent with mining operations;
- Access to readily available future water supply; and
- Optimisation of the surface landforms and partially backfilled pit from a biodiversity, rehabilitation, land use and pollution prevention perspective.

This report documents the related specialist economic alternatives and assessment results.

2 STUDY METHODOLOGY

2.1 PROPOSED APPROACH AND METHODOLOGY

The following approach and methodologies were applied in the process of identifying and evaluating potential economic impacts:

- Project initiation: As part of the project initiation, Mercury undertook a preliminary analysis to identify and prioritise economic impact considerations and to identify the information requirements;
- Profiling baseline conditions: Profiling baseline conditions focused on the gathering of information about the economic environment and context of the proposed development;
- Model development: This step involved the analysis of the information which was collected, baseline profiling and past experiences to predict possible economic impacts. Trade-offs between the adverse and beneficial impacts of a proposed development were

determined. Where applicable, issues raised by interested and affected parties were taken into consideration in the process of identifying and evaluating potential economic impacts;

- Cost benefit analysis: An initial cost-benefit analysis of the various identified alternative rehabilitation and closure options was undertaken. Mercury was involved in the evaluation of a range of economic considerations, although the cost benefit analysis also included technical, environmental, social, commercial and legal factors;
- Initial economic evaluation as part of the cost benefit analysis: The economic evaluation specifically focussed on the potential negative and positive contributions towards economic factors such as land value, employment value, revenue, and post closure liability. Consideration was given to the current mine plan, mining of future underground mineral resources, closure provision requirements and the duration of mining and closure;
- By using various reasonable and justifiable assumptions and recognised financial modelling techniques the possible outcomes were quantified in financial terms, incorporating economic risk factors;
- The impact assessment methodology as prescribed and outlined in Section 4 was utilised; and
- Mitigation plan and recommendations were defined to ensure potential risks are adequately mitigated.

2.2 REQUIREMENTS FOR SPECIALIST REPORTS

This economic impact assessment report was compiled in compliance with the requirements specified in Appendix 6 of the Environmental Impact Assessment Regulations (R982 of 2014, as amended) published in terms of the National Environmental Management Act, 107 of 1998 (NEMA) as outlined in Table 1 below.

TABLE 1: APPENDIX 6 REQUIREMENTS

REQUIREMENT 1.(1) A specialist report must contain:	**REFERENCE IN BASELINE REPORT, IF APPLICABLE**
(a) details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Curriculum vitae included as Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	A declaration of independence is included in the beginning of the report.
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3 & 7
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Sections 3,4 & 5
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	No site visit was required
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
(f) details of an assessment of the specific identified sensitivities of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Not applicable
(g) an identification of any areas to be avoided, including buffers;	Not applicable
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Not applicable
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Sections 3, 5 & 8
(k) any mitigation measures for inclusion in the EMPr;	Section 6
(l) any conditions for inclusion in the environmental authorisation;	None identified
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None identified
(n) a reasoned opinion- (i) as to whether the proposed activity or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; And (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 2.3
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 2.3
(q) any other information requested by the competent authority.	Section 3.6

2.3 ISSUES RAISED DURING PUBLIC CONSULTATION

SLR have been appointed to undertake an EIA with the objective of making an EA amendment application, which process includes a public participation process. The consultation process has included various interested and affected parties. To date, the only issue which have been raised with regards to an economic impact was from the Department of Mineral Resources (DMR) at the pre-application meeting held on 02 May 2019. The DMR questioned the possibility of completely backfilling the open pit once the underground mining is complete and that this approach can be considered as an alternative to changing the backfill commitment. Mercury has estimated the potential economic impact of this possibility, which is discussed in more detail in Section 3.6.

3 CLOSURE ALTERNATIVES

The following four alternative scenarios were considered in the alternatives analysis to identify the preferred option from a net economic gain perspective:

- Complete backfill: current approved closure scenario which allows for the complete back-filling of the open-pit;
- Partial backfill: an alternative proposed closure scenario, which allows for partial backfilling to approximately 50m below ground level. This option will allow for the partial backfill of the open pit to cover and prevent groundwater losses to evaporation.
- Concurrent backfill only : an alternative proposed closure scenario, which allows for in-pit dumping as part of pit mining operations where practical, the balance of material reporting to surface waste rock dumps. This will imply that no backfilling will be undertaken post open pit mining activities; and
- No backfill: an alternative proposed closure scenario which does not make provision for any backfilling, in-pit dumping. The planned in-pit dumping as part of the current pit mining operations will cease. [A hypothetical scenario only]

A detailed discussion of each scenario follows in sections 3.1 to 3.4 below with a summary of the various scenarios in Section 3.5.

Currently the mine produces approximately three million tonnes per annum of run-of-mine ore and has a remaining opencast life of approximately 20 years. Underground mining opportunities may add an additional 55 years to the life of mine. In this regard, Ukwazi Mining Solutions (Pty) Ltd

("Ukwazi") conducted an underground concept level study on behalf of Tshipi to determine the viability of an underground mine once the open pit reached its limits. The mining exploitation strategy employed covered an access position, mining method selection, mine design and scheduling, and the preparation of conceptual operational and capital cost schedule to steady state. The study concluded that accessing the underground reserves from the final highwall of the open pit via a decline shaft system would present a feasible scenario based on current financial and economic indicators.

In addition to the decline shaft study which was undertaken by Ukwazi, Mineral Engineering Technical Services (METS) Pty Ltd, (METS) conducted a conceptual study on behalf of Tshipi to determine the estimated costs associated with the sinking and equipping of a vertical shaft system from surface.,

3.1 COMPLETE BACKFILLING (CURRENT APPROVED CLOSURE SCENARIO)

The closure plan objectives and principles as outlined in the approved EA/EMP makes provision for the complete removal of all surface infrastructure from the site after closure and the complete backfilling of the open pit. The remaining waste rock dumps will be shaped to 1V:3H slopes or flatter. There will be roughly 45 million m^3 of waste rock remaining on surface at life of mine closure.

Once the pit has been completely backfilled, 1446 hectares (ha) of land will be made available for agricultural activities such as cattle grazing – assuming pre-mining surface conditions are achieved.
Should the pit be fully backfilled, access to available underground resources will be restricted to a vertical shaft from surface. Considering the value of the underground resource – as determined by Ukwazi and the capital cost of a vertical shaft system – as determined by METS, the underground mine will not a feasible alternative, based upon current economic and financial indicators and the underground resources will be sterilised.

3.1.1 Backfilling – economic contribution

NRD Technologies undertook a study for Tshipi to determine the most cost effective solution for backfilling the open pit. The study concluded that a conveyor system presents the best alternative solution taking equipment requirements, operational costs, safety, maintenance and health aspects into consideration.

The proposed back filling operations will take place over a period of 25.7 years, utilising one conveyor system, which will comprise front end loaders moving overburden material onto grizzly feeders that are connected to a movable conveyor system. During this time the conveyor system will be relocated from waste dump to waste dump until the pit has been completely backfilled. This conveyor option will allow for the reuse of existing conveyors were possible but an initial capital outlay of R 82 875 285 will be required over a period of 5 years. During the backfilling activities an estimate of 25-30 employment opportunities will be created.

Note that more than one conveyor system can be used to reduce the backfilling period but the costs are linear.

The NRD Technologies figures provided for a conveyor based operation over 25.7 years will result in an operational expenditure of R1.21 billion (PV), of which the employment value constitute R61.7 million in present value terms after applying a discount factor of 10%.

Making provision for the backfilling activities will however impact on Tshipi's financials and profitability margin and ultimately its contribution to taxes.

3.1.2 Agricultural activities - Economic contribution

Cattle grazing as an alternative land use with a carrying capacity of one (1) head of cattle for every 30 hectares and one (1) employee per every 100 hectares was assumed as the only feasible alternative land use in this arid area, post mining activities. This will yield a revenue of R1 174 554 in present value terms over a period of 55 years. A period of 55years was used, as this is the time line for underground mining. Labour will amount to R2.55 million in present value terms over 55 years. This is however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business to present a sustainable alternative land use.

3.1.3 Aggregate crushing - Economic contribution

The design capacity of an aggregate crushing operation will depend on the demand in the market, especially the local market as transportation costs directly impacts on the feasibility of the product. Estimates received from information provided by the client amounted to a required R10 million

capital investment for a 50 000 tonne per month plant. Although no detailed feasibility study was provided, assuming that the demand for the product will be constant, it can be assumed that the design capacity for a crushing operation for both closure option scenarios will be the same and that only the duration of the operation will be the differentiating factor due to the availability of waste rock, providing the market demand is sustained. In this case 45 million m^3 of waste rock is available, although an estimated 50% will be suitable for aggregate crushing.

3.1.4 Underground mining – lost opportunity

Utilising information provided by Ukwazi, accessing underground resources via a decline shaft from the open pit would require a capital investment R1.5 billion in present value terms discounted over 25 years. This will result in a revenue boost of R21.2 billion (PV) for the first 25 year of the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) for the first 25 year of the life of mine, assuming 30% of operating expenditure is labour. It should be noted that the mine has a potential life of 55 years, but available capital, revenue and labour figures were only available for the first 25 years.

According to the Ukwazi concept study revision 3, utilising a discount factor of 10%, this underground mining option has a positive Net Present Value (NPV) of R184 million after tax and royalties. This determination was based upon current economic factors such as capital investment, operating cost, exchange rate, metal prices and revenue assumptions.

With the complete backfilling of the open pit, it will not be possible to access the underground resources via a decline shaft from the open pit wall and as a result, the option as discussed in the two preceding paragraphs will not be an option for Tshipi.

In addition to the decline shaft study which was undertaken by Ukwazi, Mineral Engineering Technical Services (METS) Pty Ltd, (METS) conducted a conceptual study on behalf of Tshipi to determine the estimated costs associated with the sinking and equipping of a vertical shaft from surface, two services shaft and the establishment of surface infrastructure. This study indicated that a vertical shaft from surface would require an additional R1.72 billion capital investment. This is additional to the capital required as outlined in the Ukwazi study. This equates to a capital investment of R3.4 billion in present value over the first 25 years. It was assumed that the revenue and employment opportunities would be the same as for the underground operation with access

from the open pit areas, which will result in a revenue injection of R21.2 billion and a labour component of R5.7 billion in present value for the first 25 year of the life of mine.

The Ukwazi concept study for a decline shaft indicated a positive NPV of R183 million when utilising a discount factor of 10%. The additional estimated capital expenditure of R1.72 billion to construct a vertical shaft will thus result in a negative NPV, which renders a vertical shaft from surface an unfeasible project. This determination was based upon current economic factors such as capital investment, operating cost, exchange rate, metal prices and revenue assumptions.

It can therefore be concluded that based on current financial indicators, that should the entire open pit be backfilled and the underground resource cannot be accessed vis a decline shaft system of the final pit highwall, the deeper manganese resource will be sterilised.

This will result in an economic loss in direct, indirect and induced effects which would have resulted from the initial capital and operational spending. As a result, the economic activity within the local and regional economy, as businesses will not be able to directly or indirectly benefit from the underground development. The loss of a potential company and personal taxes will impact on a national level.

3.1.5 Contribution towards socio-economic development

It is expected that for the duration of the backfilling activities the contribution to socio-economic benefits to its employees and surrounding communities will be limited to the post closure commitment as outlined in Tshipi's social and labour plan.

3.2 PARTIAL BACKFILL OF OPEN PIT (ALTERNATIVE SCENARIO)

Tshipi is proposing an alternative closure scenario to backfill to approximately 50m below ground level, which is essentially partially backfilling up to the anticipated groundwater rebound level.

Approximately 118 million m^3 of waste rock will remain on surface at life of mine closure. This will be stored in the dumps furthest from the pit (i.e. Northern dump, 47 million m^3 capacity and Western dump extension, 71 million m^3 capacity). The lost surface area for grazing will be 191 ha.

In this scenario the partially backfilled pit area will be available as grazing land (flat area, below natural ground level, top-soiled and close to the water table). This will equate to 579 hectares (ha) of land which will be made available for agricultural activities such as cattle grazing.

3.2.1 Partial backfill - Economic loss from not undertaking full backfilling

Utilising the NRD figures provided for a conveyor activity over approximately 15.4 years will result in an operational expenditure of R1.23 billion (PV). The employment value will constitute R51.9 million (PV) for 25 employment opportunities.

3.2.2 Agricultural activities - Economic contribution from

Cattle grazing as an alternative land use with a carrying capacity of one (1) cattle for every 30 hectares and one (1) employee per every 100 hectares was assumed as a feasible alternative land use post-mining activities. This will yield a revenue of R1 007 507 over a period of 55 years. A period of 55 years was used, as this is the time line for underground mining. Labour will amount to R2.1million in present value terms over 55 years. This is however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business to present a sustainable alternative land use.

3.2.3 Aggregate crushing - Economic contribution

The design capacity of an aggregate crushing operation will depend on the demand in the market, especially the local market as transportation costs directly impacts on the feasibility of the product. Setting up a crushing plant requires substantial capital investment. Estimates received from information provided by the client amounted to a required R10 million capital investment for a 50 000 tonne per month plant. Although no detailed feasibility study was provided, assuming that the demand for the product will be constant, it can be assumed that the design capacity for a crushing operation for all closure option scenarios will be the same and that only the duration of the operation will be the differentiating factor due to the availability of waste rock, providing the market demand is sustained. In this scenario, 118 million m^3 of waste rock is available although an estimated 50% will be suitable for aggregate crushing.

3.2.4 Underground mining - Economic contribution

As access to the underground resources will be completely lost, the potential economic losses to the local, regional and national economy will be same as it will be for the complete backfilling of the pit as discussed in Section 3.1.4.

3.3 CONCURRENT BACKFILL OF THE OPEN PIT (IN-PIT DUMPING) (ALTERNATIVE SCENARIO)

The preferred alternative closure scenario Tshipi is proposing is that of planned in-pit dumping as part of pit mining operations where practical (i.e. allowing working space and access) and economical with no post closure backfilling of the pit. This proposed alternative scenario, which is also the preferred alternative, is illustrated in Figure 1.

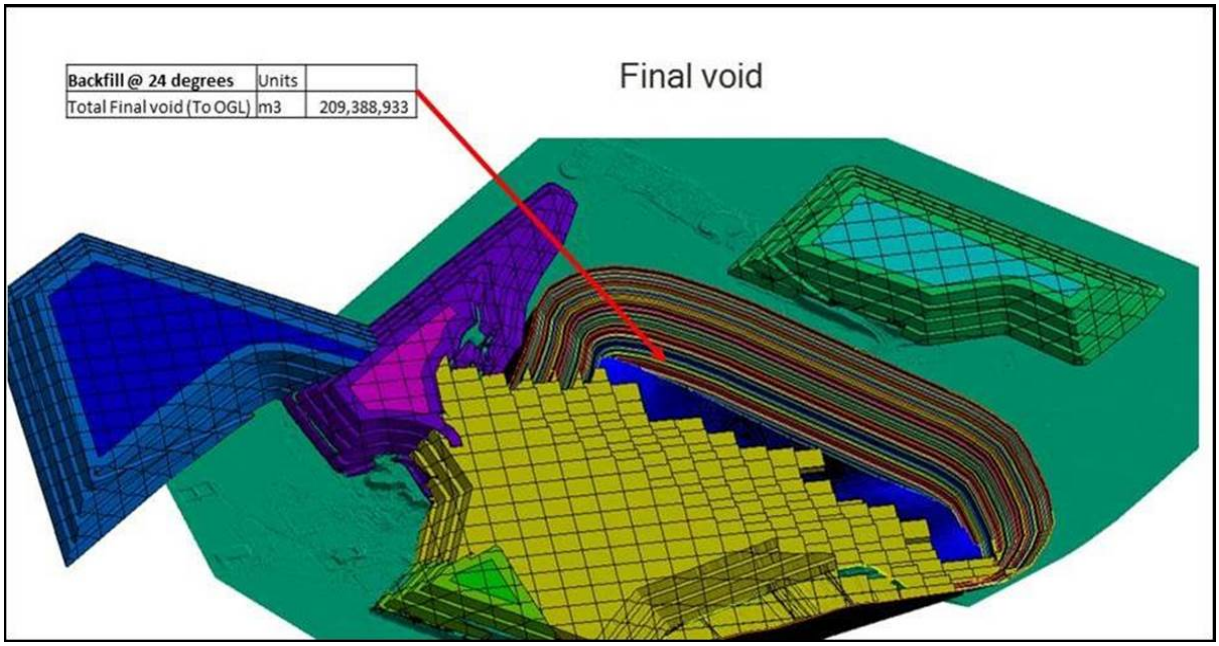


FIGURE 1: ILLUSTRATION OF THE FINAL PIT VOID AS PROPOSED IN ALTERNATIVE CLOSURE SCENARIO

There will be roughly 254 million m^3 of waste rock remaining on surface at life of mine closure. This is after open pit activities have ceased. This will be stored in the all the planned dumps as per planned operations (i.e. Northern dump, Western dump and Eastern dump).

Once the open pit activities have ceased, land will be made available for agricultural activities such as cattle grazing. The lost surface area for grazing will be 374 ha, which is the footprint area of all four waste rock dumps (Northern, Eastern, Western and Western Dump Extension) as shown in Figure 1.

Not completely backfilling the pit presents an opportunity to access underground resources via a decline shaft system of the final pit high-wall at a significantly lower capital cost to a vertical shaft system from surface.

3.3.1 In-pit dumping - Economic loss from not undertaking backfilling

As no post pit closure backfilling will take place, opportunities associated with the backfilling activities of the open pit will be lost. As discussed in Section 3.1.1, the lost opportunities to the local, regional and national economies will include:

- Initial capital outlay of R 82 875 285 over a period of 5 years;
- An operational expenditure of R1.21 billion (PV) based on a conveyor backfilling operation of 25.7 years, which includes an employment value R61.7 million in present value terms; and
- 25-30 employment opportunities.

3.3.2 Agricultural activities - Economic contribution

Cattle grazing as an alternative land use with a carrying capacity of one (1) cattle for every 30 hectares and one (1) employee per every 100 hectares was assumed as a feasible alternative land use post-mining activities. This will yield a revenue of R290 593 over a period of 55 years. Labour will amount to R631 709 in present value terms over 55 years. This is however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business to present a sustainable alternative land use.

3.3.3 Aggregate crushing - Economic contribution

The design capacity of an aggregate crushing operation will depend on the demand in the market, especially the local market as transportation costs directly impacts on the feasibility of the product. Setting up a crushing plant requires substantial capital investment. Estimates received from information provided by the client amounted to a required R10 million capital investment for a 50 000 tonne per month plant. Although no detailed feasibility study was provided, assuming that the demand for the product will be constant, it can be assumed that the design capacity for a crushing operation for all closure option scenarios will be the same and that only the duration of the operation will be the differentiating factor due to the availability of waste rock, providing the market

demand is sustained. In this preferred scenario, 254 million m^3 of waste rock is available, although an estimated 50% will be suitable for aggregate crushing.

3.3.4 Underground mining - Economic contribution

With not backfilling the open pit area, it will be possible to access underground resources via a decline shaft from the open pit wall. As outlined in Section 3.1.4 accessing underground resources will require a capital investment R1.5 billion in present value terms discounted over 25 years. This will result in a revenue boost of R21.2 billion (PV) for the first 25 year of the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) for the first 25 years of the life of mine, assuming 30% of operating expenditure is labour.

Utilising a discount factor of 10%, this underground mining option has a positive Net Present Value (NPV) of R184 million after tax and royalties. This determination was based upon current economic factors such as capital investment, operating cost, exchange rate, metal prices and revenue assumptions.

The direct effects from the initial capital and operational spending will create additional activity within the local and regional economy, as businesses benefiting directly from the proposed development will subsequently increase spending at other local businesses (indirect effect) as well as hiring additional staff members.

Induced effects are the results of increased personal income as a result of the proposed project, including indirect effects. Businesses experiencing increased revenue from the direct and indirect effects will subsequently increase payroll expenditures (by hiring more employees, increasing payroll hours, raising salaries, etc.). Households will in turn, increase spending at local businesses. The induced effect is therefore a measure of this increase in household-to-business activity.

In addition to the direct and indirect economic impacts discussed above, the proposed alternative closure scenario will create an opportunity for an underground mining operation to be established. This will allow the future underground mine to, through its corporate social investments and social and labour plan, to contribute towards the local economic development in the area, including for example:

- Development of skills through its skills development plan;
- Learnership programs to provide learners with an occupational qualification; and

- Investment in infrastructure development through local economic development and integrated development programmes.

3.4 NO BACKFILL (ALTERNATIVE SCENARIO)

This hypothetical scenario was evaluated for completeness sake only.
In this alternative closure scenario Tshipi is proposing that no backfill and no in-pit dumping activities take place. In-pit dumping activities as part of planned pit mining operations will also cease. All waste rock dumps, equating to roughly 430 million m^3 of waste rock will remain on site post life of mine closure. This equates to a lost surface area for grazing of 968 ha.

3.4.1 No backfill - Economic loss from not undertaking backfilling

As discussed in Section 3.1.1 backfilling activities will require a capital investment of R 82 875 285 over a period of 5 years. During the backfilling activities an estimate of 25-30 employment opportunities will be created. The NRD Technologies figures indicated that a conveyor based operation over 25.7 years will result in an operational expenditure of R1.21 billion (PV), of which the employment value constitute R61.7 million in present value terms after applying a discount factor.

As no post pit closure backfilling will take place, these opportunities will be lost.

3.4.2 Agricultural activities - Economic contribution

Very limited cattle grazing would be available in this scenario. Cattle grazing as an alternative land use with a carrying capacity of one (1) cattle for every 30 hectares and one (1) employee per every 100 hectares was assumed as a feasible alternative land use post-mining activities. This will yield a revenue of R144 427 over a period of 55 years. Labour will amount to R313 936 in present value terms over 70 years. This is however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business to present a sustainable alternative land use.

3.4.3 Aggregate crushing - Economic contribution

The design capacity of an aggregate crushing operation will depend on the demand in the market, especially the local market as transportation costs directly impacts on the feasibility of the product.

Setting up a crushing plant requires substantial capital investment. Estimates received from information provided by the client amounted to a required R10 million capital investment for a 50 000 tonne per month plant. Although no detailed feasibility study was provided, assuming that the demand for the product will be constant, it can be assumed that the design capacity for a crushing operation for all closure option scenarios will be the same and that only the duration of the operation will be the differentiating factor due to the availability of waste rock, providing the market demand is sustained. In this scenario, 430 million m^3 of waste rock is available.

3.4.4 Underground mining - Economic contribution

As discussed in Section 3.3.4, with not backfilling the open pit area, it will be possible to access underground resources via a decline shaft from the open pit wall. Accessing underground resources will require a capital investment R1.5 billion in present value terms discounted over 25 years. This will result in a revenue boost of R21.2 billion (PV) for the first 25 year of the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) for the first 25 years of the life of mine, assuming 30% of operating expenditure is labour.

Utilising a discount factor of 10%, this underground mining option has a positive Net Present Value (NPV) of R184 million after tax and royalties. There are however many factors which may in the future influence the financial feasibility of such a project.

The direct effects from the initial capital and operational spending will create additional activity within the local and regional economy, as businesses benefiting directly from the proposed development will subsequently increase spending at other local businesses (indirect effect) as well as hiring additional staff members.

Induced effects are the results of increased personal income as a result of the proposed project, including indirect effects. Businesses experiencing increased revenue from the direct and indirect effects will subsequently increase payroll expenditures (by hiring more employees, increasing payroll hours, raising salaries, etc.). Households will in turn, increase spending at local businesses. The induced effect is therefore a measure of this increase in household-to-business activity.

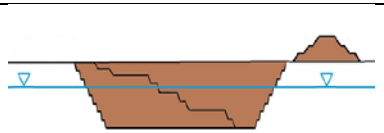
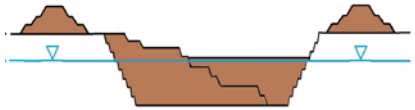
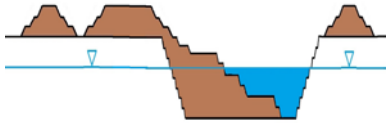
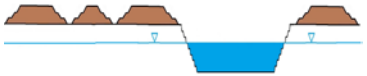
In addition to the direct and indirect economic impacts discussed above, the proposed alternative closure scenario will create an opportunity for an underground mining operation to be established. This will allow the future underground mine to, through its corporate social investments and social and labour plan, to contribute towards the local economic development in the area, including for example:

- Development of skills through its skills development plan;
- Learnership programs to provide learners with an occupational qualification; and
- Investment in infrastructure development through local economic development and integrated development programmes.

3.5 SUMMARY

The four options, which includes the approved closure scenario of complete backfilling are summarised in Table 3 below. The outcome of the options analysis, as discussed in Section 3 above, is that the preferred option from a net economic gain perspective is Option 3 i.e. Concurrent Backfill only i.e. In-pit dumping during mining operations only with no post closure backfilling of the pit.

TABLE 2: SUMMARY OF CLOSURE OPTIONS

	COMPLETE BACKFILL (CURRENT APPROVED CLOSURE SCENARIO)	PARTIAL BACKFILL (ALTERNATIVE SCENARIO)	CONCURRENT/PARTIAL BACKFILL (IN-PIT DUMPING) (PREFERRED ALTERNATIVE SCENARIO)	NO BACKFILL (ALTERNATIVE SCENARIO)
Description	Backfill of the final pit void post mining to original ground level, before rehabilitation of the surface as per the current approved EMPr.	Backfill of the final pit void post mining to a level just above the rebound water-table level, approximately 50m below original ground level, before rehabilitation of the surface.	Backfill of the pit void concurrent with mining only, also called in-pit dumping, which results in a final pit void which will be 'made safe' (profiled) before rehabilitation of the surface.	No backfill of the pit either concurrent with mining or post mining i.e. all waste rock to surface dumps. The pit side-walls and end-walls will only be 'made safe'.
Cumulative closure view				
Backfilling activities	**Gain:** Partial backfilling the Tshipi open pit will stimulate the national, local and regional economy with an approximate amount of R1.21 billion over approximately 25.7 years in operational spending as well as an initial capital investment of R82.9 million. The employment value will constitute R61.7 million (PV) for 25 employment opportunities.	**Gain:** Partial backfilling the Tshipi open pit will stimulate the national, local and regional economy with an approximate amount of R1.023 billion over approximately 15.4 years in operational spending as well as an initial capital investment of R82.9 million. The employment value will constitute R51.9 million(PV) for 25 employment opportunities over 15.4 years.	**Loss:** Not undertaking backfilling activities will result in a lost capital investment injection of R82.9 million over a period of 5 years. Furthermore, not backfilling will result in a loss of operational expenditure to the value of R1.21 billion (PV), of which the employment value constitute R61.7 million in present value terms.	**Loss:** Not undertaking backfilling activities will result in a lost capital investment injection of R 82.9 million over a period of 5 years. Furthermore, not backfilling will result in a loss of operational expenditure to the value of R1.21 billion (PV), of which the employment value constitute R61.7 million in present value terms.
Agricultural	**Gain:** Grazing may be able to resume on the fully rehabilitated area (as part of a larger operation. This will result in a potential revenue of R1.18million over a period of 55 years. Labour will amount to	**Gain:** Once the pit has been partially rehabilitated, grazing activities may be able to resume on available land as part of a larger operation. For the rehabilitated areas this will result in a potential revenue of R1.0m over a	**Minimal gain:** Not rehabilitating the open pit area, will result in a loss of grazing land due to the pit and waste rock dumps on surface. Only a small portion of land will be available for grazing. For the	**Minimal gain:** Not rehabilitating the open pit area, will result in a loss of grazing land due to the pit and waste rock dumps on surface. Only a small portion of land will be available for grazing. For the

	COMPLETE BACKFILL (CURRENT APPROVED CLOSURE SCENARIO)	**PARTIAL BACKFILL (ALTERNATIVE SCENARIO)**	**CONCURRENT/PARTIAL BACKFILL (IN-PIT DUMPING) (PREFERRED ALTERNATIVE SCENARIO)**	**NO BACKFILL (ALTERNATIVE SCENARIO)**
	R2.55million (PV).	period of 55 years. Labour will amount to R2.1million (PV).	rehabilitated areas (as part of a larger operation) this will result in a potential revenue of R290 593 over a period of 55 years. Labour will amount to R634 236 (PV).	rehabilitated areas (as part of a larger operation) this will result in a potential revenue of R144 427 over a period of 55 years. Labour will amount to R313 963 (PV).
Aggregate crushing	**Gain:** Aggregate crushing activities may be able to continue for a limited number of years depending on market demand for all four options.	**Gain:** Aggregate crushing activities may be able to continue for a limited number of years depending on market demand for all four options.	**Gain:** Aggregate crushing activities may be able to continue for a limited number of years depending on market demand for all four options.	**Gain:** Aggregate crushing activities may be able to continue for a limited number of years depending on market demand for all four options.
Accessing underground resources	**Loss.** Access to the underground resources will not be feasible utilising a vertical shaft system from surface. Backfilling the pit completely will result in a lost capital investment injection of R1.5 billion (PV) discounted over 24 years. Furthermore a potential revenue boost of R21.2 billion (PV) as well as 246 job opportunities to a value of R5.7 billion (PV) over the life of mine will be lost to loss the local, regional and national economy.	**Loss.** Access to the underground resources will not be feasible utilising a vertical shaft system from surface. Backfilling the pit completely will result in a lost capital investment injection of R1.5 billion (PV) discounted over 24 years. Furthermore a potential revenue boost of R21.2 billion (PV) as well as 246 job opportunities to a value of R5.7 billion (PV) over the life of mine will be lost to loss the local, regional and national economy.	**Gain:** Only undertaking in-pit dumping provides access to the underground resources via the un-rehabilitated open pit area. Accessing underground resources via the open pit area will require a life of mine capital investment R1.5billion(PV) discounted over 24 years. This will result in a revenue boost of R21.2 billion (PV) over the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) over the life of mine.	**Gain:** Not backfilling the pit provides access to the underground resources via the un-rehabilitated open pit area. Accessing underground resources via the open pit area will require a life of mine capital investment R1.5billion(PV) discounted over 24 years. This will result in a revenue boost of R21.2 billion (PV) over the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) over the life of mine.
Net economic impact	**Net loss:** The economy will lose an estimated value of more than R21.4 billion on a national regional and local level.	**Net loss:** The economy will lose an estimated value of more than R21.7 billion on a national regional and local level.	**Net gain:** From a net economic perspective, the national, regional and local economies will gain more than R21.5 billion from the mining of underground resources when partial backfilling is considered.	**Net gain:** From a net economic perspective, the national, regional and local economies will gain an estimate R21.5 billion from the mining of underground resources when no backfilling is considered.

3.6 BACKFILLING POST UNDERGROUND MINING

Practically the final void could be backfilled after the deeper resource is mined out however:

- Firstly, when considering environmental, socio-economic, technical, commercial and legal factors, completely backfilling the open pit is sub-optimal as a closure solution and an alternative closure and rehabilitation strategy offers; opportunities for enhanced biodiversity habitats and access to surface water;
- Secondly, this would imply that the surface waste rock dumps would remain as (un-rehabilitated) temporary dumps until after closure of the underground mine, possibly as long as 70 years from now whereas with concurrent backfill only, rehabilitation of surface waste rock dumps can commence almost immediately; and
- Lastly, the underground mine is marginal and if the attributable closure liability is included in the underground mine business plan then the business case may no longer be attractive. i.e. the deeper (underground) resource will be sterilised.

4 IMPACT ASSESSMENT

The impact assessment methodology was prescribed by SLR and is tabulated in Table 3 below. This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

TABLE 3: CRITERIA FOR ASSESSING IMPACTS (PROVIDED BY SLR)

Note: Part A provides the definition for determining impact consequence (combining intensity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.

	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

SEVERITY = L

DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**

SEVERITY = M

DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**

SEVERITY = H

DURATION	Long term	**H**	**High**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE

PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE

Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

***H = high, M= medium and L= low and + denotes a positive impact.**

5 ECONOMIC IMPACT ASSESSMENT

The overall objective of mine closure is to prevent or minimise adverse long-term environmental, physical, social and economic impacts, and to create a stable landform suitable for some agreed subsequent land uses.

In many remote and regional areas, mining operations provide a significant mainstream economic activity and have a critical role and contribution to make to regional economic development. Mining operations provide skills development and employment opportunities. In some cases, mining companies are extending their commitment to local economic development and capacity building by requiring that contractors also target their training and employment opportunities to the local community, and by giving preference to a local supply chain. Mining companies are also seeking to provide appropriate skills-transfer and employment opportunities through the development of local business enterprises.

The establishment of mining operations almost brings significant infrastructure to the mine site, to the local community and to the broader region. Planning for mine closure can assist in mitigating the consequent reduction in access to useful infrastructure and alternative mineral resources. With advanced and careful planning, it may be possible to develop capacity to optimise the use of available resources, existing facilities and services for a sustainable benefit on a local, regional and national level.

This section particularly focusses on the potential economic benefits and losses which may occur when closing and rehabilitating of the open pit activities once the open pit operations have ceased. Consideration is given to the following:

- No-go scenario, which will be the approved closure option of complete backfilling of the open pit; and
- The preferred closure scenario of no-back filling once open pit mining activities are ceased, which makes provision for in-pit dumping for the duration of the operational life of the open pit.

5.1 “NO-GO” ALTERNATIVE: POTENTIAL ECONOMIC IMPACT

No “no-go” alternative was assessed, as the current approved scenario.

5.2 EVALUATION OF ECONOMIC IMPACTS

The potential economic impacts of the proposed closure scenario of only in-pit dumping during the operational phase as well as the potential economic impacts of the no-go scenario are assessed in Table 4 below. It should be noted that the assessment of the economic impact is based on the holistic impact rather individual economic aspect such as employment, revenue etc, which includes the potential gain or loss of the underground mining activities in the proposed alternative and current approved scenarios respectively. This implies that the ratings were applied to the net economic impact of the potential scenario in the unmitigated as well as mitigated scenarios

TABLE 4: ECONOMIC IMPACT ASSESSMENT ANALYSIS

ASPECT	POTENTIAL IMPACT	PROJECT PHASE	BEFORE MITIGATION						AFTER MITIGATION					
			INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Proposed closure scenario with in pit dumping during the operational phase only	Not backfilling the pit or only undertaking in-pit dumping provides access to the underground resources via the open pit area. Accessing underground resources via the open pit area will require a life of mine capital investment R1.5billion (PV) discounted over 24 years. This will result in a revenue boost of R21.2 billion (PV) over the first 25 years of the life of mine. The mine will able to provide 246 job opportunities to a value of R5.7 billion (PV) over the first 25 years of life of mine. This alternative scenario, based on current financial conditions, provides a positive NPV. Limited cattle grazing will be able to continue. This will yield a revenue of R290 593 over a period of 55 years. Labour will amount to R631 709 in present value terms over 55 years. This is however not a feasible alternative as the employment is in excess of the revenue. I.e. cattle grazing on the rehabilitated footprint is not a viable economic activity. In this scenario aggregate crushing activities may be able to continue for a number of years depending on market demand. In the unmitigated scenario, this activity may not be implemented, even though it	Post open pit mining	**M+**	**M**	**M**	**M+**	**M**	**M+**	**H+**	**H**	**H**	**H+**	**M**	**H+**

ASPECT	POTENTIAL IMPACT	PROJECT PHASE	BEFORE MITIGATION						AFTER MITIGATION					
			INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
	may be feasible. In the unmitigated scenario it may be possible that the full economic benefit of backfilling as well as the underground mining activities may not be realised. From a net economic perspective, that takes the loss of economic contribution from the backfill activities, the loss of agricultural income generated, and the associated contribution from the underground mine, the national, regional and local economies will gain significantly from the mining of underground resources when no backfilling or concurrent backfilling is considered. In the unmitigated scenario, the economic potential of the operations may not be fully realised. From a net economic perspective, the national, regional and local economies will gain more than R21.5 billion from the mining of underground resources when no or concurrent backfilling is considered.													
No-go scenario	No "no-go" alternative was assessed, as the current approved scenario. Complete backfilling the Tshipi open pit will require an initial capital investment of R82.8million. It will result in a post life of mine operational expenditure of R1.2 billion (present value), with an employment	Post open pit mining	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**

ASPECT	POTENTIAL IMPACT	PROJECT PHASE	BEFORE MITIGATION						AFTER MITIGATION					
			INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
	component value of R61 million in present value terms over 25.7 years of utilising conveyors to completely backfill. The financial impact of this alternative on the current Tshipi business was not assessed. Complete backfilling the Tshipi open pit will stimulate the national, local and regional economy with an approximate amount of R1.29 billion (present value) over a period of approximately 26 years. Once the pit has been rehabilitated, grazing activities may be able to resume. This will yield a revenue of R1 174 554 over a period of 55 years. Labour will amount to R2.55 million in present value terms over 55 years. This is however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business. It is however unlikely that agricultural activities will proceed. In this scenario aggregate crushing activities may be able to continue for a limited number of years depending on market demand. In the unmitigated scenario, this activity may not be implemented, even though it may be feasible.													

ASPECT	POTENTIAL IMPACT	PROJECT PHASE	BEFORE MITIGATION						AFTER MITIGATION					
			INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE	INTENSITY	DURATION	SPATIAL EXTENT	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
	Should the pit be fully backfilled, access to the underground resources will be lost as a vertical shaft from surface is not deemed an economically viable option based on current financial indicators. Accessing underground resources via the open pit area will require a life of mine capital investment R1.5 billion (PV) discounted over 25 years and will result in a revenue boost of R21.2 billion (PV) over the first 25 years of the life of mine. Underground mining activities will able to provide 246 job opportunities to a value of R5.7 billion (PV) over the first 25 years. This opportunity will however be lost with the backfilling of the pit in the mitigated scenario and the economy will lose an estimated value of more than R21.4 billion on a national regional and local level. In the mitigated as well as unmitigated scenario, the net economic impact will be the same due to the loss of underground mining activities.													

6 MITIGATION MEASURES

It is assumed that Tshipi will implement the commitments detailed in the EMPr to avoid/mitigate/manage all environmental, social and economic impacts. More specifically, the operation must ensure the following mitigation measures are implemented should the in-pit dumping scenario be approved:

- Undertake a feasibility study for the establishment of an aggregate crushing operation, if feasible, this should be implemented;
- Hire people from the surrounding area as far as is possible;
- Where possible, procure local goods and services from the closest communities;
- Facilitate local involvement in indirect business and service opportunities;
- Implement a procurement mentorship programme which provides support to local and black owned businesses during the construction and operational phases; and
- Identify and develop sustainable business opportunities and skills, independent from the project for members of the local communities to ensure continued economic prosperity beyond the life of project.

7 ASSUMPTIONS AND LIMITATIONS

The purpose of this economic investigation is to undertake an evaluation of the potential economic impacts of the current closure objectives in comparison to the proposed alternative closure objectives, specifically focusing on alternative land use scenarios.

The following assumptions and limitations apply to the economic impact assessment:

- PV calculation assumed revenue received at the end of each period;
- Present value of the proposed underground mining project, assumed the present year as year zero, even though the proposed project may only be considered once the open pit resources have been depleted, which is expected after 20 years from the present year;
- A discount factor (a financial factor which, when multiplied by a predicted future cash flow from a loan or some other form of debt, gives its present value) of 10% was used to calculate the net present value calculations;
- Capital, revenue and labour information for the underground mining project was limited to the first 25 years of life of mine. The life of mine is estimated at 55 years. The potential

economic gain from the underground operations may therefore be much greater than the value that was stated in the report;

- The underground mining project, accessing reserves via a decline shaft from the open pit wall, is economically viable based on current financial condition and markets which may however change once the project is due for implementation;
- The information (capital investment, operational expenses and labour) supplied by NRD Technologies regarding the backfilling of the pit utilising a conveyor system was assumed to be an accurate reflection;
- The cost estimates for accessing the underground reserves via a vertical shaft from surface as undertaken in the METS conceptual study was based on a +/-35% level of confidence; and
- The METS study incorporated the capital costs for the sinking and equipping of a vertical shaft from surface, two services shaft and the establishment of surface infrastructure. The study excluded an incline shaft and development capital. This implies that the estimated costs as determined by METS should be added to the estimated costs as determined by Ukwazi for the cost of accessing underground reserves via a decline shaft via the open pit wall;
- To determine the economic factors for cattle grazing as an alternative land use, a carrying capacity of one head of cattle for every 30 hectares, a calfing ratio of 82% and one employee per every 100 hectares was assumed. In all the scenarios this was however not a feasible alternative as the employment is in excess of the revenue. This portion of land will therefore have to be incorporated with a larger neighbouring farming business, if that possibility exists;
- An average wage of R3 169 for farmworkers was used as supplied the Department of Labour;
- The scope of work for the economic assessment did not include a review of the rehabilitation liability, financial provision, operational and capital business plans;
- The economic contribution of the pre-mining land use activities was not assessed; and
- No detailed feasibility study was provided for an aggregate crushing operation and therefore no economic indicators could be determined.

8 CONCLUSION

The economic gain from the approved closure scenario to backfill the open pit will be approximately R1.3billion over 20 years – which will be a nett cost to Tshipi that will be funded through a provision in operating costs i.e. a reduction in profitability and taxation. If the backfilling of the pit proceeds it will however result in a potential loss of R22.7 billion to the national, regional and local economies

due to underground resources not being mined. Limiting the open pit rehabilitation to in-pit dumping or partial back-filling will create an economically efficient opportunity to access underground mineral resources.

Adopting an alternative closure strategy of not completely or partially backfilling the pit will allow for access to underground resources with a potential net economic gain of more than R21.5 billion (derived from the deducting the potential losses of R1.2 billion from the potential gains of R22.7 billion) to the national, regional and local economies in the first 25 years of a potential life of mine of 55 years. Capital, revenue and labour information for the underground mining project was limited to the first 25 years of life of mine a d therefore the economic contribution for the full 55 years could not be determined. The economic contribution can therefore be more far significant if the full impact of 55 years is to be included in the calculation. The potential economic losses from not undertaking backfilling activities will be far outweighed by underground mining activities.

Based on the evaluation of available economic indicators, it is Mercury's conclusion to implement the alternative closure scenario, which will only allow for concurrent backfill i.e. in-pit dumping during the operational phase and no post mining back-filling. The proposed closure scenario presents an opportunity for an additional underground mining operation with a potential life of mine will significantly contribute towards the local, regional and national economies through the following:

- Increased foreign investment and income;
- Direct impacts arising from wages, taxes and profits. This includes money spent to pay for salaries, supplies, raw materials, and operating expenses;
- Indirect impacts from the initial and operational spending which will create additional activity within the local and regional economy, and
- Induced impacts as a result of increased personal income or spending power.

Implementing management measures and commitments as outlined in the EMPr will ensure that the project is executed within the framework of sustainable development, which will ensure that potential negative impacts are mitigated and positive impacts enhanced.

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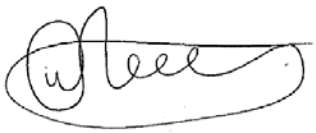

WERNER NEETHLING (ACMA)

(Author)

Appendix A: Curriculum Vitae

Werner Neethling

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Rustenburg, 0299, South Africa

werner@mercuryfc.co.za

Professional Profile

Werner is a qualified Chartered Management Accountant with more than 17 years of experience. Werner is the founding director at Mercury Financial Consultants (Pty) Ltd (Mercury) which was established in 2013. Mercury comprises of a small team of professionals and established strategic partners with key environmental and social consultants. Mercury's sole focus is on delivering strategic and sustainable solutions to its clients.

At Mercury, Werner primarily undertakes economic impact assessments in support of environmental impact assessment processes as well as business development and support services to SMMEs (Small, Medium and Micro-sized Enterprises). Werner, also provides specialised enterprise development consultation services to various clients.

Work History

2013 - Present:
Mercury Financial Consultants (Pty) Ltd
Managing Director

Duties include:

- Economic impact assessments in support of Environmental Impact Assessment (EIA) processes;
- Economic impact assessment and alternative land use analysis for mining projects in South Africa and Southern Africa;
- Facilitating, managing and co-ordinating SMME (Small, Medium and Micro-sized Enterprises) business development;
- SMME financial due diligence and compliance assessments
- SMME accounting and statutory returns
- Risk identification and solution formulation for SMME's; and
- Enterprise development strategy formulation and implementation.

August 2013 – March 2018
Enterprise Development Department – Impala Platinum (Pty) Ltd)
Specialist services provider

Duties include:

- Developing and overseeing of enterprise development strategy for the Implats group
- Managing of inter-departmental cross-functional teams on commercial issues surrounding tender opportunities.
- Analysing and reporting specific risks associated with new suppliers
- Mentor and monitor businesses identified and engaged through internal processes for the Implats Group
- Forming, evaluating and overseeing the implementation of turnaround strategies
- Commercially evaluate all business proposals submitted to the sustainable development department.
- High level engagement of untransformed Suppliers
- Overseeing job creation initiatives

August 2010 – 2013 – Sustainable Development Department
Project Manager , Impala Platinum (Pty) Ltd

- Establish and maintaining of a commercial project reporting system for all sustainable development projects
- Reviewing and reporting of financial results for the sustainable development department
- Management of service providers and finance personnel
- Facilitating of financial review meetings
- Operational management of enterprise development projects
- Building and maintaining relationships with third party stakeholders

Achievements

- Established an industry leading Enterprise Development Department
- Successfully implemented financial and reporting systems for all Sustainable Development Projects

January 2008- September 2010:
Calidris Development Group (SA)
Senior Management Accountant,
Calidris Development Group (SA) specialises in property development

Duties included:

- Overall responsibility for the finance function
- Overseeing of monthly, quarterly and annual budgets
- Review and reporting of monthly financial information
- Responsible for long, medium and short term financial planning
- Reporting of management accounts for all divisions
- Negotiating of contract terms on all new projects.
- Conducting of feasibility studies on new projects.
- Implementation of control systems and IT infrastructure
- Managing the marketing team
- Financial assistance to project team

Achievements

- Established an reporting systems for all Calidris Subsidiary companies
- Chief negotiator for the sale of shares in Destiny Africa development worth R100m

December 2005- December 2007
Freeman and Edwards Ltd (UK)
Financial Controller
Freeman and Edwards Ltd delivers 5 star catering, hospitality and logistical support services to numerous F1, Super Bikes and British Touring Car Teams

Duties included:

- Day to day running of the company's financial and human resource departments
- Daily, monthly and yearly cash forecasting
- Creating and implementing of financial modules that form the core for contract tendering
- Negotiating and liaising with clients, directors, marketing executives, logistical and other departments to Improve customer services and our companies overall cost efficiency
- Variance and efficiency reporting.
- Preparation of Monthly, Quarterly and Yearly management accounts
- Quarterly VAT returns UK and EU
- Preparation of company accounts up to Trial Balance for External Auditors
- Direct supervising of 4 finance staff members and indirect responsibility and management of 32 other members of staff

Achievements

- Restructuring of the company's European VAT policy, this saved the Company £190 000 in 2006
- Revamp of the billing process
- Implementation of numerous control measures along with excellent forecasting and budgeting skills increased the companies Gross Profit margins from 21 to 30%
- Youngest Financial Controller in the Motorsport Industry

October 2004- November 2005
UK Journal Division, Taylor and Francis Ltd
Financial Accountant
UK Journal Division, Taylor and Francis Ltd is a world leader in academic publishing.

Duties included:

- Analysing and preparing the Work in Progress modules, including variance investigation, actual vs budget, costing, closing of work in progress modules and posting of accruals

- Analysing and reporting of day end sales figures, adhoc and deferred income
- Costing forecasting and apportioning of production costs
- Overview and reporting on T&F Sterling and Dollar bank accounts
- Calculating and posting of the production creditor journals
- Analysing of marketing expenditure and drafting reports to the FD
- Cash forecasting
- Balance sheet reconciliations
- Month end accruals
- Ad hoc projects

August 2001- October 2004:
Gainsborough-stud Management Ltd (UK)
Assistant Accountant
Gainsborough stud is the Management Centre for Sheik Maktoum al Maktoum's worldwide thorough bred racing and breeding operation. Turnover is in excess of £100million per year.

Duties included:

- Preparation and producing of monthly accounts
- Overviewing and reporting of the bank reconciliation's and funding positions to the Financial Director on a weekly basis
- Preparation of quarterly reports
- Variance investigation and reporting actual vs budgeted figures
- Reconciliation of Inter and related company accounts transactions
- Assisting in calculating VAT returns
- Various P&L reconciliation's
- Maintaining of stock schedule, fixed asset, sales and audit schedules
- Analysing work done on the purchase and sales ledger
- Preparation in conjunction with line management, of annual budgets and forecasts.

Education

Professional Qualifications:
CIMA – Chartered Management Accountant
CGMA – Chartered Global Management Accountant
CFA – Level 1 Candidate 2017
JSE Qualifications Completed
Registered Person in Equity
SAIFM – Introduction to Financial Markets
SAIFM-The Regulation and Ethics of the SA Financial Markets
SAIFM – The Equity Markets

References

A list of project/management experience is attached below

Work experience summary

Client	Period/Date	Role/Responsibility
Impala Platinum	2010 -2018	Specialist Consulting Services
Royal Bafokeng Enterprise Development	2014-2018	Specialised Business Mentoring and support services.
A-Cap Uranium Mine Botswana	2015	Economic Impact Assessment
Siyanda Chrome Smelter	2014-2015	Economic Impact Assessment
Mokala Manganese (Pty) Ltd	2014	Economic Impact Assessment
Evander Gold Mine (Pty) Ltd	2014-2015	Economic impact Assessment, Social Economic Impact Assessment
Commissiekraal Coal Mine	2015	Economic impact Assessment, Social Economic Impact Assessment
UMK Manganese Mine	2016-2017	Economic Impact Assessment
COZA Iron Ore, Jenkins Mine	2016	Economic Impact Assessment
Lehating Manganeze Mine	2017	Economic Impact Assessment
Khutala Colliery	2017	Economic Impact Assessment
Maize Wet Mill Plant (SAB)	2018	Economic Impact Assessment
Glass Bottling Plant (SAB)	2018	Economic Impact Assessment
West Wits Mining Projects	2018/19	Economic Impact Assessments
PPM Plant Expansion	2019	Economic Impact Assessment
Kitwe Tailings Retreatment, Zambia	2019	Economic Impact Assessment

Updated: May 2019

Werner Neethling (ACMA)(CGMA)(MIFM)