CoAL of Africa

GREATER SOUTPANSBERG PROJECT

Generaal Project Final Report

Macro and Micro-Economic Impact Analysis of the Coal of Africa GSP Generaal Project located near Makhado within the Vhembe District Municipality

8 January 2014

Authors:

- William Mullins
- Tefelo Majoro
- Phindile Nkosi
- Daan Hamman

MOSAKA ECONOMIC CONSULTANTS cc

TRADING AS

CONNINGARTH ECONOMISTS
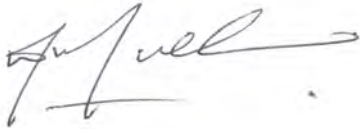
P O Box 75818
LYNNWOOD RIDGE
0040

Tel: +2712 349 1915
Fax: +2712 349 1015
e-mail: congarth@global co.za
Website: www.conningarth.co.za

* Macro-economic Analysis * Regional & Sectorial Analysis* Cost-Benefit Analysis

This document has been prepared by Mosaka Economic Consultants cc trading as Conningarth Economists.

Name of Project: Greater Soutpansberg – Generaal Project.

Report Title: Macro and Micro-Economic Impact Analysis of the Coal of Africa GSP Generaal Project located near Makhado within the Vhembe District Municipality.

Name	Responsibility	Curriculum Vitae
William Mullins	Project Manager Local Economic Impacts and Report	Appendix E
Tefelo Majoro	Cost Benefit Analysis	Appendix E
Phindile Nkosi	Local Economic Impacts and Report	Appendix E
Daan Hamman	Data Collection and Final Report	Appendix E

William Mullins – Project Manager
Date: 8 January 2014

TABLE OF CONTENTS

Tables

Graphs

Maps

ACRONYMS

Term/Abbreviation		Meaning
AU	-	Animal Unit
BCR	-	Benefit Cost Ratio
CBA	-	Cost Benefit Analysis
CoAL	-	Coal of Africa Limited
CHPP	-	Coal Handling and Processing Plant
DAFF	-	Department of Agriculture, Forestry and Fisheries
DMR	-	Department of Mineral Resources
DMS	-	Dense Medium Separation
DWA	-	Department of Water Affairs
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Programme
FEL	-	Front End Loader
GAP	-	Good Agriculture Practice
GDP	-	Gross Domestic Product
GOS	-	Gross Operating Surplus
IRR	-	Internal Rate of Return
LOM	-	Life of Mine
MEIM	-	Macro-Economic Impact Model
MRA	-	Mining Right Application
MT	-	Million Tonnes
NPV	-	Net Present Value
PHC	-	Packing House Code
Phyto	-	Phytosanitary Registration
PUC	-	Production Unit Code
RLT	-	Rapid Loading Terminal
ROM	-	Run-of-Mine
SAM	-	Social Accounting Matrix
WIM	-	Water Impact Model
WARMS	-	Water Use Authorisation and Registration Management System
WRC		Water Research Commission

GLOSSARY OF TERMS

Gross Margin of an enterprise is the gross production value less directly allocatable variable cost. It is expressed on a per hectare or livestock unit basis and is a very useful tool for the financial planning of agricultural projects.

Animal Unit (AU): Is a technique to express different sizes of animals in similar equivalents. A live mass of 500 kg is normally accepted as one AU.

Animal Unit (AU): Is used to calculate the amount of pasture space and animal feed necessary for a group of livestock. An AU is normally defined as one mature cow weighing about 1,000 pounds (450kg) with or without her unweaned calf.

Carrying Capacity: Refers to the grazing potential of pastures or for natural grazing. It is expressed as number of hectares required per AU.

Enterprise Budgets: A system introduced by Departments of Agriculture to compile gross margins for agricultural enterprises.

EXECUTIVE SUMMARY

The primary objective of this macro-economic study is to determine the nature and magnitude of the economic and socio-economic impacts that will result from the proposed Greater Soutpansberg Generaal Project.

The overall conclusion is that the project will be very beneficial to the provincial and national economies; however, some negative impacts can be experienced in the project area, and possibly also outside of the area, as far as the current economic activities are concerned. This specifically refers to a possible negative impact on the hot water spring at Tshipise Resort and the rural villages depending on groundwater.

The study has been divided into the following sections which were investigated separately and eventually integrated in order to come to a conclusion and make a recommendation:

- The quantification of the Current Local Economic Activities in the project area and the possible impact of the mining activities in the short, medium and long term,
- The determination of the Economic Viability of the mining project from a governmental and societal viewpoint, this is done by using two economic tools, namely:
  - Economic Cost Benefit Analysis, incorporating possible negative impacts to the local economic activities, natural environment, social structures and rehabilitation costs, where identified by the other project studies.
  - Macro-economic Impacts of the Mining Project, estimating the projected impacts on the Gross Domestic Product, Employment, Payments to Households, Capital Formation, Payments to Fiscus and Impact on Balance of Payments.

Current Local Economic Activities

The following Current Economic Activities have been identified as being present in the area:

- Live Stock Farming.
  - Commercial Cattle.
- Game Farming.
  - Live Sales.
  - Hunting, subdivided in "Trophy" and "Biltong".
    - Trophy hunting including the services likes professional hunter, skinner, tracker, etc.
    - Biltong hunting including tracker, skinner, etc.
  - Hunting Accommodation.
- Eco and Holiday Tourism.
- Irrigation.

The approach followed was to first establish the current activities in the area which then formed the baseline used to draw up a risk profile[1] in order to calculate the projected impacts and lastly convert it to macro-economic parameters. However, as so often happens, the economic benefits accruing from the mining project could put a negative burden on the current local economic activities in the

---

[1] The Risk Analyses of Mount Stuart and Generaal Sections are available in Appendix D.

project area and outside of the project area. For purposes of the study the project area has been divided into two, namely; the area comprising of the Mount Stuart Section, which includes the farm Schuitdrift and the other comprising of the Generaal Section, excluding the farm Schuitdrift. The two areas are referred to as Generaal and Mount Stuart.

The following table presents a summary of the current land use in the project area.

Land Use	Generaal		Mount Stuart		Total	
	Percentage	Hectares	Percentage	Hectares	Percentage	Hectares
Irrigation	0.0%	0	3.3%	168	0.8%	168
Beef Game	10.0%	1 705	10.0%	527	10.0%	2232
Game	90.0%	15 347	86.7%	4 576	89.2%	19 923
Total	100.0%	17 052	100.0%	5 271	100.0%	22 323

The table shows that 89% of the land is used for game farming and related activities, 10% beef farming and the balance irrigation.

The following table gives an indication of the magnitude of the current activities in the project area.

	Annual Income		
	Generaal	Mount Stuart	Total
	Rand mil.	Rand mil.	Rand mil.
Beef Farming	0.45	0.07	0.52
Game Farming - Animals(Turn Over)	3.81	1.17	4.98
Hunting and related activities	4.43	1.34	5.77
Eco-Tourism	6.82	1.74	8.56
Irrigation	0.00	23.30	23.30
Grand Total	15.51	27.62	43.13

The table shows that irrigation and game farming with the related activities such as hunting, tourism and accommodation are by far the largest income generators in the area representing more than 97% of the total annual turnover of R 43.13 million, expressed in 2013 prices.

In the following table the total local economic activities for the Generaal Project is shown, expressed in terms of GDP and employment opportunities and payment to households.

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	13.11	11.39	24.51	215	54	269	7.39	5.55	1.84
Beef Farming	0.56	0.29	0.85	2	1	3	0.15	0.12	0.04
Game Farming	7.95	5.58	13.53	17	43	60	3.27	2.47	0.81
Hunting	1.51	1.48	2.98	24	5	29	1.40	0.95	0.45
Taxidermy, Game catching, etc.	2.35	2.36	4.71	13	8	21	1.49	1.11	0.38
Accommodation	3.88	4.53	8.41	26	17	43	4.39	2.97	1.42
Total	29.36	25.64	55.00	297	128	425	18.09	13.16	4.94

The table shows that the activities support 297 full time direct employment opportunities with a further 128 indirect and induced opportunities, in total 425. It generates a total of R55.00 million in GDP of which R29.36 million is direct, expressed in 2013 prices.

The total payments to households are R18.09 million with R4.94 million to low income households.

The following table presents the estimated incremental negative impact of the Generaal Project in the study area expressed in macro-economic parameters for the rail transport option; the coal from the Generaal Section will be transported by overland conveyor to the Makhado mine processing plant, from where the product will be dispatched via the Makhado RLT. The Mount Stuart Section will have its own CHPP and clean coal will be transported by overland conveyor to the Makhado RLT for dispatching. In total the impact of all the areas identified are reflected in the table below.

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	-1.16	-1.01	-2.17	-19	-5	-24	-0.65	-0.49	-0.16
Beef Farming	-0.06	-0.03	-0.09	0	-1	-1	-0.02	-0.01	-0.00
Game Farming	-2.04	-1.40	-3.44	-4	-11	-15	-0.81	-0.60	-0.21
Hunting	-0.32	-0.32	-0.64	-5	0	-5	-0.30	-0.20	-0.10
Taxidermy, Game catching, etc.	-0.54	-0.55	-1.09	-3	-1	-4	-0.35	-0.26	-0.09
Accomodation	-1.49	-1.74	-3.24	-10	-6	-16	-1.69	-1.14	-0.55
Total	**-5.62**	**-5.04**	**-10.66**	**-41**	**-24**	**-65**	**-3.82**	**-2.71**	**-1.11**

The table shows that as many as 41 direct employment opportunities can be lost in the project area and a total of 65 overall. The projected direct GDP loss is R5.62 million with a total of R10.66 million.

Property Values

The estimated property values depend on a number of issues and are normally valuated using a number of different fixed capital improvements. The economic values differ from R1 503 per hectare for a beef producing unit and R2 344 for a basic game producing unit without any value added improvements to R12 204 for the units catering for the luxury market.

It is possible that the game farming and lodge facility property owners will not only suffer losses as far as income is concerned but also face the possibility that their property value will be devaluated. It must be kept in mind that the major contributing factor to a possible devaluation in property values is the negative experience of "sense of place" for a specific property. The two main issues affecting the formation of these perceptions are noise and visual intrusions.

In the case of the irrigation units the possible threat of contamination to the water that may affect the property values exists; however it appears that the risk in this case is low.

Tshipise Holiday Resort

The resort offers 3-star style fully-equipped holiday accommodation, hotel accommodation and conference facilities. The main attraction of the resort is the natural hot water spring which feeds

the different bathing facilities. As a result of the hot water bathing facilities the prime holiday period for both camping and chalet visitors is during the winter months of May to August.

The Groundwater Flow Impact Assessment Report[2] shows the impact on reductions in water for abstraction and discharge, without mitigation, as extreme and the possibility exists that the hot water spring at Tshipise could be affected or even dry up. This is not a certainty and thus leaves us with two possibilities, namely:

- The spring is not affected, or
- The hot spring is destroyed.

If the spring is not affected then no economic impact will take place. However, if the spring is impacted upon then the following possibility arise:

- Only the winter months will be negatively impacted on due to the water probably being too cold and visitor numbers will be reduced dramatically. The summer visitors will probably still frequent the resort.

No analysis has been made of the future profitability of the resort should the hot water spring be destroyed and no opinion is expressed should this situation occur.

The current direct GDP created is around R25.49 million with a total GDP of R54.49 million. The total employment created is 258 with 135 direct and 123 indirect and induced opportunities. The payments to households come to R17.49 million, with R4.44 million to low income households in the area; this is 25.4% of the total.

It was established that 49% of the resorts annual income ensues from visitors to the resort during the four winter months from May to August. The 49% income of the winter months was used to reflect the possible impact expressed in macro-economic parameters. As many as 65 of the direct employment opportunities could be destroyed with a further 61 indirect and induced. Payments to low income households can be reduced by R2.17 million.

Proposed mitigation measures are that a detailed analysis of the source of the hot water spring be made in cooperation of the Forever Resorts management, before any mining activities proceed.

Cost Benefit Analysis – Economic Viability

A detailed Economic Cost Benefit Analysis was performed for the mining activity and the coal rail transport option to the identified siding in current financial prices using 6% inflation and constant economic prices. The CBA analysis incorporated the negative impacts on current local activities as a cost item over the mining period, environmental and loss of biodiversity costs and identified social costs.

In the following table the differences between a private sector financial CBA and a public sector economic CBA is presented.

---

[2] The Groundwater Flow Impact Assessment Report – Revision 1 – dated 29 November 2013.

Attributes	Economic CBA	Financial CBA
Perspective	The broader community.	Project shareholders/capital providers.
Goal	The most effective application of scarce resources.	Maximization of net value.
Discount Rate	Social discount rate.	Market determined weighted cost of capital.
Unit of Valuation	Opportunity costs.	Market prices.
Scope	All aspects necessary for a rational, economic decision.	Limited to aspects that affect profits.
Benefits	Additional goods, services, income and/or cost saving.	Profit and financial return on capital employed.
Costs	Opportunity costs of goods and services foregone.	Financial payments and depreciation calculated according to generally accepted accounting principles.

The benefits associated with the project are the revenue resulting from the sale of the coking coal variety and Eskom quality coal.

Approximately 10.1 million tons of coking coal is expected to be produced over the LOM from the Mount Stuart Section with another approximate 8.6 million tons from the Generaal Section. About 62% of the total estimated production from the Generaal Section will be destined to Eskom. For the Mount Stuart Section, 63% of total production is destined to Eskom. The 2011 price of HCC[3] coking coal was at an all-time high, the Australian coking coal varied from July 2010 to June 2011 from US$ 225 to $328 per ton FOB. The September 2013 price is varying around US$ 171 per ton FOB. Determining the Free-on-Board (FOB.) price was therefore a bit of a puzzle and it is necessary to discuss some of the parameters used in the calculations:

1) **The 2011 situation**
   - FOB HCC price expressed in US$ - $207 ton/coking coal, the average 2010 price,
   - Exchange rate – R7 per 1US$,
   - Providing a FOR price of R1449 per ton.
2) **Current 2013 situation**
   - Average 2013 FOB HCC price expressed in US$ - $171 per ton[4],
   - Exchange Rate –R9.50 per 1 US$,
   - Providing a FOB price of R1 624 per ton.

Although the price has dropped in US$ terms by 8%, expressed in terms of Rand the price has actually increased by 12%, compensating for any inflated expenditure prices.

Coal had a separate coking coal market study done by Wood Mackenzie; the report forecasted the following price scenario for the next number of years based on the different coking quality coal. A summary of the forecasted prices for HCC and SHCC varieties is shown in the table below.

---

[3] Hunters Valley Coking Coal – the so called best quality coking coal
[4] Wood Mackenzie - Market Study for CoAL - 2012

	2013	2014	2015	2020	2025	2030
HCC[5] (Qld)	171.25	176.25	184.00	194.00	229.00	235.00
SHCC[6] (Qld)	143.64	147.84	154.56	164.90	194.65	202.10

The table shows it is expected that the price over time will increase in constant terms; Mosaka Economists accepted these figures for the base scenario as they are in line with other predictions found in a cursory research of possible coal price expectations.

The second issue is the possible movement of the South African Rand exchange rate. For the base scenario, an annual weakening of 0.50% of the South African Rand against the US Dollar was assumed. However, current predictions produce even a faster deterioration of the value of the Rand.

The following table presents the results of the financial and economic CBA models excluding the impact on the Tshipise Holiday Resort.

	Financial CBA	Economic CBA
Net Present Value (NPV) (Rand million)	3 479.34	1 845.94
Benefit Cost Ratio (BCR)	2.17	1.86
Internal Rate of Return (IRR)	23.4%	17.2%

The following table presents the results of the financial and economic CBA models including the impact on the Tshipise Holiday Resort.

	Financial CBA	Economic CBA
Net Present Value (NPV) (Rand million)	3 111.33	1 599.81
Benefit Cost Ratio (BCR)	2.05	1.75
Internal Rate of Return (IRR)	21.8%	15.7%

The results show that the project is financially and economically viable when the impacts on Tshipise Holiday Resort are both included as well as excluded and is expected to render positive results.

The following graph shows the impact of different exchange rates on the Net Present Value at a price of US $171 per ton.

---

[5] HCC – Hard Coking Coal
[6] SHCC – Semi Hard Coking Coal

NPV
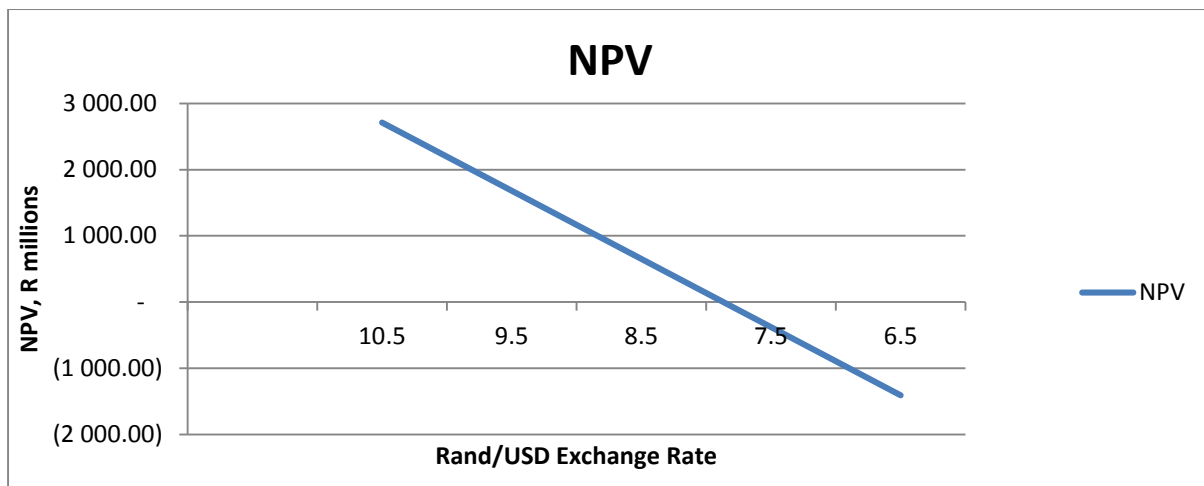
The graph shows that a linear relationship exists between the exchange rate and economic viability of the project. Currently the exchange rate is very volatile with dramatic movements up and down, however, a consensus opinion is that the lower limit would be R9.5 to the US$, although no guarantee exists that this would be the lower limit.

The graph indicates that with a $171 per ton international price and an exchange rate of about R8.00 to the US$ the NPV still remains positive. The current $171 per ton at R8.00 to the US$ gives a rand price of R1 368 per ton and with the prevailing exchange rate of R9.50 plus to the US$, the price per ton expressed in RSA Rand is R1 624.

The analyses for Generaal and Mount Stuart Mines were based on a certain number of assumptions regarding the Rand/USD exchange rate as well as the real domestic price. The real domestic price of coal was assumed to increase at a rate of 0.92% per annum. It is also assumed that the Rand will get weaker overtime (deteriorating at a rate of 0.5% per annum), resulting in higher export prices. A comparison of IRR at different price and exchange rate scenarios is given below.

IRR Sensitivity, Financial CBA

IRR	Exchange Rate R9/1$US	Domestic Price
15.8%	R9.00*	R283.72**
23.4%	R9.50***	R283.72****

*   **Constant Rand/USD exchange rate**
**   **Constant coal domestic price**
***   **Rand deteriorating at 0.50% against US Dollar**
****   **Domestic coal price increasing at a real growth rate of 0.92% per annum**

The table above indicates the extent to which the results are affected by the movements in the exchange rate and the assumptions on real growth of domestic coal price. If the domestic price and the exchange rate are kept constant, the IRR becomes slightly less.

Macro-Economic Impact Analysis

The macro-economic impact analysis also shows a positive picture for both the economic impacts on the Limpopo Province as well as the South African economy. In the following table a summary of the

Construction Phase annual impact results for the Generaal Project [R millions, 2012/2013 Prices] is presented.

Summary of the Construction Phase Results [R millions, 2010/2011 Prices]

	National - RSA Economy	Provincial - Limpopo Economy
Impact on Total GDP (R millions)	**1 298**	**391**
Impact on Total Employment [numbers]:	**5 212**	**2 143**
Impact on Households (R millions):	**972.2**	**144.96**
Low Income Households (R millions)	136.1	49.24
Medium Income Households (R millions)	168.2	25.57
High Income Households (R millions)	567.9	79.34
Fiscal Impact (R million):	**392.0**	**64.82**

The above table shows that the construction phase will have a positive impact on the National as well as the Limpopo Provincial economy for the duration of the construction phase. It is interesting to observe that out of a total 5 212 employment opportunities created, 2 143 will be in the Limpopo Province during the construction period.

Summary of the Operational Phase Results of the Generaal Project showing the impact on the National and Limpopo Province economies [R millions, 2013 Prices]. The Limpopo results are included in the National results.

	National - RSA Economy	Provincial - Limpopo Economy
Impact on Total GDP (R millions)	**5 450**	**3 090**
Impact on Total Employment [numbers]:	**9 769**	**3 703**
Impact on Households (R millions):	**3 810.5**	**1 614.3**
Low Income Households (R millions)	644.8	485.1
Medium Income Households (R millions)	1 565.6	316.9
High Income Households (R millions)	1 832.5	812.3
Fiscal Impact (R million):	**1 497.6**	**621.3**
Balance of Payment	**2 329.6**	

The table shows that the operational phase of the proposed mine will have a very positive impact on the economy of the province and that as much as 3 703 employment opportunities can be created of which 984 will be direct employment opportunities on the mine itself.

The mine will, at full production, pay various taxes amounting to R1 497.6 million annually and have a positive contribution to the "Balance of Payments" of R2 329.6 million per annum if expressed in 2013 prices and values.

Conclusion

A comparison of the Local Economic Activities Baseline and estimated Negative Impact of the operational phase of the proposed Generaal Project (2013 prices) on the National as well as the Limpopo Provincial Economy is shown in the table below.

Mining Operational Phase - Annual Impact Current Activities							
		Baseline	**Impact**			**Baseline**	**Impact**
Gross Domestic Product Rand million	Direct	29.36	-5.62	**Employment Numbers**	Direct	297	-41
	Indirect/ Induced	25.64	-5.04		Indirect/ Induced	128	-24
	Total	**55.00**	**-10.66**		**Total**	**425**	**-65**
Mining Operational Phase - Annual Impact on the National and Limpopo Provincial Economy							
		National	**Provincial**			**National**	**Provincial**
Gross Domestic Product Rand million	Direct	2 263	2 263	**Employment Numbers**	Direct	984	984
	Indirect/ Induced	3 187	827		Indirect/ Induced	8 785	2 719
	Total	**5 450**	**3 090**		**Total**	9 769	3 703

From the above table it appears that the current local economic activities in the defined project area contributes R55.00 million in total GDP and sustains 425 total employment opportunities of which 297 are direct. The mine activity will cost the local economic activities R10.66 million in GDP and 65 employment opportunities, of which 41 will be direct.

The Generaal Project will offer a minimum of 984 direct new employment opportunities compensating for the loss of 41 jobs in the project area. It is, however, in the rest of the Limpopo province where the mine will create many more jobs than the current activities, namely; 2 719 versus the 128 indirect and induced opportunities created by the local economic activities. However, an additional 8 785 indirect and induced employment opportunities are also created in the rest of South Africa.

From the above and the rest of the analysis it appears that the proposed mining project will be an economically viable venture which will add value to not only the Limpopo province, but also the total South African economy. This will take place at the expense of some of the current local economic activities, especially the game business, with ecology included, however, proper mitigation and even compensation must be part of the final solution. The investment the owner has made to a property can be negatively impacted upon if the hunting and accommodation facilities on the property are no longer fully utilised due to a down turn in the present class of hunter and tourist no longer visiting as a result of the mining activities.

The possible threat of underground and surface water contamination to the irrigators is of utmost importance and possible mitigation will have to be in place. In this respect the irrigators further to the north and outside of the project area should be included.

Probably the two most important benefits to the *national* economy are:

- The annual impact on the "Fiscus" with an annual tax contribution of R1 497 million expressed in 2013 prices, which at present represents the salary package of roughly 4 700 teachers or 5 200 nursing staff, if the government were to apply it for that purpose.
- The second impact is the favourable annual impact on the "Balance of Payments "amounting to R2 329 million, if expressed in 2013 prices.

Considering that this is the estimated results of the total Generaal Project, it appears that, from the rest of the analysis, that the proposed mining project will be an economically viable entity which will add value to the Limpopo province and the rest of the country. However, it will take place at the expense of some of the current local economic activities, impacting negatively on the irrigation areas as well as on the game and ecology sectors.

 As stated, this will be a permanent impact and it will be necessary for the mining company to negotiate a proper mitigation programme.

As discussed in the report the Tshipise Forever Resort could also experience a negative impact if the hot water spring is affected by the mining operations and it is necessary that an in depth analysis be performed on the possible impact of the mining operations.

The ground water report also mentions the possibility that the water supply to a number of rural villages outside of the project area might be impacted on by the mining operations. This issue must be investigated further as it might involve some additional costs.

1 Introduction and Background

The project area for the proposed mine straddles the Makhado and Musina Local Municipalities and falls under the jurisdiction of the Vhembe District Municipality comprising of four local municipalities covering 21 407 km² of the surface area of the province. The town Makhado is the main business centre in the area. The Makhado Region has an active tourism industry with a wide variety of hotels and lodges which sport panoramic views to the north and south of the Soutpansberg with a variety of meanders. The northern slopes of the Soutpansberg are rich in game lodges offering game viewing and hunting. To the east and north east of Makhado one finds the fruit basket of the north with rich farmland producing tropical fruits, such as avocado, citrus mango, guava, granadilla and pawpaw as well as macadamia and pecan nuts. The Soutpansberg also attracts birdwatchers to the area which hosts a large variety of species.

Coal deposits have been preserved in four down-faulted basins in the Limpopo Province, in the areas known as the Waterberg, in the vicinity of Lephalale (Ellisras), the Soutpansberg (along the northern flank of the Soutpansberg Mountains), the Limpopo (along the southern bank of the Limpopo River, west of Musina) and the Springbok Flats coalfields.

The Generaal Project forms part of the Greater Soutpansberg Project (GSP) situated to the north of the Soutpansberg in the Limpopo Province. Map 1 depicts the locality of the various GSP projects, from which it is evident that they are within close vicinity of each other, permitting possible rationalisation of infrastructure. Map 2 depicts the location of the Generaal Project.

1.1 Project Location

The Generaal Project is situated in the magisterial district of Vhembe, in the Limpopo Province, approximately 35 km north of the Makhado Town in the Makhado and Musina Local Municipal areas. Musina is situated approximately 70 km to the north. Musina and Makhado are connected by well-developed road infrastructure. The area is located north of the Mutamba River and reaches from west of the N1 north eastwards to 5 km south of Tshipise, and is divided into two (2) sections, namely the Generaal Section and the Mount Stuart Section. A single farm (Solitude 111 MS) is located further north with its southern border at the end of the Nzhelele Scheme canal. Two other farms (Maseri Pan 520 MS and Beck 568 MS) are located across the N1 at the Baobab Toll Plaza.

The Generaal Project is well situated with respect to major infrastructure, including rail, road and power. The N1 national road passes through the mining right application (MRA) area (Generaal Section) with the R525 running to the north of the project area in a west-east direction. Both of these roads carry sufficient traffic to impact on the ambient sound levels some distance away from these roads. The Makhado-Musina railway line runs in a north-south direction to the west of the Generaal Project area. Eskom grid power lines are located parallel to the N1 and are situated 6 km east of the farm Cavan 508MS at their closest point.

Map 1: Map Showing the Locality of the GSP Project Area
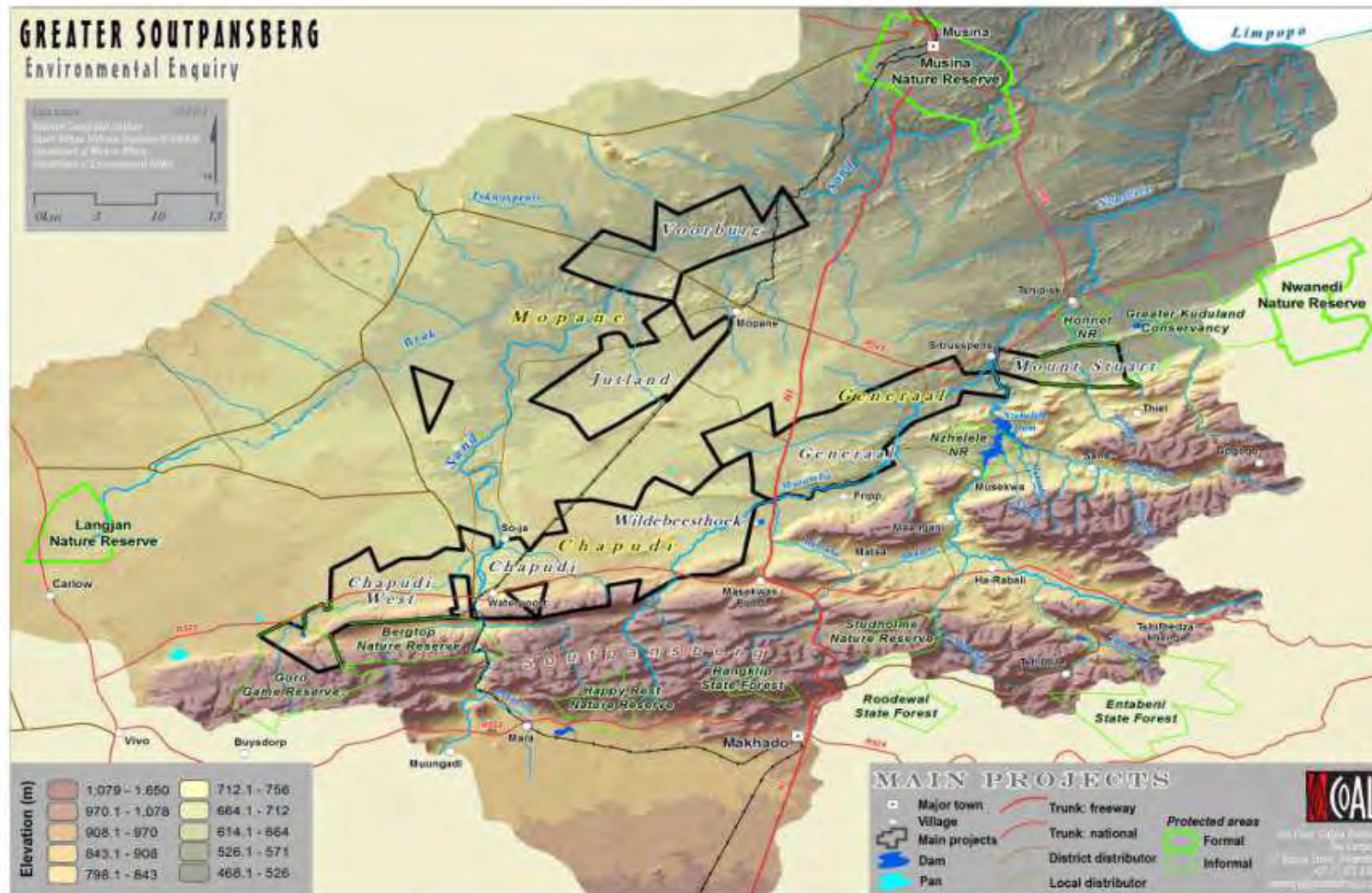
Source: Courtesy of Coal of Africa Limited

Map 2: Location of the Generaal and Mount Stuart Sections
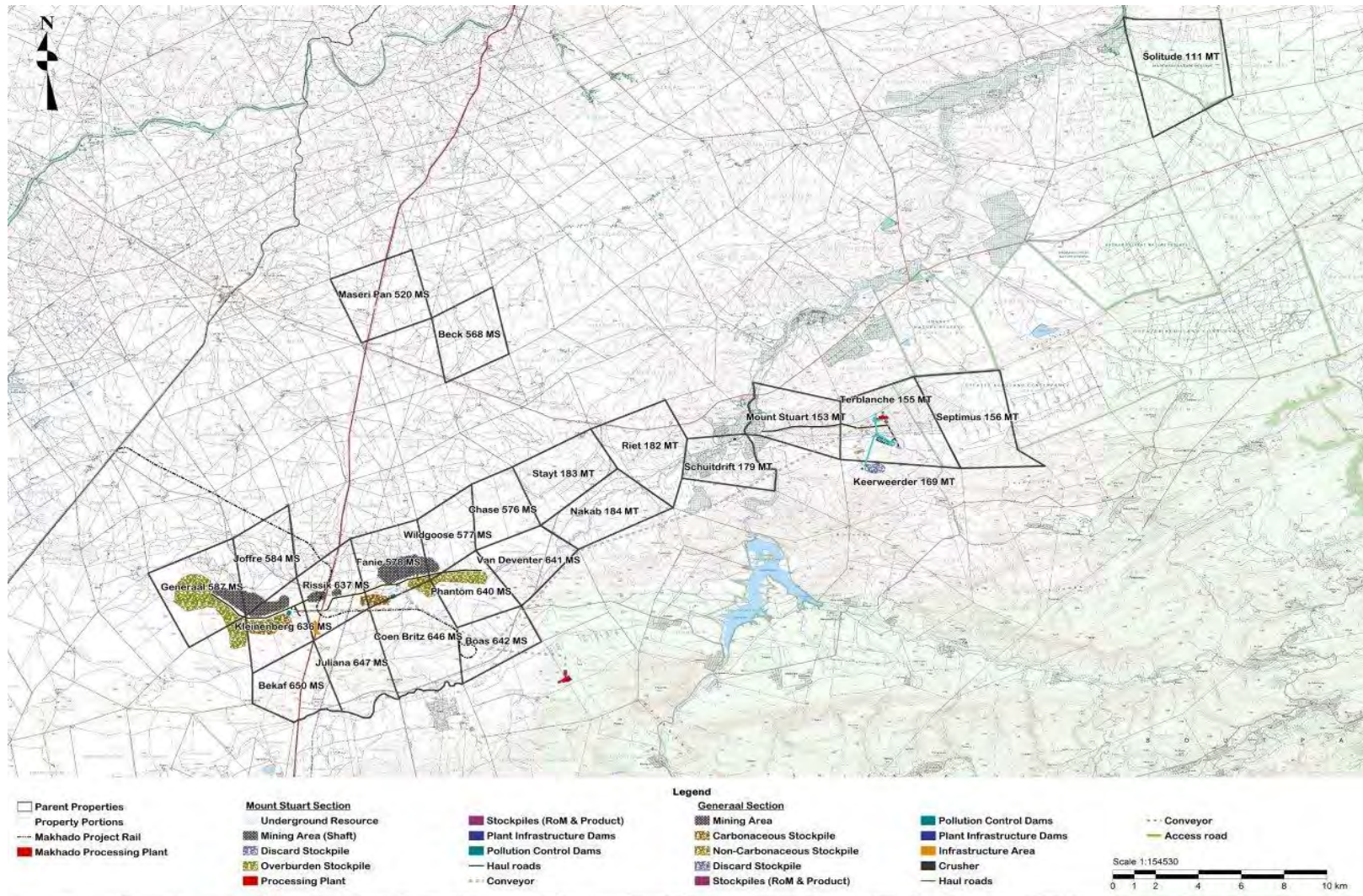
Source: Courtesy of Coal of Africa Limited

1.2 Present Land Use

The overall population density of the region beyond the Soutpansberg Range is low. The greater majority of present land use is to game and cattle farming, with the operating of guest lodges and hunting the main activity. Irrigation downstream of the Nzhelele Dam occurs on both sides of the Nzhelele River and the Mutamba River on the farm Schuitdrift 179 MT (near the confluence of the two rivers) and along the western boundary of the farm Mount Stuart 153 MT east of the Nzhelele River. Dry land agriculture is indicated on the farm Generaal 587 MS and a 22 ha section of dry land at Maseri Pan 520 MS (south of the homestead) was identified on satellite imagery.

Apart from the irrigation by surface water from the canal system and from the lower reach of the Mutamba River, the water requirements of households and livestock (including game) are supplied from groundwater sources.

Hunting, game trading and eco-tourism is an established socio-economic driver in the area. There are a number of properties utilized for trophy (for local and foreign tourists) and biltong hunting with eco-tourism spin-off activities. The Tshipise Forever Resort is situated on the farm Honnet 137 MT (Honnet Nature Reserve), just north of the Mount Stuart Section.

The area covered by the NOMR applications includes twenty-three (23) farms. The majority of the properties are privately owned.

1.3 Community Description

Four villages are located to the south of the proposed Generaal Project area, namely Mudimeli on the farm Fripp 645 MS, south of the Generaal Section, and Makushu, Mosholombe and Dolidoli to the south of the Mount Stuart Section. The villages are provided with water from boreholes and from the Nzhelele Water Supply Scheme.

- Other villages, such as Ndouvhada, Thiel and Garside (to the south east) and Smokey (to the east) are also located within the broader area.

1.4 Brief Description of the Project[7]

The Generaal Project is split into two sections, namely; the Generaal and Mount Stuart Sections. The Generaal Section footprint covers an area of 1 554 ha and the Mount Stuart Section footprint covers an area of 118 ha for mining and infrastructure development.

The Generaal Project has the potential to produce good quality hard coking coal and a domestic thermal coal product. The Mount Stuart Section will be mined at 1.4 Mtpa (for 25 years), whilst the Generaal Section will be mined at 1.7 Mtpa, therefore the life of mine is expected to exceed 30 years.

The current planning is that construction and mining will commence at the Mount Stuart Section first where the coking coal yields are the highest. It is expected that mining operations at the

---

[7] Greater Soutpansberg Generaal Project Scoping Report – August 2013.

Generaal Section will only commence much later as capacity in infrastructure is developed. From the date of granting of the mining right (anticipated to be in 2014) further feasibility and final design studies will be undertaken and construction will commence at the Mount Stuart Section in 2018 and production will commence in 2019. The Generaal Section is due to commence actual production only in 2034, that is, at the end of the life of the Makhado mine, of which it is an extension. The build-up phases are as follows:

- Completion of Feasibility Studies : 2027 to 2031
- Construction : 2031 to 2033
- First ROM Coal : 2033

The Mount Stuart Section resource allows for an underground mining method to a depth of 900m and is planned to be a mechanised mine laid out on a bord-and-pillar design using continuous miners and shuttle cars. It is envisaged that the coal will be treated by its own dedicated processing plant, but dispatched through the Makhado Rapid Load-out Terminal (RLT) situated on the farm Boas 642 MS. The product will be transported from the Mount Stuart Section to the RLT via conveyor.

The Generaal Section will be mined by the total extraction open pit mining method, up to a depth of approximately 200m. The open pit will be mined through conventional truck and shovel. The Generaal Section will make extensive use of infrastructure at the Makhado mine, including its processing plant and rail loading facility.

The major infrastructure items were designed and positioned to accommodate mining layouts at both Sections, access to stockpiles, location of the processing plants, and environmental requirements.

1.5 Macro-Economic Study

The primary objective of this socio-economic study is to determine the nature and magnitude of the economic and socio-economic impacts that will result from the proposed Mopane Project. The study has been divided in the following sections which were investigated separately and eventually integrated to come to a conclusion and make a recommendation:

- The quantification of the current local economic activities in the project area and the possible impact of the mining activities, short, medium and long term,
- The possible impact on the game, cattle and irrigation activities in the area,
- The determination of the economic viability of the mining project from a governmental viewpoint, this is done by using two economic tools, namely:
  - ➢ Economic Cost Benefit Analysis, incorporating possible negative impacts to the local economic activities, natural environment, social structures and rehabilitation costs, as identified by the other project studies.
  - ➢ Macro-Economic Impacts of the Mining Project, estimating the projected impacts on Gross Domestic Product, Employment, Payments to Households, Capital Formation, Payments to Fiscus and the Impact on the Balance of Payments.

1.6 Mining Schedule[8]

The Mount Stuart Section's estimated coal production is projected to be at a rate of 2.0 Mtpa for 20 years with the start date assumed to be 2019.

The schedule for the Generaal Section runs over a period of approximately 14 years at a ROM production rate of 3 Mtpa excluding the ramp down phase in the 14th year. The waste volumes to be mined are at approximately 19 Mtpa on steady state and that includes the waste tonnages from the inter-burden.

1.7 Coal Processing[9]

No processing plant will be required on the Generaal Section, since coal will be transported by overland conveyor to the Makhado Mine processing plant. The Mount Stuart Section will have its own plant and clean coal will be transported by overland conveyor to the Makhado Rapid Load-out Terminal (RLT) for dispatching.

1.8 Mine Infrastructure

The mine infrastructure areas (MIA) comprise all the facilities, roads, services and systems required for the mine to operate optimally. The individual mining sections will be provided with workshops and other necessary infrastructure required for the mining operation, such as personnel support structures, vehicle support structures, water management structures and management and monitoring systems. Buildings will include management offices, production offices, change house, medical and firefighting facility, shift changing facility, security and access control, training centre, control room and contractors accommodation camp.

The major infrastructure items were designed and positioned to accommodate mining layouts at both pits, access to stockpiles, location of the Coal Handling and Processing Plant (CHPP), and environmental requirements (including the management of dirty and clean water and protection of water courses and rivers).

A layout of the mine infrastructure for the Mount Stuart and Generaal Sections are shown in Map 3 and Map 4 respectively.

1.8.1 Mount Stuart Section

The Mount Stuart Mine is designated as an underground mine. As such the mine does not require substantial surface infrastructure to support the mining of the resources. However, the Mount Stuart Section will have its own CHPP and clean coal will be transported by overland conveyor to the Makhado RLT. Due to the long hauling distance a conveyor will be utilised to transport the coal product from the washing plant to the Makhado RLT.

---

[8] Greater Soutpansberg Generaal Project Scoping Report – August 2013.
[9] Greater Soutpansberg Generaal Project Scoping Report – August 2013.

1.8.1.1 Access Road

The Mount Stuart mining site is accessed along the R525 running east towards Tshipise. The R525 is a surfaced road. Approximately 16 km from the N1, at a T-junction to the south, the road leads to the mine access intersection. The access road is approximately 6 km long and runs in an easterly direction. The access road to the mining site will have a gravel wearing surface.

1.8.1.2 Mining Roads

The mine is an underground mine and therefore the surface service roads are not extensive. The necessary roads lead to the plant, mine infrastructure, conveyors and the inclined shaft and also to the stockpiles.

Service roads will be constructed gravel roads and provide ease of access to areas travelled by light mining vehicles and delivery trucks.

Map 3: Mount Stuart Section - Mine and Infrastructure Layout Plan
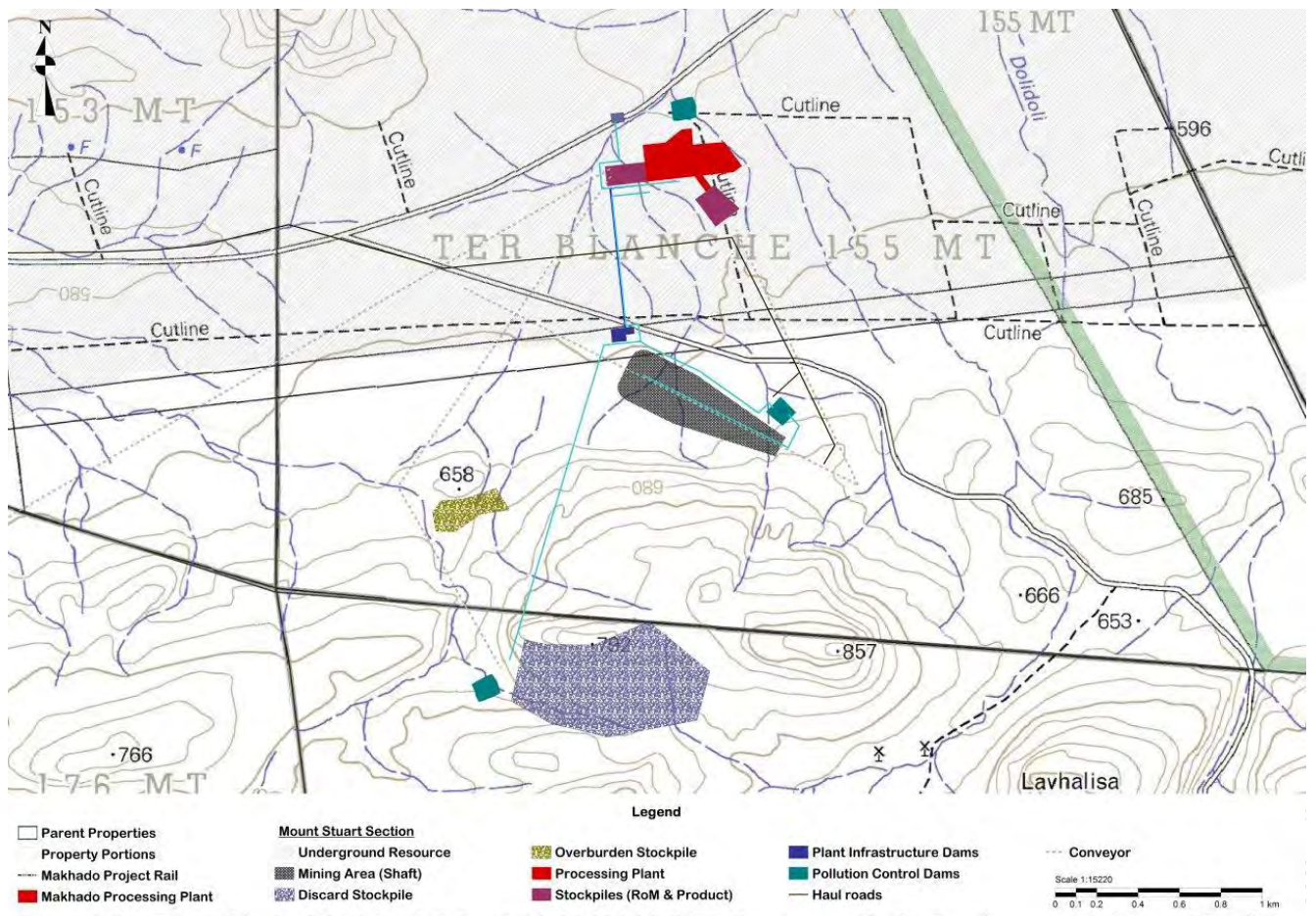
Source: Courtesy of Coal of Africa Limited

Map 4: Generaal Section - Mine and Infrastructure Layout Plan
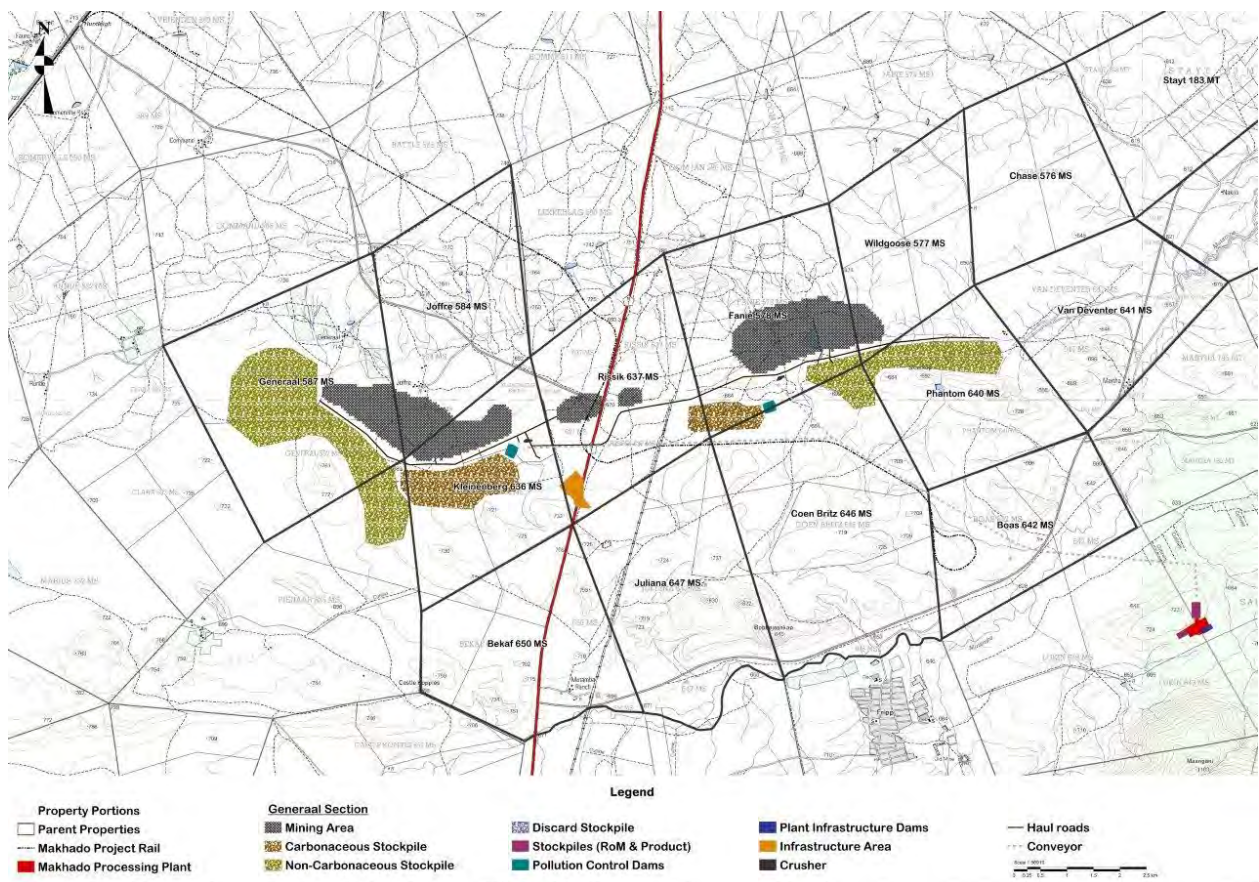
Source: Courtesy of Coal of Africa Limited

1.8.2 Generaal Section

The Generaal East and West Pits will share common mine infrastructure comprising of workshops and vehicle support infrastructure located at the West Pit.

The ROM hauled from the pits will be crushed in close proximity to the pits before transported to the CHPP at Makhado mine located to the south east of the Generaal Section.

Due to the long hauling distance a conveyor will be utilised to transport the ROM from the West Pit to the East Pit and from there to the Makhado CHPP.

1.8.2.1 Access Road

The existing intersection with the N1 will be moved approximately 1.2 km south and the road relocated to run along the N1 in a northerly direction past the coal reserve from where it will turn westwards to tie up with the existing Huntleigh road. Access to the Generaal Project site is by way of this new intersection with the N1. The access to the Generaal East Pit is from the West Pit across the N1 by means of an underpass. The access road to the mining site will have a gravel wearing surface.

1.8.2.2 Mining Roads

Haul roads and service roads will link the West and the East Pits, the stockpile areas and the infrastructure areas on the east and west sides of the N1 respectively. Haul roads have been planned to be 30m wide with gravel surfaces to meet the requirements of the hauling fleet.

Service roads will be constructed gravel roads and provide ease of access to remote areas for light mining vehicles. These roads are separate from the haul roads in order to separate light mine traffic from the heavy traffic (haul trucks) as a site safety measure.

The service roads will also cross the N1 by means of an underpass adjacent to the haul road underpass.

1.9 Storm Water Management

Water is a scarce commodity and every effort has been made in the design of the water management systems to conserve and re-use as much water as possible. A water management strategy will be implemented on the Generaal Project to address the following salient issues:

- Water uses and users, with a particular focus on consumption rates;
- Engineering design basis for the water reticulation and distribution systems required to provide water to all the infrastructure, mining and beneficiation operations;
- Effluent management, including sewage treatment and disposal;
- Engineering design basis for the clean water diversion system; and
- Engineering design basis for the dirty water collection and management systems, including flood protection.

Clean storm water run-off along the various small water courses will be diverted around the proposed infrastructure, the mining pits and dump areas. These storm water drains and deflection

berms have been positioned along the southern boundaries of the proposed mining pits to collect and convey clean water into the closest natural river course. Dirty water such as storm water run-off from the various terraces and plant area is captured and conveyed along lined channels towards the various dirty water dams positioned around the site. All water polluted on site as well as run-off from the carbonaceous dumps as well as seepage under carbonaceous dumps is retained and re-cycled on site. A detail water management strategy will be developed and implemented for the Generaal Project.

1.9.1 Clean Water Run-off

Clean storm water run-off along the various small watercourses will be diverted around the proposed infrastructure, the mining pits and dump areas. These storm water drains and deflection berms have been positioned along the southern boundaries of the proposed mining pits to collect and convey clean water into the closest natural river course.

1.9.2 Dirty Water Run-off

Dirty water such as storm water run-off from the various terraces and plant area is captured and conveyed along lined channels towards the various dirty water dams positioned around the site. All water polluted on site as well as run-off from the carbonaceous stockpiles and seepage under carbonaceous stockpiles is retained and re-cycled on site.

1.10 Bulk Water Provision

The water requirement estimate for the Generaal Project indicates that a maximum of 11 000 m³/day of water is required at the mining peak.

The water supply to the mine will come from the following sources:

- Groundwater (boreholes and seepage into the mining pits);
- Storm water run-off impounded on site; and
- Additional buy-out from Nzhelele Irrigation farmers (see below).

Storm water run-off on site is seasonal and, although it will be utilised, it is not a constant water supply and has therefore not been included in the water-supply chain.

The investigation into the most cost-effective source for water supply to the Generaal Project has yet to be completed; however, for the Makhado Colliery Feasibility Study, a reconnaissance was done of all potential water sources to support the mine water requirements. Recently supply from the Nzhelele Dam has been formalised and CoAL has reached an agreement with the Nzhelele irrigation farmers to obtain 7.7% of their irrigation allocation for mining purposes. A further agreement with the farmers is that CoAL will invest significant effort into developing "new water" by investigating the possibilities to increase the yield from the Nzhelele River catchment. The yield of the dam can also be increased by either raising the dam or other methods of increasing the capacity of the dam. One such method that was considered was to de-silt the dam and all of these will be considered in more detail as part of the new water initiative.

The abstraction rights obtained by CoAL from the Nzhelele Dam is such that some spare water will be available from this system (even during the early stages of the mine) which can be utilised for the

early stages of the Generaal Project. It will thus be possible to, if conservative assumptions concerning both demand and availability of groundwater and rain water harvesting in the Makhado Project has been made, to distribute the excess water to the Generaal Project.

1.11 Bulk Power Supply

The lengthy Eskom Tabor and Spencer 132 kV Distribution networks stretching 200 km from Polokwane to 50 km away from the Musina border-post result in low voltages and thermal constraints during transformation and line contingencies. The expected Tabor and Spencer 132 kV load growth is located 100 km north of Tabor and 70 km from Spencer - generally the area in which the Generaal Project resides - therefore, the Transmission outreach constraint will cap load growth.

The Polokwane Customer Load Network (CLN), including the Tabor and Spencer power corridor, remains susceptible to voltage instability and is the weakest part of the Northern Grid network due to being operated beyond its reliability power transfer limit. Eskom Transmission Division plan to strengthen the Northern Grid in the areas north of the Soutpansberg with a new 400 kV power line between the Tabor Main Transmission Substation and the newly approved Bokmakirie (Nzhelele) Substation.

Eskom is accordingly establishing additional Distribution and Transmission assets to cater for load north of the Soutpansberg, including the Bokmakirie Distribution Station and the 4x250 MVA 400/132 kV Nzhelele Main Transmission Station (MTS). The proposed network solution meets the 10 year Distribution load requirements in the Tabor and Spencer network area and it is also informed by the 20 year Transmission and Distribution load forecast in meeting the Transmission 20 year plan.

The Generaal Project requires an electrical supply capability of 32 MVA.

An Eskom connection can only be established once the Nzhelele/Bokmakirie 400/132 kV Main transmission Station has been commissioned - this is planned for 2017/8.

The Generaal Project electrical supply will be taken from the 132 kV network and transformed to 11kV/550/400/230V. The exact supply configuration is yet to be determined and the least environmental impact solution will be followed. The project team has evaluated the possible supply options and has identified a direct supply from Nzhelele/Bokmakirie 400/132 kV Main transmission Station – refer to Figure 82.

A 132/11 kV substation will be established at each of the mining operations. Power factor correction equipment will be installed at each of the 132/11kV substations to reduce the amount of reactive power required from Eskom and to improve the voltage regulation over the 11kV/550/400/230V distribution networks.

1.12 Logistics

The primary domestic location for middlings coal is Eskom's Tutuka, Majuba, Camden and Grootvlei Power Stations in Mpumalanga Province.

As indicated above, no processing plant will be required on the Generaal Section, since coal will be transported by overland conveyor to the Makhado Mine processing plant, from where the product will be dispatched via the proposed Makhado RLT situated on the farm Boas 642 MS with a railway link to Huntleigh where it links up with the TFR main line.

The Mount Stuart Section will have its own CHPP and clean coal will be transported by overland conveyor to the Makhado RLT for dispatching.

Map 5: Rail Link from Boas 642MS to Huntleigh as Proposed for the Makhado Project
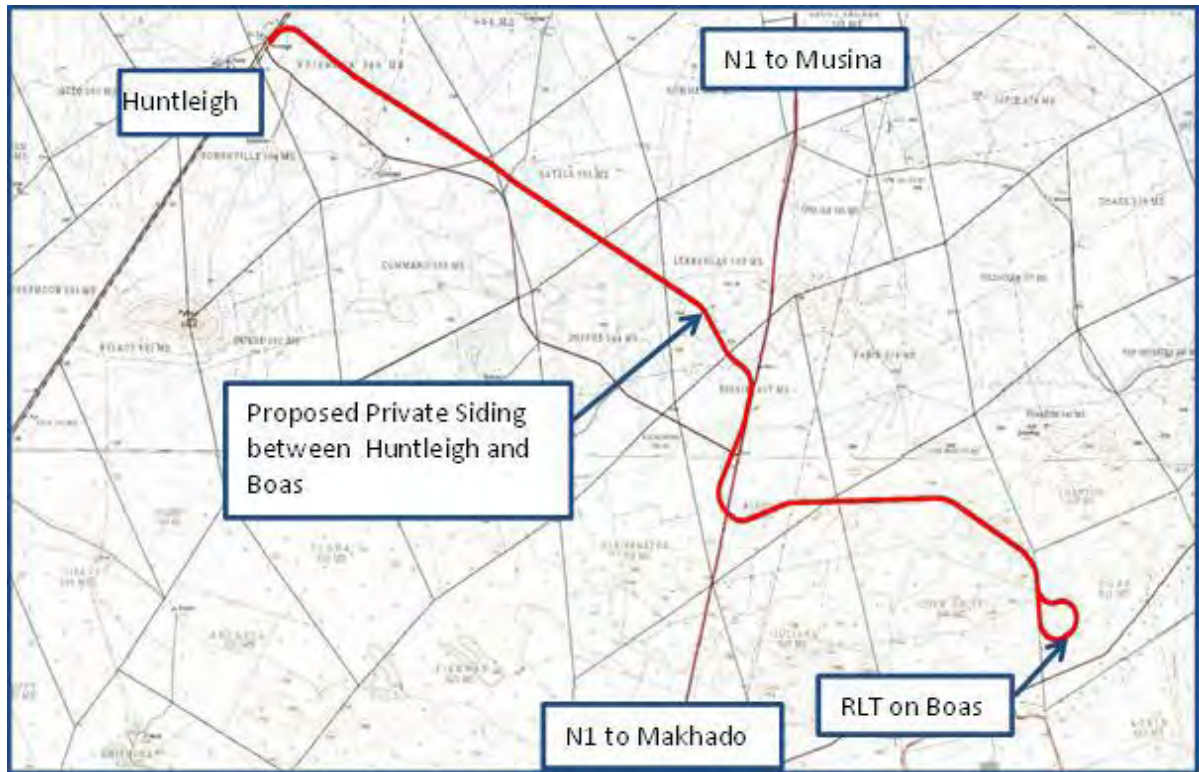
Source: Courtesy of Coal of Africa Limited.

1.13 Mine Residue Management

Mine residue stockpiles are required to accommodate mining overburden, partings and plant discards on the mine surface. Mine residue stockpiles are categorised as topsoil stockpiles, non-carbonaceous stockpiles and carbonaceous stockpiles.

1.13.1 Carbonaceous and Non-Carbonaceous Stockpiles

Design philosophy is based on the requirement to minimise the volume and surface area required for stockpiling by starting in-pit backfilling as soon as possible during the mining operation as double handling of the material is costly.

At the Generaal Section (opencast) it is envisaged that the dumping of material on the surface will be required for a period of three years after which the material mined from the pit will be returned to the pit minimising the fill material during the rehabilitation process.

Being an underground mine, the Mount Stuart Section will require surface stockpiles for its carbonaceous discard/slurry from the CHPP, as well as an overburden dump associated with the inclined shaft excavated material. Discard stockpiles will be placed according to accepted practice and procedures.

1.13.2 Topsoil Stockpiles

Topsoil will be stripped from the pit mining areas, roads and terrace areas and will be placed as close as possible to the point of stripping. The topsoil will be used as fill material, for the construction of berms and also be placed between the discards to act as isolating material. Topsoil will also be used as capping material during final rehabilitation of the stockpiles.

1.13.3 Bulk Earthworks

Bulk earthworks are required for the construction of roads and terraces around the mining site. It has been assumed that all material required for the construction of the roads and terraces will be available on site. The exact extent of available material has still to be confirmed by geotechnical investigations. Material will be taken from borrow pits but also be sourced from the mining pit such as concrete aggregates and rail ballast. This material will require crushing to reduce the aggregate size.

A layout of the mine residue stockpiles for the Mount Stuart and Generaal Sections are shown in Map 3 and Map 4 respectively.

1.14 Closure Planning and Rehabilitation

A detail Mine Rehabilitation Plan has been developed for the Generaal Project and includes the following:

- Materials Placement Plan to ensure a free draining landform;
- Topsoil Management Plan; and
- Reclamation (Re-vegetation) Plan.

The sustainable utilisation of natural resources within the mining area is also addressed.

2 Economic Approach and Methodology

In determining the economic impact of the proposed Generaal Project, the economic impact on a wider scale, namely the Limpopo Province and the RSA, was considered together with the possible impact on the current economic activities in and surrounding the proposed mining area.

At present a certain land use pattern has developed in the project area, the area has changed from a predominantly beef producing (cattle farming) area in the past to game farming with the related activities. The three villages, Mudimeli (on the farm Fripp 645 MS), Makushu and Mosholombe south of the proposed Generaal Section are outside of the study area and are unlikely to be affected. The possibility exists that the groundwater supply to the villages Dolidoli (on the farm Keerweder 169MT - to the south), Ndouvhada, Thiel and Garside (to the south east) and Smokey (to the east) of Mount Stuart might be affected[10]. These villages are all dependant on boreholes for domestic water.

Three economic evaluation methodologies have been applied to contribute to the final decision on the mining application.

- Possible impact on local economic activities. A macro-economic approach was used to determine the magnitude of the present economic activities and the possible impact of the planned mining activities.
- Economic Viability. A Cost Benefit Analysis (CBA) approach to determine medium to long term economic viability compared to current land use.
- A Social Accounting Matrix (SAM) approach to estimate the macro-economic impact on the National Economy and the Limpopo Provincial Economy.

2.1 Situational Analysis

All the economic sectors in the immediate vicinity of the proposed mining activities, as well as for the Limpopo Province as a whole, have been included in the analyses. Various stakeholders raised concerns regarding the sustainability of mining development in relation to agricultural and other economic sector activities in the proposed mining area. The long-term sustainable impact was measured in terms of mainly two alternative land use options:

- If the mine is not developed. Therefore, current activities continue, over the projected lifetime of a typical mine, without optimisation or expansion of the land.
- If the mine development goes ahead. The lifetime of the mine was applied in all calculations. Rehabilitated land, after mining, cannot necessarily be utilised for the same products and if utilised the same yields might not necessarily be attained.

The impact on the economy, before, during and after the mine's establishment, was calculated *versus* the non-mining alternative. Focus was primarily on the properties directly affected, but also to a decreasing degree on neighbouring properties, due to possible negative environmental impacts, such as air and ground water pollution, noise and visual impacts. The impact of the project on the agricultural sector was calculated, namely whether it may decrease products produced.

---

[10] Groundwater Flow Impact Assessment Report – Revision 1 – dated 29 November 2013.

2.2 Assumptions and Projections

The majority of the properties in the Generaal Section were either visited or the property owners liaised with during 2011 when the Makhado Project was under scrutiny. The land use data collected on these farming enterprises were used and the land use data for properties not visited due to various reasons was based on assumptions made for the possible crops cultivated, or beef production according to the land carrying capacity and/or game reared for trophy or biltong hunting with or without accommodation facilities. The required information was, as far as possible, acquired by studying Google Earth images dated January 2009 and the known data of neighbouring farms acquired.

For purposes of analysing the study area the farms Schuitdrift 179MT (west of the Nzhelele River), Mount Stuart 153MT, Ter Blanche 155MT and Septimus 156MT (east of the Nzhelele River) were grouped with the Mount Stuart Section and the farms Riet 182MT, Stayt 183MT, Nakab 184MT, Chase 576MS, Van Deventer 641MS, Wildgoose 577MS, Phantom 640MS, Boas 642MS, Fanie 578MS, Coen Britz 646MS, Rissik 637MS, Juliana 647MS, Joffre 584MS, Kleinenberg 636MS, Bekaf 650MS and Generaal 587MS (west of the Nzhelele River) were grouped with the Generaal Section. The farms Maseri Pan 520MS, Beck 568MS and Solitude 111MT were not included in the analyses as they are too far from the proposed mining activities.

2.3 Objective and Methodology

The objective of the study is to determine the economic and socio-economic impacts of both the construction and operation of the coal mining processes to be conducted by CoAL, on the micro and macro-economy and the economic viability of the mining development. The study reflects the total direct and indirect macro-economic impacts in quantified terms for the investment that will be generated through the inputs from all of the economic entities that are required to supply goods and services to the construction and operational segments of the project. In addition, quantification is made of the induced effects that the infrastructural investments will have on economic entities such as households, in terms of their income and expenditure activities. For analytical purposes, the total economic impact of the coal mining process can be disaggregated into the following components:

- The impact of the investment phase (construction of the mine) is based on the particular capital investment in the Limpopo Province.
- The impact of the everyday operation of the mine.
- The transportation of coal from the mine to an identified Eskom power station and/or Port of Maputo by rail.
- Medium to long term economic viability of the mining project if compared to current land use.

The results of the study focus on the contribution, negative or positive, that CoAL is expected to make towards the economy in terms of:

- Gross Domestic Product (GDP).
- Employment opportunities.
- Effective capital utilisation (investment).

In order to measure all of the economic implications associated with the construction and operational phases of the project, a partial general macro-economic equilibrium calculation was applied to determine the nature and magnitude of the macro-economic impacts of the project, based on two Social Accounting Matrices (SAMs) developed by Conningarth Economists, namely:

- The national SAM for the South African economy; and
- The regional SAM for the Limpopo Province.

A detailed description of these SAMs is provided in Appendix A and the magnitude of linkages in Appendix C.

2.4 Cost Benefit Analysis

A Cost-Benefit Analysis (CBA) forms part of the macro-economic impact analysis and focuses on the positive and negative economic impacts in order to put all direct and secondary impacts of the project into perspective for effective decision making purposes.

The theoretical foundations of a CBA are: benefits are defined as increases in human wellbeing (utility) and costs are defined as reduction in human wellbeing. For a project or policy to qualify on cost-benefit grounds, its social benefits must exceed its social costs. "Society" is simply the sum of individuals. The geographical boundary for a CBA is usually the nation, but can be readily extended to wider limits. See Appendix B for more detail about the theoretical context of a CBA.

2.5 Macro-Economic Impact Analysis

According to the general economic equilibrium analysis, the impacts of the project's developments can only be evaluated meaningfully if such impacts are assessed against the background of its total effect (direct and indirect) on certain economic objectives. The updated and benchmarked 2006 Limpopo Provincial SAM tables were used as a modelling input to quantify the relevant economic impacts. Thus, both the investment and operational activities of the project were analysed in terms of its impacts.

The macro-economic impact analysis can be regarded as an extension of the more narrowly defined financial cost-benefit analysis, at the macro level and not at the project level, demonstrating the efficiency of utilising scarce capital and other economic resources. The macro-economic analysis is therefore used in conjunction with the micro project CBA to provide an indication of the project's use of scarce resources relative to the main economic objectives contained in the economic development plan.

The macro-economic aggregates covered in the study are the following:

- Employment levels (jobs).
- Value added to the economy (or gross Limpopo Province product).
- Aggregate wages and salaries.
- Fiscal impacts.

Each of these measures reflects a particular dimension of improvement or impact in the economic well-being of the area's households.

There are different types of impacts that occur over time. In the initial construction phase, labour and materials will be used. After completion, on-going employment and other long-term impacts will result, as set out below.

- **Total Employment Levels,** reflecting the number of additional employment opportunities created by economic growth. This is the most popular measure of economic impact because it is easy to comprehend. However, employment opportunity counts do not necessarily reflect the quality/nature of the employment opportunities, nor salary levels. Therefore levels of employment, i.e. skilled/unskilled could also be assessed where necessary.

- **Value Added**, which is normally equivalent to Gross Domestic Product or Gross Regional Product, and a broader measure of the full income effect.

- **Aggregate Wages and Salaries** in the area increase as pay levels rise and/or additional employees are hired. Either or both of these conditions can occur as a result of growth in business revenues. As long as nearly all of those affected employees live in the study area, this is a reasonable measure of the personal income benefit impact of a project.

It is also important to note that economic impacts also lead to financial impacts, which are changes in government revenues and expenditures. Economic impacts on total business sales, wealth creation or personal income, can affect municipal and other government revenues by expanding or contracting the tax base. Impacts on employment and associated population levels can affect municipal and other government expenditures by changing demand for public services.

This on-going process of macro-economic impact analysis focuses on aspects stressing linkages between the project and the surrounding economy. Environmental externalities may affect other economic sectors and are, therefore, included in the techniques of macro-economic impact assessment. **This is necessary to assist in determining whether the project will enhance net societal welfare.**

This necessitates the analysis of impacts on different sectors or groups that make up society. At a broad level, investigating impacts on overall economic welfare requires considering the efficiency, equity and sustainability of the project. It is important that all three of these aspects are considered in order to provide adequate information to decision makers:

- The principle of **efficiency** raises the issue of whether the nature and form of the project would constitute the efficient use of resources.

- The **equity** principle requires the consideration of whether the project results in outcomes that can be considered fair/equitable in socio-economic terms. Investigating the distribution of impacts is required to clearly indicate who is impacted upon, in what way and for what period.

- **Sustainability** relates to the consideration of whether the project is likely to be financially viable over the medium to long term and whether it will be economically sustainable. Risks to the long-term success of the project, including factors such as changing interest and exchange rates, therefore, become important aspects for assessment.

3 Data and Data Sources

3.1 Coal of Africa

The data regarding the total tonnage, mining period and construction input prices was sourced from Coal of Africa Limited. Coal of Africa used a specific coking quality coal price for analysis purposes, Mosaka Economists investigated the pricing system and took a position on future exchange rate movement and used a slightly different price structure in the analysis. As per data received from CoAL a projected volume was sold to Eskom and the balance exported.

 In the analysis it was accepted that approximately 62% of the production will be taken up by Eskom and that balance, about 38% will be exported via Mozambique.

3.1.1 Relevant Mining Data

The relevant construction and operational phase data used in the analysis was provided to Mosaka by CoAL, the application of the data in the CBA and Macro-Economic Impact models is the responsibility of Mosaka.

3.1.1.1 Construction Phase

In the following table the construction schedule and associated amounts for the Mount Stuart mine is presented.

Table 1 Mount Stuart Section proposed Construction Schedule and Capital Costs (constant 2013 prices)

Year	2015	2016	2017	2018	2019	2020	Total
Upfront Capex – Mount Stuart	92.00	103.00	65.00	7.00	3.00	36.78	**306.78**
Capital Construction costs – Mount Stuart	-	-	-	408.76	1 021.90	613.14	**2 043.80**

Note: All figures are Rand million

The above table shows that it is planned that the upfront Capex will be spent over a period of six years for the Mount Stuart Mine.

In the following table the construction schedule and associated amounts for the Generaal Mine are presented.

Table 2: Generaal Section proposed Construction Schedule and Capital Costs (constant 2013 prices)

Year	2021	2022	2023	2024	2025	2026	2027	2028
Upfront Capex - Generaal	41.32	-	-	-	25.91	-	-	-
Capital Construction costs - Generaal	-	-	-	-	-	-	-	-

Year	2029	2030	2031	2032	2033	Total
Upfront Capex - Generaal	2.60	-	-	-	1.35	**71.19**
Capital Construction costs - Generaal	-	-	433.00	1 082.50	649.50	**2 165.00**

Note: All figures are Rand million

The above table shows that planned upfront Capex will be incurred four phases in 2021, 2025, 2029 and 2033 and that construction costs will be incurred over a period of three years.

3.1.1.2 Production

Using an average underground mine multiplier the number of employment opportunities for the Mount Stuart mine is estimated to be 412.

The estimated build-up in the production of coal for the Mount Stuart Mine over the expected life span of the mine is reflected in Table 3. It is projected that production will start in year seven, counting from the year the initial planning started.

Table 3: Production Figures for the Life of the Mount Stuart Section

Mount Stuart	YEAR:	1 to 6	7	8	9	10	11	12
		2013 - 2018	2019	2020	2021	2022	2023	2024
Eskom coal (tons)		-	392 576	809 555	809 555	809 555	809 555	809 555
Export coal (tons)		-	177 702	517 813	619 475	516 725	495 263	575 838
Other coal (tons)		-	-	-	-	-	-	-
Annual Production		-	570 278	1 327 368	1 429 030	1 326 280	1 304 818	1 385 393

Mount Stuart	YEAR:	13	14	15	16	17	18	19
		2025	2026	2027	2028	2029	2030	2031
Eskom coal (tons)		809 555	809 555	809 555	809 555	809 555	809 555	809 555
Export coal (tons)		558 025	401 388	578 050	446 413	486 388	528 038	419 150
Other coal (tons)		-	-	-	-	-	-	-
Annual Production		1 367 580	1 210 943	1 387 605	1 255 968	1 295 943	1 337 593	1 228 705

Mount Stuart	YEAR:	20	21	22	23	24	25	26
		2032	2033	2034	2035	2036	2037	2038
Eskom coal (tons)		809 555	809 555	838 150	838 150	838 150	975 731	1 124 100
Export coal (tons)		413 713	499 438	444 125	457 625	492 500	496 781	630 000
Other coal (tons)		-	-	-	-	-	-	-
Annual Production		1 223 268	1 308 993	1 282 275	1 295 775	1 330 650	1 472 512	1 754 100

Mount Stuart	YEAR:	27	28	29	30
		2039	2040	2041	2042
Eskom coal (tons)		622 529	-	-	-
Export coal (tons)		351 249	-	-	-
Other coal (tons)		-	-	-	-
Annual Production		973 778	-	-	-

Using an average open cast mine multiplier the number of employment opportunities for the Generaal mine is estimated to be 505.

The estimated build-up in the production of coal for the Generaal mine over the expected life span of the mine is reflected in Table 4. It is projected that production will start in year 21, counting from the year the initial planning started.

Table 4: Production Figures for the Life of the Generaal Section

Generaal		1 to 20	21	22	23	24	25
	YEAR:	2013-2032	2033	2034	2035	2036	2037
Eskom coal (tons)		-	1 090 887	1 038 698	1 059 319	1 030 139	1 038 499
Export coal (tons)		-	659 822	646 433	651 009	645 035	635 990
Other coal (tons)		-	-	-	-	-	-
Annual Production		-	1 750 709	1 685 131	1 710 328	1 675 174	1 674 489

Generaal		26	27	28	29	30
	YEAR:	2038	2039	2040	2041	2042
Eskom coal (tons)		1 064 332	1 031 832	1 054 480	1 129 133	1 092 412
Export coal (tons)		674 114	645 070	613 093	597 057	609 801
Other coal (tons)		-	-	-	-	-
Annual Production		1 738 446	1 676 902	1 667 573	1 726 190	1 702 213

Table 4 indicates that production will only start in year 21 (2033), for Generaal section and although the table only shows ten years of production the estimated period is also 14 years.

3.2 Makhado Situational Analysis

The proposed Generaal Project straddles the Musina and Makhado local municipalities in the Vhembe District.

Musina LM has a relatively small local economy, with a total value of production of R4.72 billion at current prices for 2011. It contributes 2.5% to the provincial economy, which had a comparative size of R190 billion at current prices in 2011 and 13% to the Vhembe District economy (R36.4 billion at current prices in 2011).

The main driver in the municipal economy is clearly mining, which contributed almost 40% to the total value of production in 2011 (at current prices). The primary commodity is diamonds, although coal is also beginning to make a significant contribution.

The trade sector, transport and government activities are growing rapidly. This growth is being driven by the local mining sector and by trading activities, including consumption expenditure from residents of neighbouring countries. The construction sector is also growing, but off a low base. Growth in the finance sector is more a reflection of the imputed value of land, rather than an increase in actual financial transactions. The agriculture sector, which has a long tradition of considerable significance, is shrinking in relative and in absolute terms.

The Makhado local economy, with a value of production of close to R13 billion, is almost three times larger than that of Musina. Government is the driver of this local economy, mostly because of the public sector needs of the very large population, which includes education, public health, safety and security, as well as local government services.

The finance sector is significant, largely due to the imputed rent estimates of extensive tracts of land that command very high prices.

The third largest sector is trade and catering. Makhado town provides a service function for a large hinterland that stretches beyond its borders. Attractive landscapes have also provided opportunities to create accommodation and catering product offerings.

Agriculture is stagnant at best, but with a tendency to shrink. Important commodities include fruit, timber and meat.

Mining has never been an important sector in the Makhado local economy, but this could change in the foreseeable future due to the interest that the Soutpansberg Coalfield is receiving with its attractive metallurgical properties.

The Makhado Integrated Development Plan (IDP) indicates that current infrastructure is inadequate to service a growing population. This was confirmed by municipal planning managers during a stakeholder consultation meeting with CoAL Ltd on 19 March 2013. Water sources in particular are insufficient and roads are generally in a bad condition. Properties in rural areas are difficult to access, particularly during times of high rainfall.

Historical evidence from other construction and mine development sites indicate that an influx of work seekers should be expected and that their numbers could significantly exceed the number of employment opportunities that may be available.

Socio-economic activities in the area are mixed between intensive irrigated agriculture, hunting and tourism.

3.2.1 Overview of the Area Included in the Generaal Project MRA

The general area is known to be water scarce therefore livelihoods in the project area largely rely on water sources to be able to sustain their socio-economic activities. Surface and groundwater is captured in dams for utilization on the various properties. In collaboration with the surface and groundwater specialists the water resources utilized and the purpose have been determined to evaluate the secondary socio-economic dependencies on water use in and adjacent to the area.

Land use within the Generaal Section is predominantly hunting, game farming, beef farming and eco-tourism. The Generaal Section includes the eastern areas of the large safari enterprise Manupond 124 (Pty) Ltd. which straddles the Chapudi and Generaal Project areas.

The Mount Stuart Section has a variety of land uses which includes game ranching and intensive irrigation farming. Game farms within this block offer activities such as trophy hunting, culling hunting and biltong hunting. Natural grazing within this area is used for game ranching. Irrigation farming is concentrated in the western part of the farm Mount Stuart along the eastern bank of the Nhzelele River.

3.2.2 Approach

It must be noted that the large safari enterprise, Manupond 124 (Pty) Ltd., extends outside of the demarcated study area. This enterprise is operated as a unit with the result that it is not always possible to isolate requested information to indicate the situation within the study area only and, for example, labourers are employed for the total farming unit. In some instances game also is not restricted to mapped farm boundaries. Other information such as crop production is submitted for the study area only.

The proposed mining operation of the Generaal Project is divided into two sections, namely; the Generaal Section and the Mount Stuart Section. For analytical purposes the farm Schuitdrift 179MT has been included in the Mount Stuart Section in this study.

The main agricultural enterprises found in the study area and adjacent areas are game ranching, beef production and irrigated crop cultivation which is dominated by citrus production.

3.2.2.1 Generaal Section

The farms Riet 182MT, Stayt 183MT, Nakab 184MT, Chase 576MS, Van Deventer 641MS, Wildgoose 577MS, Phantom 640MS, Boas 642MS, Fanie 578MS, Coen Britz 646MS, Rissik 637MS, Juliana 647MS, Joffre 584MS, Kleinenberg 636MS, Bekaf 650MS and Generaal 587MS are located within the Generaal Section of the MRA area.

Farming Activities

The area boasts a variety of land uses including game ranching, beef farming and eco-tourism. Hunting, game trading and eco-tourism are established socio-economic drivers in the area. Natural grazing within this area is used for game ranching and beef production. The majority of the properties are utilized for trophy (for local and foreign tourists) and biltong hunting with eco-tourism spin-off activities. Many of the game farms accommodate game lodges. Beef farming has over time been overtaken by game as the major land use activity and is presently less than 10%. Game farming supports the value added components of eco-tourism and also stimulates the hunting industry.

Settlements – formal and informal

A lodge of Manupond 124 (Pty) Ltd. is located on the farm Bekaf and the Castaro Lodge is located on the farm Boas very close to the perimeter of the project area. Settlements located outside of the Generaal Section area include Mudimeli (south), Makushu and Mosholombe (south-east) of the Generaal Section.

Hunting, Tourism and Related Activities

The main tourist attraction within the Generaal Section of the study area is hunting (trophy/leisure). The farms within this area offer lodge facilities for both trophy hunters and biltong and their accompanying eco-tourists.

3.2.2.2 Mount Stuart Section

The farms Schuitdrift 179MT, Mount Stuart 153MT, Ter Blanche 155MT and Septimus 156MT are located within the Mount Stuart Section of the MRA area.

<u>Farming activities</u>

Land use within this area is varied and includes intensive irrigated agriculture (mainly citrus), hunting and tourism. The farms Schuitdrift 179MT and Mount Stuart 153MT have intensive irrigated agricultural activities focused along the western bank of the Nhzelele River and along the Mutamba River in the area of the confluence of the two rivers. Most of the irrigation water is supplied by water canals from the Nhzelele Dam. The irrigation agricultural area is utilised for predominantly export citrus production. A number of packing houses for citrus are present in the Mount Stuart Section area.

<u>Settlements – formal and informal</u>

There are no settlements within the Mount Stuart Section of the study area. There are, however, several packing facilities of citrus and other vegetables on the farm Mount Stuart 153MT.

Greater Kuduland Safaris and Forever Resorts at Tshipise are outside of the Mount Stuart Section area to the north and east. Settlements also outside of the area include Dolidoli (to the south), Ndouvhada, Thiel and Garside (to the south east) and Smokey (to the east) of the Mount Stuart Section.

<u>Hunting, Tourism and Related Activities</u>

The main tourist attraction within the Mount Stuart Section of the study area is hunting (trophy/leisure). The farms within this area offer lodge facilities for both trophy and biltong hunters with the accompanying eco-tourists. Tshipise Forever Resort is located on the farm Honnet 137MT (Honnet Game Reserve) to the north of the farm Septimus in the Mount Stuart Section. The farm Septimus is also part of the Greater Kuduland Conservancy.

3.2.2.3 Water

Water within the Generaal Project area is scarce due to the dry climate. Water scarcity impacts greatly on agriculture and therefore the type of land use. On farms where cultivation of crops occurs, farmers rely on water from the Nzhelele Government Water Scheme and the abstraction of groundwater, therefore a number of boreholes are found throughout the study area. Groundwater for crop cultivation is mainly used for a back-up in emergency situations. A dominant form of land use within the area is game farming where farmers also rely on groundwater for their animals. Farms situated in close proximity to the confluence of the Nzhelele and Mutamba Rivers utilise this surface water supply for irrigation of their crops. Greater evidence of cultivated land is therefore present around the Nzhelele and Mutamba Rivers than on other portions of the study area.

3.2.2.4 Impact on Tourism

Limpopo in general has a thriving tourism industry comprising 54 provincial reserves and several luxury private game reserves. Some farms bordering the study area are used for trophy hunting and are also visited by overseas hunters and tourists. Lodges which provide accommodation for these tourists are present in the study.

The development of a mine in close proximity to the conservancies in the area would also impact on the aesthetic value of this area and could potentially deter tourists.

In this respect the larger picture of the impact mining will have in the area north of the Soutpansberg must also be considered.

The large up-market safari enterprise, Manupond 124 (Pty) Ltd., extends outside of the demarcated study area of the Generaal Section. This enterprise is operated as a unit and the impact will have an effect on the whole enterprise. Bordered to the north of the Mount Stuart Section is the Tshipise Holiday Resort, located on the farm Honnet 137MT (Honnet Game Reserve), which is a popular holiday resort with main attraction the hot water mineral spring. An analysis of the resort is included in Chapter 4. The farm Septimus, also bordering the Mount Stuart Section, is part of the Greater Kuduland Conservancy.

3.2.2.5 Impact on Employment

The unemployment rate in the Makhado Local Municipality is high (36.7%)[11], while in the Musina Local Municipality it is substantially less (18.7%)[12]. Many of the people in the study area rely on their employment as farm workers in this agriculturally rich area. These farm workers come from mixed backgrounds but most of them originate from Venda and Zimbabwe. The irrigation farms and the game farms employ a large percentage of the farm workers within the study area and the regions beyond the study area. A potential loss of these farms would result in employment losses for the farm workers.

3.2.2.6 Impact on Agricultural Production

The predominant agricultural activities in the area are the cultivation of citrus, vegetables, cattle farming and tourism (trophy hunting and eco-tourism). Producers of irrigation crops are particularly concerned that dust particles will potentially be generated from mining activities and that the presence of dust associated with strong winds can cause severe damage to crops and the possible loss of their Phytosanitary "Phyto" Registration for special export markets.

Several marketing strategies are exercised with respect to game ranching, such as hunting, which includes trophy hunting and biltong hunting. Excess game is captured alive and trans-located or sold at auctions. It is particularly the trophy hunting fraternity and eco-tourists who may be discouraged by the mining activities. The development of the mine could impact negatively on the aesthetic value of the land and may discourage any further game farming activities or expansion of existing activities in the areas bordering the study area.

The cattle production practiced in the area should not be negatively affected by the mining operations.

Water

Water in the Generaal Project area is scarce and in heavy demand for farming, specifically for irrigation. Water availability is a critical factor in terms of agricultural development.

The area is drained by two seasonal rivers, the smaller Mutamba River flowing north-east and the Nzhelele River traversing the area from south to north, with confluence on the farm Schuitdrift 179MT. The Nzhelele River then follows a route north-east wards towards the Limpopo River.

---

[11] Source: Greater Soutpansberg Generaal Project Scoping Report – August 2013.
[12] Source: Greater Soutpansberg Generaal Project Scoping Report – August 2013.

The main water sources for farming activities are the irrigation canals from the Nzhelele Dam, the Nzhelele River, and groundwater.

For analytical purposes, as mentioned, the farming activities in the project area were divided into two groups referred to as the Generaal Section and the Mount Stuart Section using the Nzhelele River as dividing line. The activities were grouped as follows:

- Generaal Section: The following farming practices were included in this group:
  - Cattle and game or only game ; and/or
  - Game lodges; as the main source of income, and/or;
- Mount Stuart Section: The following farming practices were included in this group:
  - Cultivation of irrigation crops as the main source of income; and/or
  - Cattle and game or only game ; and/or
  - Game lodges and other holiday accommodation.

Table 5: Estimated Present Land Use in the Project Area[13]

Land Use	Generaal		Mount Stuart		Total	
	Percentage	Hectares	Percentage	Hectares	Percentage	Hectares
Irrigation	0.0%	0	3.3%	168	0.8%	168
Beef Game	10.0%	1 705	10.0%	527	10.0%	2232
Game	90.0%	15 347	86.7%	4 576	89.2%	19 923
Total	**100.0%**	**17 052**	**100.0%**	**5 271**	**100.0%**	**22 323**

The dominating land use activity in both of the areas is game farming representing approximately 89% of the total area. A number of years ago beef farming was dominant but has now been replaced by game farming.

3.2.2.7 Land Use Assumptions

Information was obtained from staff members of Naledi Development Restructured who had been working in the area, visits to farms or communication with land owners in 2011. Assumptions had to be made regarding missing information by studying Google earth images and using known data of neighbouring farms. Irrigation data was obtained from WSMLeshika (Pty) Ltd.

3.2.2.7.1 Cattle and Game Numbers and Species per Farming Unit

As both the cattle and game numbers, together with the game species for every farm in the study area could not be determined, the cattle and game numbers together with the species present were projected in accordance with the neighbouring farms of which the data and also the land size was available.

The accepted grazing norm for the area together with the "Animal Unit" (AU) namely 14 ha/AU were used to estimate cattle and game numbers, which were then converted to animal numbers.

---

[13] Mosaka Economists Research.

3.2.2.7.2 Allocation of Game Sold to Trophy Hunters and Biltong Hunters or Caught for Auction

The assumption was made that all game farms are fully stocked to carrying capacity. In order to determine the percentage of game sold to trophy hunters and biltong hunters or caught to be sold at auctions or to direct buyers, some of the landowners were requested to give an estimate for their specific businesses and the average of these allocations was applied to the area. The allocation used in the analysis is[14]:

- Male animals 22% trophy hunting, 54% biltong hunting and 24% live game sales;
- Female animals 14% trophy hunting, 61% biltong hunting and 25% live game sales.

The percentages differ per animal group; the numbers reflected above are the average of all the game off take.

3.2.2.8 Site Visits

Representatives of Mosaka Economic Consultants cc did not physically visit the farms within the NOMR area in 2013, the data obtained from the farm visits and electronic contact made with the property owners during 2011 was used together with updated information obtained from Naledi Development Restructured.

Although a farming unit may be classified as being mainly a cattle farm, many of the cattle farms also stock some game and allow hunting by means of concessions made to professional hunters. Some farms, classified as game farms also have small herds of cattle.

The following sub-divisions of commercial farming enterprises in the study area were applied:

- Cattle farming.
- Game farming.
  - ➢ Live game sales.
  - ➢ Trophy hunting.
  - ➢ Biltong hunting.
- Hunting supporting services.
  - ➢ Professional hunter.
  - ➢ Skinner and tracker.
  - ➢ Transport.
  - ➢ Taxidermist
  - ➢ Game Catching
  - ➢ Other.
- Accommodation.
  - ➢ Hunting.
  - ➢ Irrigation.
  - ➢ Other.

---

[14] Mosaka Economists' Estimation

3.2.2.9 Cattle Farming

As mentioned cattle (beef) farming has over the time been overtaken by game as the major land use activity. Other than the inconvenience and disruption of prospecting (access to and the presence on premises for drilling), traffic and road surface deterioration by the proposed mining activity, mining will have little negative impact on the beef industry; a positive point may be the expected labour population increase and resulting higher demand for beef. The monetary value of the present beef farming has been calculated using a macro-economic approach based on a carrying capacity (grazing norm) of 14 hectares per AU with an average annual growth of 130kg per AU per annum as basis. Average 2013 beef prices were used and the results are presented in the following table.

Table 6: Beef Farming in the Project Area[15] (2010/2011 prices)

	Generaal	Mount Stuart	Total
Number of AU (Commercial)	120	36	156
Number of Animals (Commercial)	188	56	244
Annual Turnover (Commercial) (R.mil.)	R 0.45	R 0.063	R 0.513

The table indicates that the annual turnover of the commercial beef in the Generaal group is about R0.45 million, and in the Mount Stuart group it is about R0.063 million.

3.2.2.10 Game Farming

The game farming industry is very active in the area with large investments being made in acquiring and breeding trophy and rare animals and providing accommodation facilities.

In the study area there are farms which cater for all the needs of the industry and there are game farms that only stock the game and do not cater for the other supplementary needs of the industry such as professional hunters, trackers, skinners, accommodation, etc. This has resulted in safari organisers negotiating with such landowners to reserve certain game species to be hunted. This is referred to as concession hunting. The landowner has no responsibility to the hunters and also has no amenities to support the hunters.

A game farm as an independent enterprise can present a "one stop" hunting venture by providing the hunting supporting services, the game and the accommodation for both the hunters and non-hunters. Such an enterprise may also have acquired hunting concessions from game farms in the area for specific game species not stocked or available on the farm where the supporting services and accommodation infrastructure is located. Also, a game farm (or cattle farm) may have no supporting services or accommodation infrastructure available and only sell game by allowing hunting concessions. In some cases no hunting takes place on the farm as the game is caught and sold at auctions or to private individuals.

For purposes of this study the breeding of game and the eventual marketing of the animals are divided in to three groups:

---

[15] Mosaka Economists Research.

- Sale of live animals at either game auctions or through private transactions (the supporting service of game catching is included);
- Trophy hunting, predominantly foreign tourists, and
- Biltong hunting, predominantly South African groups.

As the numbers per sale activity varies from game specie to specie the price also differs for the different outlet activities. It was therefore necessary to use a number of assumptions, which not necessarily applies to all the farms or game producers. We also accept that this approach is open to criticism, but with the available data collected this approach gives acceptable results.

The grazing norm applied is 14 ha/AU. The different AU to game number conversion rates are presented in the following table.

Table 7: Estimated Game Representation Used in the Project Area plus the Sex Ratio and Annual Growth Rate

Specie	Conversion Rate[16]	Animal Representation[17]	Number of Females per Male[18]	Annual Growth Rate[19]
	Number/AU	Percentage	Numbers	Percentage
Blesbuck	4.50	2.73%	10	30%
Bushbuck	7.50	0.71%	6	20%
Blou Wildebeest	2.40	11.03%	10	25%
Buffalo	1.00	1.20%	15	20%
Eland	1.00	5.92%	15	20%
Gemsbok	2.20	9.11%	10	25%
Giraffe	0.70	1.75%	13	15%
Impala	7.00	39.38%	10	35%
Kudu	2.20	16.56%	7	20%
Nyala	3.30	1.31%	10	20%
Hartebeest (Red)	2.00	2.19%	10	20%
Sable Antelope (Swartwitpens)	1.67	1.15%	12	20%
Roan Antelope (Bastergemsbok)	1.56	0.95%	10	20%
Tsessebe (Basterhartbees)	2.63	0.57%	10	20%
Reedbuck, Klipspringer, Duiker, Steenbuck	7.70	2.08%	4	20%
Warthog	5.00	1.86%	10	20%
Waterbuck	2.40	0.63%	10	20%
Zebra	1.60	0.87%	6	25%
Average	3.29	100.00%		

The presence of rhinoceros and other big five animals, except buffalos, have been ignored. The selection of specific animal species and percentage representation is the interpretation of Mosaka based on the survey results.

---

[16] Department of Agriculture.
[17] Mosaka Research and Interpretation.
[18] The SA Financial Sector Forum – HB Falkena: Profit and Honour in Game Ranching (2003).
[19] The SA Financial Sector Forum – HB Falkena: Profit and Honour in Game Ranching (2003).

Applying the above to the number of Animal Units (AUs) and then converting it to animal numbers the following numbers are available for trading or hunting purposes.

Table 8: Number of AU and Game Available for Sale or Hunting purposes

	Generaal	Mount Stuart	Total
Number of AU	1 096	327	1 323
Number of Animals	4 694	1 399	6 093
Annual Growth	1 308	387	1 695

A decision was then made on the numbers of animals sold live, the number hunted as trophy animals and the number hunted for biltong. It was firstly decided that some of the species are too expensive for the "biltong" market and was allocated to the live sales and trophy hunting section, the animals treated this way are:

- Buffalo;
- Giraffe; and
- Sable Antelope.

Of the male animals of the above group, 45% were mostly allocated to trophy hunting, 27% were allocated to live sales and 28% to biltong hunting; in the case of the females 34% to trophy, 30% were allocated to live sales and 36% to biltong hunting.

For the rest of the animals an analysis was performed in terms of the number of animals per specie that was sold and feedback on the preferences of biltong hunters and information received from professional hunters on the preferences of trophy hunters.

The prices of trophy game were sourced from Greater Kuduland Safaris - Rifle Hunters Price List 2012 (Trophy), the pricelist presents the prices in US$ which was converted by Mosaka to Rand using an exchange rate of ZAR9.5 = 1US$, eliminating decimals.

Table 9: Different Outlet Prices for Game as Used in the Calculations (2013 prices)

	Male Off take - Average Prices			Female Off take - Average Prices		
	Game Sales	Trophy	Biltong	Game Sales	Trophy	Biltong
Blesbuck	1 615	2 800	2 900	1 064	2 800	2 500
Bushbuck	2 557	6 300	-	-	6 300	-
Blou Wildebeest	2 231	6 300	3 216	3 460	6 300	2 538
Buffalo	400 000	85 000	-	400 000	85 000	-
Eland	5 673	11 200	9 300	6 000	6 000	6 000
Gemsbok	4 834	7 000	4 250	4 834	6 000	3 150
Giraffe	13 750	14 700	7 000	13 750	14 700	8 000
Impala	761	2 275	1 122	1 300	700	720
Kudu	2 397	9 800	4 000	3 000	2 100	2 700
Nyala	6 100	13 650	1 122	6 100	13 650	720
Hartebeest (Red)	4 000	9 100	-	4 000	9 100	-
Sable Antelope (Swartwitpens)	135 000	52 500	-	147 500	52 500	-
Roan Antelope (Bastergemsbok)	120 000	70 000	-	100 000	70 000	-
Tsessebe (Basterhartbees)	12 000	19 600	-	12 000	19 600	-
Reedbuck, Klipspringer, Duiker,	1 020	6 860	4 500	1 020	6 860	4 500
Warthog	1 000	2 800	900	1 000	2 800	900
Waterbuck	4 132	11 900	6 000	4 334	11 900	4 000
Zebra	5 000	11 900	6 000	15 000	11 900	6 000

Using the above approach the estimated game farming annual turnover is presented in the following table.

Table 10: Annual Turnover

	Generaal	Mount Stuart	Total
Annual Turnover (R.mil.)	3.81	1.12	4.93

3.2.2.11 Hunting, Accommodation and Eco-tourism

With the game farming industry rapidly increasing in the area, large investments have been made to establish new luxury accommodation or upgrading existing accommodation for the trophy hunting fraternity, simultaneously accommodating the eco-tourism segment.

The two types of hunters hunting in the area are divided into the so-called trophy hunters and biltong hunters.

The trophy hunters are mostly foreigners who are looking for specific game species for which they are prepared to pay a very high price. They are generally not interested in the meat of the hunted animals. They, however, support a number of supplementary activities grouped together and referred to as "Supporting Services".

Supporting services (usually included in the daily rates and package purchased) comprise the transport from the airport of arrival to the hunting camp and for the duration of the hunting expeditions, the services of a professional hunter, trackers and skinners, use of facilities such as cold

room and salt, the field preparation of trophies, caping of trophies, laundry, accommodation and all refreshments.

Taxidermy, shipping of trophies and dipping and packing of trophies is for the account of the hunter and is not included in the daily rates and package quoted, although assistance is offered to deliver the trophy to the taxidermist.

3.2.2.11.1 Accommodation

- Trophy hunter accommodation

  The hunting camps and lodges used for trophy hunters and non-hunters (observers) accompanying the hunters and tourists range from very comfortable to luxurious with all modern amenities always available.

- Biltong hunter accommodation

  The biltong hunters decide, according to their budget, what accommodation is preferred. The average biltong hunter requires only basic accommodation with limited personal amenities such as sleeping quarters (single or shared), shower and facilities to prepare meals/coffee/tea (braai) all self-catering.

The number of available beds and tariffs was sourced from Naledi Development Restructured and the internet, and an estimation of the bed occupation was made. The trophy hunter group presented a special problem because included in their daily tariffs are not only the accommodation fee, but also the services of a professional hunter, skinners, trackers and vehicles. It is an all-inclusive package which also includes the transfer from the OR Tambo airport and only excludes the price of the animal and the taxidermy services.

The following number of beds could be traced per area:

- Generaal Sector – 149;
- Mount Stuart Sector – 24.

A 35% bed occupation was used to calculate the number of bed nights per annum.

After analysing the data obtained the accommodation turnover in the area was estimated and is presented in the following table.

Table 11: Annual Accommodation Turn Over in the Project Area (2013 prices)

Categories	Eco-tourism	Hunters	Total
	Rand mil.	*Rand mil.*	*Rand mil*
Generaal	3.11	4.99	8.10
Mount Stuart	0.80	0.94	1.74
Total	**3.91**	**5.93**	**9.84**

The total accommodation turnover in the project area is R 9.84 million.

3.2.2.11.2 Hunting Supporting Services

The professional hunter operates independently and is contracted by the hunting organiser for a specific safari. The professional hunter often resides in the Gauteng area and meets the hunting party at the airport on arrival. From arrival he/she will accompany the hunting party to the game farm with either his/her own transport or transport supplied by the hunting organiser or hired helicopter.

The trackers and skinners are the responsibility of the hunting organiser and are separately hired by the organiser for the specific safari. They do the field preparation of trophies and the caping of trophies. It could also be that the tracker(s) and skinners are in the full employment of the hunting organiser.

All transport and amenities on the game farm is the responsibility of the hunting organiser. Transport to visit local sights, souvenir hunting and entertainment is also supplied at additional cost.

The facilities such as cold room and salt, the field preparation of trophies, caping of trophies is provided by the hunting organiser. The arrangement and responsibility for taxidermy, the shipping of the trophies and the dipping and packing of trophies is the hunter's, although advice is given and assistance is offered to deliver the trophy to the taxidermist.

A hunting trophy is an item prepared from the carcass of a game animal killed by a hunter and kept as a souvenir of the successful hunting expedition. Often the heads or entire bodies are processed by a taxidermist, although sometimes other body parts such as teeth, tusks or horns are used as the trophies.

The cost of hunting services was calculated separately from the money spent on taxidermist services. The taxidermy fees were obtained from the internet and the number of animals treated determined from discussions with individuals in the industry.

In the following table the support services and taxidermist costs are presented.

Table 12: Annual Value of Support Services and Taxidermy Costs (2013 prices)

	Support Services Rand mil.	Taxidermy Rand mil.	Total Rand mil.
Generaal	1.79	2.91	4.70
Mount Stuart	0.35	0.99	1.34
Total	**2.14**	**3.90**	**6.04**

The table shows that the value of the support services is R 2.14 per annum and the taxidermy costs are around R 3.90 million per annum for the project area.

3.2.2.12 Irrigation

As no detailed data about the exact crop varieties produced, other than citrus, was available, it was necessary that some assumptions be made to be used for the analysis:

- In the case of tomato production it was accepted that the cultivation practice is one crop period followed by three crop free periods, in the case of a 100 hectares tomatoes the

implication is that if only the 100 hectares will be cultivated per annum, 25 hectares is in production at a time. The direct employment is based on the number used for 25 hectares while the direct and indirect reflects the 100 hectares. In the case of GDP it reflects the value of 100 hectares.

- It appears as if the more accepted practice for the other crops is three crops in a two year period, although some farmers claim two crops per annum. A 67% double cropping factor for the other vegetable crops was used.
- The area is predominantly producing citrus and the hectare areas were sourced from WSMLeshika (Pty) Ltd.

In the next table a breakdown of the physical hectares and crop hectares used in the calculation is presented based on the available information and the formulated assumptions.

Table 13: Irrigation Areas and Crops

	Generaal		Mount Stuart		Total	
	Physical Area	**Crop Area**	**Physical Area**	**Crop Area**	**Physical Area**	**Crop Area**
	hectares	**hectares**	**hectares**	**hectares**	**hectares**	**hectares**
Winter vegetables	0	0	20	36	20	36
Summer vegetables	0	0	2	3	2	3
Tomatoes	0	0	4	4	4	4
Citrus	0	0	142	142	142	142
	0	**0**	**168**	**185**	**168**	**185**

The total physical irrigated hectares are estimated at 168, all in the Mount Stuart Section. The estimated annual crop hectares are 146 ha citrus and 22 ha other crops, all in the Mount Stuart Section.

Enterprise budgets compiled for the Land Bank and Development Bank during 2012 were updated to 2013 values and applied to arrive at the total irrigation value per category.

Table 14: Enterprise Budgets (2013 Rand Values)

Current Situation (per hectare)	Tomatoes	Brassicas (Winter)	Cucurbits (Summer)	Citrus
Gross Income	**262 500**	**128 000**	**56 100**	**122 439**
Variable Costs	**183 331**	**56 017**	**32 040**	**79 147**
-Marketing Costs	*32 813*	*7 047*	*7 013*	*805*
-Pre Harvest Cost	*0*			*0*
-Irrigation labour	*0*			
- Other – pre-harvest costs	*74 965*	*37 545*	*12 726*	*29 301*
-Harvest Cost	*75 553*	*11 425*	*12 302*	*49 040*
Interest on Working Capital	*2 375*	*1 690*	*704*	*3 304*
Gross Margin	**76 794**	**70 293**	**23 356**	**39 988**
Fixed Costs	**4 199**	**3 594**	**2 910**	**7 412**
-Depreciation	0			
- Irrigation equipment				
- Other	*2 106.8*	*2 041*	*1 758*	*2 660.60*
-Labour	*354.00*	*184*	*115*	*736.00*
-Insurance	*321.98*	*311*	*269*	*572.40*
-Repairs & Maintenance	*604.20*	*596*	*511*	*1 287.90*
-Administration Costs	*508.80*	*184*	*85*	*975.20*
-Fuel & Electricity	*247.80*	*223*	*117*	*743.40*
-Sundry	*55.12*	*55*	*55*	*436.72*
Net Farm Income	**72 596**	**66 700**	**20 446**	**32 575**

In the following table the estimated value of the irrigation activities per area is presented.

Table 15: Estimated Value of the Irrigation Activities (2013 prices)

Farm Category	Value Rand million
Generaal	0
Mount Stuart	23.85
Total	**23.85**

The table shows that the annual estimated value of the irrigation activities in the total Generaal Project area is around R24.90 million.

3.2.2.13 Summary: Current Activities

In the next table the total estimated annual value of the current activities in the project area is presented.

Table 16: Annual Turn Over of the Activities in the Project Area (2013 prices)

	Annual Income	Annual Income	Annual Income
	Generaal	Mount Stuart	Total
	Rand mil.	Rand mil.	Rand mil.
Beef Farming	0.45	0.07	0.52
Game Farming - Animals(Turn Over)	**3.81**	**1.17**	**4.98**
- Game Sales	0.36	0.12	0.48
- Trophy Hunting	2.02	0.63	2.65
- Biltong Hunting	1.43	0.43	1.86
Hunting			
- Professional Hunting Services (including game	1.79	0.35	2.14
- Taxidermy	2.91	0.99	3.90
- Accommodation	4.99	0.94	5.93
Total	**9.69**	**2.27**	**11.97**
Eco-Tourism	3.11	0.80	3.91
Irrigation	0	23.85	23.85
Grand Total	**17.06**	**28.17**	**45.23**

The annual total value of the current activities are estimated at R45.23 million, with irrigation contributing around R23.85 million, 53%, with accommodation the second largest contributor at R9.84 million.

It is, however, also important to realise that the game farming and related activities, hunting, taxidermy, game catching and accommodation contributes in total R16.95 million.

4 Current Activities – Macro-Economic Parameters

In this section the baseline activities are converted to macro-economic parameters, in a later section a risk profile is established for all three the identified areas, the risk is then converted to macro-economic parameters and presented as such.

4.1 Approach

A Macro-Economic Impact Model (MEIM) is used, based on the Limpopo Social Accounting Matrix (SAM) which has been converted to an econometric model to be used in the project area. The MEIM was adapted to accommodate each of the identified project areas and was then populated with the baseline data.

The magnitude of the current activities in the project area has been calculated according to the methods as explained. In the following sections the current economic activities are expressed in terms of the following macro-economic parameters:

- Gross Domestic Product (GDP) – Direct and Indirect/Induced Impacts;
- Employment – Direct and Indirect/Induced Impacts;
- Payments to Households – Low Income and Medium/High Income.

The possible impacts of the proposed coal mine on the current economic activities was estimated and converted to the macro-economic parameters to show the impacts.

The Limpopo Social Accounting Matrix (SAM) was used to synthesise appropriate multipliers to be used in the Macro-Economic Impact Model (MEIM) to calculate the macro-economic impact of the different activities.

All economic models incorporate a number of "multipliers" which form the nucleus of the modelling system. The nature and extent of the impact of a change in a specific economic quantity, e.g. exports, on that of another economic quantity or quantities, e.g. production output or employment, is determined by a "multiplier". A multiplier summarises the total impact that can be expected from a change in a given economic activity. For illustrative purposes the figure below shows the multiplier concept used in assessing the change in economic activity.

Graph 1: Multipliers and Turnover
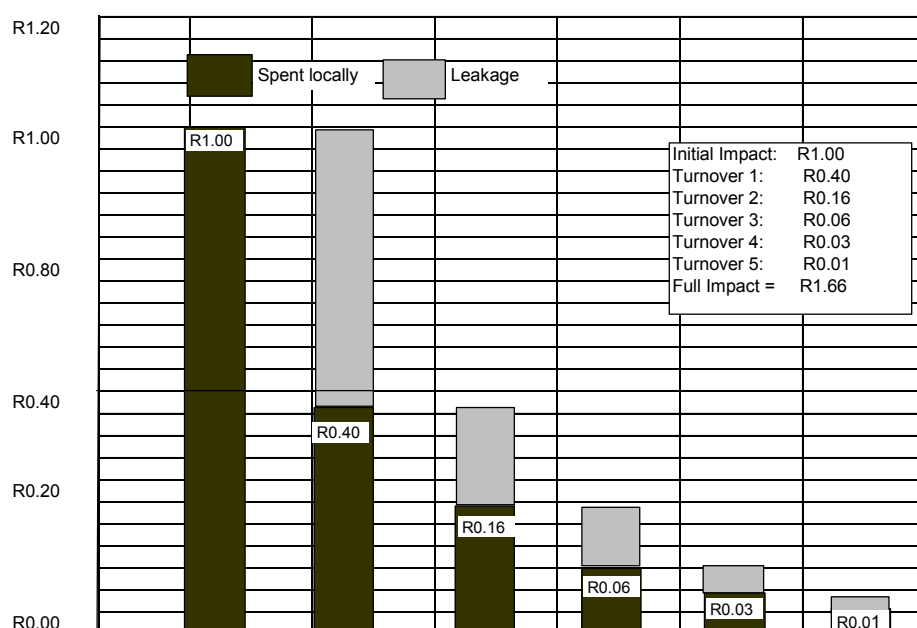
In this example, R1 is received into the local economy of the area from sales beyond the local borders. Of this, 40 cents is spent for goods and services within the region. The economic sectors and individuals who receive the 40 cents spend 16 cents within the local area. Of the 16 cents, only six cents is spent locally, and so on. The total amount of money received by local firms and residents as a result of the initial R1 in added exported earnings is R1.66. Therefore, the multiplier is R1.66.

The change in economic activity resulting from the change in one factor of production, such as water resources, is measured by different multipliers. Four multipliers are commonly used to assess the impacts of an initial increase in production resulting from an increase in sales, usually called final demand in multiplier analysis. The four multipliers are: (1) output, (2) employment; (3) income; and (4) value added.

Sectorial multipliers are calculated using information contained in the applicable Provincial Social Accounting Matrix (SAM) and the National SAM as well as data obtained from the South African Reserve Bank and Statistics South Africa. These inverse matrices capture all the direct and indirect relationships among the inputs and outputs of the various entities included in the applicable provincial SAM.

Direct GDP, labour and capital multipliers for each sector are calculated using the following formula:

GDP multiplier = $\dfrac{\text{Value Added}}{\text{Production}}$

Labour multiplier = $\dfrac{\text{Employment}}{\text{Production}}$

Capital multiplier = $\dfrac{\text{Capital stock}}{\text{Production}}$

These multipliers were incorporated into the MEIM and used to calculate the macro-economic impacts. By using a SAM for the applicable region, the above multipliers can be calculated. The multipliers that were used in this study to determine the economic impacts are as follows:

- Economic growth, i.e. the impact on GDP.
- Employment creation, i.e. the impact on labour requirements.
- Income distribution, i.e. the impact on low income, poor households and total households.

A breakdown of the different effects of the agricultural sector multipliers used in this study is as follows:

- Direct Impacts: the effects occurring directly in the agriculture sector:
- Indirect Impacts: those effects occurring in the different economic sectors that link backwards to agriculture due to the supply of intermediate inputs, e.g., fertilisers, seeds, hunting professional services, transport, etc.
- Induced Impacts: the chain reaction triggered by the salaries and profits (less retained earnings) that are ploughed back into the economy in the form of private consumption expenditure.
- Total Impacts: Represents the direct, indirect and induced summed effect.

4.2 Risk Assessment

Risk is a combination of the probability, or frequency of occurrence of a hazard and the magnitude of the consequence of the occurrence (Nel 2002). Risk estimation (RE) is concerned with the outcome, or consequences of an intention, taking account of the probability of occurrence and can be expressed as P (probability) x S (severity) = RE. Risk evaluation is concerned with determining significance of the estimated risks and also includes the element of risk perception. Risk assessment combines risk estimation and risk evaluation (Nel 2002).

The risk assessment methodology that will be used during the EIA Phase to estimate the risk and determine the impact significance is tabled below.

In developing a possible impact scenario for the construction and operation on the local economic activities, it was necessary to differentiate the activities and to again estimate it within the three identified sub-areas as the possible impacts differ for the three areas.

A risk profile was developed for each of the areas making provision for a weight allocated to a specific intrusion caused by the mining activity. A percentage impact is then allocated to each economic activity, which is then multiplied with the weight; the answer is converted to percentage impact. The percentage impact is then applied to the estimated annual turnover to arrive at the negative impact to be caused by the mining activity.

Mathematically the process can be explained as follows:

[Mining weights] x [Estimated Percentage Impact] = [Impact] ►converted to monetary values.

The weights allocated to the different identified infringements in respect of the Generaal Project farming areas are shown in the table below. For each of the other two sections a separate model was developed.

Table 17: Risk Factors Considered

Infringement	Activity	Sub -Activity
Noise	*Beef and other Livestock Farming*	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment (birds & plants)	
	Sub-total	*7*
Dust	*Beef and other Livestock Farming*	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment (birds & plants)	
	Sub-total	*14.00*
Blasting	*Beef and other Livestock Farming*	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment (birds & plants)	
	Sub-total	*7.00*
Social, Crime and other impacts	*Beef and other Livestock Farming*	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters

	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment (birds & plants)	
	Sub-total	*12.00*
Destroying the sense of place -Visual	**Beef and other Livestock Farming**	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment (birds & plants)	
	Sub-total	*10.00*
Underground water - contamination and water levels	**Beef and other Livestock Farming**	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment	
	Sub-total	*33.00*
Surface water - contamination and run-off	**Beef and other Livestock Farming**	*Commercial*
		Community
	Game Farming	*Game (breeding)*
		Live Sales
		Trophy Hunting
		Biltong Hunting
	Tourism & Accommodation	*Eco - tourists*
		Hunters
	Irrigation	*Citrus*
		Other Crops
	Community	*Life Style*
	Environment	
	Sub-total	*17.00*
	Total	**100**

4.3 Baseline Parameters and Risk Induced Parameters

The macro-economic parameters used are the Gross Domestic Product (GDP) and employment opportunity which is calculated for each of the different identified activities. It is expressed as Direct, Indirect/Induced and Total. Employment opportunities are used as many of the hunting activities are only practised for 9 to 10 months of the year, this approach has as a result the fact that the number of people involved is more than the number of opportunities.

4.3.1 Generaal Section

The following table presents the activities expressed in macro-economic parameters.

Table 18: Current Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	-	-	-	-	-	-	-	-	-
Beef Farming	0.41	0.23	0.65	2	1	3	0.12	0.09	0.03
Game Farming	7.52	4.96	12.48	13	39	52	2.86	2.06	0.80
Hunting	0.85	0.83	1.68	20	3	23	0.79	0.53	0.25
Taxidermy, Game catching, etc.	1.61	1.62	3.23	9	6	15	1.02	0.76	0.26
Accommodation	3.09	3.61	6.70	20	14	34	3.50	2.36	1.13
Total	**13.49**	**11.25**	**24.74**	**64**	**63**	**127**	**8.29**	**5.81**	**2.48**

The table above reflects that all the activities support 64 direct and 63 indirect and induced employment opportunities. Accommodation and hunting provides the majority of the direct employment, namely 20 each.

As far as direct GDP is concerned the activities create R 13.49 million per annum.

In the following table the identified risks are presented as a percentage.

Table 19: Percentage Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Beef Farming	-8.6%	-8.6%	-8.6%	0.0%	-100.0%	-33.3%	-8.6%	-8.6%	-8.6%
Game Farming	-26.3%	-26.3%	-26.3%	-26.3%	-28.2%	-27.7%	-26.3%	-26.3%	26.3%
Hunting	-22.3%	-22.3%	-22.3%	-22.3%	0.0%	-19.4%	-22.3%	-22.3%	22.3%
Taxidermy, Game catching, etc.	-22.3%	-22.3%	-22.3%	-22.3%	-16.7%	-20.0%	-22.3%	-22.3%	22.3%
Accommodation	-46.0%	-46.0%	-46.0%	-46.0%	-42.9%	-44.7%	-46.0%	-46.0%	46.0%
Total	**-29.5%**	**-31.4%**	**-30.4%**	**-31.0%**	**-30.2%**	**-30.6%**	**-33.5%**	**-33.1%**	**34.2%**

According to the methodology used to establish the risk in the farms in the Generaal Section relative low risks are identified with the highest risk in the accommodation sector with around 46%, followed game related activities all around 20%.

As far as direct GDP is concerned the percentage change for irrigation will be –9.2% per annum.

The following table presents the macro-economic parameters after the estimated risk factors were applied.

Table 20: New Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	-	-	-	0	0	-	-	-	-
Beef Farming	0.38	0.21	0.59	2	0	2	0.11	0.09	0.03
Game Farming	5.54	3.66	9.20	9	28	37	2.11	1.52	0.59
Hunting	0.66	0.65	1.31	16	3	19	0.61	0.41	0.20
Taxidermy, Game catching, etc.	1.25	1.26	2.51	7	5	12	0.79	0.59	0.20
Accommodation	1.67	1.95	3.62	11	8	19	1.89	1.28	0.61
Total	**9.50**	**7.72**	**17.23**	**45**	**44**	**89**	**5.52**	**3.89**	**1.63**

According to the table above the activities after the possible impact of the mining activities have been accounted for, will support 45 direct and 44 indirect and induced employment opportunities. The total employment will be 89.

As far as direct GDP is concerned the total is R9.50 million.

In the following table the projected negative impacts of the proposed mining activity are presented.

Table 21: Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	-	-	-	0	0	0	-	-	-
Beef Farming	-0.04	-0.02	-0.06	0	-1	-1	-0.01	-0.01	-0.00
Game Farming	-1.97	-1.30	-3.28	-3	-11	-14	-0.75	-0.54	-0.21
Hunting	-0.19	-0.19	-0.37	-5	0	-5	-0.18	-0.12	-0.06
Taxidermy, Game catching, etc.	-0.36	-0.36	-0.72	-2	-1	-3	-0.23	-0.17	-0.06
Accommodation	-1.42	-1.66	-3.08	-9	-6	-15	-1.61	-1.09	-0.52
Total	**-3.98**	**-3.53**	**-7.51**	**-20**	**-19**	**-39**	**-2.77**	**-1.92**	**-0.85**

The change in employment opportunities as shown in the table above will be -20 direct and -19 indirect and induced employment opportunities. The total change in employment will be -39.

As far as direct GDP is concerned, it will be reduced by R 3.98 million per annum.

4.3.2 Mount Stuart Section

The following table presents the activities expressed in macro-economic parameters.

Table 22: Current Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	13.11	11.39	24.51	215	54	269	7.39	5.55	1.84
Beef Farming	0.15	0.06	0.20	0	-	0	0.03	0.02	0.01
Game Farming	0.43	0.63	1.06	4	4	8	0.41	0.40	0.01
Hunting	0.66	0.64	1.30	4	2	6	0.61	0.41	0.20
Taxidermy, Game catching, etc.	0.74	0.74	1.48	4	2	6	0.47	0.35	0.12
Accommodation	0.79	0.92	1.71	5	3	8	0.89	0.60	0.29
Total	**15.88**	**14.39**	**30.26**	**232**	**65**	**297**	**9.80**	**7.34**	**2.46**

The table above reflects that all the activities support 232 direct and 65 indirect and induced employment opportunities. Irrigation provides the bulk of the employment with 215 direct jobs.

As far as direct GDP is concerned irrigation creates R13.11 million.

4.3.2.1 Citrus and Associated Risks

As the irrigated area in the Mount Stuart Section includes 146 hectares of citrus as well as a pack house, it is necessary that notice be taken of the citrus situation and possible risks.

The Nzhelele Government Water Scheme at Tshipise which lies mostly outside of the defined project area and utilises surface and in some cases also ground water, is exposed to possible contamination from the project area. However, the 146 hectares are part of the Nzhelele Scheme and receive water from the canal serving the area.

In a previous study the irrigation farmers raised a number of issues regarding the possible risks that mining operations could have on their operations. In the following few paragraphs the following issues are discussed as raised by the farmers:

- Investor perceptions.
- Mining dust.
- Water related issues.
  - Contamination.
  - Water re-allocation from the Nzhelele Dam.

The issues around "Investor Perceptions" are related to the possible impact the mine may have on investor confidence and a decline in land values on the irrigation scheme.

The following is a section quoted from the report *Makhado Colliery Project - Socio-Economic Impact Analysis of the Proposed Makhado Colliery near Makhado in the Vhembe District Municipality* compiled by Conningarth Economists.

"The value of the land on the irrigation scheme is actually the value of the water, without the water the value of the land will fall back to the same value that the game or cattle ranching land has at present. Without getting into the debate on economic value and market value, analysis of the

Net Operating Surplus (NOS) of citrus production suggests an economic value of the water of around R145 000 per hectare applying the principle of discounting the NOS of R 12 650 per hectare over a period as explained in the chapter on land values. If the same assumptions are applied a value of around R2 344 per hectare is arrived at for game ranching land. These values should not be interpreted as present market values as other factors play a role in the determination of market values. This is rather the value added by the availability of good quality irrigation water.

The total investment per hectare of citrus land is thus estimated at R145 000 per hectare. The value of the fixed investments on the land, which is included in the R145 000, is valued per hectare as follows:

- *Irrigation System*   *= R 17 000.00*
- *Implements*   *= R 10 000.00*
- *Pack Houses*   *= R 16 000.00*
- *Other Infrastructure*   *= R 12 000.00*
- *Total Infrastructure*   *= R55 000.00*

If the property owner loses his water completely the value of the infrastructure also drops as it becomes useless. However, the utilisation of the infrastructure will therefore depend on the volume of irrigation water retained by the irrigator.

As the water allocation to the farmers is set at 8 400 m3 per hectare the value of the water probably varies between:

- *R145 000 divided by 8 400 m^3 = R17.26 per m^3, and*
- *R145 000 minus R55 000 divided by 8 400 m^3 = R10.70 per m^3.*

This is a conservative estimate of the total investment on an export citrus unit; the investment in the other crops will be lower, as they do not require the same level of fixed investment. The investment of a 100 ha citrus unit is then at least R14.5 million. It must be emphasised that this is not a sworn appraisal value of citrus land or market value as such.

The first "perception issue" that the farmers are referring to is the value of the land or the value of the water that could drop if any future investor hears of the perceived risk associated with the mining activities and the possible loss of a Phytosanitary "Phyto" Registration. The "Phyto" registration refers to the Phytosanitary Registration for special export markets, which includes China, EU, Iran, Japan, South Korea and the USA. Only production units and pack houses registered with the Department of Agriculture, Forestry and Fisheries (DAFF), Directorate Food Safety and Quality Assurance with approved codes (PUC and PHC)[20] are allowed to register for Special Market(s).

The second "perception issue" that the farmers refer to is the so called "GAP" registration. Good Agriculture Practise (GAP) refers to private accreditation schemes adopted on SA citrus farms. The average cost to maintain a GAP certification is R29 560 per annum, while first-time members "invest" on average R69 564 to join these schemes. Growers ranked Market Access ("ability to retain existing customers" and "better access to foreign markets") is among the main benefits of certification.

---

[20] PUC – Production Unit and PHC – Packing Houses.

The registration is per market and represents a real quality challenge for the individual producers. The loss of registration because of outside issues could affect the value of their investments dramatically."

In addressing the above issues and trying determine the risk factors the following is taken into account:

- The source of the irrigation water,
- Possible impact of dust from the mining operations,
- Possible impact on the "Phyto" registration, and
- Good Agricultural Practise (GAP).

The bulk of the irrigation water is drawn from the canal and the ground water is only used in times of water restrictions and the change that the canal water be contaminated by the Mount Stuart mine is very low.

The dust issue will be a low risk as the mine is an underground mine and it should be possible to contain the dust.

The citrus industry is currently in a very problematic situation as the European Union is considering stopping the importation of citrus from South Africa because of the so-called "black spot" disease. Currently the only citrus producing area not contaminated is the Western Cape. In the risk analysis we could find no evidence that the mine activities would increase the risk to the producers.

The same applies to the GAP accreditation issue.

The associated risk for the citrus and other irrigation products were established at between 13% and 14%.

In the following table the identified risks are presented expressed as a percentage.

Table 23: Percentage Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	-8.8%	-8.8%	-8.8%	-8.8%	-9.2%	-8.9%	-8.8%	-8.8%	-8.8%
Beef Farming	-17.0%	-17.0%	-17.0%	-17.0%	0.0%	-17.0%	-17.0%	-17.0%	-17.0%
Game Farming	-15.2%	-15.2%	-15.2%	-15.2%	0.0%	-7.4%	-15.2%	-15.1%	-17.0%
Hunting	-20.3%	-20.3%	-20.3%	-28.4%	0.0%	-12.9%	-20.3%	-20.3%	-20.3%
Taxidermy, Game catching, etc.	-25.2%	-25.2%	-25.2%	-25.2%	0.0%	-16.6%	-25.2%	-25.2%	-25.2%
Accommodation	-8.8%	-8.8%	-8.8%	-8.8%	0.0%	-5.6%	-8.8%	-8.8%	-8.8%
Total	**-10.3%**	**-10.5%**	**-10.4%**	**-9.9%**	**-7.7%**	**-9.1%**	**-10.6%**	**-10.6%**	**-10.6%**

The total percentage change in the employment opportunities as shown in the table above will be reduced by 9.9% direct and 7.7% indirect and induced employment opportunities.

As far as direct GDP is concerned the percentage change for taxidermy and professional services will be reduced by 25.2% followed by hunting with 20.3% per annum.

The following table presents the macro-economic parameters after the estimated risk factors were applied.

Table 24: New Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	11.95	10.39	22.34	196	49	245	6.74	5.06	1.67
Beef Farming	0.12	0.05	0.17	0	0	0	0.02	0.02	0.01
Game Farming	0.37	0.53	0.90	3	4	7	0.35	0.34	0.01
Hunting	0.53	0.51	1.04	3	2	5	0.49	0.33	0.16
Taxidermy, Game catching, etc.	0.55	0.56	1.11	3	2	5	0.35	0.26	0.09
Accommodation	0.72	0.84	1.56	5	3	8	0.81	0.55	0.26
Total	**14.24**	**12.87**	**27.11**	**210**	**60**	**270**	**8.76**	**6.56**	**2.20**

According to the table above the activities will support 210 direct and 60 indirect and induced employment opportunities. Irrigation provides the majority of the direct employment, namely 196.

In the following table the projected negative impact of the proposed mining activity are presented.

Table 25: Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct R mil.	Indirect/ Induced R mil.	Total R mil.	Direct Number	Indirect/ Induced Number	Total Number	Total R mil.	High/ Medium R mil.	Low R mil.
Irrigation	-1.16	-1.01	-2.17	-19	-5	-24	-0.65	-0.49	-0.16
Beef Farming	-0.02	-0.01	-0.03	0	0	0	-0.01	-0.00	-0.00
Game Farming	-0.07	-0.10	-0.16	-1	0	-1	-0.06	-0.06	-0.00
Hunting	-0.13	-0.13	-0.26	-1	0	-1	-0.12	-0.08	-0.04
Taxidermy, Game catching, etc.	-0.19	-0.19	-0.37	-1	0	-1	-0.12	-0.09	-0.03
Accommodation	-0.07	-0.08	-0.15	0	0	0	-0.08	-0.05	-0.03
Total	**-1.64**	**-1.51**	**-3.15**	**-22**	**-5**	**-27**	**-1.04**	**-0.78**	**-0.26**

The change in employment opportunities as shown in the table above will be -22 direct and -5 indirect and induced employment opportunities. Direct employment for irrigation will be reduced by -27.

As far as direct GDP is concerned the irrigation direct change will be –R1.16 million, with the total irrigation GDP change estimated at R2.17 million.

4.3.3 Total Impact – Generaal Project

Table 26: Current Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct **R mil.**	**Indirect/ Induced** **R mil.**	**Total** **R mil.**	**Direct** **Number**	**Indirect/ Induced** **Number**	**Total** **Number**	**Total** **R mil.**	**High/ Medium** **R mil.**	**Low** **R mil.**
Irrigation	13.11	11.39	24.51	215	54	269	7.39	5.55	1.84
Beef Farming	0.56	0.29	0.85	2	1	3	0.15	0.12	0.04
Game Farming	7.95	5.58	13.53	17	43	60	3.27	2.47	0.81
Hunting	1.51	1.48	2.98	24	5	29	1.40	0.95	0.45
Taxidermy, Game catching, etc.	2.35	2.36	4.71	13	8	21	1.49	1.11	0.38
Accommodation	3.88	4.53	8.41	26	17	43	4.39	2.97	1.42
Total	**29.36**	**25.64**	**55.00**	**297**	**128**	**425**	**18.09**	**13.16**	**4.94**

The table above reflects that the total impact of all the current activities support 297 direct and 128 indirect and induced employment opportunities, with a total dependency of 425. Irrigation provides the majority of the direct employment, namely 215 with a total of 269 jobs.

As far as direct GDP is concerned irrigation creates a total of R13.11 million per annum, with a total figure of R24.51 million.

The total payments to households are R18.09 million of which R4.94 million is destined for low income households.

In the following table the identified risks are presented as a percentage.

Table 27: Percentage Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct **R mil.**	**Indirect/ Induced** **R mil.**	**Total** **R mil.**	**Direct** **Number**	**Indirect/ Induced** **Number**	**Total** **Number**	**Total** **R mil.**	**High/ Medium** **R mil.**	**Low** **R mil.**
Irrigation	-8.8%	-8.8%	-8.8%	-8.8%	-9.2%	-8.9%	-8.8%	-8.8%	-8.8%
Beef Farming	-10.8%	-10.3%	-10.6%	-3.1%	-100.0%	-31.2%	-10.2%	-10.2%	-10.2%
Game Farming	-25.7%	-25.0%	-25.4%	-23.7%	-25.6%	-25.1%	-24.9%	-24.4%	-26.2%
Hunting	-21.4%	-21.4%	-21.4%	-22.0%	0.0%	-18.2%	-21.4%	-21.4%	-21.4%
Taxidermy, Game catching, etc.	-23.2%	-23.2%	-23.2%	-23.2%	-12.5%	-19.1%	-23.2%	-23.2%	-23.2%
Accommodation	-38.4%	-38.4%	-38.4%	-38.4%	-35.3%	-37.2%	-38.4%	-38.4%	-38.4%
Total	**-19.1%**	**-19.7%**	**-19.4%**	**-13.9%**	**-18.7%**	**-15.3%**	**-21.1%**	**-20.6%**	**-22.5%**

The percentage change in the reduced employment opportunities as shown in the table above is estimated to be around 13.9% direct and 18.7% indirect and induced employment opportunities. Direct employment for irrigation will come down by 8.8% and accommodation and tourism by 38.4% direct employment opportunities.

As far as direct GDP is concerned the percentage change for irrigation will come to -8.8% and that of accommodation to -38.4% per annum.

The following table presents the macro-economic parameters after the estimated risk factors were applied.

Table 28: New Situation Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	11.95	10.39	22.34	196	49	245	6.74	5.06	1.67
Beef Farming	0.50	0.26	0.76	2	-	2	0.14	0.10	0.03
Game Farming	5.91	4.19	10.10	13	32	45	2.46	1.86	0.59
Hunting	1.19	1.16	2.35	19	5	24	1.10	0.75	0.36
Taxidermy, Game catching, etc.	1.80	1.82	3.62	10	7	17	1.14	0.85	0.30
Accommodation	2.39	2.79	5.18	16	11	27	2.70	1.83	0.88
Total	**23.74**	**20.60**	**44.34**	**256**	**104**	**360**	**14.28**	**10.45**	**3.83**

According to the table above the activities will support 256 direct and 104 indirect and induced employment opportunities. Irrigation will provide 196 direct employment opportunities.

As far as direct GDP is concerned, irrigation will create R11.95 million.

In the following table the projected negative impact of the proposed mining activity is presented.

Table 29: Change Expressed as Macro-Economic Parameters (2013 prices)

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	-1.16	-1.01	-2.17	-19	-5	-24	-0.65	-0.49	-0.16
Beef Farming	-0.06	-0.03	-0.09	0	-1	-1	-0.02	-0.01	-0.00
Game Farming	-2.04	-1.40	-3.44	-4	-11	-15	-0.81	-0.60	-0.21
Hunting	-0.32	-0.32	-0.64	-5	0	-5	-0.30	-0.20	-0.10
Taxidermy, Game catching, etc.	-0.54	-0.55	-1.09	-3	-1	-4	-0.35	-0.26	-0.09
Accommodation	-1.49	-1.74	-3.24	-10	-6	-16	-1.69	-1.14	-0.55
Total	**-5.62**	**-5.04**	**-10.66**	**-41**	**-24**	**-65**	**-3.82**	**-2.71**	**-1.11**

The change in employment opportunities, as shown in the table above, will be -41 direct and -24 indirect and induced employment opportunities. Direct employment for irrigation will be reduced by 19 direct opportunities, with the accommodation and tourism reduced by 10 direct employment opportunities.

As far as direct GDP is concerned the irrigation change will be –R1.16 million followed by accommodation and tourism with –R1.49 million per annum.

4.3.4 Projected Income Loss

In the following table the estimated negative impact is presented in terms of the reduction in annual turnover. According to the approach followed in determining the risk and associated negative impacts this is seen as the worst possible case.

Table 30: Estimated Annual Income Loss (2013 prices)

	Generaal Farms Rand million	Mount Stuart Farms Rand million	Total Rand million
Beef and Livestock Farming	-0.04	-0.01	-0.05
Game Farming and Hunting	-1.00	-0.18	-1.18
Professional and Taxidermist	-0.99	-0.27	-1.26
Accommodation (Tourists and	-3.14	-0.44	-3.58
Irrigation	0.00	-2.06	-2.06
Environmental Impact	-0.37	-0.41	-0.78
Total	**-5.54**	**-3.37**	**-8.91**

The Generaal Sector farms stand to lose the most with a R5.54 million reduction, followed by the Mount Stuart Sector farms with a reduction of R3.37 million per annum expressed in 2013 prices.

4.3.5 Possible Impacts Outside of the Study Area

4.3.5.1 Tshipise Holiday Resort

The Tshipise Holiday Resort is located next to the R525 approximately 8 km north east of the proposed Mount Stuart mine. Due to the year-round sunny climate and hot mineral springs the resort has become a very popular as a holiday destination and stay-over for visitors to the Kruger National Park with the Northern Pafuri Gate 105 kilometres away or en-route tourists to and from Zimbabwe as Beit Bridge is approximately 80 km away.

The farm Honnet is registered as a nature reserve and Forever Resorts own the farm with the resort which is located on the farm. The total land surface of the resort is 1 902 ha of which the fenced off reserve is ±1 800 ha. The resort also arranges game drives for visitors to the reserve, no hunting is allowed on the reserve and access game is caught and sold on auction. A Swartwitpens breading programme is run by the resort on the reserve.

The resort offers 3-star style fully-equipped accommodation with a six sleeper guest house, 45 one bedroom (2 sleeper), 45 two bedroom (4 sleeper) and 5 two bedroom (6 sleeper) air-conditioned self-catering thatched rondavels some with lounge, extra sleeper couch for small child, TV, M-Net, 3 DSTV channels, bathroom with bath, separate toilet, fully equipped open plan kitchen, private braai area and open parking and a 360 caravan park and 10 camping sites, all equipped with electric power points and serviced by seven ablution facilities. In addition Tshipise also offers hotel accommodation for visitors/delegates with 38 rooms, three conference facilities (equipped with standard equipment) which can accommodate 30 to 260 delegates, bar, games room and two entertainment areas.

Personnel accommodation on terrain includes ten three bedroom, five two bedroom and one hostel with 30 single rooms. The hotel also has 15 single bed rooms for staff.

Recreational facilities include tennis courts, rheumatic bath, warm water mineral pool, cold water pool, baby pool, seasonal volley ball, putt-putt, bowls, horse-riding, bush drives, etc. The business complex consists of a reception office, booking office, administrative offices, restaurant (200 guests), supermarket, butchery, laundromat, liquor store and home industry shop.

Other buildings and installations on the premises include a Caltex garage with workshop and a three bedroom house which is rented out, an industrial laundry (for resort washing), potable water works with three reservoirs, sewage treatment works, irrigation reservoir and network, and workshop, stores and offices for maintenance and cleaning staff.

The Groundwater Flow Impact Assessment Report[21] shows the impact on reductions in water for abstraction and discharge, without mitigation, as extreme and the possibility exists that the hot water spring at Tshipise could be affected or dry up.

4.3.5.2 Tshipise Baseline

As explained in the previous sections the Forever Resort – Tshipise is a well-established hot spring based holiday resort with chalet and camping facilities. A number of the current facilities are not managed by the Forever Resorts group but are let to outside groups.

The Forever Resorts made available some detailed data which was interpreted and re-worked by Mosaka. A desktop analysis was done of the three businesses rented by external and an annual turnover was estimated and added to the data presented by Forever Resorts Management.

The following table presents the annual turnover figures as used for the holiday resort analysis.

Table 31: Turnover of Businesses on the Forever Resorts Premises at Tshipise

Management	Business Facility	Turnover Rand
External	- Garage and Workshop	13 811 500
	- Butchery	5 761 800
	- Home Industry	2 825 700
Forever Resorts		
Accommodation	- *Chalets*	12 648 664
	- Camping	3 929 011
Trading		13 676 033
Conferences		624 875
Entertainment		160 453
Sundry		934 345
Total		**54 372 380**

If the trading division is disaggregated the following sub-sectors are identified:

---

[21] The Groundwater Flow Impact Assessment Report – Revision 1 – dated 29 November 2013.

- Food and Beverages – R6.40 million,
- Shops - R6.49 million, and
- Other - R0.79 million.

It is also necessary to make some remarks in respect of the level of the applicable rates for the resort. In the following table the rates of applicable rural Forever Resorts for a four sleeper self-catering unit over a peak period are presented.

Table 32: Accommodation Rates of Forever Resorts

Resort	Rate per day per unit Rand
Tshipise	1 400.00
Swadini	1 587.00
Gariep Dam	1 200.00
Loskop dam	1 735.00
Badplaas	1 859.00
Blyde Canyon	1 940.00
Warmbad	1 859.00

From the above it is clear that only the resort at Gariep Dam that is cheaper; this trend applies to all the other categories of accommodation.

According to the data provided by the management 105 people are permanently employed by the Resort. From telephonic data provided by the three rented businesses it appears that an additional 25 employees can be added which gives a total permanent labour force of around 130 on the premises.

A detailed analysis was done of the accommodation occupancy rates over a calendar year; this is presented in the following graph.

Graph 2: Accommodation Occupancy Rates over a Calendar Year Period
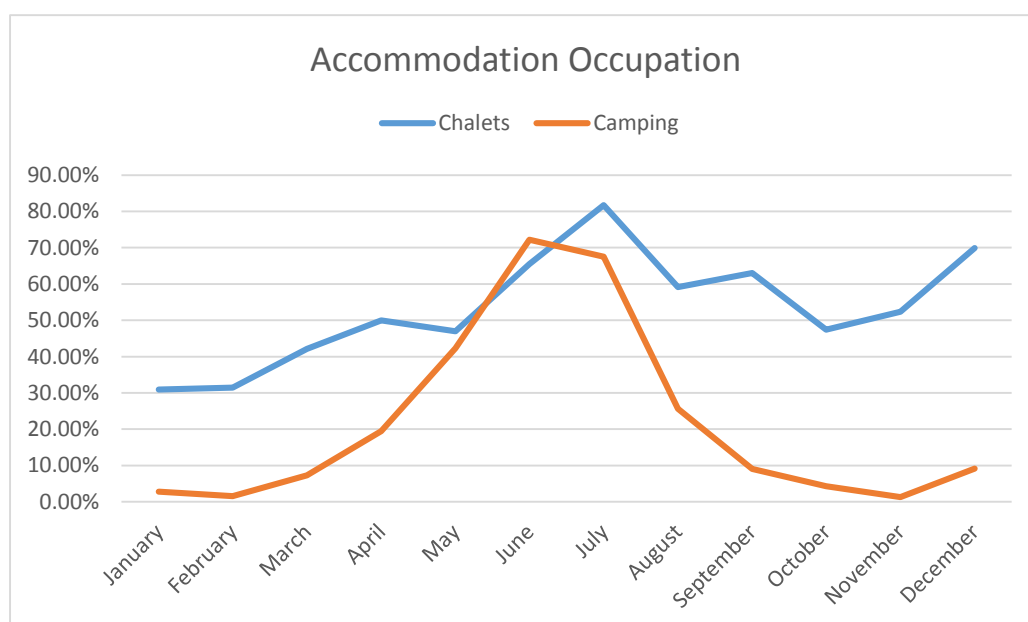
The graph shows that both the chalets and camping occupancy rates increased during the months of May to August, with the camping visitors being the more dramatic one. The analysis further shows that during the same months 61.0% of the chalets are occupied compared to the 52.9% of the camping facilities. It is clear that the hot water spring of the resort is the main attraction for camping guests during the colder winter months.

In the following graph an analysis of the income derived from the accommodation is presented.

Graph 3: Income Derived from Accommodation
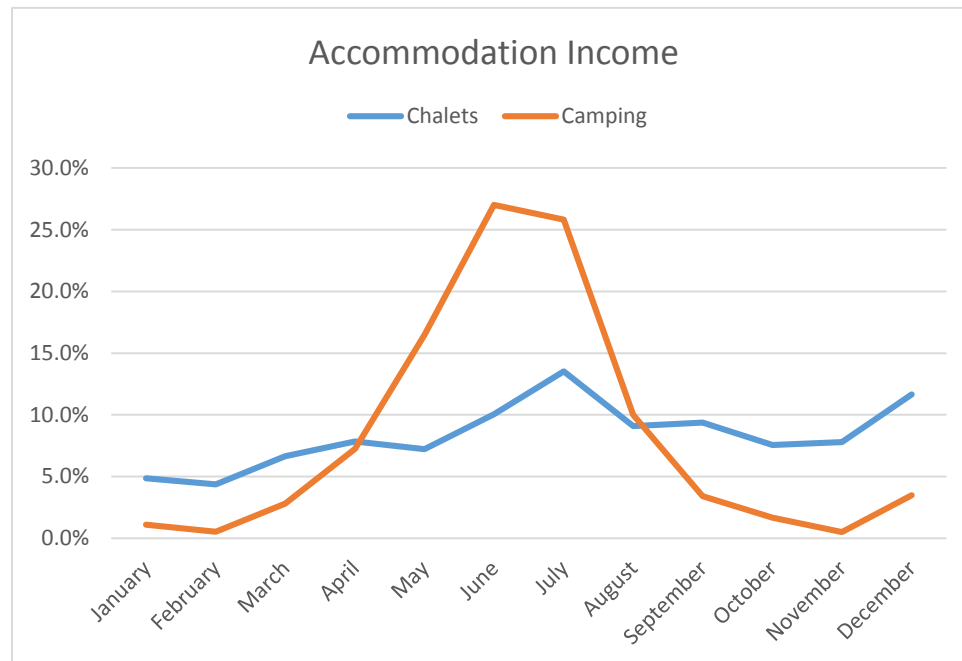
The graph above shows the same tendency as the occupancy rates, however, it is more dramatic because of the longer peak tariff periods applicable during the winter school holidays. About 39.9% of the chalet income and 79.3% of the camping income is realised during this period. The total combined income for the four month period is 49.2%, with 50.8% for the rest of the eight months. The assumption was then made that this would probably also apply for the rest of the resort income sources.

It is not possible to make an analysis of the profitability of the resort because of a lack of data; however, Tshipise will not be the most profitable unit in the Forever group. This remark is based on the relative low accommodation rates and summer occupancy levels.

The capital investment based on replacement value is estimated by the group at around R150 million. By using Aecom's "Africa Property and Construction Handbook 2013, 26th Edition 2013", and applying the key per room rate for mid-scale hotels and add a furniture allocation Mosaka Economists arrived at a figure of R153 million.

The farm Honnet, around 1 902 hectares, is registered as "Honnet Nature Reserve" and was bought as such by Forever resorts. The resort is situated on the northern boundary of the farm and is

stocked with game with a Sable Antelope breeding programme. Game drives are undertaken and excess game is sold at auctions, no hunting is allowed.

The following table presents the annual turnover in macro-economic parameters.

Table 33: Annual Turnover in Macro-economic Parameters

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	-	-	-	-	-	-	-	-	-
Beef Farming	-	-	-	-	-	-	-	-	-
Game Farming	0.78	0.19	0.97	4	1	5	0.09	0.07	0.02
Hunting	-	-	-	-	-	-	-	-	-
Taxidermy, Game catching, etc.	0.03	0.03	0.06	0	-	0	0.02	0.01	0.00
Accommodation	24.68	28.78	53.46	130	122	252	17.39	12.97	4.42
Total	**25.49**	**29.00**	**54.49**	**135**	**123**	**258**	**17.49**	**13.05**	**4.44**

The table shows that the direct GDP created is around R25.49 million with a total GDP of R54.49 million. The total employment created is 258 with 135 direct and 123 indirect and induced opportunities. The payments to households come to R17.49 million, with R4.44 million to low income households in the area; this is 25.4% of the total.

As far as the possible impact of the mining is concerned, the ground water report raises the possibility that the warm water spring may be destroyed. This is not a certainty and thus leaves us with two possibilities, namely:

- The spring is not affected, or
- The hot spring is destroyed.

If the spring is not affected then no economic impact will take place. However, if the spring is impacted upon then the following possibilities arise:

- Only the winter months will be negatively impacted on due to the water probably being too cold and visitor numbers will be reduced dramatically. The summer visitors will probably still frequent the resort.
- Forever Resorts may opt to heat the water during the winter months; this will obviously involve large capital investments and necessitate an increase in rates to cover the capital and operational costs.

Only the first option has been analysed at this stage as the actual costs of the second option is not available at such short notice. Also, no analysis has been made of the future profitability of the resort should the hot water spring be destroyed and no opinion is expressed should this scenario occur.

The 49% income of the winter months is used to reflect the possible impact expressed in macro-economic parameters. The following table presents the numbers if a 49% negative impact is experienced.

	Gross Domestic Product			Employment			Payments to Households		
	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total	Total	High/ Medium	Low
	R mil.	R mil.	R mil.	Number	Number	Number	R mil.	R mil.	R mil.
Irrigation	-	-	-	0	0	0	-	-	-
Beef Farming	-	-	-	0	0	0	-	-	-
Game Farming	-	-	-	0	0	0	-	-	-
Hunting	-	-	-	0	0	0	-	-	-
Taxidermy, Game catching, etc.	-	-	-	0	0	0	-	-	-
Accommodation	-12.15	-14.17	-26.32	-64	-61	-125	-8.56	-6.39	-2.17
Total	**-12.15**	**-14.17**	**-26.33**	**-65**	**-61**	**-126**	**-8.56**	**-6.39**	**-2.17**

The table indicates that as many as 65 of the direct jobs could be destroyed with a further 61 indirect and induced. Payments to low income households can be reduced by R2.17 million.

Proposed mitigation measures are that a detailed analysis of the source of the hot water spring be made in cooperation of the Forever Resorts management, before any mining activities proceed.

4.3.5.3 Impact on Villages Outside of the MRA Area

The following villages Dolidoli (to the south), Ndouvhada, Thiel and Garside (to the south east) and Smokey (to the east) are all dependant on boreholes for domestic water. According to the Groundwater Flow Impact Assessment Report – Final – dated 8 December 2013 the possibility exists that the water sourced from boreholes serving the five villages might be affected due to the possible drawdown envisaged. As these villages are located outside of the MRA area, further study will be required in order to determine the impact should the water supply be affected.

5 Cost Benefit Analysis: Justification of the Greater Soutpansberg Project – Generaal

5.1 Objective of the Cost Benefit Analysis

The principles underlying the Standard Cost Benefit Analysis (CBA) are applied to evaluate the financial and economic viability of the Generaal Project, taking into consideration all negative and positive costs (impacts) of the mining activities.

The CBA approach provides a logical framework by means of which development projects can be objectively evaluated and, as such, serves as an aid in the decision-making process. (A more detailed explanation of the CBA can be found in Appendix B).

5.2 Cost Benefit Analysis Methodology

A CBA comprises two distinct portions, a financial CBA component and an economic CBA component. The financial CBA component is based on market and nominal prices, whilst the economic CBA component is based on shadow/economic and constant prices. The use of shadow/economic prices is necessary in order to reflect more realistic values of scarce economic resources. Market prices often do not give a true representation of the scarcity values of resources, owing to interference in market price setting such as government tax regulation and artificial adjustments to, for example, fossil fuels prices, electricity tariffs and minimum wage levels.

Within the CBA framework, various impacts have been calculated for each year of the project period.

The impacts for each year of the project are discounted to present values, using an appropriate discount rate. The financial CBA is conducted in current prices (with the assumption that the SA inflation rate over the longer period will be less than 6%) and a real yield on capital of 5% giving a discount rate of 11% per annum, reflecting the cost of capital. The economic CBA is done in constant prices and discounted by a social discount rate of 8% per annum.

The CBA methodology has been chosen to indicate whether the project in question is feasible or not. Within the framework, the estimated cost of the project is compared by means of a ratio (Benefit Cost Ratio) to the estimated benefits of the project. In order for a project to be considered financially and economically viable, this ratio must have a value greater than 1 in order to indicate that benefits outweigh costs.

Additional viability indicators provided are Net Present Value (NPV) and Internal Rate of Return (IRR). A more detailed discussion on the interpretation of each indicator is included in the results section of each of the two CBA components.

5.3 General Overview

The CBA clearly distinguishes between cost and benefit aspects of the project.

Costs: Within the CBA framework, the costs related to the project can be separated into three distinct components:

- capital expenditure;
- operational expenditure; and

- external cost impacts (externalities).

This breakdown mirrors the more widely-defined macro-economic impact, a discussion of which follows in Appendix A.

Capital expenditure is made up of:

- Investment in the mine infrastructure itself (the largest capital expenditure component);
- Expenditure on the construction of transport infrastructure;
- Expenditure on the development of structures to supply water to the mine.

Operational expenditure includes:

- Railway maintenance cost and operational costs,
- Water Supply - Maintenance and Operation costs,
- Processing costs, and
- Coal Transport and port costs.

The benefits of the project are in the form of revenue generated from the sale of the extracted coal to domestic markets, in lieu of imported coking quality coal or revenue from exporting of the coal.

5.4 Assumptions Underlying the CBA

5.4.1 Costs Relating to the Project

The assumptions that were used in relation to the costs for both the financial and economic CBA are briefly discussed below.

5.4.1.1 Capital Expenditure:

The Generaal Project consist of two separate mines that are separately phased and developed (Generaal open pit and Mount Stuart underground) in the same area nearly 14 years apart. All capital expenditure is assumed to occur over a two three year construction periods with a three year early planning period namely 2015 to 2017. The Mount Stuart construction period is estimated to be from 2018 to 2020. The Mount Stuart life of mine (LOM) period runs from 2019 to at least 2039, 21 years, during which period the coal resources at the project location should be exhausted.

The Generaal Project construction is planned to start in 2031 to 2033. The Generaal Project is divided into two phases; first Mount Stuart, then Generaal. The Mount Stuart mine will be developed first followed by the Generaal mine.

The estimated Capital expenditure as provided by CoAL is provided in the table below:

Table 34: Projected Capital Expenditure for the proposed Mount Stuart and the Generaal Sections (2013 constant prices)

	Generaal			Mount Stuart		
	Financial Costs	Shadow Price Factor	Economic Costs	Financial Costs	Shadow Price Factor	Economic Costs
	R Millions		R Millions	R Millions		R Millions
Upfront Capex	**71.19**	**0.9866**	**70.24**	**306.78**	**0.9866**	**302.68**
Capital Construction costs	**2 164.99**	**0.9659**	**2 097.60**	**2 043.80**	**0.9659**	**1 994.82**
Exploration	74.34	0.9896	73.57	74.34	0.9896	73.57
Bulk Services	133.34	0.9323	124.31	150.18	0.9323	140.02
Mine Infrastructure	416.84	0.9855	410.80	259.61	0.9855	255.85
Surface Mining	513.99	0.9323	479.19	184.13	0.9323	171.66
ROM Handling	263.48	0.9837	259.19	203.54	0.9837	200.22
Plant	-	0.9857	-	313.61	0.9857	309.13
Product Handling	281.57	0.9837	276.98	376.96	0.9837	370.81
Overheads	481.42	0.9837	473.57	481.42	0.9837	473.57

From the above it appears that, expressed in 2013 prices, the estimated capital for the Mount Stuart mine the estimated capital is R2 044 million with R307 capital upfront. In the case of the Generaal mine the capital expenditure is estimated at R2 165 million, with upfront capital spending of R71 million.

In the following table the construction schedule and associated amounts for the Mount Stuart mine is presented.

Table 35: Mount Stuart Mine Proposed Construction Schedule and Capital Costs (constant 2013 prices)

	2015	2016	2017	2018	2019	2020	Total
Upfront Capex (R Mil)	92.00	103.00	65.00	7.00	3.00	36.78	**306.78**
Construction Schedule	0%	0%	0%	20%	50%	30%	**100%**
Capital Construction costs (R Mil)	-	-	-	408.76	1 021.90	613.14	**2 043.80**

The above table shows that it is planned that the upfront Capex will be spent over a period of six years for the Mount Stuart mine.

In the following table the construction schedule and associated amounts for the Generaal mine are presented.

Table 36: Generaal Mine Proposed Construction Schedule and Capital Costs (constant 2013 prices)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Upfront Capex (R Mil)	41.32	-	-	-	25.91	-	-	-	2.60	-
Construction Schedule	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Capital Construction costs (R Mil)	-	-	-	-	-	-	-	-	-	-

Year	2031	2032	2033	Total
Upfront Capex (R Mil)	-	-	1.35	**71.19**
Construction Schedule	20%	50%	30%	100%
Capital Construction costs (R Mil)	433.00	1 082.50	649.50	2 164.99

The above table shows that planned upfront Capex will be incurred over four phases in 2021, 2025, 2029 and 2033 and that construction costs will be incurred over a period of three years.

5.4.1.1.1 Operational Expenditure

In the following tables the projected mining costs used in the model is presented as received from mining consultants.

Table 37: Generaal Estimated Operational Mining Cost (2013 constant prices)

Item	Cost per year Rand	Rate Rand/ton
Parting Mining	-	44.15
Coal Mining	-	43.31
Diesel	-	10.45
Exploration & Drilling	3 000 000.00	-
Head Office	3 000 000.00	-
Mining Contractor	8 400 000.00	-
Other Fixed	5 100 000.00	-
Owners Team	9 000 000.00	-
Processing	-	39.97
Rehabilitation	-	0.24
Siding	-	5.40
Soft Overburden including waste	-	-
Survey	1 680 000.00 -	-
Topsoil Stripping	-	-
Waste Mining	-	37.98
Port	-	36.57
Rail Export	-	122.43

Table 38: Mount Stuart Estimated Operational Mining Cost (2013 constant prices)

Item	Cost per year Rand	Rate Rand/ton
Parting Mining	-	-
Coal Mining	-	132.36
Diesel	-	-
Exploration & Drilling	-	-
Head Office	-	-
Mining Contractor	-	-
Other Fixed	-	-
Owners Team	-	-
Processing	-	55.67
Rehabilitation	-	-
Siding	-	5.40
Soft Overburden including waste	-	-
Survey	-	-
Topsoil Stripping	-	-
Waste Mining	-	-
Port	-	-
Rail Export	-	-

The following transport costs were used in the calculations as presented in the tables above:

- Loading Cost – R5.40 per saleable ton for both Generaal and Mount Stuart.
- Rail transport from Siding to Maputo – R122.43 per ton.
- Port Costs – R36.57 per ton.

The estimated maintenance costs expressed as a percentage used in the CBA model is presented in the following table.

Table 39: Projected Maintenance Costs

	Generaal	Mount Stuart	Classification	Maintenance %	Generaal (R millions)	Mount Stuart (R millions)
Exploration	74.3	74.3	Civil	0.5%	0.37	0.37
Bulk Services	133.3	150.2	Civil	0.5%	0.67	0.75
Mine Infrastructure	416.8	259.6	Mechanical	5.0%	20.84	12.98
Surface Mining East Pit	514.0	184.1	Civil	0.5%	2.57	0.92
Surface Mining Central Pit			Civil	0.5%		
Surface Mining West Pit			Civil	0.5%		
ROM Handling	263.5	203.5	Mechanical Structures	1.0%	2.63	2.04
Plant		313.6	Engineering	5.0%		15.68
Product Handling	281.6	377.0	Mechanical Structures	1.0%	2.82	3.77
Overheads	481.4	481.4		0.0%		
Discard Dump				0.0%		
Total	**2 165**	**2 044**			**29.90**	**36.51**

At full production the amount of R29.90 million is allocated as maintenance per annum for Generaal mine and R36.51 million as maintenance cost for Mount Stuart mine.

5.4.1.2 Externalities

A number of externalities have been identified which have been costed and were included in the model. The following have been included:

- Current Local Economic Activities. These costs have been estimated in a separate section and are included in the appropriate model. The costs to the farming livestock, game and irrigation practices are discussed in detail in a previous section and the estimated annual loss in turnover by the three categories of farms were investigated and added together and an amount of R7.75 million per annum was added to the CBA as a cost to the system.
- Rehabilitation and Environmental Costs. The amount of R0.235 per ton was used as the rehabilitation costs. A value of R35.44 million was estimated and included as the environmental cost item. It must be emphasised that this amount can change as the rest of the project reports become available.
- Mine Closure: A statuary amount of R210 million was used over time in constant prices.

5.4.2 Social Costs

As no social cost has yet been provided, the item is not included in the analysis.

5.4.3 Benefits Relating to the Project

The benefits associated with the project are the revenue resulting from the sale of the coal to Eskom and the coal exported. Two issues are important in this instance, namely the quantity of coal produced the tons as provided by the mining report has been used for the base calculation.

Two price structures are present in this case, namely; the Eskom price and the export price. The Eskom price is determined during a negotiation process and is at present calculated using the Giga

Joules output per ton at R10.51 per Giga Joule. The coal price is estimated at R283/ton for both Generaal and Mount Stuart. It is obvious that these prices will depend on the quality of the coal supplied and is at present based on the provided giga joules output of the coal.

As far as the export price is concerned two factors play a role, namely; international demand which again is influenced by the health of the world wide economy and the relative strength of the Rand versus the US$. International prices are quoted in US Dollars and the exchange rate has a direct influence on the Rand price. For the base price $171 per ton was used with an exchange rate of R9.50 to the US$. Sensitivity analyses were run on a number of price scenarios and are reported on separately.

5.5 Results

5.5.1 Financial Cost Benefit Analysis

The table below reflects the summarised results of the Financial CBA. As previously discussed, the analysis has been done in nominal terms at a 6% SA inflation rate, and using a financial discount rate of 11% per annum. The long-term discount rate of 11% is in line with a real interest rate of 5%. However, it was necessary to change certain item inflation rates because of certain externalities applicable to specific items.

The following detailed rates were used.

Table 40: Inflation Rates used in the Financial CBA Model

Cost Item	Inflation Rate[22]
Coal Price	6%
Capital	6%
Mining Costs - Including Labour and Electricity	8.5%
Maintenance Costs	6%
Transport Costs	7.5%
Disbenefits	6%

As construction capital is utilised over a number of years the constant prices had to adapted, using the Reserve Bank upper limit.

Mining costs includes labour and electricity and it was necessary to make provision for a higher rate, the same apply to the transport costs.

The results for the total mining project are presented in the table below.

---

[22]Source: Mosaka Projections

Table 41: Results of the Financial CBA (Current prices) – Excluding Impact on Tshipise Holiday Resort

	CBA Results		
	NPV	*IRR*	*BCR*
Financial CBA Results	Rand Million	%	number
Indicators	3 479.34	23.4%	2.17

Table 42: Results of the Financial CBA (Current prices) - Including Impact on Tshipise Holiday Resort

	CBA Results		
	NPV	*IRR*	*BCR*
Financial CBA Results	Rand Million	%	number
Indicators	3 111.33	21.8%	2.05

Results are interpreted as follows:

- The Net Present Value (NPV) of an investment compares the present value of the benefits from an investment with the present value of all costs. In order for a project to be considered viable, a positive NPV is required as this indicates that the overall benefits outweigh the overall costs of the project over time. The NPV above shows that the net benefit accrued is positive with an amount of R 3 479.34 million, excluding the possible impacts on Tshipise Holiday Resort, while the NPV including the impacts on Tshipise Holiday Resort is estimated at R3 111.33 million
- The Benefit Cost Ratio (BCR) is a ratio of the present value of benefits relative to the present value of costs. A project should only be considered viable if the BCR is greater than 1. The BCR of 2.17 implies that for each Rand invested in the project there is an expected return of R2.17 if there is no impact on Tshipise Holiday Resort. However, with an estimated impact on Tshipise included, the BCR is expected to be slightly less at 2.05, indicating a return of R2.05 per R1 invested.
- The Internal Rate of Return (IRR) is the discount rate at which present values of both benefits and costs are equal. Projects should have and IRR greater than the discount rate to be considered viable. The IRR is 23.4% without the impact on Tshipise Holiday Resort, which is twice higher than the 11% discount rate. When the possible impacts on Tshipise Holiday Resort are included, the IRR is slightly less at 21.8%.
- The NPV, BCR and IRR all confirm the financial viability of the project when the impacts on Tshipise are included as well as when the impacts are excluded.

5.5.2 Economic Cost Benefit Analysis

The economic CBA is conducted in terms of the economic values of costs and benefits. For this purpose, the shadow prices are used in order to reflect the real cost of using scarce economic resources in the production processes, as discussed in the Methodology. Constant 2012 prices are used and a Social Discount Rate of 8% is applied.

Table 43: Results of the Economic CBA (Economic prices) - Excluding Impact on Tshipise Holiday Resort

	CBA Results		
	NPV	*IRR*	*BCR*
Economic CBA Results	Rand Million	%	number
Indicators	1 845.94	17.2%	1.86

Table 44: Results of the Economic CBA (Economic prices) - Including Impact on Tshipise Holiday Resort

	CBA Results		
	NPV	*IRR*	*BCR*
Economic CBA Results	Rand Million	%	number
Indicators	1 599.81	15.7%	1.75

The results show the following features:

- When considering the economic CBA, results similar to those in the Financial CBA are depicted. The discount rate used for the economic CBA is 8% per annum and figures are not adjusted for inflationary effects. The NPV shows that a net gain of R1 845.9 and R1 599.81 million will be accrued without and with the Tshipise Holiday Resort impacts respectively.
- The BCR of 1.86 shows that returns of R1.86 are expected for each Rand invested in the project without the inclusion of Tshipise Holiday Resort. With the impacts of Tshipise Holiday Resort, the BCR is 1.75, indicating a return of R1.75 for every R1 invested.
- The IRR is 17.2% without the impacts on Tshipise Holiday Resort, which is higher than the social discount rate of 8%. The IRR including the impacts on Tshipise Holiday Resort is 15.7%, which is still higher than the 8% discount rate.
- The NPV, BCR and IRR all confirm economic viability of the mining project.

5.5.3 Sensitivity Analysis

A sensitivity analysis was performed on a number of price options, specifically the export price as expressed in US$ terms and the possible movements in the exchange rate.

The following options were considered namely a 10% drop in US$ prices and a remarkable strengthening of the Rand against the dollar. In the following graph the NPV of a $171 per ton international price with a strengthening Rand is presented.
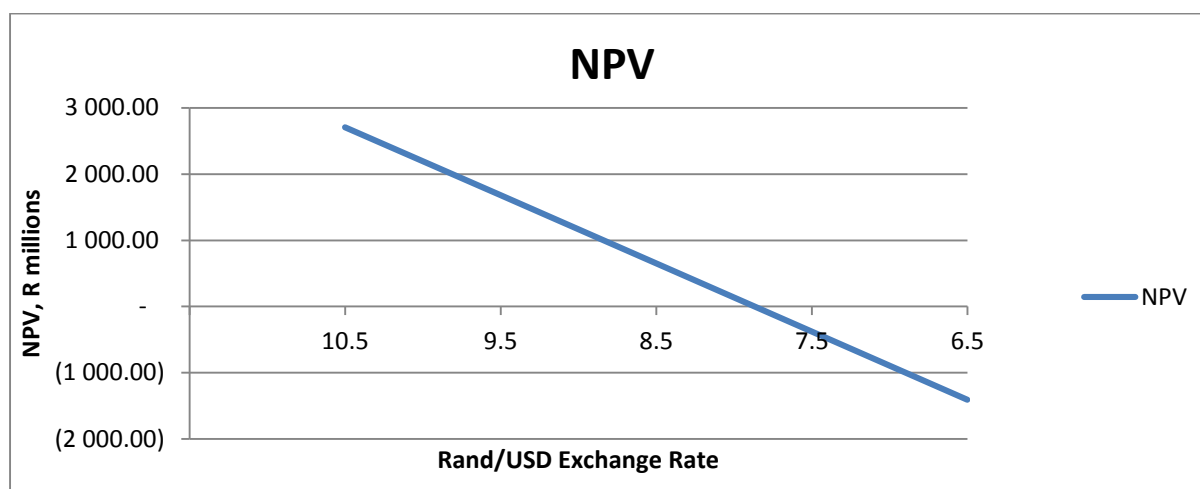
The graph indicates that with a $171 per ton international price and an exchange rate of about R8.00 to the US$ the NPV still remains positive. It must be kept in mind that less than two years ago the international price was around $207 per ton and the exchange rate R7 to the US$, giving a rand price of nearly R1 450 per ton. The current $171 per ton at R8.00 to the US$ gives a rand price of R1 368 per ton and with the prevailing exchange rate of R9.50 plus to the US$, the price per ton expressed in RSA Rand is R1 624.

The analyses for Generaal and Mount Stuart mines were based on a certain number of assumptions regarding the Rand/USD exchange rate as well as the real domestic price. The real domestic price of coal was assumed to increase at a rate of 0.92% per annum. It is also assumed that the Rand will get weaker overtime (deteriorating at a rate of 0.5% per annum), resulting in higher export prices. A comparison of IRR at different price and exchange rate scenarios is given below.

Table 45: IRR Sensitivity, Financial CBA

IRR	Exchange Rate R9/1$US	Domestic Price
15.8%	9.00*	283.72**
23.4%	9.50***	283.72****

*	**Constant Rand/USD exchange rate**
**	**Constant coal domestic price**
***	**Rand deteriorating at 0.50% against US Dollar**
****	**Domestic coal price increasing at a real growth rate of 0.92% per annum**

The table above indicates the extent to which the results are affected by the movements in the exchange rate and the assumptions on real growth of domestic coal price. If the domestic price and the exchange rate are kept constant, the IRR becomes slightly less.

Approximately 10.1 million tons of coking coal is expected to be produced over the LOM from the Mount Stuart Section with another approximate 8.6 million tons from the Generaal Section. About 62% of the total estimated production from the Generaal Section will be destined to Eskom. For the

Mount Stuart Section, 63% of total production is destined to Eskom. The 2011 price of HCC[23] coking coal was at an all-time high, the Australian coking coal varied from July 2010 to June 2011 from US$ 225 to $328 per ton FOB. The September 2013 the price is varying around US$ 147 per ton FOB. As the coking coal, SHCC[24] variety, from the proposed mine will have to compete with the imported variety for the Vanderbijl Park smelters, the determination of the price will be an important aspect and the exchange rate also play a vital role. Determining the Free-on-Board (FOB.) price was therefore a bit of a puzzle and it is necessary to discuss some of the parameters used in the calculations:

1) **The 2011 situation**
   - FOB HCC price expressed in US$ - $207 ton/coking coal, the average 2010 price,
   - Exchange rate – R7 per 1US$,
   - Providing a FOR price of R1449 per ton.
2) **Current 2013 situation**
   - Average 2013 FOB price expressed in US$ - $171 per ton[25],
   - Exchange Rate –R9.50 per 1 US$,
   - Providing a FOB price of R1 624 per ton.

Although the HCC price has dropped in US$ terms by 8%, expressed in terms of Rand the price has actually increased by 12%.

Coal had a separate coking coal market study done by Wood Mackenzie; the report forecasted the following price scenario for the next number of years based on the different coking quality coal. In the next table is a summary of the forecasted prices for HCC[26] and the next grade SHCC coking coal.

Table 46: Projected HCC and SHCC Prices used in the Analysis

	2013	2014	2015	2020	2025	2030
HCC (Qld)	171.25	176.25	184	194	229	235
SHCC (Qld)	143.64	147.84	154.56	164.9	194.65	202.1

The table shows that the price over time is expected to increase in constant terms; we accepted these figures for the base scenario as they are in line with other predictions found in a cursory research of possible coal price expectations.

The second issue is the possible movement of the South African Rand exchange rate. For the base scenario, an annual weakening of 0.50% of the South African Rand against the US Dollar was assumed. However, current predictions produce even a faster deterioration of the value of the Rand.

All international price projections indicate a strengthening of the international price over time. Mosaka Consultants is therefore of the opinion that the economic viability of the project is strong and the project is feasible.

---

[23] Hunters Valley Coking Coal – the so called best quality coking coal
[24] SHCC –Semi Hard Coking Coal
[25] Wood Mackenzie - Market Study for CoAL - 2012
[26] HCC – Hard Coking Coal

5.5.4 CBA Conclusion

For the purposes of this analysis, a CBA tool was used in order to consider the viability of the Generaal Project.

In conducting the CBA, the various stakeholders, who will be either positively or negatively impacted by the project, have been identified. The various impacts have been calculated for each year over the period that was used to evaluate the project, and then discounted to present values, using appropriate discount rates. The financial CBA has been done in nominal prices and discounted by a rate reflecting the cost of capital of 11%. The economic CBA has been done in constant and shadow prices and discounted by a social discount rate of 8%.

It thus appears that overall the project is economically viable using a CBA approach, as the analysis renders positive results.

6 Macro-Economic Impact Analysis: National, Regional and Local Impacts of the Proposed Greater Soutpansberg Project - Generaal

6.1 Objective

The objective of this section is to present the macro and socio-economic impacts that emanate from both the construction and operational phases of the capital investment project under consideration. The Cost Benefit Analysis (CBA) preceded the macro-economic impact analysis and the information requirements for the CBA will serve as a major data source needed to initiate the macro-economic modelling system that quantifies the impacts.

The macro-economic impact analysis was conducted at a national, regional/provincial and local level. However, the main focus of the analysis is the Limpopo Province and the Makhado and Musina Local Municipality areas, in particular. The impact analysis is based on the contribution that the project is expected to make towards the national, provincial and local economies in terms of the following macro-economic aggregates:

- Gross Domestic Product (Economic Growth);
- Employment Creation:
  - ➢ Skilled Labourers;
  - ➢ Semi-Skilled Labourers; and
  - ➢ Unskilled Labourers.
- Capital Utilisation (Investment);
- Household Income (Poverty Alleviation in terms of Low Income Households);
- Fiscal Impacts; and
- Balance of Payments.

The macro-economic impact analysis was so structured to reflect the average annual production output over the project period of 30 years. Furthermore these macro-economic impacts also reflect the ultimate or total outcome, i.e. through the direct, indirect and induced linkages of the construction and operational parts of the project in question.

6.2 Methodology

6.2.1 Overview of the Macro-Economic Impact Analysis

As indicated previously in the report, the main purpose of this chapter of the study is to estimate the impact of the proposed Generaal Project on the South African economy as well as to give an indication of the impact it will have on the provincial economy of Limpopo and the local economy of Musina and Makhado Local Municipalities. *It is important to note that the National and Provincial macro-economic impact results are shown in a separate format for the construction and operational phases*. For purposes of the impact analysis Conningarth Economists has compiled and updated Social Accounting Matrixes (SAMs) for the South African and Limpopo economies which formed the basis of the impact model – *viz* – a general equilibrium model. This model will quantify the direct, indirect and induced impacts over time.

The compilation of the updated South African and Limpopo SAMs was part of a major initiative by the Development Bank of Southern Africa (DBSA), Department of Provincial and Local Government (DPLG), Statistics South Africa (StatsSA) and the South African Reserve Bank (SARB) to compile nine comparable provincial SAMs that have all been updated to 2006 prices and have been benchmarked with the new South African SAM of 2006. The Limpopo SAM was finalized in October 2009, and was overseen by an expert group of people from the Limpopo Province, chaired by the Limpopo Economic Development Department.

The benchmarking exercise was necessary to ensure that all control totals add up to the National Account figures as reflected in the SARB Quarterly Bulletin – June 2008 and the relevant figures reflected in the StatsSA publications, especially P0144 that reflects the 2006 Supply and Use Matrix.

The provincial SAMs compiled by Conningarth Economists were converted into user-friendly macro-economic impact models which can be used by each province to calculate the economic impact of "interventions" by way of programmes and projects on the economy of the relevant province.

The model makes use of Excel spread sheets and is driven by a set of "Macros" which are used to eliminate the need to repeat the steps in a simple task over and over. For a specific project or say a policy intervention, the model provides the size of the macro-economic impacts, the values of which are then also used to calculate key economic performance or efficiency indicators at national, provincial and local government level. Such key macro-economic performance indicators can be produced for both the construction and operational phases of a specific project.

It is also important to highlight the fact that the macro-economic impact model is robust enough to cater for varying degrees of input data qualities and availability. For instance, if the impacts are required at local government level, the model lends itself well to adjusting relevant provincial coefficients to realistically portray the situation at lower levels.

6.2.2 The Social Accounting Matrix

In layman's terms a Social Accounting Matrix (SAM) also represents a mathematical matrix depicting the linkages that exist in financial terms between all the major role players in the economy, i.e. business sectors, households and government. It is very similar to the input/output table in the sense that it also reflects the inter-sectorial linkages that are present in an economy. The development of the SAM also provides a logical framework within the context of the National Accounts in which the activities of especially households are accentuated and distinguished prominently. The households are indeed the basic economic unit where significant decisions are taken affecting economic variables, such as consumption expenditure and personal saving. By combining households into homogenic groups in the SAM, makes it possible to study how the economic welfare of these groups is affected by changes in the economy.

To summarise, the SAM serves a dual purpose. Firstly, it is a reflection of the magnitude of financial linkages that exist between the major stakeholders in an economy, and secondly, it becomes a powerful econometric tool that can be used to conduct various economic analyses such as calculating the impact of investment projects on the economy. A more detailed technical description of the SAM and its analytical attributes are provided in Appendix A.

By applying the general tenets of the general equilibrium economic model to the SAM structure, the so-called direct, indirect and induced effects emanating from the various levels of value adding at all levels i.e. primary (including mining), manufacturing, commercial services etc. are quantified.

The direct impact that occurs, for example, in the mining industry, is measured through changes in production/turnover, payment of remuneration to employees and profit generation. The indirect impacts refer to impacts on industries that provide raw material inputs to the mining industry and other backward linkages. The induced effect or income effect refers to a further round of economic activity that takes place in the economy because of additional consumer spending as a result of the additional salaries and wages that occur throughout the economy. The impact analysis will be based on the standard economic aggregates.

6.3 Data Sources and Assumptions

Modelling the macro-economic impact of the construction and operational phases of the Generaal Project requires certain detailed information regarding these two phases of the project. However complicating the issue is the two sections of the project namely; the Generaal and Mount Stuart Sections, which will be developed apart over a number of years. The construction data used in the analysis is the capital cost for an average year during the construction period of the first of the mines to start producing, interpreting the results means that for the two separate four construction periods is the estimated annual impact.

The same applies to the operational phase as the Mount Stuart mine is in production a number of years before the Generaal mine starts with production. The results are presented are for an average Mount Stuart production year and then for a combined production year for both mines.

When evaluating the construction and operational phases the model requires information on the new mine such as costs of buildings, machinery and equipment, etc. This type of data as well as the planned outputs of the mine, etc. are discussed in detail in the appropriate section. There are, however, also externalities linked to the operation of the mine, such as the negative impact on agriculture and positive impacts on government spending. The possible magnitude of these externalities is discussed in detail in the previous chapters.

6.4 Macro-Economic Impact Results on the National Economy

6.4.1 Summary of Results

The following macro-economic impact table reflects the total construction phase and the average annual totals for the operational phase for the 21 year period on the Province of Limpopo. The components measured incorporate the construction and operation of the mine, transport and water supply of the project.

In the tables below the impact on the National Economy for the Generaal and Mount Stuart Sections are presented for the construction period and the operational period.

Table 47: The Annualised Macro-economic Average Impact of the Construction Phase of the Mount Stuart Mine on the South African Economy (2013 prices)

| | Construction Impact: *National* | | | |
| | 2.Mining | | | |
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	179	195	260	**634**
Impact on capital formation	260	322	483	**1065**
Impact on employment [person years]	1335	521	707	**2563**
Skilled impact on employment [person years]	248	122	171	**541**
Semi-skilled impact on employment [person years]	618	220	294	**1132**
Unskilled impact on employment [person years]	469	179	242	**890**
Impact on Households				428.95
Low Income Households				66.94
Medium Income Households				82.73
High Income Households				279.28
Fiscal Impact				192.76
National Government				177.14
Provincial Government				2.17
Local Government				13.44
All monetary numbers represent Rand millions.				

The above table presents the macro-economic results per annum during the construction phase of the Mount Stuart Mine.

Table 48: The Annualised Macro-economic Average Impact of the Construction Phase of the Generaal Mine on the South African Economy (2013 prices)

| | Construction Impact: *National* | | | |
| | 2.Mining | | | |
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	185	202	268	**655.05**
Impact on capital formation	269	332	499	**1 100.81**
Impact on employment [person years]	1 379	538	731	**2 649**
Skilled impact on employment [person years]	256	126	177	**559**
Semi-skilled impact on employment [person years]	639	228	303	**1 170**
Unskilled impact on employment [person years]	484	185	251	**920**
Impact on Households				443.2
Low Income Households				69.2
Medium Income Households				85.5
High Income Households				288.6
Fiscal Impact				199.2
National Government				183.04
Provincial Government				2.25
Local Government				13.89

Note: All Rand values reflected are expressed in Rand Millions

The above table presents the macro-economic results per annum during the construction phase of the Generaal Mine.

Table 49: The Annualised Macro-economic Impact of the Operational Phase of the Mount Stuart Mine on the South African Economy (2013 prices)

	Operational Impact: *National*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	967	372	989	**2 328**
Impact on capital formation	759	870	1 839	**3 467**
Total impact on employment [job opportunities]	479	1 020	2 733	
Skilled impact on employment [job opportunities]	77	227	655	**959**
Semi-skilled impact on employment [job opportunities]	316	421	1 136	**1 873**
Unskilled impact on employment [job opportunities]	86	371	943	**1 400**
Impact on Households				**1627.81**
Low Income Households				**270.76**
Medium Income Households				**668.80**
High Income Households				**782.86**
Fiscal Impact				**639.77**
National Government				590.86
Provincial Government				6.89
Local Government				42.01
Impact on the Balance of Payments				**995.16**
All monetary numbers represent Rand millions.				

Table 50: The Annualised Macro-economic Impact of the Operational Phase of the Generaal Mine on the South African Economy (2013 prices)

	Operational Impact: *National*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	1 296	499	1 326	**3 122**
Impact on capital formation	759	1 167	2 465	**4 391**
Total impact on employment [job opportunities]	505	1 367	3 665	**5 537**
Skilled impact on employment [job opportunities]	81	305	878	**1 264**
Semi-skilled impact on employment [job opportunities]	333	565	1 523	**2 421**
Unskilled impact on employment [job opportunities]	91	498	1 265	**1 853**
Impact on Households				**2182.75**
Low Income Households				**363.06**
Medium Income Households				**896.80**
High Income Households				**1049.74**
Fiscal Impact				**857.87**
National Government				792.29
Provincial Government				9.24
Local Government				56.33
Impact on the Balance of Payments				**1334.42**

Note: All Rand values reflected are expressed in Rand Millions

Table 51: The Annualised Macro-economic Impact of the Operational Phase of the Mount Stuart and Generaal Mines on the South African Economy (2013 prices)

	Operational Impact: *National*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	2 263	872	2 315	**5 450**
Impact on capital formation	759	2 037	4 304	**7 100**
Total impact on employment [job opportunities]	984	2 387	6 398	**9 769**
Skilled impact on employment [job opportunities]	157	532	1 533	**2 222**
Semi-skilled impact on employment [job opportunities]	649	986	2 658	**4 294**
Unskilled impact on employment [job opportunities]	177	869	2 208	**3 253**
Impact on Households				**3810.56**
Low Income Households				**633.82**
Medium Income Households				**1565.60**
High Income Households				**1832.60**
Fiscal Impact				**1497.63**
National Government				1383.15
Provincial Government				16.14
Local Government				98.35
Impact on the Balance of Payments				**2329.59**
All monetary numbers represent Rand millions.				

6.4.2 Impact on Gross Domestic Product (GDP)

GDP is a good indicator of economic growth and welfare as it represents, among other criteria, remuneration of employees and gross operating surplus (profits) as components of value added at all the levels of the economy.

According to Table 47 the total GDP of the construction phase impact on the RSA's GDP of the Mount Stuart Mine is estimated to amount to approximately R633.9 million (in constant, 2013 prices) annual impact over the construction period, of which the direct impact is estimated at R179 million.

According to Table 48 the total GDP of the construction phase impact on the RSA's GDP of the Generaal Mine is estimated to amount to approximately R655.05 million (in constant, 2013 prices) annual impact over the construction period, of which the direct impact is estimated at R185 million.

Similarly, Table 49 reflects the total average annual GDP, during the Mount Stuart operational phase, impact on the RSA's GDP, which is estimated to amount to approximately R2 328 million (in constant, 2013 prices), of which the direct impact is estimated at R967 million and accounting for nearly half (41.3%) when compared to the total GDP. This emphasises the importance of the so-called multiplier effects which the mine will have on the South African economy.

Similarly, Table 50 reflects the total average annual GDP, during the Generaal operational phase, impact on the RSA's GDP, which is estimated to amount to approximately R3 122 million (in constant, 2013 prices), of which the direct impact is estimated at R1 296 million and accounting for

nearly half (41.5%) when compared to the total GDP. This emphasises the importance of the so-called multiplier effects which the mine will have on the South African economy.

Similarly, Table 51 reflects the total average annual GDP, during the Mount Stuart and Generaal operational phase during the period that they will be operating simultaneously, impact on the RSA's GDP, which is estimated to amount to approximately R5 450 million (in constant, 2013 prices), of which the direct impact is estimated at R2 263 million and accounting for nearly half (41.4%) when compared to the total GDP. This emphasises the importance of the so-called multiplier effects which the mine will have on the South African economy.

From these figures, it can already be assumed, that the ultimate benefit of the bulk of salaries and wages paid out, directly and indirectly, in the course of constructing and operating the project will not accrue within Limpopo, but will filter through to the other provinces in SA.

6.4.3 Impact on Capital Investments

Productive capital assets are required to support or generate any given amount of economic activity (i.e. GDP). These capital assets, together with labour and entrepreneurship, form the core productive factors needed for production. Obviously the effectiveness and efficiency with which these factors are combined will determine the overall level of productivity and profitability of such assets. The former will in turn depend on a whole array of factors, of which the appropriate technology and skills content of the labour force are important. The above Table 47 indicates the following: construction phase capital stock that needs to be employed (utilised) nationally to sustain this project amounts to R1 065.3 million, of which, R260 million is attributed directly to the Mount Stuart mine annually during construction. Table 48 indicates the following: construction phase capital stock that needs to be employed (utilised) nationally to sustain this project amounts to R1 100.8 million, of which, R269 million is attributed directly to the Generaal mine annually during construction.

During the operational phase of the Mount Stuart mine the total annual capital necessary to sustain the mining activity is presented in Table 49 and amounts to R3 467 million. During the operational phase of the Generaal mine the total annual capital necessary to sustain the mining activity is presented in Table 50 and amounts to R4 291 million.

During the combined production period of both mines the annual capital necessary to sustain mining activity is presented in Table 51 and amounts to R 7 100 million.

6.4.4 Impact on Employment Creation

During the Mount Stuart construction phase (Table 47) the annual impact on total employment amounts to 2 563 employment opportunities that will only be sustained over the construction period. Of this number, the annual labour compliment of 1 335 during the construction phase is associated directly with the project.

During the Generaal construction phase (Table 48) the annual impact on total employment amounts to 2 649 employment opportunities that will only be sustained over the construction period. Of this number, the annual labour compliment of 1 379 during the construction phase is associated directly with the project.

The Mount Stuart operational phase impact (Table 49) on employment amounts to 4 232 employment opportunities that will be sustained on an annualised basis over the lifespan of the mine in the province. Of this number, 479 employment opportunities are associated directly with the project, the rest is indirect and induced opportunities created at various sectors of the economy.

The Generaal operational phase impact (Table 50) on employment amounts to 5 537 employment opportunities that will be sustained on an annualised basis over the lifespan of the mine in the province. Of this number, 505 employment opportunities are associated directly with the project, the rest is indirect and induced opportunities created at various sectors of the economy.

The Mount Stuart and Generaal combined operational phase impact (Table 51) on employment amounts to 9 769 employment opportunities that will be sustained on an annualised basis over the combined production period the mine in the province. Of this number, 984 employment opportunities are associated directly with the project during the period that both mines are operational, the rest is indirect and induced opportunities created at various sectors of the economy.

It is important to keep in mind that all the employment created in the Limpopo province is new.

6.4.5 Impact on Households

One of the crucial aspects of any macro-economic assessment is determining the personal income distribution characteristics thereof, especially with regard to how low income households will be impacted. In this section the extent to which low-income households will be positively affected by the spin offs created by the total development project is under scrutiny.

The impact on low-income households is presented in the tables above. From Table 47 it is evident that the Mount Stuart construction phase impact on low-income households will be R 66.9 million per annum which translates to 15.6% of the total impact on households' income.

The impact on low-income households is presented in the tables above. From Table 48 it is evident that the Generaal construction phase impact on low-income households will be R 69.2 million per annum which translates to 15.6% of the total impact on households' income.

The operational phase impact on low income households is given in Table 49 for the Mount Stuart Mine production. From this table it is evident that the operational phase impact on low income households will be R270.76 million per annum which translates to 16.6% of the total (direct, indirect and induced) operational phase impacts on household income.

The operational phase impact on low income households is given in Table 50 for the Generaal Mine production. From this table it is evident that the operational phase impact on low income households will be R363.1 million per annum which translates to 16.6% of the total (direct, indirect and induced) operational phase impacts on household income.

6.4.6 Impact on Balance of Payments

It is estimated that the positive impact on the Balance of Payments will amount to approximately R995.16 million per annum (Table 49) for the operational phase of the Mount Stuart Mine and approximately R1 334 million per annum (Table 50) for the operational phase of the Generaal Mine.

The methodology used in this particular calculation is elementary, but does at least indicate whether a notable positive or negative impact on the Balance of Payments can be expected.

6.4.7 Fiscal Impact

According to Table 49, total government revenue during the Mount Stuart production is expected to increase on an average annual basis of approximately R639.77 million and according to Table 50, total government revenue during the Generaal production is expected to increase on an average annual basis of approximately R858 million. The combined government revenue (Table 51) for the period when the two mines are in production simultaneously is estimated to be around R1 497 million annually. The main tax revenues are from direct tax and indirect tax, where direct tax consists mainly of personal income tax and company tax. Examples of indirect taxes are value added tax (VAT) and customs and excise tax. The increase in VAT is the result of additional household spending made possible by the increase in household incomes as a result of the project being implemented.

The increase in annual state revenue as a result of the construction and operation of the identified project could provide the means to increase government expenditure on social services. Using the latest information on the functional distribution of government spending on social services an estimate is made of how the state can expand its services in this regard.

6.4.8 Economic Efficiency Criteria

The macro-economic impacts discussed above provide an indication of the contribution that the coal mine will make to economic and socio-economic goals and objectives. However, it is also necessary to further interpret these impacts in order to determine whether or not the project represents an effective use of scarce economic resources. Since capital is a scarce resource in South Africa, the effectiveness criteria used in this study measure the use of capital in terms of GDP and job creation, relative to averages for South Africa.

In order to do these comparisons, two key multipliers/ratios have been calculated i.e. the GDP/Capital ratio, and the Labour/Capital ratio. Using these two ratios, it is possible to establish whether the capital employed in these projects and the contribution towards economic growth and job creation could in fact be regarded as effective and efficient. If continuous economic growth in the long-term is considered to be more important than job creation in the short-term, then the GDP/Capital ratio's performance is the more important of the two. However, if employment creation is given priority, particularly in the short term, then the Labour/Capital ratio is the more important one to use in evaluating the project's efficiency.

The efficiency/effectiveness criteria measured for the project is provided in the table below. This table also reflects the averages for the South African economy and for the mining sector.

The macro-economic impacts discussed above provide an indication of the contribution that the coal mine will make to economic and socio-economic goals and objectives. However, it is also necessary to further interpret these impacts in order to determine whether or not the project represents an effective use of scarce economic resources. Since capital is a scarce resource in South Africa, the

effectiveness criteria used in this study measure the use of capital in terms of GDP and job creation, relative to averages for South Africa.

In order to do these comparisons, two key multipliers/ratios have been calculated i.e. the GDP/Capital ratio, and the Labour/Capital ratio. Using these two ratios, it is possible to establish whether the capital employed in these projects and the contribution towards economic growth and job creation could in fact be regarded as effective and efficient. If continuous economic growth in the long-term is considered to be more important than job creation in the short-term, then the GDP/Capital ratio's performance is the more important of the two. However, if employment creation is given priority, particularly in the short term, then the Labour/Capital ratio is the more important one to use in evaluating the project's efficiency.

The efficiency/effectiveness criteria measured for the project is provided in the table below. This table also reflects the averages for the South African economy and for the mining sector.

Table 52: Economic Effectiveness Criteria of the Generaal Project Compared to the South African Economy

	GDP/Capital	Labour/Capital	Low Income/ Total Income
Project Efficiency Criteria	0.75	1.29	16.6%
Mining and quarrying	0.45	2.18	18.7%
Total National Economy	**0.45**	**2.94**	**16.2%**

A comparison of the coal mines GDP/Capital ratio with the average for the total South African economy indicates that for every R1 million of capital invested in the coal mine, it generates an overall GDP ratio of 0.75 compared to the average for the national economy of 0.45. This suggests that the coal mine utilises capital more effectively than other sectors in the national economy.

When a similar comparison of the Labour/Capital ratio is made, the coal mine will generate fewer jobs i.e. 1.29 jobs created for every R1 million invested in this project, in comparison with the national average of 2.94 jobs created, but in comparison with the mining sector average of 2.18 jobs created, the project is also falling short..

In terms of the income portion that is distributed to the low income households during the operational phase it is above the national average of 16.2% at 16.6%.

6.5 Macro-Economic Impact Results on the Limpopo Provincial Economy

6.5.1 Summary of Results

The following macro-economic impact table reflects the total construction phase and the average annual totals for the operational phase for the period the 12 year period on the Province of Limpopo. The components measured incorporate the construction and operation of the mine, transport and water supply of the project.

Table 53: The Annualised Macro-economic Average Impact of the Construction Phase of the Mount Stuart Mine on the Limpopo Provincial Economy (2013 prices)

	Construction Impact: *Provincial*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	98	21	24	**143**
Impact on capital formation	157	53	67	**276**
Impact on employment [person years]	863	63	128	**1 054**
Skilled impact on employment [person years]	137	13	21	**172**
Semi-skilled impact on employment [person years]	383	28	53	**463**
Unskilled impact on employment [person years]	343	22	54	**419**
Impact on Households				**75.72**
Low Income Households				**24.22**
Medium Income Households				**12.48**
High Income Households				**39.02**
Fiscal Impact				**31.88**
National Government				30.49
Provincial Government				0.34
Local Government				1.05

All monetary amounts represent Rand millions

Table 54: The Annualised Macro-economic Average Impact of the Construction Phase of the Generaal on the Limpopo Provincial Economy (2013 prices)

	Construction Impact: *Provincial*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	101	22	25	**148**
Impact on capital formation	162	54	69	**285**
Impact on employment [person years]	892	65	132	**1 089**
Skilled impact on employment [person years]	142	14	21	**177**
Semi-skilled impact on employment [person years]	395	29	55	**479**
Unskilled impact on employment [person years]	355	22	56	**433**
Impact on Households				**78.24**
Low Income Households				**25.02**
Medium Income Households				**12.90**
High Income Households				**40.32**
Fiscal Impact				**32.94**
National Government				31.51
Provincial Government				0.35
Local Government				1.08

Note: All Rand values reflected are expressed in Rand millions

Table 55: The Annualised Macro-economic Impact of the Operational Phase of the Mount Stuart Mine on the Province of Limpopo Provincial Economy (2013 prices)

	Operational Impact: *Provincial*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	967	162	192	**1 320**
Impact on capital formation	759	537	527	**1 822**
Total impact on employment [job opportunities]	505	421	741	**1 667**
Skilled impact on employment [job opportunities]	81	81	143	**304**
Semi-skilled impact on employment [job opportunities]	333	175	304	**813**
Unskilled impact on employment [job opportunities]	91	165	293	**549**
Impact on Households				**689.60**
Low Income Households				**207.22**
Medium Income Households				**135.39**
High Income Households				**346.99**
Fiscal Impact				**265.39**
National Government				254.23
Provincial Government				3.15
Local Government				8.00

Note: All Rand values reflected are expressed in Rand Millions

Table 56: The Annualised Macro-economic Impact of the Operational Phase of the Generaal Mine on the Province of Limpopo Provincial Economy (2013 prices)

	Operational Impact: *Provincial*			
	2.Mining			
	Direct impact	Indirect impact	Induced impact	Total impact
Impact on Gross Domestic Product (GDP)	1 296	217	257	**1 770**
Impact on capital formation	759	720	706	**2 185**
Total impact on employment [job opportunities]	479	564	993	**2 037**
Skilled impact on employment [job opportunities]	77	108	192	**376**
Semi-skilled impact on employment [job opportunities]	316	235	408	**959**
Unskilled impact on employment [job opportunities]	86	222	393	**701**
Impact on Households				**924.69**
Low Income Households				**277.86**
Medium Income Households				**181.54**
High Income Households				**465.28**
Fiscal Impact				**355.86**
National Government				340.90
Provincial Government				4.23
Local Government				10.73

Note: All Rand values reflected are expressed in Rand millions

Table 57: The Annualised Macro-economic Impact of the Operational Phase of the Mount Stuart and Generaal Mines on the Limpopo Provincial Economy (2013 prices)

	Operational Impact: *Provincial*			
	2.Mining			
	Direct impact	**Indirect impact**	**Induced impact**	**Total impact**
Impact on Gross Domestic Product (GDP)	2 263	378	449	**3 090**
Impact on capital formation	759	1 257	1 233	**3 249**
Total impact on employment [job opportunities]	984	985	1 734	**3 703**
Skilled impact on employment [job opportunities]	81	188	335	**604**
Semi-skilled impact on employment [job opportunities]	333	410	712	**1 456**
Unskilled impact on employment [job opportunities]	91	387	686	**1 164**
Impact on Households				**1 614.29**
Low Income Households				**485.08**
Medium Income Households				**316.93**
High Income Households				**812.27**
Fiscal Impact				**621.25**
National Government				595.14
Provincial Government				7.38
Local Government				18.73
Impact on the Balance of Payments				**838.30**

Note: All Rand values reflected are expressed in Rand Millions

6.5.2 Impact on GDP

According to Tables 53 and 54 the construction phase total annualised GDP impact on GDP for Limpopo Province, is approximately R143 to R148 million per mine (in constant, 2013 prices), of which the direct impact on GDP is estimated at about R98 million and R101 million per mine.

According to Tables 55 and 56 the operational phase total annualised GDP impact on GDP for Limpopo Province, is approximately R1 320 to R1 770 million per mine (in constant, 2013 prices), of which the direct impact on GDP is estimated at about R967 million and R1 296 million per mine.

According to Table 57, the operational phase total average impact on annualised GDP for Limpopo Province, is approximately R3 090 million on an annualised basis (in constant, 2013 prices), of which the direct impact on GDP is estimated at R2 263 million.

6.5.3 Impact on Employment Creation

The construction phase annual impact on total employment (Tables 53 and 54) amounts to 1 054 to 1 089 per mine employment opportunities per annum that will be sustained over the construction period. Of this number, 863 and 892 employment opportunities are associated directly with the project.

The operational phase annual impact on total employment opportunities (Tables 55 and 56) that will be sustained over the operational period amounts to 1 667 and 2 037 per mine. Of this number, 505 and 479 employment opportunities are associated directly with the project.

The total provincial operational phase impact on employment amounts to 3 324 employment opportunities (Table 57) that will be sustained on an annualised basis over the lifespan of the mine. Of this number, 984 employment opportunities are associated directly with the project.

6.5.4 Impact on Households

The total provincial operational phase impact on low-income households is given in Table 57. From this table it is evident that the operational phase impact on low-income households will be R485.08 million per annum which translates to 30.4 % of the total (direct, indirect and induced) operational phase impact on household income.

6.5.5 Magnitude of Linkages (Direct, Indirect and Induced Effects)

As indicated before, the SAM-based model measures the sum of the direct, indirect and induced effects that will emanate from the project under consideration. The direct effect of employment, for example, refers to the number of persons that will on an annual basis be directly linked to either the construction and/or the operation of the relevant project. In the same vein, the indirect effect on employment is measured as the number of employment opportunities that will be created in other sectors because of their supporting roles to sustain the increased investment and operational activities emanating from the project. The induced effect of employment refers to the number of employment opportunities created due to the increase in spending power that is flowing from the remuneration of workers employed at all the levels described above.

Below are the graphs representing the direct, indirect and induced impacts on employment for the Limpopo Province. The direct effect in terms of construction phase employment accounts for more than the indirect and induced effects combined. The operational phase employment is reflected differently to the construction phase employment due to this particular project under investigation being very labour intensive during the construction phase with less employment required on the direct effect level in the operational phase.

Graph 4: Macro-economic Impact in Terms of the Employment on the Construction and Operational Phases for the Province of Limpopo

Construction Phase

Induced Impact 12%
Indirect Impact 6%
Direct Impact 82%

Operational Phase

Direct Impact 29%
Induced Impact 45%
Indirect Impact 26%
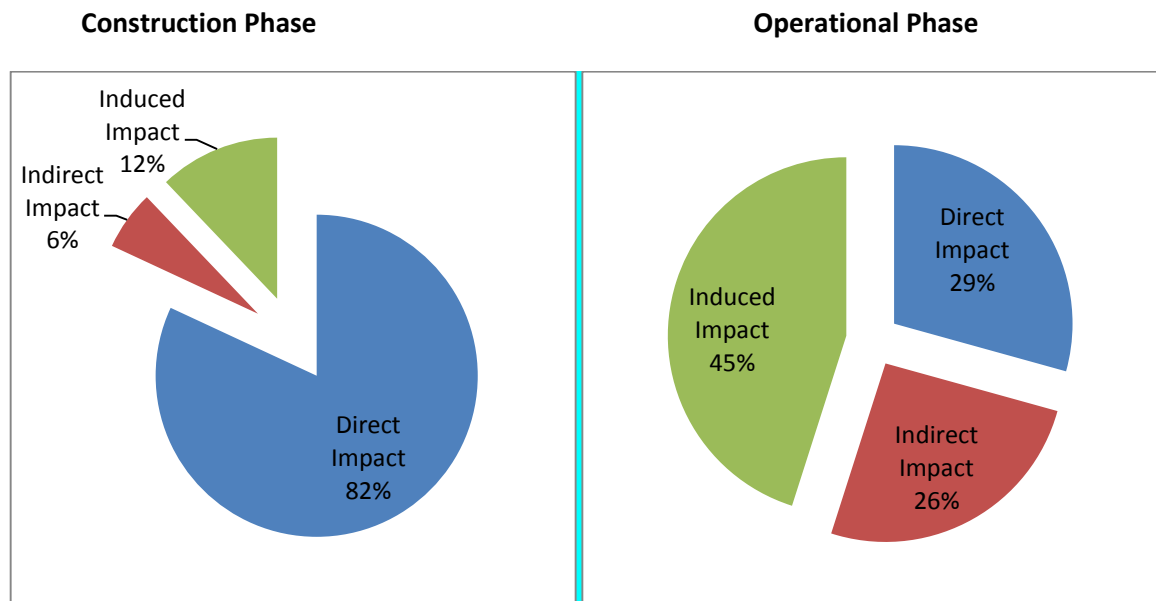
The construction graph indicates that 82% of the employment created will be on site compared to the 34% in the case of the operational phase, which is an indication that a considerable leakage will take place. In the case of the operational phase 29% will be on sight while the rest is indirect and induced.

6.5.5.1 Sectorial Impact

It is important to note that the total impact of the project concerned in Limpopo takes place across a wider spectrum of sectors than those in which the investments initially take place. In the graph below the GDP is divided according to the nine (9) main sectors of the Limpopo Provincial economy. From this it can be seen that the total effect is more profound in the mining sector which is quite understandable because the capital development project *per se* is classified to fall in the mining sector.

Graph 5: Sectorial GDP Impact on the Limpopo Province (percentages)

Community services 2%

Agriculture 1%

Financial & business services 7%

Transport & communication 9%

Trade & accommodation 4%

Construction 0%

Electricity & water 2%

Manufacturing 1%

Mining 74%
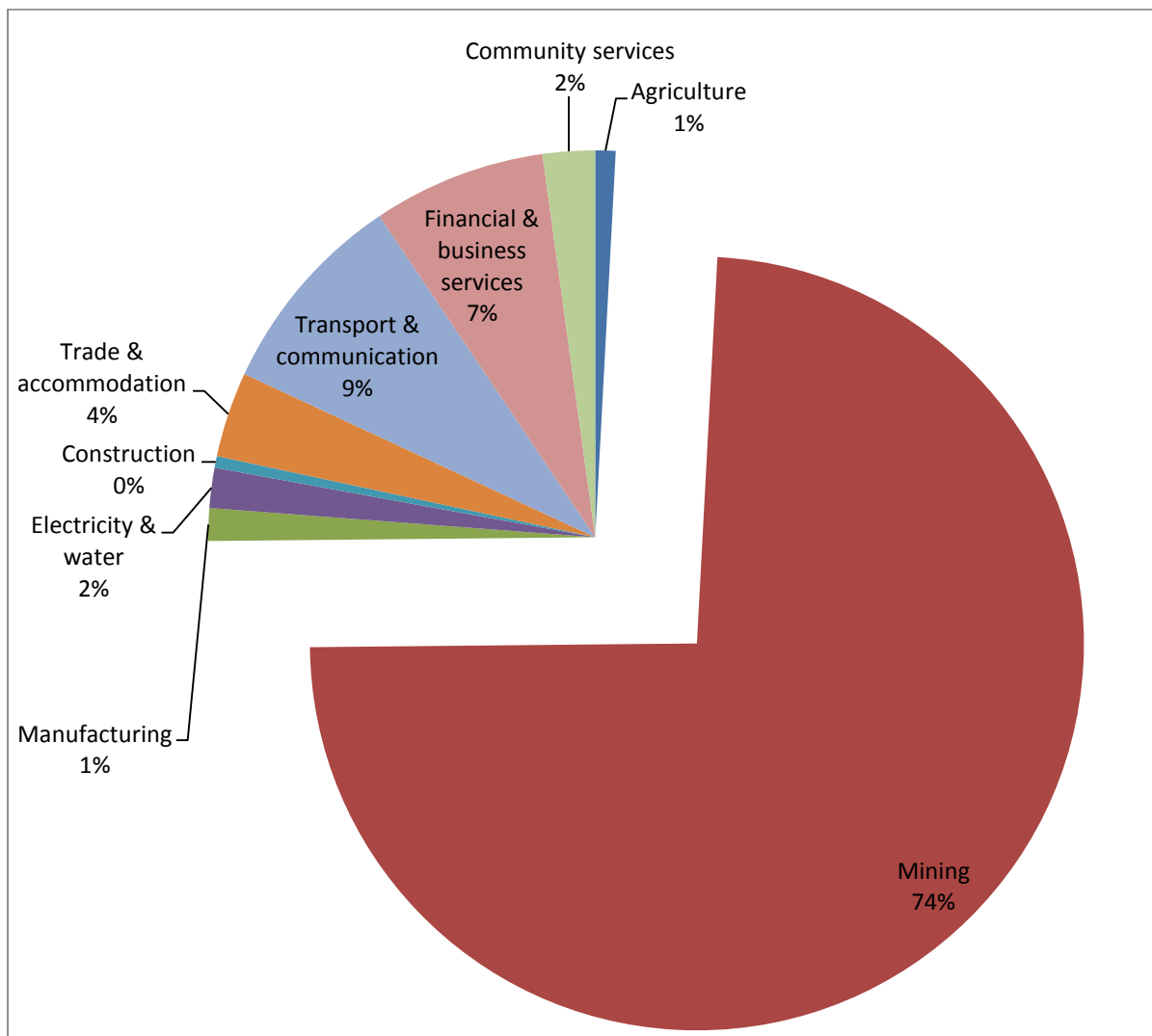
7 Conclusion

A comparison of the Local Economic Activities Baseline and estimated Negative Impact of the operational phase of the proposed Generaal Project (2013 prices) on the National as well as the Limpopo Provincial Economy is shown in the table below.

Table 58: Comparison of the Current Local Economic Activities and the Proposed Generaal Project. (2013 prices)

Mining Operational Phase - Annual Impact Current Activities							
		Baseline	Impact			Base Line	Impact
Gross Domestic Product Rand million	Direct	29.36	-5.62	**Employment Numbers**	Direct	297	-41
	Indirect/ Induced	25.64	-5.04		Indirect/ Induced	128	-24
	Total	**55.00**	**-10.66**		**Total**	**425**	**-65**
Mining Operational Phase - Annual Impact on the National and Limpopo Provincial Economy							
		National	Provincial			National	Provincial
Gross Domestic Product Rand million	Direct	2 263	2 263	**Employment Numbers**	Direct	984	984
	Indirect/ Induced	3 187	827		Indirect/ Induced	8 785	2 717
	Total	**5 450**	**3 090**		**Total**	9 769	3 703

From the above table it appears that the current local economic activities in the defined project area contributes R55.00 million in total GDP and sustains 425 total employment opportunities of which 297 are direct. The mine activity will cost the local economic activities R10.66 million in GDP and 65 employment opportunities, of which 41 will be direct.

The Generaal Project will offer a minimum of 984 direct new employment opportunities compensating for the loss of 41 jobs in the project area. It is, however, in the rest of the Limpopo province where the mine will create many more jobs than the current activities, namely; 2 717 versus the 128 indirect and induced opportunities created by the local economic activities. However, a total of 8 785 indirect and induced employment are also created of which 6 068 (8785 - 2717) are additional 8 785 indirect and induced employment opportunities are also created in the rest of South Africa.

From the above and the rest of the analysis it appears that the proposed mining project will be an economically viable venture which will add value to not only the Limpopo province, but also the total South African economy. This will take place at the expense of some of the current local economic activities, especially the game business, with ecology included, however, proper mitigation and even compensation must be part of the final solution. The investment the owner has made to a property can be negatively impacted upon if the hunting and accommodation facilities on the property are no longer fully utilised because of a down turn in the present class of hunter and tourist no longer visiting as a result of the mining activities.

The possible threat of underground and surface water contamination to the irrigators is of utmost importance and possible mitigation will have to be in place. In this respect the irrigators further to the north and outside of the project area should be included.

Probably the two most important benefits to the *national* economy are:

- The annual impact on the "Fiscus" with an annual tax contribution of R1 497 million expressed in 2013 prices, which at present represents the salary package of roughly 4 700 teachers or 5 200 nursing staff, if the government were to apply it for that purpose.
- The second impact is the favourable annual impact on the "Balance of Payments "amounting to R2 329 million, if expressed in 2013 prices.

Considering that this is the estimated results of the total Generaal Project, it appears that, from the rest of the analysis, that the proposed mining project will be an economically viable entity which will add value to the Limpopo province and the rest of the country. However, it will take place at the expense of some of the current local economic activities, impacting negatively on the irrigation areas as well as on the game and ecology sectors.

As stated, this will be a permanent impact and it will be necessary for the mining company to negotiate a proper mitigation programme.

As discussed in the report the Tshipise Forever Resort could also experience a negative impact if the hot water spring is affected by the mining operations and it is necessary that an in depth analysis be performed on the possible impact of the mining operations.

The ground water report also mentions the possibility that the water supply to a number of rural villages outside of the project area might be impacted on by the mining operations. This issue must be investigated further as it might involve some additional costs.

8 Sources

The following sources were consulted:

1. CoAL of Africa Limited Greater Soutpansberg Chapudi Project Scoping Report June 2013.
2. GSP - Generaal Coal Project – Groundwater Flow Impact Assessment Report – Revision 1 – 29 November 2013.
3. Van Der Merwe P. and Saayman, M.; Managing Game Farms from a Tourism Perspective – Published by the Institute for Tourism and Leisure Studies, North West University (2004).
4. Falkena HB; The SA Financial Sector Forum - Profit and Honour in Game Ranching (2003).
5. Game and Cattle farming in the Soutpansberg – Verbal and electronic communication with farmers in the study area.
6. Taxidermy – Waterberg Taxidermy see http://www.waterbergtaxidermy.co.za Price List.
7. Wild en Jag dated July 2013 – "An Economic Outlook: The Wildlife Industry", by Bernard Groenewald and Richard York.
8. Wood Mackenzie -2012 – CoAL of Africa – Coking Coal Market Study

9 APPENDIX A: THE SOCIAL ACCOUNTING MATRIX (SAM)

A Social Accounting Matrix (SAM) is a comprehensive, economy-wide database, which contains information on the flow of resources that take place between the different economic agents that exist within an economy (i.e. business enterprises, households, government, etc.) during a given period of time – usually one calendar year.

When economic agents in an economy are involved in transactions, financial resources change hands. The SAM provides a complete database of all transactions that take place between these agents in a given period, thereby presenting a "snapshot" of the structure of the economy for that time period. As a system for organising information, a SAM presents a powerful tool in terms of which the economy can be described in a complete and consistent way:

Complete in the sense that it provides a comprehensive accounting of all economic transactions for the entity being represented (i.e. country, region/province, city, etc.), and Consistent in that all incomes and expenditures are matched.

Consequently, a SAM can provide a unifying structure within which the statistical authorities can compile and present the national accounts.

Like the traditional Input-Output Table, the SAM reflects the inter-sectorial linkages in terms of sales and purchases of goods and services, as well as the remuneration of production factors that forms the essence of any economy's functioning. What is also of importance is that a SAM reflects the economic related activities of households in some detail. Households are responsible for decisions that have a direct and indirect effect on important economic variables such as private consumption expenditures and savings. These economic aggregates are important drivers of the economic growth processes and ultimately the creation of employment opportunities and wealth. Private consumption expenditure, for example, comprises approximately 60 percent of total gross final domestic spending in the economy. By combining households into meaningful categories, such as a range of income levels, the impact on these households' welfare of a changing economic environment is made possible by the SAM.

It is clear from the above that because of the intrinsic characteristics of the SAM, once compiled, it renders itself as a useful tool for analytical purposes. Especially, based on the mathematical traits of the matrix notations that describe its structure, a SAM can be transformed into a powerful econometric tool/model. For example, the model can be used to quantify the probable impact on the economy of a new infrastructural project such as a new power station – both the construction phase and the operational phase will be modelled.

Thus apart from serving as an extension to a country's National Accounts, the SAM in its model form opens up many opportunities for the economic analyst to conduct rigorous policy and other impact analyses for the purpose of ensuring optimal benefit to the stakeholders concerned.

Application(s) of the SAM

The development of the SAM is very significant as it provides a framework within the context of the International System of National Accounts (SNA) in which the activities of all economic agents are accentuated and prominently distinguished. By combining these agents into meaningful groups, the

SAM makes it possible to clearly distinguish between groups, to research the effects of interaction between groups, and to measure the economic welfare of each group. There are two key reasons for compiling a SAM:

Firstly, a SAM provides a framework for organising information about the economic and social structure of a particular geographical entity (i.e. a country, region or province) for a particular time period (usually one calendar year), and

Secondly, to provide a database that can be used by any one of a number of different macro-economic modelling tools for evaluating the impact of different economic decisions and/or economic development programmes.

Because the SAM is a comprehensive, disaggregated, consistent, and complete data system of economic entities that captures the interdependence that exists within a socio-economic system, it can be used as a conceptual framework for exploring the impact of exogenous changes in such variables as exports, certain categories of government expenditure, and investment on the entire interdependent socio-economic system. The SAM, because of its finer disaggregation of private household expenditure into relatively homogenous socio-economic categories that are recognisable for policy purposes, has been used to explore issues related to income distribution.

The SAM's main contribution in the field of economic policy planning and impact analysis is divided into two categories:

As a Primary Source of Economic Information

As a detailed and integrated national and regional accounting framework consistent with officially published socio-economic data, a SAM instantly projects a picture of the nature of a country or region's economy. It lends itself to both descriptive and structural analysis.

As a Planning Tool

Due to its mathematical/statistical underpinnings it can be transformed into a macro-econometric model that can be used to:

- Conduct economic forecasting exercises/scenario building.
- Conduct economic impact analysis both for policy adjustments at a national and provincial level and for large project evaluation.
- Conduct self-sufficiency analysis i.e. gap analysis to determine, with the help of the inter industry and commodity flows contained in the provincial SAM, where possible investment opportunities exist, and
- Calculate the inflationary impacts on provincial level of price changes instigated at national level (i.e. administered prices, VAT, etc.).

To summarise, the SAM mechanism provides a universally acceptable framework within which the economic impact of development projects and policy adjustments can be reviewed and assessed at both national and provincial/regional levels. It serves as an extension to the official National Accounts of a country's economy and, therefore, provides a wealth of additional information, especially when disaggregated to more detailed levels.

10 APPENDIX B: COST BENEFIT ANALYSIS

Introduction

The CBA method provides a logical framework for evaluating development programmes, and can serve as an aid in decision-making processes. The following is a brief overview of the theory underlying the CBA method.

The theoretical foundations of CBA are: benefits are defined as increases in human wellbeing (utility) and costs are defined as reduction in human wellbeing. For a project of policy to qualify on cost-benefit grounds, its social benefits must exceed its social costs. "Society" is simply the sum of individuals. The geographical boundary for a CBA is usually the nation, but can be readily extended to wider limits.

Basic Aggregation Rules

There are two basic aggregation rules. Firstly, aggregating benefits across different social groups or nations involves summing willingness to pay for benefits, its willingness to accept compensation for losses (WTP and WTA, respectively), regardless of the circumstances of the beneficiaries or losers. A second aggregation rule requires that higher weights be given to benefits and costs accruing to disadvantages or low income groups. One rationale for the second rule is that marginal utilities or income will vary, being higher for the low income group.

The notions of WTP and WTA are firmly grounded in the theory of welfare economics and correspond to the notions of compensation and equivalent variations. WTP and WTA should not, according to past theory, diverge very much. In practice they appear to diverge, often substantially, and with WTA > WTP. Hence, the choice of WTP or WTA may be of importance when conducting a CBA.

Discounting

Aggregating over time involves discounting. Expressing future benefits and costs in present value is known as discounting. Inflation can result in future benefits and costs appearing to be higher than is really the case. Inflation should be netted out to secure constant price estimates.

Costs and benefits that are immediately incurred are judged differently by the community from costs and benefits that materialize over a period of time. Usually a community would prefer receiving a benefit today rather than reaping the benefits in the future, while deferred costs are more attractive than immediate payment. Therefore, the money value of costs and benefits over time cannot simply be added together, and the time preference of the community has to be taken into account through the use of a weighting process. This is done by calculating the net present value by discounting future cash-flows at a rate that reflects the value of a benefit or cost over time, known as the social discount rate. In other words, at what real interest rate will the community be prepared to forego immediate benefits in exchange for longer term benefits?

Suppose $b_0, b_1, b_2, …, b_n$ are the project benefits in years 0, 1, 2, …, n and $c_0, c_1, c_2, …, c_n$ are the costs in years 0, 1, 2, …, n, respectively, and I is the social discount rate, then the present value of the benefits is given by

$b\_0 \div ⟦(1+i)⟧ ^0 + b\_1 \div ⟦(1+i)⟧ ^1 + … +b\_n \div ⟦(1+i)⟧ ^n$

And the present value of the costs are given by

$c\_0 \div ⟦(1+i)⟧ ^0 + c\_1 \div ⟦(1+i)⟧ ^1 + … +c\_n \div ⟦(1+i)⟧ ^n$

These present values are then used to calculate various assessment criteria, while assisting in the evaluation of each development sphere. These criteria are:

- Net Present Value (NPV).
- Internal Rate of Return (IRR).
- Benefit Cost Ratio (BCR).

Net Present Value (NPV)

The difference between the benefits and costs (the net benefits) in the specific year is discounted to the present by using the social discount rate. The discounted sum of all these net benefits over the economic project life is defined as the NPV. In terms of terminology set out above:

NPV= $\sum b\_j \div ⟦(1+i)⟧ ^j - \sum c\_j \div ⟦(1+i)⟧ ^j$

The criteria for the acceptance of a project are that the NPV must be positive; in other words, funds will be voted for a project only if the analysis produces a positive net present value. Where a choice has to be made between mutually exclusive projects, the project with the highest present value will be chosen since it maximizes the net benefits to the community.

Internal Rate of Return (IRR)

The IRR is the discount rate at which the present value of costs and benefits are equal. It is therefore the value of the discount rate, r, which satisfies the following criteria:

$\sum b\_j \div ⟦(1+r)⟧ ^j - \sum c\_j \div ⟦(1+r)⟧ ^{(j)} =0$

Only projects with an IRR higher than the social discount rate, which forms a limit, will be considered for funding. The IRR must be handled carefully, because there are situations in which mathematical solution of the above equation is not unique. This happens when the stream of net benefits over the assessment period changes its sign (positive or negative) more than once.

Benefit Cost Ration (BCR)

The discounted BCR is the ratio of the present value of the benefits to the present value of the costs, i.e.

BCR= $\{\sum b\_j \div (1+r)^j \} \div \{\sum c\_j \div (1+r)^{(j)} \}$

A project will be considered for funding if the BCR is greater than 1.

Appropriate Discount Rate

When considering an appropriate discount rate, note must be taken of the various points of departure in the economic literature as well as of the rates applied in other countries and by international development institutions.

The points of departure described in the literature can be broadly divided into three schools of thought, namely those who argue that the discount rate should be equal to the marginal return on capital (opportunity cost of capital), those whose arguments rests on long-term real interest rate (cost of funding to the State), and those who advocate a social time preference rate.

The first two schools take an economic view, whilst the third school adopts a multiple-goal approach which includes social aims. There is no consensus which method should be used to determine the social discount rate that would apply for a specific country. Therefore, a relative pragmatic approach takes the following factors into account:

- The discount rate should not be influenced by business cycle conditions and policy, since the preferences that find expression in this rate are aimed at the extension of the long-term welfare structure.
- A low discount rate generally favours projects with a higher capital cost and low future current costs, while the opposite applies to high discount rates. Since labour costs are part of current expenditure, a high discount rate favours the employment of labour in the future. If the real social discount rate is lower than the real implicit discount rate in the private sector, then investment by the public sector will be encouraged at the expense of investment by the private sector. The larger the gap between the two discount rates, the stronger the effect.

Financial Discount Rate

In the case of public projects, where CBA is being performed for financial purposes, calculations are done at either current price, where inflation is taken into consideration or at constant/real prices, where inflation is excluded.

In terms of the financial analysis, the discount rate used is equal to the market rate, or weighted marginal cost of capital, plus uncertainty and a risk premium. It should be noted that if the calculation is being done in constant/real prices, the discount rate used should be in real terms. For instance, if the discount rate in current prices is 10% and the prospects for inflation over the project appraisal period is 5%, then the real discount rate is approximately 5%. It can be calculated as follows:

$((1.10 \div 1.05) - 1) \times 100 = 4.76\%$

Therefore the real discount rate is not exactly 5% but 4.76%.

Due to the fact that projections are made over a long period into the future, and the fact that the future inflation rate is dependent on various economic factors (e.g. worldwide shocks such as oil price, etc.), it is generally difficult to estimate long-term price movements. In this study, the Consultants have used a real discount rate of 5%, and an inflation rate of 6%. Using the methodology described above, this yields a nominal discount rate of 11%.

Economic Discount Rate

Although the calculation of the social time preference rate (STPR) is very difficult to determine, this has not stopped some analysts attempting empirical estimates. According to Kirkpatrick and Weiss (1996) "… such estimates are normally in the 1 percent to 5 percent range, since per capita consumption growth will rarely exceed 3 percent annually, and the conventional estimates of the elasticity of the marginal utility of consumption are typically between 1.0 and 1.5." Walshe and Dafferen calculated that the STPR is slightly in excess of the potential growth rate of an economy.

The study uses an economic discount rate of 8%, which is standard to most studies of this nature.

Market *versus* Shadow Prices

As indicated above, the CBA can be conducted in financial (market) as well as economic (shadow) prices. Market prices are those perceived prices at which products and services are traded in the market place, irrespective of the level of interference in the market, e.g. the market wage rate of labour, the price of 2kg of maize meal, the price of 1 kilowatt-hour of electricity, etc. In theory, market prices are mainly manifestations of consumers' willingness to pay.

Shadow prices (economic prices) are regarded as the opportunity costs of products and services when the market price, for whatever reasons, does not reflect these costs in full. Examples are the shadow wages of labour, where minimum wages are fixed at levels higher than market prices; shadow price for fuel, where taxes and subsidies are excluded; and shadow exchange rates are pegged and/or some kind of exchange control is still in place. The shadow price is therefore nominal (market) price, adjusted for the effect of interventions or other factors that are causing the market not to perform its natural role.

In practice, shadow prices should only be use when the market price of products and services do not reflect their scarcity value or economic contributions. In cases where market prices give an indication of the scarcity of products and services, market prices are used not only for financial analysis, but also for economic analysis.

Financial and Economic Cost Benefit Analysis

The private and public sectors evaluate projects very differently. The private sector is mostly interested in the profitability of a project and the return on capital that will be achieved. In doing so, the private sector makes use of market prices (i.e. the prices that would be paid in the open market for inputs, labour, etc.) when determining the value of direct project-related costs and financial benefits. Furthermore, a financial CBA evaluated the project using market-determined interest and return rates that reflect the cost of private funds, uncertainties and risk.

In contrast, evaluating a public sector project involves determining a broader range of costs and benefits that will affect the community. Furthermore, when calculating the value of costs and benefits, economic analysis re-evaluates the project by making use of prices that reflect the relative economic scarcity/value of inputs and outputs. As such, in the public sector it is necessary to evaluate and weigh the wider benefits emanating from a project against the capital expenditure and costs associated with a project, using discount and return rates that reflect the time preferences of the community, known as the social discount rate.

The table below summarises the main differences between a financial and economic CBA.

Table 59: Comparison of Financial and Economic Costs Benefit Analysis

Attributes	Economic CBA	Financial CBA
Perspective	The broader community	Project shareholders/capital providers
Goal	The most effective application of scarce resources	Maximization of net value
Discount Rate	Social discount rate	Market determined weighted cost of capital
Unit of Valuation	Opportunity costs	Market prices
Scope	All aspects necessary for a rational, economic decision	Limited to aspects that affect profits
Benefits	Additional goods, services, income and/or cost saving	Profit and financial return on capital employed
Costs	Opportunity costs of goods and services foregone	Financial payments and depreciation calculated according to generally accepted accounting principles

11 APPENDIX C: MAGNITUDE OF LINKAGES AND DEFINITION OF MACRO-ECONOMIC AGGREGATES

Formally, economists distinguish between direct, indirect and induced economic effects. Indirect and induced effects are sometimes collectively called secondary effects. The total economic impact is the sum of direct, indirect and induced effects within a region. Any of these impacts may be measured in terms of gross output or sales, income, employment or value added.

Direct Impacts

The direct impacts refer to the effect of the activities that take place in the mining and electricity industries. It refers to the income and expenditure that is associated with the everyday operation of each of the components of the relevant industry. For instance if the mining component is taken as an example the direct impacts refer to the total production/turnover of the mine; the intermediate goods bought by the mine; the salaries and wages paid by the mine; the profits generated by the mine.

Indirect Impacts

The indirect impacts refer to economic activities that arise in the sectors that provide inputs to the mining and electricity industries' components and other backward linked industries. For example, if the electricity sector uses steel, the indirect impacts refer to the activity (paying of salaries and wages; and profit generation) that occurs in the steel sector as well as the sectors that provide materials to the steel sector.

Induced Impacts

Induced impacts refer, inter alia, to the economic impacts that result from the payment of salaries and wages to people who are (directly) employed at the various consecutive stages of beneficiation of the mining and electricity industries. In additional the induced impact also includes the salaries and wages paid by businesses operating in the sectors indirectly linked to these industries through the supply of inputs. These additional salaries and wages lead to an increased demand for various consumable goods that need to be supplied by other sectors of the economy that then have to raise their productions in tandem with the demand for their products and services.

These induced impacts can then be expressed in terms of their contributions to GDP, employment creation and investment or other useful macro-economic variables.

Added together, the direct, indirect and induced impacts provide the total impact that these industries will have on the South African and Limpopo economies.

Definitions of Macro-Economic Aggregates

Impact analysis will be based on a number of standard economic parameters and the results will be presented under the following headings:

- Impact on Gross Domestic Product (GDP).
- Impact on Capital Utilisation.
- Impact on Employment Creation.

- Skilled labourers.
- Semi-skilled labourers.
- Unskilled labourers.
- Impact on Households Income (Income distribution).
- Impact on Balance of Payments, as a result of Imports and Exports.

The following is a brief overview of the definition of each of these economic parameters.

Impact on Gross Domestic Product (GDP)

The impact on GDP reflects the magnitude of the values added to the coal mining industry from activities within the industry. Value added is made up of three elements, namely:

- Remuneration of employees,
- Gross operating surplus (which includes profit and depreciation), and
- Net indirect taxes.

Impact on Capital Utilisation

For an economy to operate at a specific level of activity, investment in capital assets (i.e. buildings, machinery, equipment, etc.) is needed. Capital, together with labour and entrepreneurship, are the basic factors needed for production in an economy.

The effectiveness and efficiency with which these factors are combined influence the overall level of productivity/profitability processes, bearing in mind that productivity is affected by an array of factors of which appropriate technology and skill level of the labour force are two important elements.

Impact on Employment Creation

Labour is a key element of the production process. The study will determine the number of new employment opportunities that will be created by investment in the coal mining industry. These employment opportunities will be broken down into those created directly by a particular project and those indirectly created and induced throughout the broader economy. Furthermore, a distinction will be made between skilled, semi-skilled and unskilled labourers.

Impact on Household Income

One of the elements of the additional value added (i.e. GDP) which will result from the proposed expansion is remuneration of employees, which, in turn, affects households income.

The SAM measures the magnitude of changes that will occur to both household income and spending/savings pattern. As such, the study will highlight the impact of the coal mining industry on the low income households as this can be used as an indicator of the extent to which the coal mining industry contributed to poverty alleviation throughout the economy.

Impact on the Current Account of the Balance of Payments

The coal mining industry will have direct, indirect and induced impacts on the exports and imports of goods and services that will take place across all of the various economic sectors that are affected by

the coal mining industry. Imports consist of direct and indirect material imports, as well as goods consumed by households that are imported as a result of the induced impact.

Input Data Required Conducting the Macro-Economic Impact Analysis

Modelling the macro-economic impact of the construction and operational phases of the total development project requires detailed information regarding these two phases of the project. The relevant "building blocks: containing the required data and information are given and discussed below.

Construction Phase

The information required to model the macro-economic impact of the construction phase of a project relate to the nature and costs of the capital assets that are actually created. The following standard breakdown of the asset types is used:

- Civil engineering costs:
    - Earth works (site clearance, foundations, etc.).
    - Structures (bridges, dams and other structures built mainly from concrete).
    - Roads (freeways, other arterials and streets).
- Building and construction costs:
    - Residential buildings (houses, etc.).
    - Non-residential buildings (factories, offices, shopping centres, etc.).
- Machinery and other equipment costs:
    - Mechanical equipment.
    - Electrical and electronic equipment.
    - Research, design, architecture and development costs.
    - Furniture.
    - Rubber products.
    - Structural metal products.
    - Other fabricated metal products.
    - Manufacturing of transport equipment.
    - Other manufacturing and recycling.
- Water related construction costs:
    - Bulk water (dams).
    - Reservoirs.
    - Pump stations (water and sewerage).
    - Bulk pipelines (water and sewerage).
    - Treatment works (water and sewerage).
    - Reticulation (water and sewerage).
    - Storm water.
    - Parks and recreation.

Operational Phase

In order to quantify the macro-economic impact of the operational component of a project, the following information is required by the model:

- Production/turnover, divided between:
- Sales/turnover destined for domestic consumption; and
- Export sales.

Production/Operation Costs, Broken Down Into:

- Intermediate input costs, i.e. all materials and services necessary for the production process broken down by industries from which inputs are sources (classified according to the Standard Industrial Classification (SIC) code system),
- Remuneration of staff, broken down by skill levels (i.e. skilled, semi-skilled and unskilled workers), and
- Gross operating surplus (i.e. remuneration of capital).

The table below gives an example of the exogenous vector for Water – Water Supply. These figures are used as the inputs for the operational phase of the model, but are only used as an example to give the reader more clarity on the input requirements for such a model.

12 APPENDIX D: RISK PROFILE

12.1 Risk Profile – Mount Stuart Farms

	Infringement	Weight
Mining and Transport Operations	*Noise*	8.00
	Dust	25.00
	Blasting	8.00
Community, etc.	*Social, Crime and Other*	8.00
	Sense of Place - Visual	11.00
Water	*Ground Water*	8.00
	Surface Water	32.00
		100.00

Infringement	Activity	Sub -Activity	Extend	Duration	Magnitude	Probability
Noise	*Beef and other Livestock Farming*	Commercial	1	2	2	1
		Community				-
	Game Farming	Game (breeding)	1	2	2	1
		Live Sales	1	1	2	1
		Trophy Hunting	3	5	4	2
		Biltong Hunting	1	5	3	1
	Tourism & Accommodation	Eco - tourists	2	4	4	3
		Hunters	2	4	4	2
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style	0	0	0	-
	Environment (birds & plants)		2	4	2	3
	Sub-total	5				
Dust	*Beef and other Livestock Farming*	Commercial	1	5	1	1
		Community				-
	Game Farming	Game (breeding)	1	5	2	1
		Live Sales	1	5	1	1
		Trophy Hunting	3	5	6	2
		Biltong Hunting	2	5	5	1
	Tourism & Accommodation	Eco - tourists	3	5	6	2
		Hunters	2	5	3	2
	Irrigation	Citrus	1	5	4	2
		Other Crops	1	5	4	2
	Community	Life Style				
	Environment (birds & plants)		2	5	6	2
	Sub-total	12.00				
Blasting	*Beef and other Livestock Farming*	Commercial	1	2	2	1
		Community				-
	Game Farming	Game (breeding)	1	2	2	1
		Live Sales	1	1	1	1
		Trophy Hunting	2	3	3	2
		Biltong Hunting	2	3	2	1
	Tourism & Accommodation	Eco - tourists	1	3	5	3
		Hunters	1	3	5	2
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style				
	Environment (birds & plants)		1	2	2	4
	Sub-total	5.00				

Social, Crime and other impacts	**Beef and other Livestock Farming**	*Commercial*	*2*	*5*	*6*	2
		Community				-
	Game Farming	*Game (breeding)*	*2*	*5*	*6*	2
		Live Sales	*1*	*5*	*1*	2
		Trophy Hunting	*2*	*5*	*4*	2
		Biltong Hunting	*2*	*5*	*4*	2
	Tourism & Accommodation	*Eco - tourists*	*2*	*5*	*3*	2
		Hunters	*2*	*5*	*2*	2
	Irrigation	*Citrus*	*2*	*5*	*2*	2
		Other Crops	*2*	*5*	*2*	2
	Community	*Life Style*				-
	Environment (birds & plants)		*1*	*1*	*4*	3
	Sub-total	*5.00*				
Destroying the sense of place - Visual	**Beef and other Livestock Farming**	*Commercial*	*1*	*1*	*2*	1
		Community				-
	Game Farming	*Game (breeding)*	*1*	*1*	*2*	1
		Live Sales	*1*	*1*	*2*	1
		Trophy Hunting	*4*	*5*	*6*	3
		Biltong Hunting	*2*	*5*	*5*	2
	Tourism & Accommodation	*Eco - tourists*	*4*	*5*	*6*	3
		Hunters	*1*	*1*	*1*	1
	Irrigation	*Citrus*	*1*	*1*	*1*	1
		Other Crops	*1*	*1*	*1*	1
	Community	*Life Style*				
	Environment (birds & plants)		*3*	*5*	*6*	3
	Sub-total	*11.00*				
Underground water - contamination and water levels	**Beef and other Livestock Farming**	*Commercial*	*1*	*5*	*3*	1
		Community				-
	Game Farming	*Game (breeding)*	*1*	*5*	*3*	2
		Live Sales	*3*	*5*	*4*	2
		Trophy Hunting	*2*	*5*	*3*	1
		Biltong Hunting	*2*	*5*	*3*	1
	Tourism & Accommodation	*Eco - tourists*	*2*	*5*	*4*	2
		Hunters	*2*	*5*	*3*	2
	Irrigation	*Citrus*	*1*	*5*	*2*	1
		Other Crops	*1*	*5*	*2*	1
	Community	*Life Style*				
	Environment		*1*	*5*	*2*	1
	Sub-total	*57.00*				
Surface water - contamination and run-off	**Beef and other Livestock Farming**	*Commercial*	*1*	*5*	*2*	2
		Community				0
	Game Farming	*Game (breeding)*	*1*	*5*	*2*	2
		Live Sales	*1*	*5*	*1*	1
		Trophy Hunting	*1*	*5*	*2*	1
		Biltong Hunting	*1*	*5*	*1*	1
	Tourism & Accommodation	*Eco - tourists*	*1*	*5*	*3*	2
		Hunters	*3*	*5*	*6*	3
	Irrigation	*Citrus*	*1*	*5*	*4*	2
		Other Crops	*1*	*5*	*3*	2
	Community	*Life Style*				-
	Environment		*2*	*5*	*4*	2
	Sub-total	*5.00*				

12.2 Risk Profile – Generaal Farms

	Infringement	Weight
Mining and Transport Operations	*Noise*	10.00
	Dust	30.00
	Blasting	8.00
Community, etc.	*Social, Crime and Other*	8.00
	Sense of Place - Visual	11.00
Water	*Ground Water*	7.00
	Surface Water	26.00
		100.00

Infringement	Activity	Sub -Activity	Exten	Duratio	Magnitud	Probabilit
Noise	*Beef and other Livestock Farming*	Commercial	1	2	2	1
		Community				-
	Game Farming	Game	1	5	1	1
		Live Sales	1	5	1	1
		Trophy Hunting	2	5	3	2
		Biltong	1	5	3	2
	Tourism & Accommodation	Eco - tourists	2	5	4	3
		Hunters	2	5	5	2
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style	0	0	0	-
	Environment (birds &		1	5	1	1
	Sub-total	5				
Dust	*Beef and other Livestock Farming*	Commercial	1	5	1	1
		Community				-
	Game Farming	Game	1	5	1	1
		Live Sales	1	5	1	1
		Trophy Hunting	3	5	6	2
		Biltong	2	5	5	1
	Tourism & Accommodation	Eco - tourists	3	5	6	2
		Hunters	2	5	3	1
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style				
	Environment (birds &		2	5	6	2
	Sub-total	12.00				
Blasting	*Beef and other Livestock Farming*	Commercial	1	5	1	1
		Community				-
	Game Farming	Game	1	5	1	1
		Live Sales	1	1	1	1
		Trophy Hunting	2	3	3	2
		Biltong	2	3	2	1
	Tourism & Accommodation	Eco - tourists	1	3	5	2
		Hunters	1	3	5	2
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style				
	Environment (birds &		1	2	2	2
	Sub-total	5.00				
Social, Crime and other impacts	*Beef and other Livestock Farming*	Commercial	2	5	6	2
		Community				-
	Game Farming	Game	2	5	6	2

		Live Sales	1	5	1	2
		Trophy Hunting	2	5	4	2
		Biltong	2	5	4	2
	Tourism & Accommodation	Eco - tourists	2	5	3	2
		Hunters	2	5	2	2
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	5	2	2
	Community	Life Style				-
	Environment (birds &		1	1	4	2
	Sub-total	5.00				
Destroying the sense of place -Visual	Beef and other Livestock Farming	Commercial	1	1	2	1
		Community				-
	Game Farming	Game	1	1	2	1
		Live Sales	1	1	2	1
		Trophy Hunting	3	5	6	3
		Biltong	2	5	5	2
	Tourism & Accommodation	Eco - tourists	3	5	6	3
		Hunters	1	1	1	1
	Irrigation	Citrus	1	1	1	1
		Other Crops	1	1	1	1
	Community	Life Style				
	Environment (birds &		3	5	6	3
	Sub-total	11.00				
Underground water - contamination and water levels	Beef and other Livestock Farming	Commercial	1	5	3	1
		Community				-
	Game Farming	Game	1	5	3	2
		Live Sales	1	5	1	1
		Trophy Hunting	2	5	3	1
		Biltong	2	5	3	1
	Tourism & Accommodation	Eco - tourists	2	5	4	2
		Hunters	2	5	3	2
	Irrigation	Citrus	1	5	1	1
		Other Crops	1	5	1	2
	Community	Life Style				
	Environment		1	5	2	1
	Sub-total	57.00				
Surface water - contamination and run-off	Beef and other Livestock Farming	Commercial	1	5	2	1
		Community				0
	Game Farming	Game	1	5	2	1
		Live Sales	1	5	1	1
		Trophy Hunting	1	5	2	1
		Biltong	1	5	1	1
	Tourism & Accommodation	Eco - tourists	1	5	3	2
		Hunters	3	5	6	3
	Irrigation	Citrus	2	5	4	2
		Other Crops	2	5	3	2
	Community	Life Style				-
	Environment		2	5	4	2
	Sub-total	5.00				

13 APPENDIX E: CURRICULUM VITAES OF PROPOSED PROFESSIONAL STAFF

MR WILLIAM MULLINS

PERSONAL DETAILS:

Date of Birth: 26 April 1949

Nationality: South African

Current Position: Economist - Agriculture Specialist

ACADEMIC QUALIFICATIONS:

1968:   UED – University of Free State.

1967   BSc – University of Free State.

OTHER TRAINING:

Excel, MS Word and PowerPoint.

LANGUAGE SKILLS:

Language	Reading	Speaking	Writing
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

PROFESSIONAL CAREER:

William Mullins is originally trained as a mathematician and statistician and after a short spell in industry, became a teacher. In 1976, William took over the family farm in Southern KwaZulu Natal, where he farmed until joining by Mosaka Economic Consultants cc in 2000. During his time in farming William Mullins served a period as chairman of the Natal Agricultural Union and was a member of the Regional Development Committee of Region C (RDAC) and the National Regional Development Advisory Committee (NRDAC). He also served as a board member of the KwaZulu Development Corporation and its successor, the Ithala Development Corporation from 1993 to 2001. William was also a member of the KwaZulu Training Trust (KTT) and a board member of the Natal Parks Board.

In the early years of by Mosaka Economic Consultants cc, William worked on projects on a part-time basis and then, in 2000, he joined the organisation as the resident statistician. William's leadership qualities and ability to work with people makes him a natural choice as a project team leader. His extensive experience in the agricultural field means that he is involved in most projects in this field, as well as impact studies on rivers. William has also worked in specialist fields like the SKA Telescope study and impact studies for Eskom.

Some of William Mullins's most recent projects include:

- Macro-economic Impact Analysis and Cost Benefit Analysis of the Sekoko Coal Waterberg Project, 2011 [Sekoko Resources (Pty) Ltd.]

- Macro-economic Impact Analysis and Cost Benefit Analysis of the Proposed Vele Colliery near Musina, Limpopo 2010 [Naledi Development (Pty) Ltd.]

- Port Economic Decision Making Framework [eThekwini Municipality, 2007-2008].

- Environmental impact assessment for the proposed Gamma-Grass Ridge 765kV Transmission Power Lines (x2). [ESKOM Transmission, 2008].

- Integrated comprehensive study of the water resources of the Maputo River Basin [Plancenter Ltd, 2008].

- Comprehensive Determination of the Reserve for the Inkomati WMA [Water for Africa, 2007].

- CBA Analysis of Further Water Augmentation in the Komati and Extension and Updating of the Current Database of the Komati WMA [KNPSF/BIGEN, 2008].

- Feasibility Study of the Potential for Sustainable Water Resources Development in the Molopo-Nossob Watercourse [Iliso Consulting Pty Ltd, 2008].

- Impact study SKA/Meerkat [Imani Development (South Africa) Pty Ltd, 2008].

- Development of a Draft Water Allocation Plan to guide compulsory licensing in the Mhlatuze Catchment. [Iliso Consulting Pty Ltd, 2008].

- Environmental Impact Assessment and Environmental Management Programme for a Proposed Nuclear Power Station [Imani Development (South Africa) Pty Ltd, 2007].

- Socio-economic and ecological implications of water restrictions in the Letaba catchment [DWAF, 2009].

PROJECT EXPERIENCE OUTSIDE SOUTH AFRICA:

Country	Date from - Date to
Swaziland	1996, 2001, 2006-2007
Mozambique	2004-2006, 2008
Namibia	2002, 2004, 2008
Botswana	2008
South Africa	1996-2009

TEFELO MAJORO

PERSONAL DETAILS:

Date of Birth: 3 June 1981

Nationality: Lesotho

Current position: Economist at Mosaka Economic Consultants cc

ACADEMIC QUALIFICATIONS:

1999-2003:   B. Com (Accounting); National University of Lesotho, Lesotho

2006-2009:   MBA (Finance); Wuhan University of Technology, China

                          Current studies:ACCA (CA)

LANGUAGE SKILLS:

Sesotho   Read   Speak   Write

English   Read   Speak   Write

OTHER TRAINING:

MS Excel, MS Word and MS PowerPoint.

PROFESSIONAL CAREER:

September 2010 – Present: Economist at by Mosaka Economic Consultants cc

January 2010 – July 2010: Qinfo Solutions: Business analyst.

April 2004 – July 2006: Educator at Lesotho High School.

Duties:

Responsible for various tasks ranging from consulting with clients to developing macro-economic models, macro-economic analyses, cost-benefit analyses and report writing and editing.

Extract on projects worked on at Mosaka Economic Consultants cc:

- Cost Benefit Analysis of either Developing Support Precinct 6 Land Commercially or Declaring it a Conservation Reserve (Dube Trade Port)

- Costs Benefit Analysis and Macro-economic Impact of the Richards Bay Industrial Development Zone (RBIDZ)

- Financial and Economic Costs Benefits Analysis of the 2010 FIFA Soccer World Cup in eThekwini (Golder Associates)

- Cost Benefit Analysis and Macro-economic Impact Analysis of the South African Sugar Industry (South African Sugar Association)

- Macro-economic Impact Analysis and Cost Benefit Analysis of the Sekoko Mine (Sekoko Resources (Pty) Ltd.)

- Financial and Economic Cost Benefit Analysis for implementing a 10 000 hectare sugar cane plantation in Mozambique (Burger and Du Plessis)

- Cost Benefit Analysis for Water Monitoring Programme (Department of Water Affairs)

PHINDILE NKOSI

PERSONAL DETAILS:

Date of Birth: 23 March 1987

Nationality: South African

Current position: Economist at Mosaka Economic Consultants cc

ACADEMIC QUALIFICATIONS:

2009-2010:   BCom. Honours in Trade and Development; University of Johannesburg, South Africa

2007-2009:   Bachelor of Economics & Econometrics; University of Johannesburg, South Africa

LANGUAGE SKILLS:

Zulu   Read   Speak   Write

English   Read   Speak   Write

OTHER TRAINING:

MS Excel, MS Word and MS Power Point

PROFESSIONAL CAREER:

January 2011 – Present: Economist at by Mosaka Economic Consultants cc

January 2010 – November 2010: Tutoring Economics at University of Johannesburg.

Duties:

Ms Nkosi is responsible for various tasks ranging from developing macroeconomic models, report writing and editing.

Extract on projects worked on at by Mosaka Economic Consultants cc:

- Development and Implementation of a Model to be used for Economic Impact Assessment of Regulatory Decisions taken by NERSA (NERSA)

- Growth and Intelligence Network 2012. The Sub-Saharan Africa Logistics Flow Project (Growth and Intelligence Network)

- Review and Update of Annual Report Models based on the Social Accounting Matrices (SAM's) for SADC (Development Bank of Southern Africa)

DANIEL SMITH HAMMAN

PERSONAL DETAILS:

Date of Birth: 08 August 1938

Nationality: South African

Current position: Research and Data Collection

ACADEMIC QUALIFICATIONS:

Date 1961   B.Mil (US)

LANGUAGE SKILLS:

English	Read	Speak	Write
Afrikaans	Read	Speak	Write
French	Read	Speak	

OTHER SKILLS:

MS Excel, MS Word and MS PowerPoint.

PROFESSIONAL CAREER:

1999-present: Mosaka Economic Consultants cc – Information research, data collection and assisting in various tasks surrounding report writing etc.

1997-2009: Merhast (Pty) Ltd. Co-Director - Facilitating the utilisation of the vast pool of knowledge and expertise available in the large number of prematurely retired Defence Force members.

1993-1998: Inter-State Defence and Security Committee (ISDSC) as Reserve Officer - Coordinator of the Inter-State Defence and Security Committee (ISDSC) of the Southern African Development Community (SADC) and was responsible for the inter-state co-operation programme, committee agendas, monitoring the execution of ministerial committee decisions and the arrangement of the various levels of committee meetings (secretariat, accommodation, logistics, transport, meeting venue, etc.) on ministerial and defence chiefs level.

1958-1993: South African Defence Force – Served in several posts, retired in 1993 as Deputy Chief of the Army.

Extract on projects worked on at Mosaka Economic Consultants cc:

- Macro-economic Impact Analysis and Cost Benefit Analysis of the Sekoko Coal Waterberg Project, 2011 [Sekoko Resources (Pty) Ltd.]

- Macro-economic Impact Analysis and Cost Benefit Analysis of the Proposed Vele Colliery near Musina, Limpopo 2010 [Naledi Development (Pty) Ltd.]

- Eskom Makopane Integration Project – Economic Impact Assessment – Savannah Environmental (Pty) Ltd.

- Proposed construction of the Invubu Theta Transmission Power line – Macro Economic Impact Assessment – Bembani Sustainability Training.

- Proposed Eskom Venus – Sigma Transmission Line – Macro Economic Impact Assessment – Eskom Holdings Ltd.

- Mokolo and Crocodile River (West) Water Augmentation Project – Regional and Local Economic Impact Assessment of the Proposed Water Augmentation – Naledi Development Restructured.

- Intermediate Reserve Determination Study for the Surface and Groundwater Resources in the Mokolo Catchment, Limpopo Province – Socio Economic Present State Evaluation – Department of Water Affairs.

- Millennium Development Goals needs assessment and costing exercise in Botswana – UNDP.

- Costing of the Lesotho Poverty Reduction Strategy Paper (PRSP) – UNDP.

- A Needs Assessment for Achieving the Millennium Development Goals (MDG) in Lesotho – World Bank.