Environmental Impact Assessment for a Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province

# **Economic Impact Assessment Study**

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I, Elena Broughton as duly authorised representative of Urban-Econ Development Economists (Pty) Ltd., hereby confirm my independence (as well as that of Urban-Econ Development Economists (Pty) Ltd.) and declare that neither I nor Urban-Econ Development Economists (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Pamish Investments No. 39 (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the proposed Magnetite Mine, to be located near Mokopane in the Limpopo Province.

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# **EXECUTIVE SUMMARY**

Pamish Investments No.39 (Pty) Ltd ("Pamish Investments") is applying in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 ("MPRDA") for a mining right over an area currently covered by its Prospecting Right LP 30/5/1/1/2/95PR, based in Bakenberg, which is located 65 km west of Polokwane and 45 km north-northwest of Mokopane District, Limpopo Province. The company intends to establish a mine (the "Pamish Magnetite Mine", or the "Magnetite Mine") to produce a magnetite concentrate product.

The proposed project is to be located near Mokopane in the Mogalakwena Local Municipality, the Limpopo Province. The ore bodies that are planned to be mined are situated on the farm portions Vogelstruisfontein 765 LR, Vriesland 781 LR, Vleigekraal 783 LR, Schoonoord 786 LR and portions Re/1, Re/2, 3, 4, 5 and 6 of the farm Bellevue 808 LR.

This report details the results of the Economic Impact Assessment (EIA) specialist study undertaken by Urban-Econ Development Economists as part of the overall Environmental Impact Assessment (EIA) process undertaken by Digby Wells Environmental (South Africa) (Pty) Ltd. The EIA documented in this report builds on the Economic Impact Assessment: Scoping Phase Inputs Report compiled as part of the Scoping Phase of the EIA process.

Economic impact refers to the effect on the level of economic activity and the welfare of households in a given area because of some form of external intervention in the economy. The intervention can be in the form of new investment in infrastructure (as in the case of the current assessment), new development, adoption of a new policy or service, expansion of the current operations, etc. The types of economic impact stimulated by the intervention are generally positive and include creation of additional jobs, generation of business sales and value-added, improved quality of life, increase in disposable income, and growth of government revenue.

Any type of intervention does not only create direct benefits experienced by the investor, but has spill over effects on the other economic agents through a multiplier effect. Two types of multiplier effects can be distinguished, i.e. production induced effects or indirect effects and consumption induced effects or induced impacts:

- Production induced effects or indirect effects occur when the suppliers of goods and services to the new business experience larger markets and potential to expand. Indirect impacts result in an increase in sustainable number of jobs, new business sales, value added, and household income.
- Consumption induced impacts or induced effects represent further shifts in spending on food, clothing, shelter and other consumer goods and services as a consequence of the change in workers' payroll of directly and indirectly affected businesses. This leads to further business growth/decline throughout the local economy.

Economic impacts can also be viewed in terms of their duration, or the stage of the project's lifecycle that is being analysed. Generally two phases are subjected to the economic impact assessment namely the construction phase and the operational phase. The construction phase economic impacts are of a temporary nature, they have, therefore, a temporary effect.

On the other hand, the operational phase of the project usually takes place over a long-term; hence, the impacts during this stage are generally of a sustainable nature.

After collecting the relevant data for the project and delineating the study area, an economic modelling exercise based on the Social Accounting Matrix (SAM) was used to assess the direct, indirect, and induced economic impacts of the construction and the operational phases on the local and regional economies of Limpopo.

The results of the impact assessment found that the project will have a total production impact of R1 288.1 million (2015 prices), a total GDP-R impact of R509.5 million (2015 prices), and will create a total 2 986 Full-Time Equivalent (FTE) employment opportunities over the two-year construction period. The above figures include both direct and multiplier effects that the project is envisaged to create during that period; the direct impact alone though is estimated at generation of R222.6 million of GDP (2015 prices) and creation of 1 089 FTE jobs. During the operational period, the project will have a total production impact of R36 143 million, a total GDP-R impact of R25 516 million, and will create a total 32 196 full-time equivalent (FTE) employment opportunities over the entire 30-year period. It should be noted that FTE jobs do not directly translate into the headcount of people employed but is the equivalence of one employee working full time. On an annual basis, though, the project will contribute to the generation of R850.5 million of GDP in the national economy, of which R687.6 million will be created by the mine directly. At the same time, it will create and support for the entire operational period 1 073 FTE employment opportunities, of which 168 jobs will be created at the mine itself.

Considering that the mining sector in the local economy has been declining in the past few years, the proposed establishment of the mine is expected to reverse this trend and offset the decline in the local economic base; importantly, it will re-establish sustainable employment opportunities that have been lost in the economy in the past.

The proposed mine is also expected to create some negative environmental impacts that may result in negative economic effects in the immediate locality from the site. Among the negative impacts that are expected to ensue as a result of the project include potential decline in property values and a possible loss of income derived by some of the properties from international and domestic tourists visiting the area for trophy hunting. These impacts are not expected to be of significance; furthermore, it is believed that proper mitigation measures may significantly reduce their probability and magnitude. Importantly, if losses do occur, the potential negative economic effects will be a fraction of the positive impacts that will be created by the mine.

To conclude, from the economic perspective, the proposed project is beneficial. The proposed Magnetite mine will have a positive effect in terms of stimulation of domestic production, job creation, and government revenue. The project also falls within the government's objective to stimulate job creation, especially in rural and peri-urban areas. Therefore, from an economic perspective, the project should be approved for development, under the condition that the proposed mitigations are implemented.

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# **1** Introduction

Urban-Econ Development Economists was appointed by Digby Wells Environmental to undertake an Economic Impact Assessment study for the establishment and operation of the **Pamish Magnetite Mine**, proposed to be located near Mokopane in the Limpopo Province. The study forms part of the Environmental Impact Assessment (EIA) process in support of a Mining Right Application for the project as prescribed in the National Environmental Management Act, Act 107 of 1998 (NEMA), and its subsequent amendments.

# 1.1 Project Background

Pamish Investments No.39 (Pty) Ltd ("Pamish Investments") is applying in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 ("MPRDA") for a mining right over an area currently covered by its Prospecting Right LP 30/5/1/1/2/95PR, based in Bakenberg, which is located 65 km west of Polokwane and 45 km north-northwest of Mokopane District, Limpopo Province. Pamish Investments intends to establish a mine (the "Pamish Magnetite Mine", or the "Magnetite Mine") and initially produce magnetite (Pamish Investments No 39 (PTY) Ltd, 2015a).

The Pamish Magnetite Mine is proposed to be located in the central portion of the Northern Limb of the Bushveld Complex (BC) and situated on a group of six adjacent farms. The farms cover a total area of approximately 10 100 hectares and a strike of approximately 5.5 km. The mineral resources initially targeted as mineable are two essentially disseminated vanadiferous magnetite ore bodies, developed above the contact of the Upper and Main Zones of the Bushveld Igneous Complex (Pamish Investments No 39 (PTY) Ltd, 2015a).

The current mining right application is in respect of mining of vanadiferous titano-magnetite ore. The final product from the mine is envisaged to be a magnetite concentrate product, with the primary element of interest being vanadium, with iron and titanium as potential by-products (Pamish Investments No 39 (PTY) Ltd, 2015a).

# 1.2 Terms of Reference

The Terms of Reference for the Economic Impact Assessment Report include:

- Delineation of the primary, secondary, and tertiary study area;
- Compilation of an economic profile of the study area;
- Development of an economic model on the basis of a Social Accounting Matrix for Limpopo;
- Collection of required data and interpretation thereof in economic variables required for the modelling exercise;
- Estimation of economic impacts associated with the proposed Magnetite Mine using the economic models;
- Interpretation of the potential economic impacts in the context of the affected environment, be it local or regional economies;

- Comparison of the identified impacts against the status quo, i.e. "no go" alternative to determine whether the project will produce a net benefit or net loss; and
- Provision of recommendations with respect to possible mitigation measures that could be implemented to reduce potential negative impacts and capitalise on the possible positive economic effects of the project.

# 2 Details of the Specialist

The Economic Impact Assessment of the project was prepared by Urban-Econ Development Economists. The details of the consultants responsible for the compilation of the report are as given below:

**Elena Broughton** is a senior professional at Urban-Econ and has an extensive knowledge in various fields of economic development, including impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a special interest in project evaluation and decision-making framework, with the latter being the focus of her Master's dissertation. Over the past few years, she was able to extend her experience in these fields working on projects for both government and the private sector.

**Memory Madondo** is a professional at Urban-Econ who has gained experience over the past three years in several economic arenas such as collation and analytic processing of economic data, trend analysis, forecasting and economic development among others. She has also carried out a number of socio-economic impact assessments of varying magnitude and has in turn gained good skill in report writing and presentation. She continues to gain further knowledge as well as expertise in the economic field.

# 3 Aims and Objectives

The purpose of the Economic Impact Assessment is to determine the potential positive and negative effects of the proposed Magnetite Mine on the local and regional economies and to compare its effects with the "no go" alternative. The "no go" alternative assumes that the mine is not established at the proposed location, nor anywhere else in the country, thus retaining the current economic status quo. The study also aims to provide recommendations on how negative economic impacts, if identified, can be mitigated or eliminated altogether and advise on the potential actions that could be implemented to enhance positive impacts.

# 4 Methodology

# 4.1 Project location and study area delineation

The proposed project is to be located near Mokopane in the Mogalakwena Local Municipality (LM), the Limpopo Province. The ore bodies that are planned to be mined are situated on the farm portions Vogelstruisfontein 765 LR, Vriesland 781 LR, Vleigekraal 783 LR, Schoonoord 786 LR and portions Re/1, Re/2, 3, 4, 5 and 6 of the farm Bellevue 808 LR.

In order to delineate the study area, it is important to understand the concept of economic impacts. Economic impacts can be of a different nature and spatial extent. The latter differs

significantly depending on the type of activity that is being analysed and the structure and composition of the locality where it is to be established. The more diversified the immediate locality of the project is in terms of its economic variables, the more concentrated the impact will be in that area. It is very rare, though, to find a case when the demands of the proposed activity to be constructed and operated can be fully satisfied within the immediate locality of the project. Therefore, more often than not, economic impacts derived from any activity are spread throughout various administrative units. Understanding the potential distribution and concentration of impacts throughout the area is important to determine the magnitude and significance of these impacts in the context of spatial units.

Regarding the proximity of the mine to urban areas, it is critical to differentiate between towns and settlements. Towns are defined as urban establishments comprising an urban area that has a name, defined boundaries, and local government offices. Towns are generally characterised as being larger than a village and smaller than a city. Communities do not maintain local government offices and fall within the bounds of a nearby town or regional boundary.

As mentioned before, the project is located on the land owned by the Bakenberg Tribal Council in the Mogalakwena LM, Limpopo Province. The closest major town to the proposed project is Mokopane, which is located approximately 45 km by road from the site. Other smaller settlements include, inter alia:

- Sepharane;
- Bakenberg;
- Ditlotswana;
- Malokong;
- Mosate;
- Haakdoring;
- Etc.

It is believed that most of the people who will be employed by the proposed project will come from the town of Mokopane and the above-mentioned nearby settlements. The Mogalakwena LM, though, is a relatively small municipality with a population of about 307 863 people as per Stats SA's Census 2011. It is, however, adjacent to the Polokwane LM, where the capital of Limpopo is located. This suggests that some of the labour for the proposed project and services could probably be sourced from the local municipality and the nearby areas such as the town of Polokwane. It is likely though that the majority of skilled and highly skilled people as well as inputs required for the development of the proposed mine, will most likely be sourced from other parts of the country and possibly even from other countries. Considering that the project is to be located in proximity to the Gauteng Province, it could be argued that a significant portion of the inputs and services required for construction and operation of the mine could be sourced from the Gauteng Province.

The proposed project could be associated with a number of environmental impacts. These might impact people and economic activities situated in close proximity to the site and on the farms that will be affected by the footprint of the project and its various components. This

area, which could be defined as a zone of influence of the project, will also need to be taken into account.

Given the above, the following delineation of the study areas is done:

- Primary study area includes the site and the adjacent farms, which form part of the immediate zone of influence, the Bakenberg Traditional Authority, and the MogalakwenaLM.
- Secondary study area includes Limpopo.
- Tertiary study area is South Africa.

# 4.2 Literature Review and Desktop Assessment

The literature review covered a range of strategic government documents and secondary data related to the delineated study areas. It encompassed, inter alia:

- Strategic government documents:
  - New Growth Path Framework (NGPF) (2010);
  - National Development Plan (NDP) (2011 2030);
  - Industrial Policy Action Plan (IPAP) (2014/15-2016/17);
  - Limpopo Employment, Growth and Development Plan (LEGDP) (2009 2014);
  - Limpopo Green Economy Plan;
  - Mogalakwena Local Economic Development Plan (LED) 2011-2016;
  - Waterberg Local Economic Development (2007);
  - Waterberg Mining Strategy (2006);
  - Waterberg Spatial Development Framework (SDF) (2009);
  - Waterberg Environmental Management Framework (EMF) (2010);
  - Mogalakwena Housing and SDF (2005);
  - Waterberg District Integrated Transport Plan (DITP) (2011);
- Background documents:
  - South Africa's Mineral Industry report (2012/2013);
  - Grain SA reports related to agricultural production;
  - o Council of Geoscience documents related to geology of the area;
- Statistical data:
  - Census 2011, Stats SA;
  - Regional standardised data, Quantec;
- Google Earth for observation of land used and spatial composition of the area.

# 4.3 Fieldwork and Seasonal Influence

The proposed project is to be located in the rural area that is dominated by two types of land uses – farming activities (agriculture and game) and settlements. From an economic perspective, any activity that is located with the potential zone of influence of the proposed project needs to be examined with the purpose of:

- Firstly, to understand the economic profile of the zone of influence;
- Secondly, to determine whether the existing economic activity in the zone of influence may be impacted by the proposed project and whether the impact will be of positive or negative nature; and
- Thirdly, to determine the extent to which the positive or negative impact will affect the economic viability of the existing economic activity.

The following map illustrates the zone of influence that was examined during the economic impact assessment study.





The proposed project is to be located on land that is owned by a tribal authority and that is currently not used for any commercial economic activity; however, it is utilised for subsistence farming by local communities. Based on the understanding of the potential environmental impacts that could ensue from the proposed project in the area and specifically visual, noise, and dust pollution, the potential zone of influence, i.e. the area where immediate impacts are to be concentrated, is therefore limited to the adjacent and

nearby land parcels. Therefore, site visits and engagement with the directly and indirectly affected parties was limited to the owners or managers of these land parcels.

In order to obtain baseline information on the economic conditions characterising the potentially affected land parcels in terms of current and predicted future changes with and without the project, face-to-face interviews were conducted on 5 May, 8 May, and 26 May of 2015. Most of the interviews were undertaken at the farms themselves, while some were held in Pretoria, where the landowners reside permanently. However, all farms were visited on 5 May 2015. The site visits covered visual observations of the affected area, including structures, land use, and activities.

Table 4-1 outlines the land parcels that were included in the zone of influence and summarises information about site visits and interviews. Out of the list of nine farms that were included in the zone of influence, eight farmers were engaged with. No contact details were available for the owners of Portion 1 of Mozambique 807 LR.

Farm	Registered Landowners	Contact Person	Data collection type and date	
Portion 2 of Bellevue 808 LR	Broad Brush Investments 26	Mr Louis Botha	On site face-to-face interview on 05/05/2015 Interviewee: Louis Botha	
Portion 3 of Bellevue 808 LR	Educated Risk Investments 40	Mr AJ Kotze	E-mail/fax; 20/04/2015 Interviewee: AJ Kotze	
Portion 4 of Bellevue 808 LR	Kotze Abel Daniel- Trustees	Mr AJ Kotze	E-mail/fax; 20/04/2015 Interviewee: AJ Kotze	
Portion 5 of Bellevue 808 LR	Trekdrift Boerdery CC	Mr Stephanus Kotze	On site face-to-face interview on 05/05/2015 <b>Interviewee:</b> Abel Kotze	
Portion 1 of Eckstein 806 LR	Meijer Jacob Hendrik	Jaap Meijer	Face-to-face interview in Pretoria on 26/05/2015 <b>Interviewee:</b> Jaap Meijer	
Portion 1 of Mozambique 807 LR	Molekwa Clan Communal Prop Assoc	-	Not contacted	
RE of Delagoa 809 LR	Marqott Farming Pty Ltd	Rui Marques Manie Uys	On site face-to-face interview on 05/05/2015 Interviewee: Manie Uys	
Portion 4 of Delagoa 809 LR	-	Mr FJ Lee	On site face-to-face interview on 05/05/2015 Interviewee: FJ Lee	
Portion 2 of Delagoa 809 LR	-	Hendrik Vermaak	Face-to-face interview in Pretoria on 08/05/2015 Interviewee: Hendrik Vermaak	

### Table 4-1: Landowners' contact details

The first engagement with all of the contacted land owners was done over the phone in order to set up a suitable meeting date and time. At that stage, the researcher would explain the reason and purpose of the requested meeting. All interviews followed a semi-structured approach to ensure consistency and uniformity in the derived information. Information gathered during the interviews included, inter alia:

- The current land use of the land parcel;
- Type of economic activity taking place on the land parcel;
- Number of people employed and their status (permanent or temporary);

- Annual average revenue derived by economic activity on the land parcel and key revenue streams;
- Information about number of tourists, duration of stay, purpose of visits, if the land is a game farm or a tourist attraction;
- Information about agricultural yields and livestock, if the land parcel is used for commercial agriculture; and
- Opinion and concerns, if any, of the land owners or manager regarding the proposed project.

Other data collection methods took on the following forms:

- E-mail correspondence where the farm owner/manager was not available for face-toface interview;
- A desktop study of the sites and surrounding areas through the use of Google Earth
- Perusing the various locality maps generated through the project process; and
- Perusing existing project documentation, this included shape files and project descriptions received from the client.

### 4.4 Economic impacts explained

Prior the introduction of the methodology employed in the study, it is important to explain the concept of an economic impact. Economic impact refers to the effect on the level of economic activity and the welfare of households in a given area because of some form of external intervention in the economy. The intervention can be in the form of new investment in infrastructure (as in the case of the current assessment), new development, adoption of a new policy or service, expansion of the current operations, etc. The types of economic impact stimulated by the intervention are generally positive and include creation of additional jobs, generation of business sales and value-added, improved quality of life, increase in disposable income, and growth of government revenue.

Any type of intervention does not only create direct benefits experienced by the investor, but has spill over effects on the other economic agents. As illustrated in Figure 4-1, three types of economic impacts are generally assessed:

- Direct effects are generated when a new business creates new jobs and purchases goods and services to operate the new facility. Direct impact results in an increase in job creation, production, business sales, and household income.
- Indirect effects occur when the suppliers of goods and services to the new businesses experience larger markets and potential to expand. Indirect impacts result in an increase in job creation, GGP, and household income.
- Induced effects represent further shifts in spending on food, clothing, shelter and other consumer goods and services as a consequence of the change in workers and payroll of directly and indirectly affected businesses. This leads to further business growth/decline throughout the local economy.



Figure 4-1: Impact of capital investment/operational expenditure

Economic impacts can also be viewed in terms of their duration, or the stage of the project's lifecycle that is being analysed. Generally two phases are subjected to the economic modelling exercise and assessment, namely the construction phase and the operational phase. The construction phase economic impacts are of a temporary nature, they have, therefore, a temporary effect. On the other hand, the operational phase of the project usually takes place over a long-term; hence, the impacts during this stage are of a sustainable nature.

# 4.5 Methodology

The methodology employed in conducting the study comprised of five main steps described below.

#### Step 1: Study area profiling

Profiling involved the description of the study area in terms of selected economic variables. It included the analysis of parameters such as population size and household numbers, structure and growth of the economy, labour force, and employment situation. Profiling for the study was done making use of Quantec Research database and selected Stats SA statistics, such as Census 2011.

#### Step 2: Modelling

The modelling exercise made use of economic models developed on the basis of the Social Accounting Matrices (SAMs) for Limpopo updated to 2015 prices. The SAM is a comprehensive, economy-wide database that contains information about the flow of resources that takes place between the different economic agents in this case in the provincial economy. Two models were developed, one for South Africa and the other for Limpopo. The selection of two models to be used in the assessment is attributed to the expected spatial distribution of procurement during various phases of the project. It is envisaged that during construction most of the inputs will be procured from different parts of

South Africa and importantly from outside Limpopo; while the impact observed during operation would be largely localised in Limpopo.

The following assumptions were used with respect to the economic model and the modelling exercise:

- No structural changes in the economy are experienced during the analysed period (between 2003 and 2015).
- The model was closed with respect to households, which implies that households are
  regarded as an industry whose output is labour and whose inputs are various
  consumer goods and services. The closed economic model, compared to the open
  economic model, allows determination of induced impacts (i.e. impacts stimulated
  through household consumption) in addition to direct and indirect impacts predicted
  by the open economic model.
- When calculating the exogenous inputs, Gross Operating Surplus was excluded from the consumption induced effects thus assuming that all earnings will be retained and not paid out as dividends. Capital formation and interest payments were excluded from modelling, too.
- The model assumes that the economy is in equilibrium.
- The supply of each good and service is assumed to be perfectly elastic and absent of any capacity constraints. This means that industries and sectors can produce any quantities of goods and services and would not experience technological, budgetary, and/or human resource constraints.
- Employment is estimated in Full-Time Equivalent (FTE) person-years for one year. This, however, does not necessarily directly translate into new employment positions. In the short-term, an increase in FTE could be absorbed by currently employed through working overtime or it could translate into the support of currently employed people.

#### Step 3: Impact evaluation and recommendations

The purpose of this step was to interpret the modelling data and collected information and describe economic implications of the proposed project on the affected economies and economic activities and evaluate their significance. Where applicable, measures to reduce or eliminate negative impacts and enhance positive impacts were proposed.

All impacts identified were rated according to the evaluation methodology prescribed by the environmental consultant. The following table outlines various ratings used to determine different levels of severity, spatial scale, duration and probability during evaluation.

	Intensity / Replacability				
Rating	Negative impacts (Nature = -1)	Positive impacts (Nature = +1)	Extent	Duration/ Reversibility	Probability
7	Irreplaceable loss or damage to biological or physical resources or <b>highly</b> sensitive environments. Irreplaceable damage to <b>highly sensitive</b> cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international oorders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or <b>moderate to highly</b> sensitive environments. Irreplaceable damage to cultural/social resources of <b>moderate to highly</b> sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some ume arter tne ure or the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: I ne Impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or <b>moderately</b> sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.
3	Moderate loss and/or damage to biological or physical resources of <b>low</b> <b>to moderately</b> sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on- going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	viedium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen ifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem	Low positive impacts experience by a small percentage of	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances.

#### Table 4-2: Impact assessment parameter rating

	Intensity / Replacability				
Rating	Negative impacts (Nature = -1)	Positive impacts (Nature = +1)	Extent	Duration/ Reversibility	Probability
	functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	the baseline.			The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low- level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Higniy uniikely / None: ⊨xpectea never to happen. <1% probability.

The combination of intensity, geographic extent, duration and probability is used to determine the **significance** following the next formula: **Consequence** (Intensity + Geographic Extent + Duration) \* **Probability** (Likelihood of an impact occurring)\* **Nature** (positive (+1) or negative (-1) impact). The significance of an impact is then determined and categorised into one of the categories as indicated in Table 4-3 below. Impacts are rated prior to mitigation and then again after mitigation measures have been considered.

#### Table 4-3: Impact significance thresholds

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)

Score	Description	Rating
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

# **5** Assumptions and Limitations

This chapter provides assumptions related to the proposed project and the activities in the zone of influence.

# 5.1 Proposed project related assumptions

### 5.1.1 Construction phase assumptions

Based on the information contained in the Mining Work Programme (MWP) for the proposed project (Pamish Investments No 39 (PTY) Ltd, 2015a), it is assumed that construction will take place during the first two years from the date of granting of the mining right (assumed to be March 2016). Establishment of the mine will involve the erection of a crushing, milling, beneficiation, waste recovery and waste handling plants on site. In addition, the construction phase will involve building of temporary offices and general site establishment such as provision of lavatories. During the construction phase, topsoil clearing and pre-stripping of waste in advance of ore production will also be undertaken.

It is estimated that the construction phase will require capital investment to the value of R681.5 million (2015 prices), excluding land costs but including transaction fees. About half of these expenses (47.6%) will be directed towards site establishment, infrastructure development, pre-stripping activities and other general construction-related activities, which are generally localised. The rest will be spent on machinery and equipment for setting up crushing, milling and beneficiation plants, as well as for waste recovery and handling. The majority of the machinery and equipment required for the establishment of these plants is expected to be imported. Overall, it is assumed that about 72.7% of all capital expenses will be spent in South Africa, while the remainder will be spent on imported machinery and equipment such as crushers, mill, filters, instrumentation, and other items. It is also assumed that all labour during construction will be procured from within South Africa. Based on the preliminary estimates, it is assumed that a total of 1 089 Full Time Equivalent (FTE) personyears will be created over the entire period of construction activities, which equates to about 545 construction workers and engineers working on site for two years in a row.

# 5.1.2 Operational phase assumptions

Following the construction phase, full production will commence. During the first year of the production schedule, topsoil is cleared and pre-stripping is done. From the second year onwards ore is produced at a rate of 1 million ton (Mt) Run of Mine (ROM) for 30 years.

It is expected that the mine will operate for 30 years and a total of 28 Mt of ore will be mined over the life of the mine. The annual production of magnetite concentrate will be 714 000 tons, which equates to 59 500 tons per month.

Based on the information provided in the MWP (Pamish Investments No 39 (PTY) Ltd, 2015a), annual average revenue during the operational phase is estimated at R855.7 million in 2015, which will be divided in terms of the following key items:

#### Table 4-2: Breakdown of operational revenue and expenditure (R'ml, 2015 prices)

ltem	R'ml	% of total
Intermediate Products and Services	R168.8	19.7%
Labour Costs	R53.5	6.3%
Gross Operating Surplus (including taxes, royalties, finance charges, etc.)	R633.4	74.0%
TOTAL	R855.7	100%

(Pamish Investments No 39 (PTY) Ltd, 2015a)

All intermediate inputs required to sustain operations at the mine and labour costs will be localised, i.e. spent within South Africa. The mine is expected to provide sustainable employment opportunities to 168 people. Of these, about 110 will be unskilled and semi-skilled workers (predominantly semi-skilled) and the rest will be skilled and highly skilled workers.

#### 5.1.3 Decommissioning phase assumptions

The rehabilitation activities will be on-going. The decommissioning phase will last for five years and it is estimated that R147.1 million will be spent and approximately 500 people will be employed for one year for this task. This will be followed by a post-closure phase, which will last for three years and is expected to cost R7.1 million.

After the facility is closed, buildings will be demolished and landform designs will be implemented for the disturbed areas. Rehabilitation monitoring will be undertaken as per the post-closure monitoring programme to confirm success of rehabilitation measures.

### 5.2 Assumptions regarding affected land uses and economic activities

The prospecting rights applied for by the project owner cover an area of 10 100ha and include both tribal land and privately owned farms. The project footprint, inclusive of mine pits and other mine infrastructure will cover an area of about 2 000ha and will only fall within the tribal land.

As mentioned earlier, the proposed mine's footprint is to be located on land parcels that are owned by a tribal authority and that are currently used for subsistence farming and specifically for livestock grazing. Such activities are used to provide for basic needs of the households or communities and involve creation of little or no value added. Subsistence farming is not considered to be a commercial agricultural activity; therefore, the proposed project is not expected to sterilise land from any existing commercial land use. However, due to the range of economic activities observed in the near vicinity of the site, the project's potential environmental effects may lead to some negative impacts on the adjacent farms that could have an implication on their economic viability.

Table 5-1 below provides information on the land parcels that form part of the zone of influence (i.e. including directly affected land and adjacent farms), which includes their current uses and concerns raised by the land owners during face-to face interviews.

Farm	Economic activity	Raised concerns	Sensitivity	
Portion 2 of Bellevue 808 LR	Mainly game farming with some crop farming	<ul> <li>Increased crime, which will require additional investment in security</li> <li>Depreciation of land value</li> <li>Water supply and quality</li> </ul>	Part of the farm, for which the prospecting right was applied for;	
Portion 3 and 4 of Bellevue 808 LR	Game and livestock farming, irrigation	<ul> <li>Plans for exotic game breeding may be stopped if mine were to be established</li> </ul>	mine's footprint will not be extended to these portions, but the land parcels may be affected by various environmental impacts	
Portion 5 of Bellevue 808 LR	Game and livestock farming, irrigation	<ul> <li>Increased crime</li> <li>Noise pollution</li> <li>Water supply and quality may be affected</li> <li>Depreciation of land value</li> </ul>		
Eckstein 806 LR	Game and livestock farming, irrigation	<ul> <li>Noise might disturb the wildlife</li> <li>Degradation of roads</li> </ul>		
Remainder of Delagoa 809 LR	Game and livestock farming	<ul> <li>Poor water supply and quality</li> <li>Noise might disturb the wildlife</li> <li>Increased crime</li> </ul>	Located in proximity to the mine's footprint and may be impacted through environmental impacts	
Portion 4 of Delagoa 809 LR	Game and livestock farming	<ul><li>Water supply and quality</li><li>Increase in crime</li></ul>		
Portion 2 of Delagoa 809 LR	Game and livestock farming	<ul> <li>Water supply and quality</li> <li>Depreciation of property value</li> </ul>		

#### Table 5-1: Land uses - site and adjacent land

The following was also determined from the site visit:

- Farm sizes vary with the smallest farm portion being 268 ha and the largest 1 700 ha.
- Many farmers in the affected and adjacent farms use their farms mainly for game, livestock, and crop production purposes.
- Trophy hunting and game viewing are practiced extensively on the affected and surrounding farm portions.
- Many of the farm owners are venturing into exotic game breeding
- Farm workers who do not live on the farm mainly come from Sepharane settlement.

The following paragraphs provide description of business operations observed on the farms located in direct proximity to the proposed mine's footprint and that are expected to be impacted the most.

**Portion 2 of Bellevue 808 LR** extends over an area of about 400 ha and is privately owned and run by Mr. Louis Botha. His concerns regarding the establishment of the mine include depreciation of the value of the farm, reduced water supply and quality and increased crime, which will result in additional expenditure on security. The farm's livestock and crop farming have an estimated annual revenue of R200 000; currently the farm employs one full-time employee and two temporary workers for about three weeks. During the winter season (May-July), the farm entertains about ten domestic guests interested in trophy hunting and game viewing activities. Guests usually stay on the farm for about three to four days and spend about R6 000 during the stay. This translates to an annual revenue of about R260 000 of total revenue on average on an annual basis.

Portion 3 and 4 of the Bellevue 808 LR Farm make up about 1 100 ha of the farm and is owned and run by Mr. AJ Kotze. His greatest concern is that the establishment of the mine might make it impossible for him to start exotic game breeding. It is estimated that the exotic game breeding will require an initial capital investment of R10 million and will generate an annual revenue of R5 million. Currently, the farm is largely being used for livestock and game farming, for which about 1 000 ha is used, while the rest is used mainly for cultivation of crops. These activities earn the farm owners about R1.65 million of annual revenue and provide two permanent and four temporary employment opportunities for farm workers. In addition, the farm receives about 20 international trophy hunters in winter months (May-July). As indicated by the owner of the farm, an international tourist usually spends up to R50 000 per visit of four days, inclusive of all expenses incurred such as accommodation, hiring of professional hunter, payment for animals, services of taxidermist, etc. Approximately 25 domestic tourists also visit the farm for trophy hunting all year round; their average stay, as indicated by the owner, is about a week and each of them spends up to R25 000 per visit. Considering the above, it is estimated that game hunting on this land parcel could generate up to R1.6 million worth of additional revenue to the land owner.

**Portion 5 of the Bellevue 808 LR Farm** covers an area of about 268 ha of the farm and is run by Mr. Abel Kotze. His concerns regarding the establishment of the mine include noise pollution, depreciation of the value of the farm, reduced water supply and quality, and increased crime. Currently, the farm is largely being used for livestock and game farming covering about 238 ha, and for cultivation of crops (lucerne and peppadews) that occupies 30 ha. These activities earn the farm about R1 million of annual revenue and provide four permanent and 40 temporary (over a six month period) employment opportunities.

# 5.3 Assumptions regarding potential environmental impacts that may lead to economic impacts

Aside from positive economic impacts that any investment tends to create, a project can also be be associated with a number of environmental impacts. These might impact economic activities situated in close proximity to the site and on the farms that will be affected by the footprint of the project and its various components.

In order to adequately assess potential negative impacts that can be exerted by the proposed project during various stage of its life cycle, other specialists' studies are reviewed. The spatial extent of potential environmental effects (i.e. noise, visual, etc.) that the

proposed project will create is then examined and compared with the location of various economic activities in the delineated zone of influence. These are examined in the paragraphs below.

# 5.3.1 Assumptions related to noise-related impacts in comparison economic activities in the zone of influence

The noise specialist has compiled a number of maps illustrating spatial distribution of noise during construction and operational periods, as well as both during day and night time. These are provided below (a more detailed map can be seen in Noise specialist's report).



Map 5-1: Noise impacts during construction - Pit 1 and Pit 2



Map 5-2: Noise impacts during operation - Pit 1, night-time and day-time



#### Map 5-3: Noise impacts during operation - Pit 2, night-time and day-time

From the above, the following can be highlighted:

- During construction: Noise levels above recommended limits will be largely contained to the footprint of the mine and the nearby areas. Based on this, none of the farms in the zone of influence that are currently earning income from tourism activities are expected to experienced notable impact from noise.
- During operations: Noise levels above recommended day-time and night-time levels will extend slightly further away from the mine's footprint; however, they are not expected to reach farm portions that have been identified to earn income from tourism activities.

# 5.3.2 Assumptions related to visual impacts in comparison economic activities in the zone of influence

The maps below have been compiled by the visual expert and assist in determining the extent of the mine's visual intrusion.







Map 5-5: Theoretical view shed model

Although the proposed project will create visual disturbances, this biggest visual impact will be felt by those activities located within a 5km radius of the proposed site with moderate impacts extending to about 8km of the site. Farms and subsequently economic activities located about 10km away will have the least visual exposure. Given this information, the farms within the zone of influence currently engaging in tourism activities will experience moderate to low visual obstructions. Portion 5 of the Bellevue 808 LR Farm and Portion 2 of Bellevue 808 LR are expected to fall within the moderate visual disturbance area. Due to the terrain in the area, the mine will not be visible from the majority of the land comprising Portion 3 and 4 of the Bellevue 808 LR Farm. It is important to note that revenue derived from game farming by the first two farms mentioned above represents a secondary income for the owners; game farming though is the primary income at the farms located on Portion 3 and 4 of the Bellevue 808 LR Farm. However, it appears that it will not be significantly affected by visual impacts.

# 6 Baseline Environment

### 6.1 Review of strategic developmental priorities

The national developmental policies communicate the aim to reduce poverty, achieve equity, and increase economic growth. The **New Growth Path Framework** (Department of Economic Development, 2010) and the **National Development Plan 2030** (National Planning Commission , 2011) confer that all regions are to seize advantage of the natural resources endowed to them towards achieving these aims, but in a sustainable and equitable manner. These action plans of the government focus firstly on the creation of decent employment opportunities through the support of labour-intensive sectors and secondly on ensuring long-term growth through the support of advanced industries. The NDP 2030 sets a target of creating approximately 11 million new jobs and achieving an annual average economic growth rate of 5.4% by 2030.

The Industrial Policy Action Plan (IPAP) 201415-2016/17, which is the sixth iteration of the IPAP, recognises the important role that the industrial sector plays in terms of job creation in South Africa. The plan provides guidelines in terms of job creation and economic development throughout South Africa. The plan further focuses on specific sectors that will be the priority sectors in terms of economic development in South Africa. It identifies the development of the metal fabrication, capital and tail transport equipment industry to be one of key priorities for the analysed period. Importantly, it specifies that one of the key areas of opportunity for growing this industry is among others by implementing mining turnkey projects in the country.

Echoing the need to reduce poverty, create employment and increase economic growth is the **Limpopo Employment Growth and Development Plan (2009 – 2014)** (Limpopo Provincial Government, 2009). The Plan recognises the province's mineral resource endowment and the potential for development of selected sub-clusters within the mining industry. Mining is one of the main contributing sectors to the provincial economy and is also perceived as a key economic sector for growth and development.

There remains a central question about what needs to be done in order for local economies and societies to realise mutual objectives of investing in natural capital, decarbonising the economy and creating green jobs (Musyoki, 2012). The Limpopo province shows its commitment to championing sustainable development through (among other things) the promotion of green economy and creation of green jobs in the **Limpopo Green Economy Plan (LGEP)**. The proposed Limpopo province "pathway to a green economy" as indicated in the LEGP starts with enabling policy formulation within the context of national priorities for growth and development; that is, green economic growth as a necessary response to climate change. The pathway also seeks to promote changes in production and consumption at the individual levels while creating competition and positive growth of the economy. The pathway is based on the creation of labour-intensive activities, which would promote growth and ensure job creation. It is emphasised though that green economy in Limpopo can only be achieved if there is adequate capital injection from government and other sources at the initial stage, and through collaboration and partnerships. Similar to the Limpopo Employment Growth and Development Plan (2009 - 2014), the **Waterberg LED** of 2007 also recognises mining as a key economic sector in the district municipality followed by agriculture. The LED focuses on clusters, which have been formed in order to facilitate the beneficiation of certain resources and specialisation of the local economy in selected industries. With the assistance of the public sector, the cluster development aims to maximise the benefits of mineral resources through upstream and downstream activity in the local area.

A mining development strategy focusing on the improvement of the mining value chain has been devised in support of the local mining industry. Although the **Waterberg Mining Strategy** of 2006 is out-dated, it set the following objectives:

- Create a conducive environment for mining expansion and new mining developments through, among others improved infrastructure (e.g. water, roads, electricity, and rail), skills promotion, and small scale mining development;
- Promoting the capacity of Broad Based Black Economic Empowerment (BBBEE) companies with regard to supply side for local mines; and
- Enhance the capacity of local municipalities and local authorities as well as communities, to maximise the benefit from mining activity in and around their areas.

The strategy calls for the increased local procurement practices and development of downstream beneficiation. The above are suggested to be achieved through a partnership between the local mines and government, whereby government should assist with the development of necessary infrastructure and removing land-use constraints.

The **Waterberg District Integrated Transport Plan** (Infra Africa Investment Holdings (Pty) Ltd, 2011) attempts to give an overview of the status quo of the transport system, trends, objectives and proposed interventions of transport infrastructural projects within the Waterberg District Municipal area. The plan highlights a concern on the rapid degradation of many roads due to the increasing economic activities in the District, which lead to an increase in heavy vehicles travelling on local roads, and a lack of maintenance and rehabilitation.

According to the **Mogalakwena LM LED Plan (2011-2016)** linkages between mining and upstream and downstream economic activities in the municipality are limited; however, there are opportunities for expansion. The limited linkages create an environment where capital retention is difficult and is not distributed throughout the local communities of the area. Mining is the largest economic component of the municipality and it is acknowledged that it is the main driving force to achieve growth and development in the area; therefore, the diversification of the mining sector would encourage further employment creation and competitive advantages to the local business industry.

From a spatial perspective, the **Waterberg SDF** (The Development Partnership, 2009) identified the area where the proposed project is to be established as the area holding potential for platinum mining (Map 6-1).



Map 6-1: Waterberg SDF (The Development Partnership, 2009)

The **Waterberg EMF** (MetroGIS, 2010), zoned the area where the proposed project is to be located as Zone 2, which refers to as "areas with a generally high, natural, visual and cultural quality that has significant potential for the development of nature and/or culture based tourism" (MetroGIS, 2010).

The Waterberg EMF (MetroGIS, 2010) suggests that mining activities in this area are undesirable, as tourism and conservations are the preferred activities in this zone (MetroGIS, 2010). The Waterberg EMF (MetroGIS, 2010), with reference to Zones 1, 2 and 9, further indicates that "developments that transform natural veld or cultivated land into any other cover should only be allowed if such development clearly present conservation, production or tourism advantages that could justify the transformation of land." It further states that "already disturbed areas in Zones 1 and 2 should be considered as the first option for development (the August 2010 Google/Spot images for the areas should be used as the baseline)." (MetroGIS, 2010)



Map 6-2: Waterberg EMF (MetroGIS, 2010)

The **Mogalakwena Housing and SDF** (MetroPlan, 2005) is also outdated, as some other strategic document reviews for the delineated study area, and does not provide for a clear indication of the zone that the proposed project falls under. The Mogalakwena Housing and SDF (MetroPlan, 2005) identified specific farms that have been prioritised for mining development based on the knowledge of the mineral resources and the proposed projects at that time; however, no map outlining various developmental zones was included in the document. Therefore, it is difficult at this time to state whether the location of the proposed project is in any contravention of the proposed spatial development by the Mogalakwena LM. However, it is clear that the zoning undertaken by the Waterberg EMF will need to be given due consideration when analysing the proposed development and specifically comparing its costs and benefits with the existing economic activities found on site and tourism potential of that area.

Overall, it is clear that the proposed project is in line with the development priorities set by both provincial and local governments as outlined in the respective strategic policies. The proposed project, though, is to be located in the area that is zoned for conservation and tourism development. This means that the analysis of the economic impacts will need to take due cognisance of the existing and potential tourism activities observed in the zone of influence and nearby areas. Importantly, the analysis will need to focus on assessing the production benefit that the proposed project will bring compared to the current and potential use of the land for tourism and conservation purposes.

# 6.2 **Demographics**

According to Census 2011 data, South Africa's population was estimated to be above 51 million (Table 6-1). About one out of ten people in the country resided in Limpopo. The Mogalakwena Local Municipality housed about 307 863 people in 2011, or just more than 6% of the Limpopo population. Of the settlements closer to the proposed site, Mokopane and Bakenberg housed 30 150 and 7 98 people, respectively.

Study area	Population		Historical g	rowth rates		
		1996-2001	2001-2006	2006-2011	1996-2011	
South Africa	51 770 562	1.7%	1.3%	1.1%	1.4%	
Limpopo	5 404 866	3.4%	2.3%	1.8%	2.5%	
Waterberg DM	679 336	1.5%	1.0%	1.0%	1.2%	
Mogalakwena LM	307 863	1.1%	1.2%	1.5%	1.3%	
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(Quantec, 2015)

As indicated in the table above, the Compounded Annual Growth Rate (CAGR) of the local municipality's population between 1996 and 2011 was 1.3%. It was lower than the CAGR of the national and provincial population during the same period, but slightly higher than that of the district. Whilst the population of the rest of the study areas experienced a slowdown in their growth rates, the primary study area's population growth rate has been increasing (Table 6-1).

Household data enables a richer interpretation of the results of economic impact analysis. The economic model employed in the study assumes a closed system, where households are included as an additional endogenous sector. This provides for an opportunity to estimate the effects of the increase of disposable income of households due to changes in employment and income. The number of households and the rate at which they grow also provide crucial information for the prediction of future demands, and therefore, potential economic growth. High increase in household numbers coupled with the increase in disposable income levels result in greater consumption, which in turn stimulate local production and as a result the economy. In addition, knowledge of the size of the study areas in terms of households is useful for interpretation of the magnitude of the economic impact that could be created by the proposed activity. Factors influencing household size (i.e. he number of people residing in a household) and the formation of households are mostly universal in nature although some might be more country specific.

Table 6-2: Household numbers (2011), average household size (2011) and its historical
growth rate (1996-2011)

		Average HH	Household number historical growth rates				
Study area	Households	size (persons per household)	1996-2001	2001-2006	2006-2011	1996-2011	
South Africa	14 450 163	3.6	4.0%	2.1%	1.0%	2.3%	
Limpopo	1 418 101	3.8	5.5%	2.8%	1.2%	3.2%	
Waterberg DM	179 866	3.8	4.0%	1.7%	0.6%	2.1%	
Mogalakwena LM	79 395	3.9	4.0%	2.0%	1.1%	2.4%	

In 2011, South Africa had about 14 450 163 households, which means that the average number of persons included in a household was about 3.6. Limpopo had just over 1.4 million households and a bigger average household size than in the country. The primary study area had about 79 395 households and almost the same average household size (3.9) as the district municipality.

Over the years, as indicated in Table 6-2, the rates at which the number of households in the secondary and tertiary study areas have been slowing down, which mirrors the trend observed with respect to population dynamics in these study areas. In the primary study area, the trend though was different – while the population growth rate was increasing, the household growth rate was slowing down. When compared with population growth rates, it could be noted that the household growth rate in South Africa was on par with the population growth rate between 2006 and 2011. The rate at which the number of households has grown in all study areas has been significantly higher than the rate at which the population in these regions has increased over the same period. This is an indication of a decrease in the average household size in these areas.

#### 6.3 Income and expenditure patterns

There is a direct linkage between household expenditure and economic growth. Increase in household expenditure means a greater demand for goods and services, which means an increase in production and positive change in the size of an economy. Knowledge of the volume of the disposable income and the expenditure patterns of households, therefore, can provide vital intelligence with respect to the sectors that are most dependent on household income and therefore would be most affected in the case of a change in household income.

Income category	South Africa	Limpopo	Waterberg DM	Mogalakwena LM	Mokopane	Bakenberg
No Income	14.9%	13.4%	13.4%	14.9%	15.4%	17.2%
R1 – R4 800	4.5%	6.4%	3.9%	5.0%	3.4%	6.8%
R4 801 – R9 600	7.4%	12.2%	8.1%	10.8%	6.6%	14.2%
R9 601 – R19 200	17.1%	23.0%	19.5%	22.6%	14.4%	25.2%
R19 201 – R38 400	19%	21.3%	21.9%	22.8%	14.3%	19.8%
R38 401 – R76 801	13.1%	9.9%	14.0%	10.5%	11.0%	5.5%
R76 801 - R153 600	9.3%	6.3%	8.9%	6.4%	9.9%	5.2%
R153 601 - R307 200	7.2%	4.5%	6.2%	4.5%	13.4%	3.6%
R307 201 - R614 400	4.7%	2.2%	2.8%	1.8%	8.2%	2.2%
R614 401 - R1 228 800	1.9%	0.6%	0.7%	0.4%	2.4%	0.0%
R1 228 801 - R2 457 600	0.6%	0.2%	0.3%	0.2%	0.7%	0.2%
R2 457 601 and above	0.3%	0.2%	0.2%	0.1%	0.4%	0.2%
Average monthly	R9 743	R5 459	R6 947	R5 138	R13 3 73	R4 384

Income category	South Africa	Limpopo	Waterberg DM	Mogalakwena LM	Mokopane	Bakenberg
income						
Less than R3 200 pm.	62.9%	76.2%	66.8%	76.1%	54.0%	83.1%

(Quantec, 2015)

According to the Census 2011, it could be concluded that the household income situation in the local municipality mirrored some of the patterns observed in Limpopo and in the rest of the country. First of all, the percentage of households earning less than R3 200 per month (R38 400 per annum) in the Mogalakwena LM was slightly less than in the province, but considerably bigger than in the rest of the country in 2011. Overall, more than three quarters of households in Mogalakwena LM earned less than R3 200 per month in 2011. At the same time, though the percentage of households without any income at all was considerably lower in the province than in any other study area analysed. From an average household income perspective, an average household in the local municipality earned R5 138 in 2014 prices, which is lower than the provincial level of R5 459 and the district level (R6 947). Figure 6-1 illustrates the expenditure pattern of the study area. The household spend across all delineated areas are similar with the bulk of expenditure comprising of non-durable goods and services.



Figure 6-1: Household expenditure per main groups (Quantec, 2015)

Figure 6-1 shows that there are slight differences between expenditure patterns of households in the Mogalakwena LM and other study areas, particularly Limpopo. In the primary study area, households tend to spend the same share of their disposable income on services and non-durable goods, whilst in Limpopo households tend to spend more on non-durable goods than on services. The share of disposable income spent by Mogalakwena households on non-durable goods is also greater than the share of expenditure on these goods by households in the rest of the country.

Table 6-4 provides more detailed information on the items that households spend the largest share of their income on. It shows that expenditure on food, beverages, and tobacco products is the largest expenditure item amongst households in all areas. A larger portion of income from households in Mogalakwena has to be allocated towards paying rent than is the case for households in other study areas. Households in the local municipality also tend to spend a bigger share of their income on transportation than households in Limpopo. This

could be attributed to the remoteness of the Mogalakwena LM with respect to the concentration of economic activities such as Polokwane in Limpopo which forces people to travel further.

Expenditure type	South Africa	Limpopo	Waterberg DM	Mogalakwena LM
Food, beverages and tobacco	26.2%	28.3%	28.2%	27.2%
Rent	10.8%	8.8%	11.2%	12.3%
Transport and communication services	8.8%	7.6%	8.1%	8.4%
Medical services	7.3%	6.5%	6.8%	6.8%
Household fuel and power	4.3%	5.7%	5.2%	4.8%
Clothing and footwear	5.2%	5.8%	4.4%	4.7%

#### Table 6-4: Dominant expenditure items (2013)

(Quantec, 2015)

# 6.4 The labour market and employment structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs. As such, employment and unemployment rates are important indicators of socio-economic well-being. The following paragraphs examine the study area's labour market from a number of angles, including employment rate and sectorial employment patterns.

Indicator	South Africa	Limpopo	Waterberg DM	Mogalakwena LM	Mokopane	Bakenberg
Working age population	33 928 806	3 237 489	437 259	179 677	20 247	3 870
Non-economically active pop	15 087 353	1 776 344	203 221	100 318	6 817	2 460
Labour force	18 841 453	1 461 145	234 038	79 359	13 430	1 410
Employed	13 254 829	897 385	168 408	47 826	10 505	715
Unemployed	5 586 624	563 760	65 630	31 533	2 925	695
Unemployment rate	29.7%	38.6%	28.0%	39.7%	21.8%	49.3%
LF participation rate	55.5%	45.1%	53.5%	44.2%	66.3%	36.4%

#### Table 6-5: Labour force statistics (2011)

(Quantec, 2015)

In 2011, South Africa had 33.9 million individuals of working age (i.e. 15 – 64 years old). Of these individuals, 7.6% resided in Limpopo. According to the official unemployment definition, Limpopo had an unemployment figure of 38.6%, which was higher than the national figure. Within the Mogalakwena LM, just slightly more than a quarter of active job seekers were unemployed. Mokopane had a significantly lower unemployment rate of 21.8%, and spotted the highest labour force participation rate of the study areas. The relatively prosperous conditions in Mokopane correspond with the higher household income figures as discussed in the previous section.

The unemployment situation in Bakenberg, however, is worse than the other study areas under analysis, this directly corresponds with the low household income levels described earlier and emphasises the need for the development of the economy of the Mogalakwena Local Municipality focusing on creation of sustainable employment opportunities in and around various settlements in the municipality.

# 6.5 The economy and its structure

Analysis of the structure of the economy and the structure of its employment provide insight into the scale of reliance of an area on a specific sector(s) and thus the sensitivity of the area to changes in different sectors of global and regional markets. Understanding the size and composition of each sector in the economy in the area under analysis is important for studying the economic impacts that the proposed project may have. This helps to predict the changes that may occur because of the implementation of the project.

### 6.5.1 Economic production and GDP-R

The Gross Domestic Product per Region (GDP-R) of the Mogalakwena LM was valued at R13 142 million in 2013 constant prices. This is equal to a per capita GDP-R of R42 629. This is lower than the national economy but higher than the provincial economy GDP-R per capita of R58 533 and R39 818 respectively. The Waterberg district has the strongest economy of all the study areas with a GDP-R per capita of R74 023. In addition to signalling a stronger economy, a higher GDP-R per capita is usually associated with a higher standard of living.

	GDP-R (R'million)	GDP-R per capita (R)
South Africa	R3 030 263	R58 533
Limpopo	R215 212	R39 818
Waterberg DM	R50 287	R74 023
Mogalakwena LM	R13 142	R42 629

#### Table 6-6: GDP-R and GVA-R per capita (2013)

(Quantec, 2015)

Another important indicator of the wellbeing of a region's economy is the rate at which it is growing. Between 2003 and 2013 the Waterberg DM's economy grew at an average rate of 0.9% per year. This is much lower than the national Compounded Annual Growth Rate (CAGR) of 3.4% per annum. When one considers the structure of the economy in nominal terms, it becomes evident that the national economy is predominantly a service economy. The tertiary sector comprised 70% of the national economy in 2013, and grew by 4%. The primary sector that includes agriculture and mining contributes the smallest amount to the national economy. These sectors are, however, strategically important for food security and job creation. The mining and agricultural industries experienced the worst growth rates nationally. This could indicate potential job losses for individuals who are typically low to semi-skilled with a specific skill set. The major drivers of economic growth were the finance, insurance and business sector and the trade, transport and communication industries.

The primary sector contributed 30.7% towards Limpopo's GDP-R showing a significantly greater reliance on this sector than the national economy; however, the economy of Limpopo is still predominantly driven by tertiary industries with the observed CAGR of 3.5%. The mining industry showed the lowest growth rate in the province, emphasising the need for retention of these industries from a sustainability perspective and most importantly the need for greater investment to support their growth.

The structure of the primary study areas' economy follows that of the province more closely. Mining comprises more than a third of the LM's economy; it experienced a CAGR of 1.6% over the period 2003 to 2013. Following the mining sector, the largest sectors in the Mogalakwena LM are general government followed by the trade and finance, insurance and business industries. The agricultural sector contributed a relatively small percentage to the local economy's GDP-R; it however experienced a larger CAGR over the period between 2003 and 2013 compared to other study areas.

Sectors	South Africa		Limpopo		Waterberg DM		Mogalakwena LM	
	Nominal 2013	CAGR ('03–'13)	Nominal 2013	CAGR ('03-'13)	Nominal 2013	CAGR ('03- '13)	Nominal 2013	CAGR ('03-'13)
Primary sector	11.6%	0.2%	30.7%	0.2%	58.9%	-0.5%	34.3%	1.8%
Agriculture, forestry and fishing	2.4%	1.9%	2.4%	3.5%	2.2%	0.9%	1.5%	4.7%
Mining and quarrying	9.2%	-0.4%	28.3%	-0.1%	56.7%	-0.6%	32.8%	1.6%
Secondary sector	18.4%	3.0%	8.3%	3.1%	6.0%	0.4%	9.8%	5.7%
Manufacturing	11.6%	2.6%	2.4%	2.2%	1.8%	-0.4%	3.3%	3.7%
Electricity, gas and water	3.0%	1.6%	3.6%	1.9%	2.4%	-2.2%	3.8%	10.0%
Construction	3.7%	6.8%	2.3%	6.3%	1.8%	5.6%	2.7%	6.5%
Tertiary sector	70.0%	4.0%	61.0%	3.5%	35.2%	2.6%	56.0%	2.9%
Trade	16.6%	3.7%	13.7%	3.6%	8.8%	1.4%	13.4%	1.4%
Transport & communication	8.9%	3.6%	8.0%	2.7%	5.7%	2.3%	9.5%	3.1%
Finance, insurance, & business	21.5%	5.1%	15.5%	4.9%	9.5%	4.3%	13.4%	4.0%
Community services	6.0%	2.6%	4.7%	2.5%	2.5%	1.7%	4.9%	2.9%
General government	17.1%	3.3%	19.1%	2.8%	8.6%	2.2%	14.8%	3.0%
TOTAL	100%	3.4%	100%	2.5%	100%	0.9%	100%	2.9%

# Table 6-7: Structure of the study areas' economies (nominal 2013 prices) and CAGR(2003-2013)

(Quantec, 2015)

### 6.5.2 Sectoral employment structure

Almost three quarters of people employed in South Africa work in the tertiary sector, in particular the community and government services sector and the trade sector. Agriculture, which accounted for 2.4% of the national GDP-R in 2013, on the other hand, provided 5.8% of all employment opportunities; whilst the contribution of the mining industry towards the employment in the country was smaller than its contribution towards GDP-R. Nevertheless, both of the sectors are labour-intensive and create a notable number of employment opportunities in the country, particularly in rural areas.
The Limpopo Growth and Development plan recognises the importance of mining in developing the provincial economy and creating new employment opportunities. However although mining is a major contributor towards GDP-R in the province, it creates limited job opportunities. This is supported by the fact that in 2013 the mining sector created only 15.6% of employment in the district while contributing 56.7% towards its GDP. Within Limpopo the mining sector contributed 7% of employment opportunities while contributing 28.3% to the province's GDP. Most of the people employed in Limpopo are working in the tertiary sector too, specifically in the trade and community and government services sectors. Its secondary sector creates 15.8% of jobs in the province, whilst its primary sector creates 17%.

The employment composition in the Mogalakwena Local Municipality is quite similar than that of Limpopo with the sectors providing the largest numbers of jobs being the trade, community and government services, and mining sectors. Although the mining sector contributes 32.8% to the GDP-R (in nominal prices), it provides only 8.3% of employment opportunities in the area. At the same time, the trade sector's employment contribution is greater than its contribution towards GDP-R



Figure 6-2: Employment structure (2013) (Quantec, 2015)

### 6.5.3 Agriculture and mining in Limpopo

Considering the importance of both agricultural and mining activities in the local and provincial economies from an economic development and job creation perspective, the following paragraphs examine composition of these industries in greater detail.

• **Limpopo agricultural activities:** Within Limpopo the agriculture, forestry and fishing sector constitutes 2.4% of the province's GDP-R as per nominal 2013 figures. This sector employed one in every ten of the province's working population.

The major commercial crops in South Africa include maize, wheat, sunflowers and soya beans. While the ranging climates in the Limpopo province allows for the production of a wide variety of agricultural products, water is the most limiting

resource. Maize is South Africa's most important food crop. The production and yield data for the major crops within the country and Limpopo for the 2013/2014 season is provided in Table 6-8. During this time, the country produced more than 7.6 million tons of white maize and 6.6 million tons of yellow maize. Production in Limpopo accounts for only 2.4% and 1.9% of the national yield of white and yellow maize, respectively. In addition to this, the province produces 10.1% of the national sunflower yield. The higher yields for maize production in Limpopo (during the 2013/2014 season the yield for white maize was 6.1 t/ha vs. 4.96 t/ha in the country) also indicates that the province may enjoy a comparative advantage over the rest of the country as a result of the productivity of the relevant inputs.

	South Africa			Limpopo		
	Area	Tons	Tons/ha	Area	Tons	Tons/ha
	('000 ha)	('000 t)		('000 ha)	('000 t)	
White maize	1 551	7 697	4.96	30	183	6.1
Yellow maize	1 137	6 610	5.8	20	124	6.2
Wheat	506	1 870	3.7	28	146	5.2
Soya beans	503	944	1.88	22	66	3.0
Sunflower	599	853	1.4	90	86	1.0
	(Grain SA, 2014)					

#### Table 6-8: 2013/2014 Production and yield data

Total white maize exports from South Africa for the 2013/2014 season were 0.9 million tons, while 1.1 million tons of yellow maize was exported during the same season (Grain SA, 2014). It is difficult to accurately provide detail on the size of Limpopo's contribution to the export total since all maize produced in the country is pooled and then exported. Based on the fact that a percentage (albeit small) of total maize production takes place within Limpopo, it can be assumed that a decrease in production within the province is likely to have an impact on the export earnings from this commodity.

• South Africa vanadium mining focus: The proposed project involves the production of a magnetite concentrate product, with the primary element of interest being vanadium, and iron and titanium as a potential by-products (Pamish Investments No 39 (PTY) Ltd, 2015a). Approximately 33% of the world's vanadium is produced by South Africa, making the country the second largest producer after China (38%) (Department of Mineral Resources, 2015). In addition, South Africa has about a quarter of the world's known vanadium resources (Department of Mineral Resources, 2015).

Overall the production of vanadium has dropped in the past decade; however, a positive trend was observed in 2013 compared to 2012. In 2013, 21.3 kilotons of vanadium was produced in the country versus 20 kilotons that were reported in 2012 (Department of Mineral Resources, 2015). Local sales equated to 2.0 kilotons in 2013, a 0.6 kiloton increase compared to 1.4 kilotons consumed in 2012 (Department of Mineral Resources, 2015). Just under 90% of total vanadium sold in 2013 was exported (Department of Mineral Resources, 2015).

According to South Africa's Mineral Industry 2012/13, production capacity is expected to increase by 3.6 kilotons per annum by 2016 from co-product vanadium production as a result of growth in steelmaking from vanadium bearing titaniferous magnetite ores, driven mainly by the government's industrialisation policy objectives (Department of Mineral Resources, 2014). The country's capacity is also expected to increase by approximately 700 tons per annum from primary vanadium mining in 2013 (Department of Mineral Resources, 2014). This could preserve the domestic market's competitiveness and attract investment in the industry, with a subsequent increase of employment in the sector.



# Figure 6-3: South Africa's production and sales of vanadium between 2003 and 2013 (kilotons) (Department of Mineral Resources, 2015)

The Bushveld Complex hosts platinum group metals (with associated copper, nickel and cobalt mineralisation), chromium and vanadium bearing titanium iron ore formations as well as large deposits of the industrial minerals, including fluorspar and andalusite. Figure 6-4 below illustrates selected platinum, chromite and vanadium deposits in South Africa.



Figure 6-4: Vanadium deposits in South Africa (Council of Geoscience, 2000)

## 7 Sensitivity Analysis and No-Go Areas

Overall, it is clear that the proposed project is in line with the development priorities set by both provincial and local governments as outlined in the respective strategic policies. The proposed project, though, is to be located in the area that is zoned for conservation and tourism development. This means that the analysis of the economic impacts will need to take due cognisance of the existing tourism activities and potential tourism activities observed in the zone of influence and nearby areas.

As outlined earlier in the report, the area where the proposed mine is to be located already attracts domestic and international tourists interested in trophy hunting. The three farm portions that are located in direct proximity to the mine's site are already deriving some income from game farming activities, although it appears that only Portion 3 and 4 of the Bellevue 808 LR Farm that on average hosts 20 international tourists and 25 domestic tourists on an annual basis appears to derive a notable income from such activities. The other two portions of the Bellevue 808 LR Farm make use of game farming to supplement their annual income derived from livestock farming and crop production.

## 8 Impact Assessment

The following sections present the assessment of the expected economic impacts during different phases of the mine's life, i.e. construction, operation, and closure. All efforts are made to quantify each potential impact, whether positive or negative to provide for a more accurate assessment of the project's impact on the local and regional economies. Assessment of impacts follows the methodology outlined earlier in the report.

### 8.1 Construction phase impact assessment results

The following paragraphs describe the impact of the proposed construction of the Pamish Magnetite Mine on the local and regional economies. It includes the assessment of both positive and potential negative economic impacts.

### 8.1.1 Impact on production

Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods. The construction phase of the mine will involve activities such as engineering and design, site and infrastructure development, construction of buildings and facilities, installation of machinery and equipment, civil engineering works, and other business activities related to the construction of the proposed open pit mine. This would create a positive impact on the local and regional economies, as the demand for products and services used in construction will generate new business sales.

The R681.53 million (2015 prices) of investment required for the construction phase of the Magnetite project will increase the production output of the national economy by R1 288.1 million (2015 prices). Direct effects of the two-year construction phase comprises 53% of the total increase in business output resulting from this phase of the project. This impact will be largely influenced by companies that will be directly involved in the construction of the mine,

i.e. construction contractors and engineering firms. The rest will be generated through production and consumption induced effects as detailed in Table 8-1.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 1.3	R 9.1	R 10.4	0.8%
Mining and quarrying	-	R 90.6	R 5.5	R 96.1	7.5%
Manufacturing	-	R 37.3	R 22.8	R 60.1	4.7%
Electricity	-	R 9.1	R 4.1	R 13.2	1.0%
Water	-	R 58.7	R 1.5	R 60.3	4.7%
Building and construction	R 681.5	R 201.3	R 2.6	R 885.4	68.7%
Trade and accommodation	-	R 23.3	R 17.9	R 41.2	3.2%
Transport	-	R 19.0	R 14.9	R 33.9	2.6%
Finance	-	R 4.8	R 11.5	R 16.2	1.3%
Real estate and business services	-	R 34.8	R 18.8	R 53.6	4.2%
Government	-	R 7.0	R 5.4	R 12.4	1.0%
Other services	-	R 1.2	R 4.0	R 5.2	0.4%
TOTAL	R 681.5	R 488.4	R 118.1	R 1 288.1	100.0%

Table 8-1: Impact on production during construction (R million) (2015 prices)

(Urban-Econ, 2015)

Approximately R488.42 million (2015 prices) or 38% of the production output generated as a result of the construction activities will be stimulated though indirect effects or productioninduced effects, i.e. by companies that will be supplying inputs and services to the contractors and engineering firms operating on site. The construction of the mine requires a wide range of materials, goods, and services. Aside from the building and construction sector that will benefit from sub-contracting activities, the biggest increase in business sales throughout the construction period will be experienced by the mining sector, manufacturing industries, and the trade sector. The indirect effects during the construction period will be distributed throughout the country depending on the location of the suppliers.

It is estimated that R118.14 million (2015 prices) or 9% of the production output generated by the project will be as a result of consumption induced effects. Construction activities will stimulate the creation of new temporary employment opportunities through both direct and indirect effects that will in turn increase the household income, which will in turn stimulate sales in a variety of sectors through household consumption. Considering the distribution of consumption induced impacts, the manufacturing industry, real estate and business services, as well as trade will be the biggest beneficiaries from the temporary increase in household spending. Although the majority of new business sales stimulated through consumption induced effects will be distributed throughout the country, some of it will be captured in the local economy and will most likely benefit businesses within the tertiary sectors such as trade, transport, and personal services.

Temporary increase in production in the country during construction					
Dimension	Rating	Motivation	Significance		
Impact Description	on: The impact takes	place due to the investment on the project that	at will be spent in the		
country. Besides t	he direct impact, it in	volves the indirect and induced effects that an	e created when either		
suppliers of goods	and services to the pr	oject experience an increase in demand or whe	n businesses servicing		
households experie	households experience an increase in demand for their products.				
Prior to mitigation/ management					
Duration	Medium-term (3)	The construction phase will last two years	Moderate (positive)		

Extent	National (6)	Production increase will affect the entire country	(+90)
Intensity x type of impact	High – positive (+6)	The national economy's output will increase by R1.2 billion	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in production during construction.	
Mitigation/ Manag	ement actions	•	
The impact is positi goods and services the rating.	tive; measures to maxing from local small busing t	nise the stimulation of the local economy may in ness where feasible. This, however, will not chan	clude procurement of ge the significance of
Duration	Medium-term (3)	The construction phase will last two years	
Extent	National (6)	Production increase will affect the entire country	Mederata (positiva)
Intensity x type of impact	High – positive (+6)	The national economy's output will increase by R1.2 billion	(+90)
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in production during construction.	

#### 8.1.2 Impact on GDP-R

A country's gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country, during a year. Most of the investment activities in the country are associated with a value-adding activity, which has a positive impact on the Gross Domestic Product per Region (GDP-R). The capital investment into the establishment of the proposed mine to the value of R681.5 million (2015 prices) will generate R509.5 million of value added, which means that for every R1 invested in the construction of the mine, R0.75 of value added will be generated somewhere in South Africa's economy.

As indicated in Table 8-2, the majority of the value added will be created through direct and production induced effects. While the building and construction industry will be the direct beneficiary of the stimulated increase in value added, industries that will experience the largest temporary growth through production induced impacts will include the manufacturing, water, mining and quarrying, and business services sectors.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.6	R 4.2	R 4.8	0.9%
Mining and quarrying	-	R 42.3	R 2.6	R 44.8	8.8%
Manufacturing	-	R 17.4	R 10.7	R 28.0	5.5%
Electricity	-	R 4.2	R 1.9	R 6.2	1.2%
Water	-	R 27.4	R 0.7	R 28.1	5.5%
Building and construction	R 226.6	R 93.9	R 1.2	R 321.7	63.1%
Trade and accommodation	-	R 10.9	R 8.3	R 19.2	3.8%
Transport	-	R 8.9	R 7.0	R 15.8	3.1%
Finance	-	R 2.2	R 5.4	R 7.6	1.5%
Real estate and business services	-	R 16.2	R 8.8	R 25.0	4.9%
Government	-	R 3.3	R 2.5	R 5.8	1.1%
Other services	-	R 0.6	R 1.9	R 2.4	0.5%
TOTAL	R 226.6	R 227.8	R 55.1	R 509.5	100.0%

#### Table 8-2: Impact on GDP during construction (R million) (2015 prices)

(Urban-Econ, 2015)

Again, increase in employment will lead to increase in household income and consequently result in an increase of household consumption and expenditure on goods and services. It is expected that during the two-year duration of the construction phase, the country's GDP will be stimulated by a value of R55.09 million in 2015 prices though consumption induced impacts. Sectors expected to benefit the greatest from this consumption induced spending

Temporary increase in the country's GDP-R during construction						
Dimension	Rating	Motivation	Significance			
Impact Descriptio	Impact Description: The impact is generated through capital expenditure that shocks the economy. It results in					
growth of sectors	growth of sectors that include businesses supplying goods and services required for the establishment of the					
mine and business	es that benefit from the	increased consumer expenditure.				
Prior to mitigation	/ management					
Duration	Medium-term (3)	The construction phase will last two years				
Extent	National (6)	Increase in GDP will affect the entire country				
Intensity x type	Medium – positive	The national economy's GDP will increase by	Moderate (positive)			
of impact	(+5)	R500 million	(+84)			
Drobobility	Highly probable (6)	It is most likely that there will be a temporary				
FIODADIIIty		increase in GDP during construction.				
Mitigation/ Manag	ement actions					
<ul> <li>Recruit loc</li> </ul>	cal labour					
<ul> <li>Sub-contr</li> </ul>	act to local construction	companies				
Use local	suppliers where viable a	and arrange with the local Small and Medium Ente	erprises to provide			
transport,	catering, and other serv	vices for the construction crew				
Post management	t: mitigation measures t	hough will not increase the significance rating but	will assist with			
increasing the bene	efits felt by the local eco	nomy.				
Duration	Medium-term (3)	The construction phase will last two years				
Extent	National (6)	Increase in GDP will affect the entire country				
Intensity x type	Medium – positive	The national economy's GDP will increase by	Moderate (positive)			
of impact	(+5)	R500 million	(+84)			
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in GDP during construction.				

include manufacturing, trade, transport, as well as real estate and business services.

#### 8.1.3 Impact on employment

#### Info Box: Full-Time Equivalent (FTE) man-year or FTE jobs

Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work. This does not directly translate into the headcount of people employed or into new job opportunities. Generally, one FTE man-year is equal to one person working for 40 hours per week for about 50 weeks per year; however, it could vary depending on the industry.

A FTE man-year means that if one person worked only 20 hours per week for 50 weeks in a year, its FTE equivalent would be 0.5; if two people worked for 20 hours per week for 50 weeks in a year, the combined work load would be estimated as one FTE man-year or one FTE job. In the short-term, an increase in FTE employment positions could be absorbed by the existing workforce either by working overtime or if these labour resources are underutilised in the industry.

The establishment of the Magnetite Mine is expected to create a total of 2 986 FTE manyears over the over the construction period. Of the total FTE person-years to be created, 1 089 FTE man-years will be created as a result of direct effects, which equates to an average of 545 people working on site continuously for two years. An additional 1 511 FTE man-years will be created through the increased production among businesses that will be supplying goods and services for construction and their suppliers, whilst the induced impacts of the investment will result in the creation of 385 FTE man-years. As indicated in Table 8-3, the sectors with the largest expected positive changes during the construction phase will include:

- Construction, stimulated through direct effects.
- Trade and accommodation, stimulated through both indirect and induced effects.
- Real estate and business services, stimulated predominantly through indirect production activities.
- Agriculture that will be stimulated through increased consumer spending.
- Manufacturing, particularly stimulated by indirect effects generated by the inputs required for the site construction.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	14	95	109	3.6%
Mining and quarrying	-	44	3	47	1.6%
Manufacturing	-	92	37	129	4.3%
Electricity	-	8	4	12	0.4%
Water	-	53	1	54	1.8%
Building and construction	1 089	1 007	13	2 109	70.6%
Trade and accommodation	-	83	63	146	4.9%
Transport	-	17	12	29	1.0%
Finance	-	21	50	70	2.4%
Real estate and business services	-	151	82	233	7.8%
Government	-	19	15	33	1.1%
Other services	-	3	11	14	0.5%
TOTAL	1 089	1 512	386	2 986	100.0%

#### Table 8-3: Impact on employment during construction (FTE-man years)

(Urban-Econ, 2015)

All construction workers will be sourced as far as possible from the local area, depending on the skills available in the local villages surrounding the mining area under the Bakenberg Traditional Council. Should sufficient skills not be found, preference will be given to candidates from Mokopane, then from Limpopo before employing people from the rest of South Africa or abroad, which is envisaged to be very unlikely.

Due to the nature of the work involved in the construction of the mine, the majority of positions made available on site are expected to be of semi-skilled nature, which can be filled by individuals with limited skills and experience. Therefore, it is envisaged that a significant share of the available positions during the construction phase will be filled by people coming from the local area. According to Census 2011 data, Bakenberg and Mokopane areas had 695 and 2 925 unemployed people in 2011, respectively. This suggests that the area is likely to be able to provide labour, required to fill semi-skilled and unskilled positions.

Depending on the percentage of workers that will be possible to source from local communities, the temporary positive effects on the unemployment situation in the local areas

could be notable. In 2011, Bakenberg and Mokopane had 49.3% and 21.8% unemployment rates, respectively. Considering the size of the unemployed group of people reported for the same year, a provision of just a quarter of employment positions to the people in the Bakenberg area could already reduce the unemployment rate to below 40%, albeit for a temporary period. A further increase in the number of on-site construction jobs filled by individuals from the local community, the bigger the benefit will be experienced by that community.

Regardless of where the construction workers will be sourced, much of their income will be spent in the local area on perishable and non-perishable goods, personal services, transportation, etc. This means that the local economy of Mogalakwena LM will not only benefit from the direct jobs that will be created but also from the creation of employment opportunities resulting from induced impacts that are primarily expected to be created in the tertiary industries.

Creation of employment opportunities during construction				
Dimension	Rating	Motivation	Significance	
Impact Description	on: The impact is gene	rated through capital expenditure that shocks th	ne economy. It involves	
the creation of direct new job opportunities related to the construction of the proposed development and				
employment opportunities that will be indirectly created through the increased expenditure in sectors supplying				
goods and servic	es to the constructior	n activity and in sectors benefiting from the	increase of consumer	
expenditure.				
Prior to mitigation	n/ management			
Duration	Medium-term (3)	The construction phase will last two years		
Extent	National (C)	Increase in employment will affect the entire		
Extent	National (6)	country		
Intensity x type	Average to intense	Could potentially reduce Bakenberg area	ivioderate (positive)	
of impact	(+4)	unemployment rate to below 40%,	(+78)	
		It is most likely that there will be a temporary		
Probability	Hignly probable (6)	increase in employment during construction.		
Mitigation/ Manag	ement actions			
Employ la	bour-intensive measure	es in construction		
<ul> <li>Employ lo</li> </ul>	cal residents			
<ul> <li>Sub-contr</li> </ul>	act to local construction	companies		
<ul> <li>Utilise loc</li> </ul>	al suppliers			
<ul> <li>Set-up a s</li> </ul>	skills desk at the local m	nunicipal office and in the nearby communities to it	dentify skills available	
in the con	nmunity and assist in re	cruiting local labour during both construction and o	operation	
Post managemen	t: mitigation measures of	could increase the impact on the local economy b	ut would not change	
the total impact. Th	erefore, the weights as	signed for the impact before mitigations will not be	e affected.	
Duration	Medium-term (3)	The construction phase will last two years		
Extent	National (C)	Increase in employment will affect the entire		
Extent	National (6)	country	Madarata (nasitiva)	
Intensity x type	Average to intense	Could potentially reduce Bakenberg area	(, 70)	
of impact	(+4)	unemployment rate to below 40%,	(+78)	
Duchchilith	l linkty grade also (4)	It is most likely that there will be a temporary		
Probability	Highly probable (4)	increase in employment during construction.		

#### 8.1.4 Impact on household income

The creation of 2 986 direct, indirect, and induced FTE man-years during the construction period will temporarily increase affected households' income to the value of R200.5 million in 2015 prices. Half of this income will be earned by households whose members will be

working on the construction site. Since some of these construction workers will be recruited from outside the area, not all of that spending will be realised in the local community and nearby towns. Nevertheless, a great portion thereof, as well as income earned by households that will benefit through induced employment, will remain in the local communities thus improving the standard of living of the benefiting households, although for a temporary period.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.3	R 1.1	R 1.4	0.7%
Mining and quarrying	-	R 17.8	R 1.1	R 18.9	9.4%
Manufacturing	-	R 4.5	R 2.4	R 6.9	3.4%
Electricity	-	R 1.9	R 0.8	R 2.7	1.4%
Water	-	R 6.3	R 0.2	R 6.4	3.2%
Building and construction	R 100.2	R 29.8	R 0.4	R 130.4	65.0%
Trade and accommodation	-	R 5.5	R 4.1	R 9.7	4.8%
Transport	-	R 3.1	R 2.4	R 5.5	2.7%
Finance	-	R 1.2	R 3.0	R 4.2	2.1%
Real estate and business services	-	R 6.4	R 3.4	R 9.8	4.9%
Government	-	R 1.4	R 1.1	R 2.4	1.2%
Other services	-	R 0.5	R 1.8	R 2.3	1.1%
TOTAL	R 100.2	R 78.6	R 21.7	R 200.5	100.0%

Table 8-4: Impact on household income during construction (R million) (2015 prices)

(Urban-Econ, 2015)

The businesses benefitting from an increase in production as a result of the indirect impacts will create an additional R78.6 million in 2015 prices. It is difficult to estimate how much of this indirect income increase will be accrued within the local economy. It can be assumed, however, that the benefit will be limited to companies providing small supplies and non-critical services.

Lastly, due to an increase in household consumption induced through the creation of direct and indirect employment opportunities, an additional R21.7 million in household income will be earned by households in South Africa. It is expected that a portion of this income will be earned in the Mogalakwena LM itself due to the daily living expenditure of the construction crew in the local economy, regardless of whether they come from the local community or from outside.

Temporary increase in household income and standard of living during construction				
Dimension	Rating	Motivation	Significance	
Impact Description	on: The impact takes	place during construction as a result of jobs cr	eated through direct,	
indirect and induce	d impacts			
Prior to mitigation	n/ management			
Duration	Medium-term (3)	The construction phase will last two years		
Extent	National (6)	Increase in income will affect households of local workers as well as workers benefitting through multiplier effect throughout the country	Moderate (positive)	
Intensity x type of impact	Average to intense (+4)	Household income will increase for those employed during this phase	(+70)	
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in income during construction.		
Mitigation/Manag	ement actions			

- · Recruit local labour as far as feasible to increase the benefits to the local households
- Employ labour-intensive methods in construction
- Sub-contract to local construction companies
- Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew

**Post management:** mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.

Duration	Medium-term (3)	The construction phase will last two years	
Extent	National (6)	Increase in income will affect households throughout the country	Moderate (positive)
Intensity x type of impact	Average to intense (+4)	Household income will increase for those employed during this phase	(+78)
Probability	Highly probable (6)	It is most likely that there will be a temporary increase in income during construction.	

#### 8.1.5 Impact on skills development

The construction of the proposed mine will require general construction experience as well as expert knowledge. It is expected that where specialist training can be provided, candidates from local communities will be trained. People involved in the project will have opportunities to further perfect and develop the skills within their own fields of expertise or acquire new skills. This could particularly be relevant to the unskilled and semi-skilled people engaged in the construction.

The creation of jobs (FTE) through indirect and induced effects, although for a short-term, will create another opportunity for people to develop and acquire new skills. Given that the impact during construction will affect almost all sectors, although at different levels, it could be argued that the project will stimulate a creation of a comprehensive set of new skills in the country. Most importantly, unlike employment opportunities during construction, skills developed during that period will not expire once the phase is complete. Thus, the impact on skills development is much more sustainable and has a positive impact on the employability of the affected people. This means that although employment will be temporary, people benefiting from skills developed during that employment will have a far greater chance of finding permanent job than they had before the project.

Skills development during construction				
Rating	Motivation	Significance		
Impact Description: The impact takes place during the creation of new employment opportunities, and unlike				
ent created is sustainal	ble.			
/ management				
Medium-term (3)	The construction phase will last two years			
National (6)	Skills will be transferred to workers sourced nationally			
Low – positive (+3)	Average impact on local employees' skills	Minor (positive) (+48)		
Probable (4)	It is probable that there will be knowledge transfer during construction			
Mitigation/ Management actions				
<ul> <li>Contractor should provide learnerships and on-job training;</li> <li>Where specialist training can be provided, candidates from local communities should be prioritised for</li> </ul>				
nd wladgo with the sub-co	ntracting companies during the construction perio	d		
	t during construction Rating n: The impact takes p ent created is sustainal (management Medium-term (3) National (6) Low – positive (+3) Probable (4) ement actions should provide learner ind wledge with the sub-co	t during construction         Rating       Motivation         n: The impact takes place during the creation of new employment oppent created is sustainable.       Motivation         Image: Construction of the impact takes place during the creation of new employment oppent created is sustainable.       Second takes place during the creation of new employment oppent created is sustainable.         Image: Construction of takes place during the construction phase will last two years       Skills will be transferred to workers sourced nationally         National (6)       Skills will be transferred to workers sourced nationally       Skills will be transferred to workers sourced to workers sourced nationally         Low - positive (+3)       Average impact on local employees' skills         Probable (4)       It is probable that there will be knowledge transfer during construction         ement actions       Should provide learnerships and on-job training; training can be provided, candidates from local communities should wiledge with the sub-contracting companies during the construction period		

Post management:					
Duration	Medium-term (3)	The construction phase will last two years			
Extent	National (6)	Skills will be transferred to workers sourced nationally			
Intensity x type of impact	Low-positive (+3)	Average impact on local employees' skills	Minor (positive) (+60)		
Probability	Likely (5)	It is likely that there will be skills development and knowledge share during construction.			

#### 8.1.6 Impact on government revenue

The construction phase of the proposed Magnetite mine will last for two years. During this period, the construction company and the workers will earn income and pay government taxes including income taxes and payroll taxes. Although the spending of this money by government is difficult to associate with a specific budget item, any revenue received by government is allocated towards certain budget items, provinces or local municipalities to support and assist with improvement of their service delivery. Thus, without doubt this revenue would be spent on improving socio-economic conditions of the population one way or another.

Increase in government revenue during construction					
Dimension	Rating	Motivation	Significance		
Impact Description	on: The impact will tak	e place as a result of local expenditure on co	nstruction and will be		
acquired by govern	ment through indirect a	nd direct taxes on the project's activity.			
Prior to mitigation	n/ management				
Duration	Medium-term (3)	The construction phase will last two years			
Extent	National (6)	Increase in employment will affect the			
LAtent	National (0)	national government revenue	Moderate (positive)		
Intensity x type	$l_{0}$ ow $-$ positive (+3)	Increase in revenue is not widespread but is	(+84)		
of impact	Low = positive (+0)	felt by government			
Probability	Definite (7)	It is definite that tax will be paid			
Mitigation/ Manag	ement actions				
No mitigat	tion				
Post managemen	t:				
Duration	Medium-term (3)	The construction phase will last two years			
Extont	National (6)	Increase in employment will affect the			
LAtent	National (0)	national government revenue	Moderate (positive)		
Intensity x type	1  ow - positivo (+3)	Increase in revenue is not widespread but is	(+84)		
of impact	Low = positive (+3)	felt by government			
Probability	Definite (7)	It is definite that tax will be paid			

### 8.1.7 Impact on the balance of payment

The balance of payments can be described as a summary of all economic transactions between South Africa and all other countries in the world. Two sections make up the balance of payments, namely the current account and the capital account whereby the former refers to trade in the form of export and imports whereas the latter refers to Foreign Direct Investment (FDI), Investment Portfolio, and other investments which reflect on national accounts.

Over the last decade, South Africa's trade balance has been at a deficit. Between 2007 and 2014, the deficit fluctuated between 1.5% and 5.8% of the GDP (SARB, 2015). It reached

the lowest level in 2010 (1.5% of GDP), which could be associated with the increase in demand for South Africa's goods and services due to the shift in global trade patterns following the global financial crises in 2009 and increase in travel receipts from South Africa hosting 2010 FIFA World Cup<sup>™</sup>. After 2010, though, while the merchandise exports and service receipts continued to grow, the volumes of imported goods and services also sharply increased leading to the widening of the trade deficit. In 2014, the balance on current account reached R206.6 bn, which equated to 5.4% of the national GDP. Although it was slightly smaller compared to 2013, it is still among the highest trade deficits observed post the global financial crisis.

Persistent large or consistently growing trade deficit is associated with a number of negative effects:

- Increasing trade deficit implies that the nation needs to borrow more money from outside, which makes it more dependent on foreign funds. This in turn means that the national economy becomes more sensitive to the changes in the global financial markets and any instability or shocks that would lead to withdrawal of foreign investors' funds from the country would have a detrimental effect on the country's economy.
- Increasing trade deficit gives rise to inflation, which in turn makes the locally produced goods less competitive on both international and domestic markets, resulting in the slowdown of the domestic production and decline in employment.
- Rising inflation also tends to increase borrowing and as a result reduces internal savings. Lower savings in the economy means lower investment and slower economic growth and employment creation.
- Rising inflation could also lead to lower interest rates that from one side could stimulate domestic consumer spending but at the same time would make the country less attractive for foreign investors, which have the potential to reduce the current account inflows and lead to the expansion of trade deific.

The establishment of the proposed Magnetite mine will require about R186 million (2015 prices) to be spent on imported goods such as crushers, mill, filters, instrumentation, and other items. This will have a temporary negative effect on the balance of the current account, as it will increase the import component of the current account and lead to the increase of the current account deficit. The effect will be temporary and will likely be noted only during the first year of the construction period. Importantly, though, the amount is not significant to have any notable negative effect on macro-economic indicators and government policy. Moreover, a temporary increase of the deficit as a result of this project also means that in the future a greater quantity of vanadium may be exported. This means that in the medium to long-term, the project will stimulate the increase of merchandise exports, which will in turn translate into foreign exchange and profits.

The negative effect of the balance of payment during the construction period will be negligible. Mitigations thereof are possible, but only if goods and services required for the establishment of the project can be procured locally at a competitive price.

Impact on balance of payment during construction					
Dimension	Rating	Motivation	Significance		
Impact Description: The impact takes place during construction as a result of importing goods and services					

Prior to mitigation	Prior to mitigation/ management					
Duration	Immediate (1)	The impact is completely reversible				
Extent International (7)		Importing will affect the balance of the national current account				
Intensity x type Minimal – negative of impact (-1)		The impact is negligible	Minor (negative) (-42)			
Probability Highly probable (6		It is most likely that machinery will be imported.				
Mitigation/ Manag	ement actions					
Local goo	ds and services are pro	ocured domestically as far as feasible				
Post managemen	t:					
Duration	Immediate (1)	The impact is completely reversible				
Extent	International (7)	Sourcing goods and services locally will affect the national economy	Minor (negative) (-36)			
Intensity x type of impact	Minimal – negative (-1)	The impact is negligible	minor (negative) (-30)			
Probability	Probable (4)	It is probable that machinery will be imported.				

#### 8.1.8 Negative impact on surrounding agricultural and game farming activities

During construction, ground and civil works, movement of vehicles and assembly activities would generate visual, dust, and noise pollution. Such activities could create disturbances for tourists visiting the area predominantly during winter months for trophy hunting. As was indicated earlier, the nearby properties (i.e. Portion 2, 3 and 4, and 5 of the Bellevue 808 LR Farm) host in total up to 20 international and 35 domestic tourists, who visit the farms for trophy hunting. Although it could be argued that tourists embarking on trophy hunting may be less sensitive to visual and other environmental disturbances than those who visit game farms for game viewing, leisure, and safari, their overall experience may still be negatively affected due to the created disturbances associated with the construction activities.

The review of potential noise-related and visual impacts suggested that noise levels at the portions of the farms where game farming is practiced are not expected to exceed recommended levels for day-time and night-time. Dust pollution could also have an effect on production of vegetables (peppadews) and crops that are farmed within the surrounding area; however, maps illustrating dispersion of air pollution suggest that it will not extend to Portion 5 of Bellevue 808 LR, where peppadews are grown. Overall, though, the effects are expected to be limited and do not lead to significant implications on the local economic activities.

However, the establishment of the facility could lead to the loss of workers at the local farms. This is due to expectations of the greater pay that could be received on construction site compared to the farm. This could also negatively impact on the agricultural and farming activities in the area as it could necessitate the farm owners to look for new staff and it could take time to appoint reliable and skilled farm workers who would be willing to work on the farms.

Overall, the significance of the impact is estimated to be low before mitigations and could be reduced to a negligible level if mitigations proposed by other specialists were implemented.

Negative impact on surrounding agricultural and tourism activities				
Dimension	Rating	Motivation	Significance	

**Impact Description:** The impact will take place as a result of various environmental effects that would ensue during construction activities, i.e. noise, visual, and dust pollution

dannig bohoti dollori dollori dollori dollori, noi dollo, violadi, and dollo poliation					
Prior to mitigation	n/ management				
Duration	Medium-term (3)	The construction phase will last two years			
Extent	Local (3)	Will affect farms around the development site	Negligible (pegative) (-		
Intensity x type of impact	Moderate – negative (-4)	Could affect the agricultural activities	30)		
Probability	Unlikely (3)	There is a possibility impact will occur.			
Mitigation/ Manag	ement actions				
<ul> <li>Mitigation and intens</li> </ul>	measures proposed by sity of noise, visual, and	other specialists should be strictly adhered to min dust pollution in the area	nimise the probability		
Post management	t:				
Duration	Medium-term (3)	The construction phase will last two years			
Extent	Local (6) Will affect farms around the development site				
Intensity x type of impact	Moderate – negative (-4)	Could affect the agricultural activities	20)		
Probability	Improbable (2)	There is a possibility impact will occur.			

#### 8.1.9 Potential negative impact on property values

Local farm owners, and specifically the owners of Portions 2 and 5 of the Bellevue 808 LR Farm and Portion 2 of Delagoa 809 have raised their concerns that the establishment of the mine will affect the sense of place in the area and subsequently reduce the farm's marketability and diminish their land values. The changes in property values have limited direct impact on local economies as far as development is concerned; they, however, affect the value of real estate and subsequently the loans that could be applied for by farmers, the revenue that could be derived from the sale of the property, and overall their future income security.

In general, any development associated with some negative environmental effects can influence property values in two ways:

- On the one hand, it can reduce the value of the land if the proposed development has a negative image associated with it. This could be related to real or perceived adverse effects of the proposed development on air quality, noise levels, aesthetics, traffic congestion, health, and crime levels in the area.
- On the other hand, the development could spike the demand for the surrounding properties and lead to the increase in property values in the area. This could occur in situations where nearby properties are found to carry valuable marketable natural resources or they offer improved accessibility of workers to the facility or other nearby developments.

The area surrounding the site where the proposed Magnetite mine is to be established is classified as rural and is dominated by commercial agricultural activities involving livestock and crop production, as well as game farming. Game farming takes place almost on every single property that forms part of the zone of influence, although the income derived from these activities vary among the farms.

Two of the farms, whose land owners raised their concerns regarding the property value are situated in the area of the applied prospecting right, i.e. where the ore body is located. This suggests that these farms bear valuable mineral resources that could potentially be mined in

the future. With the establishment of the mine, the attractiveness of these properties for future mining activities is likely to be increased, which could positively impact on the property value of these farm portions.

Until then, though, the value of the properties of the surrounding farm portions and other farms is likely to be negatively affected, although extent to which it may be impacted is expected to be relatively small considering that noise, visual and air pollution are not expected to be of notable significance during operations, for example.

Nonetheless, the discussions with real estate agents in the Mokopane area and other parts of Limpopo where game farming and mining activities compete for land revealed that land value of farms located in close proximity to mines do decline and more so for farms located adjacent to the mining sites. The degree to which land values drop vary significantly and depend on the farming activity taking place on the affected farms and the distance of the farm from the mine's site; it could though range between 10% and 30%. Property values of game farms seem to be more negatively affected than property values of farms deriving their income from livestock or crop farming, for example, which is mainly explained due to the nature of revenue derived by these activities and sensitivity thereof to various environmental changes, ensued due to the activities of the mine.

The effects on property values are expected to present themselves during the construction phase and even at the pre-construction phase when the knowledge about the proposed mining activity spreads. During this time the decline in property values could be greater than expected due to the uncertainty in the market regarding the actual extent of environmental impacts that can ensue from the construction activity. The negative effects on property values during operation usually continue; however, the extent of that impact could change (i.e. reduced or increased) depending on the actual changes that the construction of the mine and its operation brought to the surrounding environment. In some cases, the negative impact could be reduced and more so for properties located further away from the site, and in some cases it could be increased if the perceived impacts were underestimated or new impacts occur.

Potential negative impact on property values						
Dimension	Rating	Motivation	Significance			
Impact Description	Impact Description: The impact will take place as a result of various environmental effects that would ensue					
during construction	activities, i.e. noise, vis	sual, and dust pollution				
Prior to mitigation	n/ management					
Duration	Long-term (4)	The construction phase will last two years				
Extent	Local (3)	Will affect farms around development site				
Intensity x type	Moderate –	Moderate loss of sense of place	Minor (negative) (-50)			
of impact	negative (-3)	moderate loss of sense of place				
Probability	Likely (5)	The impact may occur				
Mitigation/ Manag	ement actions					
<ul> <li>Mitigation</li> </ul>	measures proposed by	y other specialists should be strictly adhered to n	ninimise the probability			
and intens	sity of noise, visual, and	d dust pollution in the area that affect the sense	of place, experience of			
the tourist	s visiting the local farms	s, and as a result impact on property values				
Post management:						
Duration	Long-term (4)	The construction phase will last two years				
Extent	Local (3)	Will affect farms around development site	Minor (negative) (-45)			
Intensity x type	Minor – negative (-	Minor loss of sense of place				

of impact	2)		
Probability	Likely (5)	The impact may occur	

### 8.2 Operational phase impact assessment results

The following paragraphs describe the economic impact that is expected to take place during operation of the proposed Magnetite mine. The information provided in the tables show the impact that will take place during one year of full operations. These impacts will last as long as the operational phase continues. Since the facility will be in operation for 30 years, economic impacts stimulated by the project and observed during that time are considered to be sustainable. Sustainability is an integral component of the continuous growth and development of any economy, as it ensures retention and possibly even the growth of standard of living of affected people and their households.

#### 8.2.1 Impact on production

It is estimated that the Pamish Magnetite project will produce 714 000 tons for magnetite concentrate and will generate R1 204.9 million (2015 prices) in turnover on average per annum for the duration of its operations in the entire economy. The total impact on production in the economy over the lifespan of the mine, i.e. 30 years, is estimated at R36 143.8 million.

The majority of the above-mentioned new business sales will be generated through direct effects, i.e. through production and sale of the produced concentrate. On average, R855.7 million in sales revenue will be derived by the mine on an annual basis.

The mine will also have to acquire inputs from a variety of sectors such as transport, trade, utilities and manufacturing. As indicated in Table 8-5, beside the new business sales attributable to direct impacts, additional new business sales averaging R217.1 million (2015 prices) per year, will be created as a result of the indirect multiplier effect stimulated by operating activities of the Magnetite mine. The sectors that are set to benefit the most from production induced impacts are electricity, trade, real estate and business services, as well as transport. Furthermore, sectors that will benefit as a result of an increase in household income and the subsequent increase in demand for consumer goods and services include food industries such as meat and dairy producers, transport, trade and accommodation, and the insurance industry.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	R 0.0	R 0.6	R 9.5	R 10.0	0.8%
Mining and quarrying	R 855.7	R 32.7	R 6.1	R 894.5	74.2%
Manufacturing	R 0.0	R 8.1	R 24.7	R 32.9	2.7%
Electricity	R 0.0	R 42.3	R 4.5	R 46.8	3.9%
Water	R 0.0	R 5.6	R 1.7	R 7.3	0.6%
Building and construction	R 0.0	R 3.0	R 2.9	R 5.9	0.5%
Trade and accommodation	R 0.0	R 40.5	R 19.8	R 60.3	5.0%
Transport	R 0.0	R 29.0	R 16.5	R 45.5	3.8%
Finance	R 0.0	R 3.6	R 14.0	R 17.6	1.5%
Real estate and business services	R 0.0	R 33.0	R 21.1	R 54.2	4.5%

# Table 8-5: Average annual impact on production during operational phase (R million) (2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Government	R 0.0	R 17.8	R 6.5	R 24.3	2.0%
Other services	R 0.0	R 1.0	R 4.7	R 5.7	0.5%
TOTAL	R 855.7	R 217.1	R 132.1	R 1 204.9	100.0%

(Urban-Econ, 2015)

Increase in production during operations					
Dimension	Rating	Motivation	Significance		
Impact Description	on: The impact results	from sustainable production of the mine, as v	well as procurement of		
goods and service	s required for its susta	inable operations and creation of sustainable en	nployment opportunities		
through direct and	indirect effects.				
Prior to mitigation	n/ management				
Duration	Project life (5)	The impact will cease after project life span of 30 years.			
Extent	National (6)	Production increase will affect the entire			
Extent		country.	Moderate (positive)		
Intensity x type	High – positive (+6)	The national economy's output will increase	(+102)		
of impact		by R1.2 billion per annum.			
Probability	Highly probable (6)	It is most likely that there will be an increase			
Trobability	righty probable (0)	in production during operational phase.			
Mitigation/ Manag	ement actions				
The project should	aim to benefit the local	economy as far as possible and feasible by opting	g for procurement of		
locally procured go	ods and supplied servic	es.			
Post managemen	t				
Duration	Project life (5)	The impact will cease after project life span			
Duration		of 30 years.			
Extent	National (6)	Production increase will affect the entire			
Extone		country.	Moderate (positive)		
Intensity x type	High – positive (+6)	The national economy's output will increase	(+102)		
of impact		by R1.2 billion per annum.			
Probability	Highly probable (6)	It is most likely that there will be an increase			
		in production during operational phase.			

#### 8.2.2 Impact on GDP-R

New business sales generated through direct and spin-off effects of operations at the mine will generate an annual average GDP of R850.49 million (2015 prices) through the national economy. Approximately 80% of this will be created directly by the mine operations. The rest will be created through production and consumption induced impacts. The biggest stimulus will be experienced by sectors such as manufacturing, trade and accommodation, transport and communication, and real estate and business services. Over the entire LOM, the project will generate R25 516 million of GDP.

# Table 8-6: Average annual impact on GDP-R during operational phase (R million)(2015 prices)

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	R 0.3	R 4.4	R 4.7	0.5%
Mining and quarrying	R 687.6	R 15.2	R 2.9	R 705.7	83.0%
Manufacturing	-	R 3.8	R 11.5	R 15.3	1.8%
Electricity	-	R 19.7	R 2.1	R 21.8	2.6%
Water	-	R 2.6	R 0.8	R 3.4	0.4%
Building and construction	-	R 1.4	R 1.3	R 2.8	0.3%

Sector	Direct	Indirect	Induced	Total	% total
Trade and accommodation	-	R 18.9	R 9.2	R 28.1	3.3%
Transport	-	R 13.5	R 7.7	R 21.2	2.5%
Finance	-	R 1.7	R 6.5	R 8.2	1.0%
Real estate and business services	-	R 15.4	R 9.8	R 25.3	3.0%
Government	-	R 8.3	R 3.0	R 11.3	1.3%
Other services	-	R 0.5	R 2.2	R 2.7	0.3%
TOTAL	R 687.6	R 101.3	R 61.6	R 850.5	100.0%

(Urban-Econ, 2015)

In 2013, the size of the Mogalakwena LM's economy was estimated at R13 142 million. Assuming that the mine's GDP will be accounted in the local municipality, once operational, the Pamish Mine will increase the local economy by about 6.5%. Mining makes up 32.8% of the local municipality's economy. Based on the relative importance of this sector in the local economy it can be argued that the proposed project will assist in offsetting some of the losses experienced in the local mining sector in the past.

Some of the production and consumption induced impacts may also be retained in the Mogalakwena LM, suggesting that the mine will benefit the local economy not only through direct impact but also through the multiplier effect. Importantly, the greater the value of goods and services procured by the mine during its operations from the local economy, the greater the overall economic benefit for the local municipality.

Temporary increase in the country's GDP-R during operations				
Dimension	Rating	Motivation	Significance	
Impact Description	n: The impact is gene	rated through continuous operation of the mine.	It stimulates economic	
activities of directly	and indirectly affected	I businesses, which subsequently leads to the cr	reation of new business	
sales and generation	on of value added. Thr	ough increased household expenditure, additiona	al round of value adding	
is created.				
Prior to mitigation	/ management			
Duration	Project life (5)	The impact will cease after project life span of		
Duration	T TOJECT III E (J)	30 years.		
Extent	National (6)	GDP-R increase will affect the entire country.	Modorato (positivo)	
Intensity x type	High positivo (+6)	The national economy's value added will		
of impact	-positive (+0)	increase by R850 million per annum.	(+0+)	
Drohohility	Highly probable (6)	It is most likely that there will be an increase		
Frobability	Fightly probable (6)	in GDP-R during operational phase.		
Mitigation/ Manag	ement actions	•		
<ul> <li>Investigate</li> </ul>	e local procurement opp	oortunities		
<ul> <li>Procure fr</li> </ul>	om local suppliers shou	ld be encouraged if feasible to the viability of the r	nine. This will improve	
the benefi	t to the local economy b	out will not affect the impact rating.		
Post management	t: mitigation measures t	hough will not increase the significance rating but	will assist with	
increasing the bene	efits felt by the local eco	nomy.		
Duration	Project life (5)	The impact will cease after project life span of		
Duration	T TOJECI IIIE (J)	30 years.		
Extent	National (6)	Increase in GDP will affect the entire country.	Modorato (positivo)	
Intensity x type	High positive (+6)	The national economy's GDP will increase by	(184)	
of impact	nigri – positive (+6)	R850 million per annum.	(+0+)	
Probability	Highly probable (6)	It is most likely that there will be an increase		
FIODADIIIty	riigiliy probable (0)	in GDP.		

#### 8.2.3 Impact on employment

The mine will create 168 sustainable employment opportunities, of which about 110 will be created for semi-skilled and unskilled people, whilst the rest will be for skilled and highly skilled people. The creation of the unskilled and semi-skilled jobs will provide opportunities for the unemployed people in the local communities to acquire a sustainable source of income and potentially develop skills. This means that the proposed facility will be able to reduce the current unemployment level in the Mogalakwena LM, albeit by a small percentage. This positive impact though will be retained for the entire duration of operational activities at the mine.

Besides the employment opportunities created at the facility itself, the project will stimulate the creation of an additional 905 jobs throughout the economy through production and consumption induced impacts. This makes a total contribution of the project towards sustainable employment creation in South Africa equal to 1 073. Based on the information presented in Table 8-7, it can be concluded that most of the jobs to be created through indirect and induced effects will be created in the trade, real estate and business services, and agricultural sectors. Some of these jobs will be created or supported on a regular basis in the Mogalakwena LM. This specifically related to employment opportunities that will be created in the tertiary services sectors such as trade, transportation, personal services, and business services.

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	-	6	99	105	9.8%
Mining and quarrying	168	16	3	187	17.4%
Manufacturing	-	15	41	56	5.2%
Electricity	-	38	4	42	3.9%
Water	-	5	2	7	0.6%
Building and construction	-	15	14	30	2.7%
Trade and accommodation	-	144	70	215	20.0%
Transport	-	27	14	40	3.8%
Finance	-	15	61	76	7.1%
Real estate and business services	-	143	92	235	21.9%
Government	-	48	18	65	6.1%
Other services	-	3	13	15	1.4%
TOTAL	168	476	430	1 073	100.0%

## Table 8-7: Average annual impact on employment during the operational phase (FTE man years)

(Urban-Econ, 2015)

Considering the entire mine's operational period of 30 years, the project will create 32 196 FTE jobs. It is estimated that a total of 14 264 FTE person-years will be created indirectly over the lifespan of the operation as a result of production induced impacts, while consumption induced opportunities are estimated to contribute to creation of 12 887 FTE jobs in total.

Creation of employment opportunities during operations				
Dimension	Rating	Motivation	Significance	
Impact Description: The impact takes place throughout the operational phase and is translated into the creation				
of new employment opportunities at the mine and businesses that are affected through indirect and induced				
effects.				

Prior to mitigation/ management				
Duration	Project life (5)	The impact will cease after project life span of 30 years.		
Extent	National (6)	Increase in employment will affect the entire country.	Moderate (positive)	
Intensity x type of impact	Medium to high – positive (+5)	Could potentially reduce local unemployment.	(+96)	
Probability	Highly probable (6)	It is most likely that there will be increase in employment during operations.		
Mitigation/ Manag	ement actions	•		
Where pos communit	ssible, the employment y through prevention of	of local labour should be practiced to increase the leakage of buying power.	benefit to the local	
Post management	t:			
Duration	Project life (5)	The impact will cease after project life span of 30 years.		
Extent	National (6)	Increase in employment will affect the entire country.	Moderate (positive)	
Intensity x type of impact	Medium to high – positive (+5)	Could potentially reduce local unemployment.	(+96)	
Probability	Highly probable (4)	It is most likely that there will be a temporary increase in employment during operations.		

#### 8.2.4 Impact on household income

The creation of 1 073 FTE persons-year opportunities in each year of operation of the Pamish Magnetite project will positively impact on household income levels. It is estimated that households benefitting directly will earn R53.4 million on average annually, allowing these households to improve their standard of living. Furthermore, persons who obtain jobs as an indirect result of the mine's operations will experience growth in their income levels and consequently more households in the province and other parts of the country will also benefit. On average, an additional R66.2 million (2015 prices) in household income will be earned annually by households that will benefit from sustainable jobs created as a result of multiplier effects. The total income earned by benefiting households over the lifespan of the mine, i.e. 30 years, is estimated at R3 584.5 million (2015 prices).

Sector	Direct	Indirect	Induced	Total	% total
Agriculture	R 0.0	R 0.1	R 1.1	R 1.2	1.0%
Mining and quarrying	R 53.4	R 5.7	R 1.3	R 60.3	50.4%
Manufacturing	R 0.0	R 1.0	R 2.6	R 3.6	3.0%
Electricity	R 0.0	R 8.7	R 0.9	R 9.6	8.0%
Water	R 0.0	R 0.6	R 0.2	R 0.8	0.7%
Building and construction	R 0.0	R 0.4	R 0.4	R 0.8	0.7%
Trade and accommodation	R 0.0	R 9.6	R 4.6	R 14.2	11.9%
Transport	R 0.0	R 4.8	R 2.6	R 7.4	6.2%
Finance	R 0.0	R 0.9	R 3.6	R 4.6	3.8%
Real estate and business services	R 0.0	R 5.9	R 3.8	R 9.7	8.1%
Government	R 0.0	R 3.5	R 1.3	R 4.7	4.0%
Other services	R 0.0	R 0.5	R 2.1	R 2.5	2.1%
TOTAL	R 53.4	R 41.6	R 24.5	R 119.5	100.0%

# Table 8-8: Average annual impact on household income during operations (R million)(2015 prices)

Increase in household income and standard of living during construction				
Dimension	Rating	Motivation	Significance	
Impact Descriptio	n: The impact takes pla	ace during operations as a result of jobs created t	hrough direct, indirect	
and induced impact	ts			
Prior to mitigation	n/ management			
Duration	Project life (5)	The impact will cease after project life span of 30 years.		
Extent	National (6)	Increase in income will affect households in the local area and in the country.	Moderate (positive)	
Intensity x type	Medium to high –	Household income will increase for those	(+96)	
of impact	positive (+5)	employed during this phase.		
Probability	Highly probable (6)	It is most likely that there will be an increase		
	·	in income during operations.		
Mitigation/ Manag	ement actions			
Recruit loc	cal labour as far as feas	ible to increase the benefits to the local household	ls	
Employ la	bour-intensive methods	in construction		
Post management	t:			
Duration	Project life (5)	The impact will cease after project life span of 30 years.		
Extent	National (6)	Increase in income will affect the local households and some households in the rest of SA.	Moderate (positive)	
Intensity x type	Medium to high -	Could potentially improve standard of living of	(+30)	
of impact	positive (+5)	benefitting households.		
Probability	Highly probable (6)	It is most likely that there will be an increase in income during operations.		

#### 8.2.5 Impact on skills development

The Pamish Magnetite Mine, through implementation of its Social and Labour Plan (SLP), is planning to provide for skills development and training for employees to ensure acquisition of appropriately skilled workforce for its operations and allow for career development within the mining industry beyond the mine's needs.

As such, the mine plans to make the following contributions towards skills development (Pamish Investments No 39 (PTY) Ltd, 2015b):

- Firstly, the mine is undertaking to offer all employees the opportunity to become functionally literate through the establishment of the Adult Basic Education and Training (ABET) Programme. During the first four years of the mine's operations, around R870 000 is planned to be spent on this programme alone. This will have a permanent impact on the lives of those involved. Literacy improves the employability of the beneficiaries greatly and other skills gained will not cease once the mine closes. Productivity is likely to increase, improving these individuals' chances of finding gainful employment in future.
- Secondly, the mine committed to offer mining-related learnerships and learnerships with portability outside the mining industry. In total, eight learnerships is planned to be offered during the first four years of mine's operation such as boilermakers, electrician, fitters, and riggers. About R1.2 million is planned to be spent on these learnerships during the first four years of the mine's operations.

- Thirdly, the mine will provide Core Business Skills Training to ensure that employees are able to support the business operation at the mine effectively. Over the first four years of operations, 60 people are to be enrolled on an annual basis in various training exercises that will include training in heavy duty vehicles operation, FAG mill operation, leadership training, health and safety training, and computer training.
- Fourthly, Portable Skills Training will also be offered and it is envisaged that on average 63 people will be trained in plumbing welding, oxy-acetylene, and IT during the first four years of operation.

In addition to the above, mentorship programme, career progression plans, internships, and bursaries will also be offered to the employees to advance their skills and assist in their personal development. Importantly, bursaries will be offered not only to the employees of the company but also to the individuals from the local communities that represent labour-sending areas.

Skills development during operations					
Dimension	Rating	Motivation	Significance		
Impact Descriptio	n: The impact results fr	om the mine's investment in skills development d	uring its operations		
Prior to mitigation	n/ management				
Duration	Permanent (7)	Skills will be retained beyond project's life			
Extent	National (6)	Skills will be transferred to workers locally and potentially beyond	Maior (positive) (±102)		
Intensity x type of impact	Medium – positive (+4)	Average impact on local employees' skills			
Probability	Highly probable (6)	It is definite as this is a requirement			
Mitigation/ Manag	ement actions				
The mine	is required by law to ac	here to the provisions detailed in the Social and L	.abour Plan – no		
mitigation	measures required				
Post managemen	t:				
Duration	Permanent (7)	Skills will be retained beyond project's life			
Extent	National (6)	Skills will be transferred to workers locally and potentially beyond	Maior (positive) (±119)		
Intensity x type of impact	Medium – positive (+5)	Average impact on local employees' skills			
Probability	Definite (7)	It is definite as this is a requirement			

#### 8.2.6 Impact on government revenue

Operations at the mine will contribute to government review collection through direct, indirect and payroll taxes during the operational phase. It is estimated that about R8 761.8 million will be paid by the mine though payment of royalties, company tax, secondary taxes, as well as employees' personal income taxes over its lifespan. On an annual basis, the government will earn approximately R294 million in 2015 prices, of which R60 million will represent royalties and the rest largely comprise of corporate and withholding taxes.

Increase in government revenue during operations					
Dimension	Rating	Motivation	Significance		
Impact Description: The impact takes place mostly with payment of royalties and corporates taxes, as well as a					
result of payment of	of salaries and wages ar	nd declaration of dividends.			
Prior to mitigation/ management					
Duration	Project life (5)	The impact will cease after project life span	Moderate (positive)		

		of 30 years	(+90)
Extent	National (6)	Increase in employment will affect the	
		national government revenue	
Intensity x type	Moderate –	Increase in revenue is not widespread but is	
of impact	positive (+4)	felt by government	
Probability	Highly probable (6)	It is most likely that tax will be paid	
Mitigation/ Manag	ement actions	• •	
No mitigat	tion		
Post managemen	t:		
Duration	Project life (5)	The impact will cease after project life span	
Daration		of 30 years	
Extent	National (6)	Increase in employment will affect the	Moderate (positive)
Extent		national government revenue	
Intensity x type	Moderate -	Increase in revenue is not widespread but is	(+90)
of impact	positive (+4)	felt by government	
Probability	Highly probable (6)	It is most likely that tax will be paid	

### 8.2.7 Local economic development benefits derived through mine's SLP

The proposed project will contribute to the diversification of the local economy through investment into the development of local Small and Medium Enterprises (SME) as part of the Local Economic Development (LED) programme. Based on the information contained in the mine's SLP (Pamish Investments No 39 (PTY) Ltd, 2015b), three projects are planned to be invested during the first four years of mine's operations:

- Bakenberg Community Creche: Infrastructural development
- Bakenberg Sewing Project: SME
- Crop Production and Hydroponic Gardening: SME A

total of R2.5 million will be invested in the above projects.

Local economic development					
Dimension	Rating	Motivation	Significance		
Impact Descriptio	n: The impact results fr	om the mine's investment in LED programme			
Prior to mitigation	n/ management				
Duration	Project life (5)	The impact will cease after project life span of 30 years			
Extent	National (6)	Development of the local economy	Moderate (positive)		
Intensity x type of impact	Low – positive (+3)	Average impact on local economy	(+98)		
Probability	Definite (7)	It is definite as this is required by law			
Mitigation/ Manag	ement actions				
<ul> <li>The mine mitigation</li> </ul>	is required by law to ad measures required	here to the provisions detailed in the Social and L	abour Plan – no		
Post management	t:				
Duration	Project life (5)	The impact will cease after project life span of 30 years			
Extent	National (6)	Development of the local economy	Moderate (positive)		
Intensity x type of impact	Low – positive (+3)	Average impact on local economy	(+98)		
Probability	Definite (7)	It is definite as this is required by law			

# 8.2.8 Potential losses of sustainable revenue by local farming activities due to various environmental impacts that affect the sense of place

The proposed activity is likely to create a number of environmental impacts that would have a negative impact on the sense of place. As mentioned earlier, the area where the proposed Magnetite mine is to be established hosts farms that derive some form of income from game farming activities and specifically trophy hunting by hosting international and/or domestic tourists.

Most of the farms in the zone of influence make use of game farming to supplement their income, which is primarily derived from livestock farming and crop production. None of the property owners in the zone of influence though raised a concern that they would lose the income derived from game farming activities, although some were concerned about the noise and its effect on the wildlife in the area. The review of the sensitivity maps produced by the noise specialist, though, suggested that the noise levels on the portions of the farms where game is observed are expected to be low and are not expected to reach the levels that are beyond the recommended noise levels. Therefore, the concerns of the local farm owners are likely to be unrealised.

Nonetheless, if the area's sense of place changes to such an extent that negatively affects the experience of the international and domestic tourists visiting the area for trophy hunting, losses from game farming activities could ensue. In this instance, the biggest impact may be observed on Portion 3 and 4 of the Bellevue 808 LR Farm considering the size of tourism activity observed on that farm. However, the visual impact assessment suggested that this farm is located in an area from where the mine will unlikely be seen; therefore, the potential for change in the sense of place and subsequently the experience of trophy hunters is very small. Importantly, the owner of Portion 3 and 4 of the Bellevue 808 LR Farm did not raise a concern over the effect of the proposed project on the existing operations on the farm; however, he emphasised that the establishment of the proposed mine is likely to force him to abandon investment into establishment of the exotic game breeding programme.

Considering the above, some negative impact on the local tourism activities may be expected during operations; however, the extent of these impacts is expected to be limited.

Negative impact on surrounding local tourism activities				
Dimension	Rating	Motivation	Significance	
Impact Descriptio	n: The impact will take	e place as a result of various environmental effe	ects that would ensue	
during construction	activities, i.e. noise, visi	ual, and dust pollution		
Prior to mitigation	/ management			
Duration	Project life (5)	The impact will cease after project life span of		
Bulation		30 years		
Extent	Local (3)	Will affect farms around the development site	Negligible (negative) (-	
Intensity x type	low-negative (-3)	Could affect tourism activities	33)	
of impact	iow negative ( 0)			
Probability	Unlikely (3)	There is a possibility impact will occur.		
Mitigation/ Manage	ement actions			
Implement mitigations proposed by other specialists on the team to reduce environmental impacts that				
affect the sense of place and overall experience by tourists visiting the area				
Post management:				
Duration	Project life (5)	The impact will cease after project life span of	Negligible (negative) (-	

		30 years	33)
Extent	Local (3)	Will affect farms around the development site	
Intensity x type of impact	low– negative (-3)	Could affect tourism activities	
Probability	Unlikely (3)	There is a possibility impact will occur.	

### 8.3 Rehabilitation and closure phase impact assessment results

It is expected that the life of the mine will be approximately 30 years. Once mining operations are completed, any structures will be taken down, final rehabilitation of disturbed areas will take place and the required infrastructure will be re-instated. During this five-year phase, it is envisaged that a total of R147.1 million will be spent. In addition, to money spent, a further 500 employment opportunities will be created.

Following the decommissioning phase there will be a post-closure phase, during which professionals will undertake rehabilitation monitoring to confirm success of rehabilitation measures for three years. About R7.1 million is expected to be spent on this process.

Stimulation of the economy and job creation during closure			
Dimension	Rating	Motivation	Significance
Impact Descriptio	n: the impact takes place	ce during closure of the mine	
Prior to mitigation	n/ management		
Duration	Medium-term (3)	The closure phase will last five years	
Extent	Regional (5)	Temporary increase in regional employment	
Intensity x type of impact	Intensity x type Low – positive (+2) Will marginally improve business sales and employment Minor p		Minor positive (+40)
Probability	Highly probable (4)	It is most likely that there will be a temporary increase in employment during closure	
Mitigation/ Manag	ement actions		
<ul> <li>Where feasible:</li> <li>Contract closure activities to local contractors</li> <li>Procure supplies from local businesses</li> <li>Source suitable candidates from the community when additional labourers are needed</li> </ul>			
<b>Post management:</b> These measures will localise the positive impact but significance rating will remain unchanged.			
Duration	Medium-term (3)	The closure phase will last five years	
Extent	Regional (5)	Increase in employment will affect the entire country	
Intensity x type of impact	Low – positive (+2)	Will marginally improve business sales and employment	Minor positive (+40)
Probability	Highly probable (4)	It is most likely that there will be a temporary increase in employment during closure	

## 9 Environmental Management Plan

The following enhancement measures are proposed to be implemented to increase the benefits of the identified positive impacts and reduce effects of the analysed negative economic effects. Such measures are proposed to be implemented and **should be seriously considered by the project owner**.

# Table 9-1: Proposed environmental management plan for enhancement of positive impacts derived by the local community or economy

Impact	Mitigation
Construction phase	

Impact	Mitigation		
Construction phase			
Temporary increase in	Measures to maximise the stimulation of the local economy should		
production in the country	include procurement of goods and services from local small business		
during construction	where feasible.		
	The project owner should encourage the project main contractor to		
	increase the local procurement practices and employ people from local		
	communities as far as feasible to maximise the benefits to the local		
Temporary increase in the	economies:		
country's GDP-R during	Recruit local labour		
construction	<ul> <li>Sub-contract to local construction companies</li> </ul>		
	<ul> <li>Use local suppliers where viable and arrange with the local Small</li> </ul>		
	and Medium Enterprises to provide transport, catering, and other		
	services for the construction crew		
	The following possible mitigation measures could increase the benefit to		
Creation of amployment	the local economy:		
opportunition during	<ul> <li>Employ labour-intensive measures in construction</li> </ul>		
construction	<ul> <li>Employ local residents</li> </ul>		
construction	<ul> <li>Sub-contract to local construction companies</li> </ul>		
	Utilise local suppliers		
	It is advisable that where possible the positive effects on the local		
	communities and their standard of living are increased through the		
	intensification in local procurement spent and recruitment practices		
Temporary increase in	<ul> <li>Becruit local labour as far as feasible to increase the benefits to</li> </ul>		
household income and	the local households		
standard of living during	<ul> <li>Employ labour-intensive methods in construction</li> </ul>		
construction	Sub-contract to local construction companies		
	Ise local suppliers where viable and arrange with the local Small		
	and Medium Enterprises to provide transport, catering, and other		
	services for the construction crew		
	In order to improve the chances of skills being developed during the		
Skills development during	construction period, it is recommended that the contractor provides on-		
construction	the ioh training learnerships and share knowledge with the sub-		
Sonoradian	contracting companies during the construction period		
	In order to minimise the negative impact on the balance of payments, it is		
Impact on balance of	suggested that where possible local goods and services are procured		
payment during	domestically instead of imported. Local goods though in this case need to		
construction	be readily available and need to be offered at competitive prices.		
Operational phase			
la sus sus in una duration	The project should aim to benefit the local economy as far as possible		
Increase in production	and feasible by opting for procurement of locally procured goods and		
during operations	supplied services.		
	Procurement from local suppliers should be encouraged if feasible to the		
increase in GDP-R during	viability of the mine. This will improve the benefit to the local economy		
operations	but will not affect the impact rating.		
Creation of employment	Where possible, the employment of local labour should be practiced to		
opportunities during	increase the benefit to the local community through prevention of		
operations	leakage of buying power.		
Increase in household	The mine should be encouraged to recruit local labour and procure		
income during operations	locally as far as is feasible to increase the number of local households		
	that will benefit.		

Closure phase	
Stimulation of the economy and job creation during closure	Where feasible the following measures should be implemented to
	improve the benefit to the local community:
	<ul> <li>Contract closure activities to local contractors</li> </ul>
	<ul> <li>Procure supplies from local businesses</li> </ul>
	Source suitable candidates from the community when additional
	labourers are needed

The following table outlines mitigation measures and enhancement measures that are required to be implemented either to reduce negative impacts or enhance positive impacts to the local communities and economies. They have to be included in the management plan.

# Table 9-2: Proposed environmental management plan for enhancement of positive impacts derived by the local community or economy

Impact	Mitigation			
Construction phase				
Temporary increase in the country's GDP-R during construction	<ul> <li>Procure services from local Small and Medium Enterprises to provide transport, catering, and other required services for the construction crew</li> </ul>			
Creation of employment opportunities during construction	<ul> <li>Recruit local labour for semi-skilled and unskilled positions</li> <li>Procure services from local Small and Medium Enterprises to provide transport, catering, and other required services for the construction crew</li> <li>Set-up a skills desk at the local municipal office and in the nearby communities to identify skills available in the community and assist in recruiting local labour during both construction and operation</li> </ul>			
Negative impact on surrounding agricultural and tourism activities	<ul> <li>Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area</li> </ul>			
Potential negative impact on property values	<ul> <li>Mitigation measures proposed by other specialists should be strictly adhered to minimise the probability and intensity of noise, visual, and dust pollution in the area that affect the sense of place, experience of the tourists visiting the local farms, and as a result impact on property values</li> </ul>			
Operational phase				
Increase in GDP-R during operations	<ul> <li>Investigate opportunities for local procurement to develop backward linkages</li> </ul>			
Creation of employment opportunities during operations	<ul> <li>Employ local labour for unskilled and semi-skilled positions, as a minimum</li> </ul>			
Development of skills during operations	Adhere to SLP			
Local economic development	Adhere to SLP			
Negative impact on local tourism activities during operations	<ul> <li>Implement mitigations proposed by other specialists on the team to reduce environmental impacts that affect the sense of place and overall experience by tourists visiting the area.</li> </ul>			
Closure phase				

## 10 Monitoring Plan

The following indicators and activities are proposed to be considered for monitoring of the effects the proposed project will have on the local economy:

- Document the number of person-months created during construction and determine the percentage thereof that benefited the local communities
- Document the value of procurement spent and determine the spatial distribution of the expenditure to identify the areas that benefited the most from capital expenditure with a specific focus on the benefits that are created in the local economy
- Document skills development initiatives during construction and quantify the number of people who benefitted from these
- Document the number of permanent employment opportunities created at the mine during operations
- Document the goods and services procured by the mine during operations from the local economy and quantify the number of jobs that is being supported through these activities
- Engage with the local property owners during both construction and operation of the mine and investigate the effects the mine had on the number of tourists visiting the game farms in the zone of influence

## **11 Consultation Undertaken**

As mentioned earlier, eight people located in the zone of influence were consulted during the study. In addition, the team also engaged with the local authority to determine the recent developmental trends in the area.

### **12 Comments and Responses**

	increase in expenditure in the communities and increased local tax base.
	The Macro Economic and Social Impact Assessment identify a number of positive impacts associated with the project. Please refer to Appendix N and O, respectively, for the full reports.

### **13 Conclusion and Recommendation**

The Mogalakwena LM, where the proposed activity is to take place, comprises of 307 863 people and 79 395 households, thus representing about 6% of the provincial population (Stats SA, 2014). Over the fifteen-year period between 1996 and 2011, the size of the municipality from the population perspective has been growing at lower than the average growth rate observed in the rest of the Province or the country. Households residing in the Mogalakwena LM are on average less well-off off than households in both Limpopo and South Africa. This can be attributed to the fact that there is a higher percentage of unemployed people in the local municipality than in the country or in the province, which means that a fewer number of households have access to sustainable income. Consequently, this means that households in the primary study area have a lower weighted average household income than in the other study areas.

The labour force in the Mogalakwena LM comprises of 47 826 employed and 31 533 unemployed people. It has a lower labour participation rate (44.2%) than the other study areas, while its unemployment rate is significantly higher than in South Africa or in the province.

The economy of the municipality is highly dependent on the mining industry, which means fluctuations in the demand for mineral output or prices have significant impact on the performance of the economy, and subsequently on the employment situation. Mining activities in the municipality have been downscaling in the past, leading to a notable loss of employment opportunities. The economy appears to be stagnating and is in need for investment and injections into sustainable economic activities.

The proposed Magnetite mine will be in operation for approximately 30 years and will create a notable positive impact on the local economy. This will translate into economic growth, sustainable job creation, skills development, and improved household income. From the developmental perspective, the project has the potential to notably positively change the employment situation and developmental trajectory of the local municipality.

Construction of the Pamish Magnetite Mine will take two years and will cost R681.53 million (2015 prices). It has been determined that during this period, the mine will stimulate new business sales in the country to the value of R1 288.1 million (2015 prices), generating R509.45 million of GDP-R and creating 2 986 FTE person-years. During the operational phase, which is estimated to last 30 years, the Magnetite mine will contribute to the creation of 32 196 FTE jobs in the country and generate R25 516 million of GDP-R (2015 prices) over its operational period. Considering that the mining sector in the local economy has been declining in the past few years, the proposed establishment of the mine is expected to reverse this trend and offset the decline in the local economic base; importantly, it will reestablish sustainable employment opportunities that have been lost in the economy in the past.

Among the negative impacts that are expected to ensue as a result of the project are potential decline in property values and a possible loss of some income derived by some of the properties from international and domestic tourists visiting the area for trophy hunting. The value of these impacts is difficult to quantify; however, it is believed that proper mitigation measure may significantly reduce their probably and magnitude. Furthermore, if losses do occur, the potential negative economic effects will be a fraction of the positive impacts that will be created by the mine.

To conclude, from the economic perspective, the proposed project is beneficial. The proposed Magnetite mine will have a positive effect in terms of stimulation of domestic production, job creation, and government revenue. The project also falls within the government's objective to stimulate job creation, especially in rural and peri-urban areas. Therefore, from an economic perspective, the project should be approved for development, under the condition that the proposed mitigations are implemented.

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# Appendix A: Consultant CV

Memory Madondo		1
Date of Birth: Profession:	17 August 1986 Development Economist	
Specialisation:	Sustainable Development	
Years within Firm:	3 Years	12
Nationality:	RSA	an an 11
Years of Experience:	3 Years	18 623 R
HDI Status:	Black Female	10
		Service and and

Education:			
2011 – 2013, University of South	Africa	BSc: Mathematical Statistics	
2009, University of Pretoria		BSc: Mathematical Statistics (not completed)	
2006-2008, University of Pretor	ia	BCom: Statistics	
Professional Membership:			
Development of Society of Southern Africa			
South African Planning Institute			
Language Proficiency:	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Zulu	Average	Average	Poor
Shona	Poor	Poor	Average

#### **Key Qualification**

**Memory Madondo** completed a BSc degree in Mathematical Statistics from the University of South Africa in 2013, her majors being Mathematics and Statistics. She also holds a BCom in Statistics from the University of Pretoria. She is fully computer literate including computerised statistics (which is referred to as SAS – Statistical Analysis System), Structured Query Language (SQL) and MS Access Database Management. Her interests lie in statistical analysis and any numerical challenges.

Memory joined Urban-Econ in 2011 as a Technical Assistant working on the company's electronic database system and gradually started assisting with some projects. She has gained experience in several economic arenas such as collation and analytic processing of economic data, trend analysis, forecasting and economic development amongst others. She has also carried out a number of socio-economic impact assessments of varying magnitude and has in turn gained good skill in report writing and presentation. She continues to gain further knowledge as well as expertise in the economic field.

<b>Experience Record</b>	
Project:	Waterval East Filling Station Study
Year:	2012
Location:	Rustenburg
Client:	Private
Project Features:	Provide an understanding of local market area
Position held:	Analysis of the local market's potential to absorb the proposed development
Activities Performed:	Researcher
	Economic Impact Assessment
Project:	NC Renewable Energy
Year:	2012
Location:	Northern Cape
Client:	Northern Cape Department of Economic Development and Tourism
Project Features:	<ul> <li>Description of the status and potential of the local renewable energy sector</li> <li>Investigation of the potential to establish clean and green sustainable</li> </ul>

	development projects in the Province in line with the optimal mix identified.
Position held:	Researcher
Activities Performed:	Strategy and implementation plan formulation

#### Other Projects:

- Zonnebloem Comparative Analysis: Urban-Econ Development Economists was appointed by Golder Associates to undertake an economic impact assessment study for the proposed Zonnebloem Coal Mine situated near Middelburg in the Mpumalanga Province. The included providing a baseline profile of the study area - analysis of parameters such as population size, household numbers, income levels, structure and growth of the economy, labour force and employment situation.
- Nelson Mandela Scoping: Urban-Econ Development Economists was appointed to undertake a specialist market analysis as part of planning for provision of infrastructure to the Nelson Mandela Bay Metropolitan Municipality. The primary objective of this study was to identify the growth rates and anticipated number of households per demand zone within the Nelson Mandela Bay Metropolitan Municipality to gain insight on the Metro's infrastructural needs.
- Land Claims Re-opening: Urban-Econ Development Economists was appointed to undertake a Socio-Economic Impact Assessment study as part of the Regulatory Impact Assessment on the feasibility of the reopening of lodgement of claims and provisions to the 19 June cut-off date to accommodate the descendants of the Khoi and San and claims on heritage sites and historical landmarks.
- Suncorp Solar PV EIA: The study presented the socio-economic development (SED) and enterprise development (ED) plans for the proposed Hertzogville Solar Photovoltaic (PV) energy facility. These plans form part of the requirements of the bidding processes for new power generation facilities under the Renewable Energy Independent Power Producer Procurement (IPPP) Programme.
- RBN Mining Procurement Assessment: The objective of the study was to determine the first set of business opportunities that can be established in the Royal Bafokeng area considering the current procurement practices of the selected mines.
- Saldanha REE Separation Plant EIA: Urban-Econ Development Economists was appointed by AGES (Pty)
  Ltd to undertake an economic impact assessment study for the proposed construction and operation of a
  Rare Earth Elements (REE) separation plant in Saldanha Bay. This study presented the analysis of economic
  impacts that are expected to ensure from the proposed project during various stages of the project's life
  cycle and considering both positive and negative effects.
- Exarro Power Station SEIA: Urban-Econ Development Economists was requested by Savannah Environmental (Pty) Ltd. (Savannah Environmental) to undertake a Socio-Economic Impact Study for the proposed Exxaro coal-powered power station near the town of Lephalale, the Limpopo province. This study presented the analysis of socio-economic impacts that are expected to ensure from the proposed project during various stages of the project's life cycle and considering both positive and negative effects.

#### **Countries of Work Experience:**

South Africa

#### **References:**

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#### **Contact Details:**

Memory Madondo Email: memory@urban-econ.com Cell Phone: +27 (0) 73 936 2660

#### **Elena Broughton**

Date of Birth: Designation: Profession: Specialisation: Years within Firm: Nationality: Years of Experience: HDI Status: 11 September 1980 Unit Manager Sustainable Development Senior Development Economist Sustainable Development 10 Years RSA 10 Years White Female

#### Education:

2008-2011 – University of Pretoria		MSc in Technology Management	
2006 – 2007 – University of Pretoria		BSc (Hon) in Technology Management	
2004, Parkland College, USA		Computer Integrated Accounting	
2004, Parkland College, USA		Independent Business	
2003, Parkland College, USA		Intermediate Accounting	
2003, Parkland College, USA		Records Management	
2003, Parklands College, USA		Financial Accounting	
2003, Parklands College, USA		Managerial Accounting	
2002, Nizhny Novogorod University, Russia		BCom (Hon) in Economics	
Language Proficiency:	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Russian	Excellent	Excellent	Excellent

#### **Key Qualification**

Elena Broughton completed her BCom (Hon) in Economics in Russia, at Nizhny Novgorod State University in 2002 specialising in regional economics. At the same time, she completed an additional degree as Translator/Interpreter in Professional Orientated Communication. After completion of her Honours degree in Economics, Elena has moved to the USA and stayed there for 1.5 years. During her stay in the USA, she completed a number of Accounting and Business courses at Parkland College, Illinois. In 2007, she obtained her BSc (Hon) in Technology Management (Cum Laude) at the University of Pretoria and later received her MSC in Technology Management (2011) from the same university.

Elena Broughton is a senior professional at Urban-Econ and has an extensive knowledge in various fields of economic development, including impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a special interest in project evaluation and decision-making framework, with the latter being the focus of her Master's dissertation. Over the past few years, she was able to extend her experience in these fields working on projects for both government and the private sector.

#### **Experience Record**

1
Economic and Socio-	b Thabametsi Coal Mine Sustainable Development Investigation and
Economic Impact	Economic Impact Assessment, Limpopo
Assessment studies	Mafube Nooitgedacht and Wildfontein EIA/EMP Sustainable Development
	Investigation Study, Mpumalanga
	Mooifontein Coal Mine Comparative Analysis, Mpumalanga
	Inyoni Colliery Mine, Mpumalanga
	29 Zandkopsdrift Rare Earth Elements (REE) Project Economic Impact
	Assessment
	Saluanna Bay Separation Plant Economic Impact Assessment
	Proposed Exvaro IPP Coal-Powered Power Station near Lenhalale
	Fskom Sere Wind (WEF1) Macro-Economic Impact Assessment
	Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape
	(210 MW PV solar facility)
	🕼 Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State
	Province (75 MW PV solar facility)
	🕼 Eskom Ariadne-Eros Power Lines Economic and Agricultural Impact
	Assessment
	🕼 Eskom Ingula Pumped Storage Scheme Regional Economic Impact
	Assessment
	N3 Highway Economic Impact Assessment
	Ine Mandela Bay Precinct Economic Impact Assessment
	MW CSP-Tower facility and 225 MW PV solar facility)
	Humansrus Solar Energy Facility near Postmashurg in the Northern Cane
	(100 MW CSP-Tower facility)
	Booipunt Solar Energy Park near Upington in the Northern Cape (100 MW
	CSP-Tower facility and 215 MW PV solar facility)
	Barm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape
	(210 MW PV solar facility)
	🖑 🚱 Wagʻnbiekiespan PV Solar Energy Facility near Boshof, the Free
	State Province (75 MW PV solar facility)
Project:	The localisation potential of Photo Voltaics (PV) and a Strategy to support large
	scale roll-out in South Africa
Year:	June 2012 – March 2013
Location:	National
Client:	WWF SA
Project Features:	South African Photovoltaic Industry Association (SAPVIA)
	The Department of Trade and Industry, RSA
	Describing of the global PV industry and its trends
	Profiling of the local PV industry
	49 Analysing of the local PV value chain considering three markets segments,
	i.e. rooftop, commercial, and utilities
	<b>B</b> Analysing of financial dynamics of the market and standardisation
	requirements
	Determining the potential for localisation in the country
	Elena Broughton - policy environment review market comments analysis demand
Position held:	analysis value chain analysis pricing of components local context analysis
	analysis, value chain analysis, pricing of components, local content analysis,
	potential for localisation assessment, strategy formulation
Activities Performed:	The goal of the study was to describe the global and local PV industry trends and
	dynamics, and to develop localisation scenarios for the purposes of providing
	recommendations with respect to the future roll out of the industry.

Project:	Feasibility study into establishing CSP component manufacturing facilities in South
Year:	Africa
Location:	November 2012 – February 2013
Client:	National
Project Features:	The Industrial Development Corporation, RSA
	<ul> <li>The Identification of various CSP technologies and systems that are promoted internationally and the various designs and configuration of each technology.</li> <li>An overview of the international and local CSP market, the major materials and components of CSP with a view of establishing a local manufacturing base of CSP systems and components</li> <li>The identification of key technical and technology partner in the development of the manufacturing facility</li> <li>Engagement with the potential technical partner to determine whether the IDC can capacitate the supplier to manufacture components and systems locally</li> <li>Identification of a suitable location for the new facility or expansion of existing local CSP component manufacturing</li> </ul>
	facilities in South Africa
Position held:	The amount of potential jobs that will be created from expansion or creation of a new facility, preliminary financial model and CAPEX budget.
Activities Performed:	Elena Broughton – global CSP industry analysis, value chain analysis, local industrial
	capabilities assessment, demand analysis, job creation potential analysis
	The Industrial Development Corporation (the IDC) has commissioned Urban-Econ
	Development Economists supported by EScience Associates to undertake a
	feasibility study to determine the viability of the establishment of a manufacturing
	facility of CSP modules and components in South Africa.
Project:	Northern Cape Renewable Energy Strategy
Year:	November 2012 – June 2013
Location:	National
Client:	The Northern Cape Department of Economic Development and Tourism, RSA
Project Features:	<ul> <li>Description of the status and potential of the local renewable energy sector</li> <li>Investigation of the potential to establish clean and green sustainable development projects in the Province in line with the optimal mix identified.</li> <li>Identification of income generation opportunities for the purpose of revitalising rural communities</li> <li>Assessment of the institutional capacity and capability</li> <li>Strategy and implementation plan formulation</li> </ul>
	Elena Broughton – policy environment analysis, renewable energy industry profiling, desired state of industry analysis, market segmentation and demand analysis, stakeholder analysis and institutional structures review, strategy formulation
Position held:	The consortium comprising of Urban-Econ Development Economists, Escience, and the CRSES was appointed to formulate the Renewable Energy Strategy for the
Activities Performed:	Northern Cape Province. The study involved undertaking a situational assessment of the Northern Cape economy to identify the opportunities and constraints with respect to renewable energy development; to formulate a plan to unlock the
	existing potential of the Province to harness renewable energy to the benefit of its communities and economy; to position the Province to attract a maximum share of investment under the IRP2010 Renewable Energy Target and beyond.

Project:	Wag'nhiekiespan Socio-Economic Impact Assessment
Voor:	December 2011 Echrupy 2012
rear.	December 2011 – rebruary 2012
Location:	National
Client:	Savannah Environmental
Project Features:	<ul> <li>Compilation of the socio-economic profile for the area</li> <li>Site visit and interview of the affected parties</li> <li>Compilation of the profile of the directly and indirectly affected communities/farms</li> <li>Economic modeling</li> </ul>
	Assessment of potential negative and positive impacts during construction
Position held:	<ul> <li>Evaluation of impacts according to the pre-defined criteria</li> <li>Formulation of the mitigation plan</li> <li>Elena Broughton – socio-economic profiling of the area land use analysis and</li> </ul>
	affected parties cosis economic profiling impact modeling enperturity applyis
	impact accomment and evaluation mitigation plan formulation
Activities Performed:	Impact assessment and evaluation, mitigation plan formulation.
	Urban-Econ was appointed to undertake socio-economic impact assessment
	studies of the proposed 75 MW PV facility in the Free State Province.
Project:	Arriesfontein PV solar facility socio-economic impact assessment
Year:	January 2012 – May 2012
Location:	Northern Cape
Client:	Worley Parsons
Project Features:	<ul> <li>Compilation of the socio-economic profile for the area</li> <li>Site visit and interview of the affected parties</li> <li>Compilation of the profile of the directly and indirectly affected communities/farms</li> <li>Economic modeling</li> <li>Assessment of potential negative and positive impacts during construction and operation</li> </ul>
Position held:	<ul> <li>Evaluation of impacts according to the pre-defined criteria</li> <li>Formulation of the mitigation plan</li> <li>Elena Broughton – socio-economic profiling of the area, land use analysis and affected parties socio-economic profiling, impact modeling, opportunity analysis.</li> </ul>
Activities Performed:	impact assessment and evaluation, mitigation plan formulation
	Urban-Econ was appointed to undertake socio-economic impact assessment studies
	of the proposed 75 MW/ BV/ facility in the Northern Cane Province
	$\Gamma$ of the proposed rowing r viacing in the northern cape rowince.

## References:

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