

Annex G.10

## Economic Specialist Report

**ESIA of the Proposed Vedanta Mine and Zinc Production  
Facility near Aggeneys in the Northern Cape:  
Economic Specialist Study**

**Draft Report**

**April 2013**

Prepared for:

**Environmental Resource Management (ERM)**

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## EXECUTIVE SUMMARY

This report provides economic specialist inputs into the ESIA of the proposed Gamsberg zinc mine, concentrator plant and associated infrastructure near Aggeneys, Northern Cape.

Vedanta's financial feasibility assessment of the project has weighed up the risks and rewards associated with the project and found that it should be **financially viable** to the degree required to make the necessary investments provided an open-cast mine is established. It is recognised by Vedanta that the project will not be without commercial risks. However, the available evidence provides no reason to conclude that financial failure is likely.

On the whole, the project should result in significant positive implications for the **development of the South African zinc market**. Initially benefits would be focused on increasing exports. The presence of the project would, however, also increase the chances that at some point local production of zinc metal would be possible.

A critical aspect of economic desirability is whether the proposed development complements **economic planning** as reflected in **spatial development planning**. Based on a review of the relevant planning documents, it was found that the proposed project achieves in-principle compatibility with the key thrusts of planning documents for the province, district and local municipality. These documents also do, however, call for caution regarding the conservation status of the mining site in particular.

The expansion would have a positive impact on economic activity in the local area and region given the sizes of the **new spending injections** associated with it. Preliminary estimates indicate that a total of approximately R8.35 billion would be spent on all aspects of the construction phase. It is anticipated that approximately 3,200 contract jobs with an average duration of 19 months each would be associated with all construction expenditure. Based on the likely availability of labour and the experience of the applicant in the area and at other sites, approximately 357 workers would probably come from within Khâi-Ma Municipality, a further 1,335 workers from the rest of the Namakwa District and 960 workers from the rest of the Northern Cape. Direct household income impacts would flow from all wages paid during construction. Total incomes of R1.01 billion would be associated with the construction phase. Approximately R80 million of this total would probably accrue to workers currently resident in Khâi-Ma Municipality, a further R339 million to workers in the rest of the Namakwa District and R319 million to workers from the rest of the Northern Cape.

Operational expenditure would increase in line with production from approximately R528 million per year during the first year of production to R1.76 billion in the fifth year of production at which point it is anticipated that full production levels would be achieved. During the first year of production (planned for 2015) approximately 630 jobs would be created (of which,

roughly 195 would be outsourced to contractors) increasing to 1,230 jobs (of which, 380 would be outsourced to contractors) once full production is reached by the 5<sup>th</sup> year of production. Out of these total jobs, it is anticipated that:

- Khâi-Ma Municipality residents would benefit from 127 jobs in the first year of production and 258 jobs once full production is reached.
- Residents in the rest of the Namakwa District would benefit from 276 jobs in the first year of production and 540 jobs once full production is reached.
- Residents in the rest of the Northern Cape would benefit from 112 jobs in the first year of production and 220 jobs once full production is reached.

Note that these estimates are based largely on a fairly broad assessment of the availability of labour in these areas and it is the proponent's intention to use a greater proportion of labour from Khâi-Ma Municipality and the Namakwa District if people are available and/or willing to be trained.

At the start of production approximately R138 million in total salaries and sub-contractor payments would be made yearly increasing to R256 million once full production is reached by the 5<sup>th</sup> year of production. Approximately R23 million of these salaries and payments to contractors should accrue to workers from Khâi-Ma Municipality during the first year of production increasing to R44 million once full production is reached. A further R50 million of salaries and payments to contractors should accrue to workers from the rest of the Namakwa District during the first year of production increasing to R94 million at full production.

Vedanta's social and labour plan (SLP) should act as a departure point and take the lead when considering and enforcing **benefit enhancement measures**. This plan will have to deal with and provide specific guidance on actions and be drawn up with care and in full consultation with all relevant stakeholders and as per the requirements of the Department of Mineral Resources. Targets should preferably be set (in tender documents) for how much local labour should be used based on the needs of the proponent and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities during construction and operation should be maximized. Local sub-contractors should be used where possible and contractors from outside the local area that tender for work should also be required to meet targets for how many locals are given employment.

Positive **macroeconomic impacts** are also expected to flow from the project and have been quantified focusing on **increased foreign exchange earnings and tax revenues**. Foreign exchange revenues are expected to start at roughly USD385 million/yr (for 360,000 tonnes of concentrate production) in the first year of production, increasing to USD750 million/yr (for 735,000 tonnes of concentrate production) in the third year and stabilising at roughly USD1.257 billion/yr (for 1,225,000 tonnes of concentrate production) from the fifth year

onwards. The present value of the sum of these flows over the project's life should be roughly USD10.2 billion (or R76.7 billion) using a base case discount rate of 6%. Note that during the construction phase, foreign exchange outflows would occur in order to import key project components. However, these outflows would be minor when compared to inflows during operations (i.e. outflows would be less than 5% - 10% of the magnitude of total inflows over time).

Tax payments consisting of income taxes and royalties are expected to start at roughly R142 million/yr (for 360,000 tonnes of concentrate production) in the first year of production, increasing to R277 million/yr in the third year, R277 million/yr in the fifth year and stabilising at roughly R1.52 billion/yr from the seventh year onwards. The present value of the sum of these flows should be roughly R10.8 billion using a base case discount rate of 6%.

It was concluded that that key **risks to tourism** would relate to visual impacts and to the loss of conservation worthy areas. With regard to the former, the combined scale of the project elements and their visual impacts indicate that overall changes to the visual sense of place which supports tourism will be highly significant. Impacts on specific tourism facilities and key tourism areas would be limited, however, given the project's location relative to these. Visual exposure from the N14 would be high although temporary in nature for passing motorists who would largely still be able to enjoy the key attractions and tourist facilities in the wider area which are relatively far removed and screened from the project.

Any significant loss of highly conservation worthy land such as that found on the site and particularly on the Gamsberg Inselberg has potential implications for tourism. This is because conservation worthy lands have appeal to tourists and are becoming increasingly scarce. Should the project proceed on the site, a significant portion of highly conservation worthy land would be sacrificed. This is a highly significant loss as recognised in the vegetation specialist study and will trigger the need for a biodiversity/conservation offset which conserves and safeguards appropriate conservation worthy land elsewhere. With pro-active planning there may be possibilities to allow controlled eco-tourism activities on an offset site. An investigation of appropriate options in this regard should ideally form part of offset selection and planning.

With regard to positive tourism impacts, experience indicates that increased business tourism would be associated with the project as a number of technical, management and sales staff would be required to periodically visit the project site to conduct business. These staff generally fall into middle to higher income brackets and will require accommodation for their stays thereby creating opportunities for accommodation and other tourist facilities and services.

Based on a consolidated consideration of risks and opportunities, impacts on tourism have been given a moderate negative significance rating during operations with mitigation.

Aside from impacts on the tourism sector assessed above, the project has the potential to **impact on other neighbouring land uses** focused on farming and future solar project potential. The following findings are relevant in this regard and indicate overall impacts on surrounding land uses with minor to moderate significance after mitigation:

- The hydrogeological specialist study indicates that overall risk to groundwater levels with serious implications for farming on adjacent lands area are considered low and mostly expected to manifest in the long term.
- The findings of the hydrological specialist study indicates that, with adequate mitigation, impacts on surface water flows on neighbouring farms are likely to be minor.
- Based on the findings of air quality specialist study it is considered unlikely that air quality impacts (mainly from dust deposition) would translate into material impacts on the grazing potential of land outside the project boundaries.
- Air quality impacts on the potential of neighbouring lands to be used for solar projects are also considered minor and confined to the narrow areas along the Loop 10 Road (where dust deposition was found to be moderate) and, to a lesser degree, the N14 (where dust deposition was found to be light).
- Based on the findings of the noise specialist study, unacceptable noise and related nuisance impacts on surrounding farms are not predicted.
- The social specialist study found that the significance of impacts associated with an increase in social pathologies would be moderate without mitigation and minor to moderate with mitigation. Among the risks identified, a general increase in crime including stock theft would be of particular concern to neighbouring land owners. Based on experiences elsewhere it stands to reason that some level of stock loss would be inevitable.

While risks to neighbouring land owners with mitigation seem manageable, uncertainties regarding these risks remain. It is therefore clear that risks would need to be monitored and systems put in place to deal with impacts should they arise. It will be particularly important that these systems are devised with inputs from neighbouring land owners and that they are highly explicit regarding actions required from the applicant should negative impacts arise.

Ultimately it is the Khâi-Ma Municipality and, to a lesser degree, the Namakwa District Municipality's responsibility to ensure that the proposed project contributes to the **financial health of the municipal area** and does not burden the municipality with increased costs. These potential cost should be viewed at a broad scale and include costs associated with potential influxes of workers and job seekers as well as any other impacts that could impose costs on the municipality. Discussions with the Khâi-Ma Municipality revealed that they are well aware of the need to recover costs and would endeavour to

ensure that Vedanta not only covers their own costs, but also make a contribution to the development of the area. The municipality has confirmed that they are currently in the early stages of a process of negotiation with Vedanta in this regard. No clear conclusions regarding impacts on municipal finances are therefore possible at this stage. It is, however, safe to predict overall positive impacts on finances provided these negotiations proceed well and in-migration is managed. This kind of outcome would be consistent with other smaller municipalities that have benefited from increased incomes among its residents and an in-flux of new residents with jobs. With sound municipal management, both of these trends tend to increase municipal income from existing residents and provide municipalities with a wider rates resulting in healthier municipal finances.

In **conclusion**, when considering the quantifiable as well as more qualitative costs and benefits of the project it is considered more likely that it would achieve a net benefit at a provincial scale provided the financial projections of the applicants prove reasonably accurate and provided adequate mitigation measures are instituted. The achievement of a net benefit at a regional and local scale would be highly dependent on extensive mitigation as the key societal costs of the project would be felt at these scales.

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## ABBREVIATIONS

BBBEE	Broad Based Black Economic Empowerment
BEE	Black Economic Empowerment
CBA	Cost-benefit Analysis
DEA&DP	Department of Environmental Affairs and Development Planning
DM	District Municipality
DR	District Road
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
GRP	Gross Regional Product
HDSA	Historically Disadvantaged South African
IDP	Integrated Development Plan
IRR	Internal Rate of Return
KMLM	Khâi-Ma Local Municipality
LED	Local Economic Development
LM	Local Municipality
MR	Main Road
NCPG	Northern Cape Provincial Government
NCPGDS	Northern Cape Provincial Growth and Development Strategy
NDM	Namakwa District Municipality
NKLM	Nama-Khoi Local Municipality
NPV	Net Present Value
NSDI	Noise Sensitivity Depreciation Index
SANS	South African National Standard (for noise levels)
SDF	Spatial Development Framework

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## 1.1

## BACKGROUND AND BRIEF

Vedanta proposes to construct a zinc mine, concentrator plant and associated infrastructure at the Gamsberg near Aggeneys in the Northern Cape. In terms of the relevant environmental legislation the proposed development triggers a suite of activities which require authorisation from the competent environmental authorities. Environmental Resource Management (ERM) have been appointed as the lead consultant by the applicants to conduct the necessary environmental and social impact assessment (ESIA) process of the proposed project. This report contains an economic specialist study that forms part of the assessment phase of the ESIA process. Its brief is to:

- Establish and describe the existing economic context that would be affected by the proposed project via the review of:
  - Existing project information;
  - Statistical databases for example Census information;
  - Local economic development and planning documents; and
- Other Specialist studies/ reporting during the EIA phase.
- Identify significant economic impacts, (positive and negative, direct and indirect) on the regional (Northern Cape) and local scale for the construction and operational phases of the project by:
  - Assessing the impacts for each alternative compared against the 'nogo' option, and
  - Commenting on significant economic impacts on the national/ macro level.
- Assessment/ evaluation of the economic impacts that include:
  - A review of the justification and financial sustainability of the project using a broad cost-benefit review of financial projections and highlighting risk factors vital for the project's success;
  - Determining the need for the project (economy);
  - Direct impacts (long and short term) on the region due to increased commercial activity and project expenditure (including employment, international service provider visits, household incomes and production);
  - Impacts on municipal finances - rates and payments for services and assessment of positive and negative impacts regarding the financial position of the Municipality;
  - Indirect impacts;
  - Impacts on property values/tourism market value focusing on properties affected by the activities;
  - Assessing the impacts for each of the alternative sites and compared against the 'no-go' option, and
  - Commenting on significant economic impacts on the national/ macro level.
- Comment on the potential risk and short and long term impacts on commercial activities/ enterprises near the site, and on the tourism sector;

- Propose mitigation measures that could reduce identified economic impacts for both the macro and micro levels over the short and long term;
- Make available own reports to all other specialists, especially the social specialist, to facilitate alignment of the specialist reports; and
- Take cognisance of applicable local, provincial and national guidelines.

Note that economic impacts often have significant social elements and vice versa – it is thus advisable to read this report in conjunction with the social specialist study (ERM, 2013).

## 1.2 *PROJECT DESCRIPTION<sup>1</sup>*

This section provides a brief overview description of the proposed project. A more detailed project description can be found in the ESIA summary report compiled by ERM.

The mine would be located between the existing town of Aggeneys and the town of Pofadder, approximately 120 km east of the Springbok, along the N14. The mine and plant site will be located on properties Bloemhoek 61 Portion 1, Gams 60 Portion 1, Aroams 57 RE and Gams 60 Portion 4, approximately 14 km east of the town of Aggeneys, along the eastern border of the N14. The proposed site is commonly referred to as Gamsberg, and is characterised by an oval shaped inselberg approximately 220 meters above the surrounding plains.

The existing gravel road from Gamsberg to the Sishen-Saldanha railway line, at Loop 10 railway siding, is located approximately 160 km east of the Gamsberg mine. The Loop 10 siding and associated infrastructure is the property of Black Mountain.

Through optimising existing infrastructure of the Loop 10 Road, N14 and railway lines, Black Mountain intends to transfer the zinc concentrate from the mine to the Port of Saldanha, if this is selected as the preferred port of export. The presence of existing transportation infrastructure provides a strategic advantage and market viability for Black Mountain, while limiting the footprint of the proposed development.

The proposed project comprises the following (refer to the locality map in Figure 1.1):

- Gamsberg zinc mine and waste rock dumps. The mine would have an expected extraction rate of 10 million tons of ore per year once fully operational. Based on current estimations, a total of 150 million tons of ore will be mined from the Gamsberg over the Life of Mine (provisionally estimated at 20 years).
- Tailings dam. Based on the relatively low grade of the zinc deposit, the treatment process will generate approximately 132 million tons of

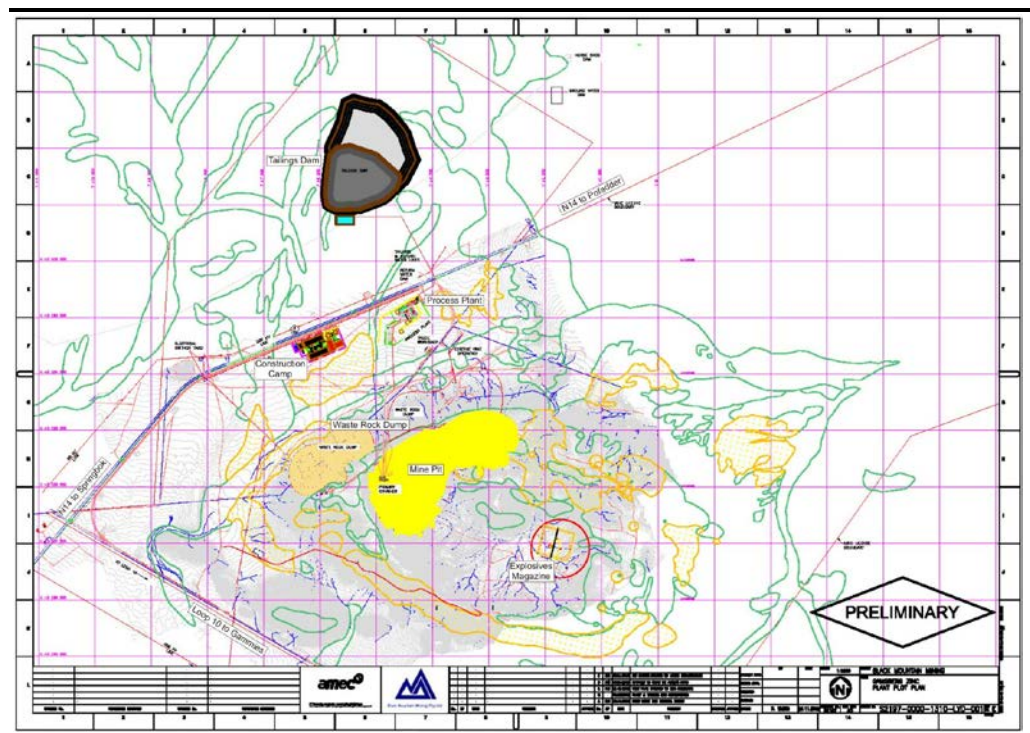
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<sup>1</sup>Taken from ERM (2012).

tailings over the Life of Mine. One tailings dam would be constructed with a final height of approximately 40m, covering a total area of 800 hectares and having a total storage capacity of 132 million tons.

- Zinc concentrator plant. This plant would produce approximately 1.225 million tpa of concentrate at peak production and 18 million tons over the Life of Mine.
- Associated infrastructure elements including:
  - Construction of a new 5 km off-take water pipeline from the existing Pella Drift Water board pipeline to the Gamsberg mine.
  - Construction of a transmission line from Aggeneys substation to the proposed mine.
  - Construction of a temporary on-site contractor housing camp located near the construction camp and covering a total area of approximately 15 hectares to 20 hectares with a total of approximately 500 units to be erected.
  - Construction of additional permanent housing in Aggeneys and/or Pofadder and provisionally estimated at 600 units.
  - Two transport options for the movement of zinc concentrate (Option 1: existing road to loop 10 and existing railway line from Loop 10 to Saldanha Bay Port; Option 2: existing road to Saldanha Bay Port).

**Figure 1-1**      *Locality map of Vedanta Zinc Mine, Concentrator Plant and Associated Infrastructure*



The project programme, based on the current work schedule, is summarised below:

*Project Programme*

Phase	Commencement	Completion	Duration	Remarks
Planning & Design	First Quarter 2012	First Quarter 2013	12 months	
Construction	Fourth Quarter 2013	First Quarter 2017	42 months	First stream of 3.35 Mtpa will come into operation from 1st quarter of 2015
Operation	Second Quarter 2015	2035	20 years	
Decommissioning	2036	To be confirmed in ESIA Phase	To be confirmed in ESIA Phase	

Not that the timeframe for the proposed phasing of the project could vary, based on market demand and other unforeseen factors.

The approach adopted involved the following steps in line with accepted ESIA practice:

1. Investigate the existing economic context within which the project would be established.
2. Identify economic impacts.
3. Assess economic impacts without mitigation.
4. Recommend mitigation measures.
5. Re-assess economic impacts assuming mitigation measures are implemented.

Guidance on the approach was taken from the Department of Environmental Affairs and Development Planning (Western Cape) guidelines on economic specialist input to EIA processes (van Zyl et al., 2005). This included guidance on the appropriate level of detail required for the assessment in order that it be adequate for informing decision-making without going into superfluous detail (i.e. superfluous detail in this report as well as superfluous detail when the briefs of other specialist studies forming part of the ESIA are taken into account).

Information was gathered from the following sources in order to investigate the existing economic situation that would be affected by the project:

- Information generated during consultations with the public and authorities.
- Census 2001 and 2011, Community Survey 2007 and other data from the Statistics South Africa database.
- Provincial, district and local economic development and planning documents.

Assessment focused on the construction and operational phases and included a consideration of decommissioning impacts where relevant. Aside from compatibility with planning and financial viability (and associated zinc market considerations), the following impacts were identified as relevant for assessment based on the guidelines for economic specialist input (van Zyl et al., 2005), information from consultations with I&APs and nature of the project and receiving environment:

1. Impacts on jobs and incomes linked to expenditure on the construction and operation of the project
2. Impacts on key macro-economic variables focused on foreign exchange earnings and taxes
3. Impacts on tourism
4. Impacts on other surrounding land uses
5. Impacts on municipal finances

These impacts were rated using accepted EIA conventions for determining their significance provided by ERM (see Appendix 1).

All of these impacts are assessed individually and then as a whole to the degree possible and appropriate. Unfortunately the monetary quantification of costs and benefits was not possible for many impact categories. This increases the difficulty with which one is able to come to an overall assessment regarding the net benefit or cost of the project (i.e. whether overall benefits exceed costs). An overall assessment and discussion of net impacts was, however, undertaken to the degree thought appropriate and justifiable combining quantifiable and unquantifiable impacts. Given uncertainties and the potentially subjective nature of comparisons between impact categories, the emphasis in the report is on presenting assessments of the abovementioned impact categories with less emphasis on trying to reconcile them in an overall assessment of net effects. To a large degree this role of comparing and weighing up different (and sometimes hard to reconcile) impacts is the ambit of the relevant decision-making authorities.

Note that the majority of the potential negative environmental externalities (i.e. uncompensated for environmental costs) are captured in the sections dealing with impacts on tourism, property values and municipal finances. These impacts would all primarily manifest at a local level.

Further details on the approaches used to assess impacts are contained in the individual sections dealing with the impacts.

## 2.1

### *ASSUMPTIONS AND LIMITATIONS*

The following key assumptions and limitation apply to this study:

- All technical, financial (i.e. business plan and costs) and other information provided by the applicant, the applicant's project team, other specialists and official sources is assumed to be correct.
- The quantification of economic impacts in order to inform the assessment of the significance of impacts was not possible, nor considered necessary, for all impacts. Where possible, quantification focused on impacts considered to be most important in the overall assessment. Assessments of impact significance made without quantification (and based on a consideration of the likely magnitudes of impacts and/or expert judgements) are, however, considered adequate unless otherwise specified.
- Alternative mine sites were not part of the brief of the study.
- The Vegetation/Botanical Specialist was responsible for the assessment of the significance of biodiversity losses and the adequacy of offsets to compensate for these losses.
- The findings of the assessment reflect the best professional assessment of the author drawing on relevant and available information within the constraints of time and resources thought appropriate and made available for the assessment. See Appendix 2 for the disclaimer associated with this report.



The report was compiled by Dr Hugo van Zyl. Dr van Zyl holds a PhD in economics from the University of Cape Town. He has fifteen years experience focusing on the analysis of projects and policies with significant environmental and development implications and has been involved in project appraisals of infrastructure projects, industrial and mining developments, mixed use developments, renewable energy projects, conservation projects and eco-tourism initiatives throughout Southern Africa. He has lead, participated in and co-ordinated research in economic impact assessment, environmental resource economics and project appraisal and has contributed specialist input to over 60 environmental assessments. Dr van Zyl is also the lead author of the Western Cape Department of Environmental Affairs and Development Planning guidelines on economic specialist input into EIAs (van Zyl et al., 2005).

Declaration of Independence:

The author of this report, Dr Hugo van Zyl, does hereby declare that he is an independent consultant appointed by ERM and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of the specialist performing such work. All opinions expressed in this report are his own.



Dr. Hugo van Zyl  
April 2013

The significance of impacts is often highly dependent on the economic environment or context within which they occur. For example, job creation in a small local community with a stagnating economy will be far more significant than it would be in a larger community with a healthy economy. With this in mind, this section describes the economic environment focusing on the local area and sub-region where the majority of impacts are likely to be felt. The main information sources used were Census 2001 and 2011 data, 2007 Community Survey data, Integrated Development Plans (IDPs), Locals Economic Development (LED) Strategies and Spatial Development Frameworks (SDFs).

Given the scale of the project the economic context includes information on the Northern Cape, the Namakwa District, the Khâi-Ma Local Municipal areas as well as, where available, the key local areas within the local municipality (e.g. Aggeneys, Pofadder, Pella, etc.). Note that the currently available Census 2011 data presented in this section only provides data for the four wards within the Khâi-Ma Local Municipality and not necessarily for individual towns. The key towns and areas included in these wards are as follows:

- Ward 1 – Onseepkans, Raap end Skraap, Melkbosrand, Viljoensdraai, Vrugbaar and surrounds.
- Ward 2 – Mainly the part of Pofadder to the north of the N14 (incl Blyvooruitsig) and immediate surrounds.
- Ward 3 – Pella, Klein Pella and Witbank.
- Ward 4 – The part of Pofadder to the south of the N14, Aggeneys and the sparsely populated rural area to the south and south east of Aggeneys.

Data is also provided for the neighbouring Nama Khoi Local Municipality area which includes the town of Springbok.

### 3.1

#### DEMOGRAPHICS

During the 2001 Census, the population of the Namakwa District was estimated at 108,111. Within the District, the population of the Khâi-Ma Municipal area was 11,344.

More recently, the 2011 Census estimated that 115,842 people live in the Namakwa District and 12,466 in the Khâi-Ma Local Municipality area (see Table 3-1). The period between 2001 and 2011 thus saw a modestly positive population growth in the area seldom exceeding 1% per annum. With regard to expected population growth, the 2012 Namakwa Spatial Development Framework uses a rate of 1.5% per annum as its base case for projections (NDM, 2012).

**Table 3-1 Population Numbers in the Wider Study Area for 2011**

Population Group	Northern Cape	Namakwa District	Khâi-Ma Municipality	Khâi-Ma Municipality Ward 1	Khâi-Ma Municipality Ward 2	Khâi-Ma Municipality Ward 3	Khâi-Ma Municipality Ward 4	Nama Khoi Municipality
Black African	576 986	7 904	2 195	1 268	101	257	568	1 959
Coloured	461 899	96 360	9 359	2 093	2 456	2 648	2 162	41 425
Indian or Asian	7 827	612	55	14	14	10	16	219
White	81 246	10 113	754	97	2	21	633	3 084
Other	17 903	853	103	48	12	20	24	353
<b>Total population</b>	<b>1 145 861</b>	<b>115 842</b>	<b>12 466</b>	<b>3 520</b>	<b>2 585</b>	<b>2 956</b>	<b>3 403</b>	<b>47 040</b>

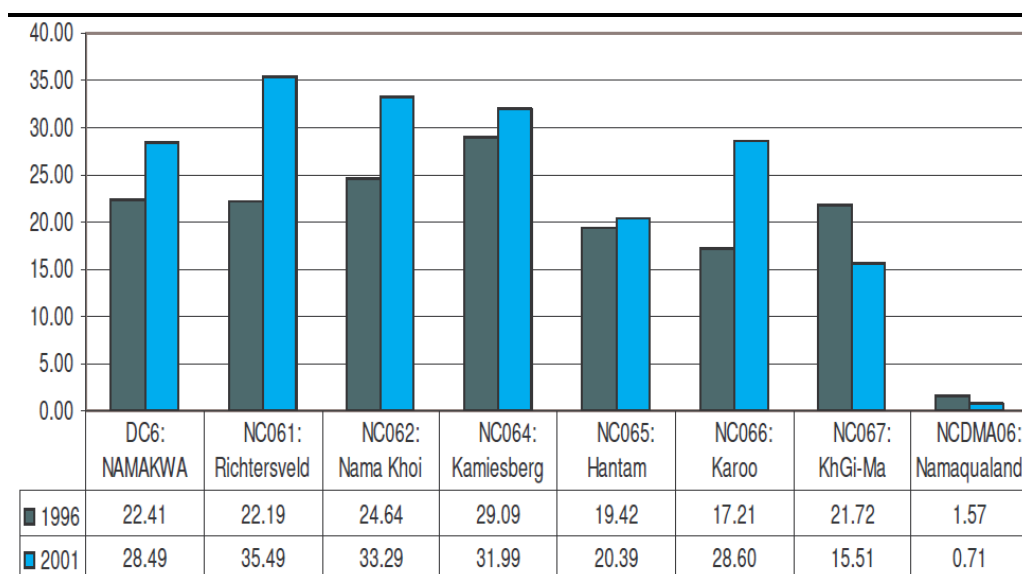
Source: Census 2011

### 3.2

#### EMPLOYMENT LEVELS

As with the rest of the country, unemployment is a major challenge in the area. This situation continues to be exacerbated by the current difficult economic climate with low levels of economic growth. Based on the 2001 Census figures in Figure 3-1 below, the Khai Ma Municipality had an unemployment rate of approximately 15.5% in 2001 down from 21.7% in 1996. This 2001 rate was lower than the rate for the Namakwa District (28.5%) and somewhat lower than for the Northern Cape (27%).

**Figure 3-1 Unemployment in the Wider Study Area for 1996 and 2001**



Source: NDM, 2006

More recently, the 2011 Census estimated that unemployment in the Namakwa District was at 20.1% (and up to 27.1% if discouraged work-seekers are included in estimates – see Table 3-2). Unemployment in the Khâi-Ma Local Municipality was slightly higher than in the District at 22.9% with Ward 3 showing particularly high levels of unemployment (i.e. 52.2%) within the municipality. These averages for the Khâi-Ma Municipal area contrast with significantly better figures for the Nama Khoi Municipality which had an unemployment rate of roughly 8.9% for 2011.

**Table 3-2 Unemployment in the Wider Study Area for 2011**

Employment category	Northern Cape	Namakwa District	Khâi-Ma Municipality	Khâi-Ma Municipality Ward 1	Khâi-Ma Municipality Ward 2	Khâi-Ma Municipality Ward 3	Khâi-Ma Municipality Ward 4	Nama Khoi Municipality
Employed	282 791	33 684	12 351	4 600	1 737	443	970	1 450
Unemployed	106 723	8 471	3 665	1 304	416	483	263	141
<b>% unemployed</b>	<b>27.4%</b>	<b>20.1%</b>	<b>22.9%</b>	<b>22.1%</b>	<b>19.3%</b>	<b>52.2%</b>	<b>21.3%</b>	<b>8.9%</b>
Discouraged work-seeker	39 913	4 040	1 935	322	24	121	113	64
<b>% unemployed including discouraged work-seekers</b>	<b>34.1%</b>	<b>27.1%</b>	<b>31.2%</b>	<b>26.1%</b>	<b>20.2%</b>	<b>57.7%</b>	<b>27.9%</b>	<b>12.4%</b>

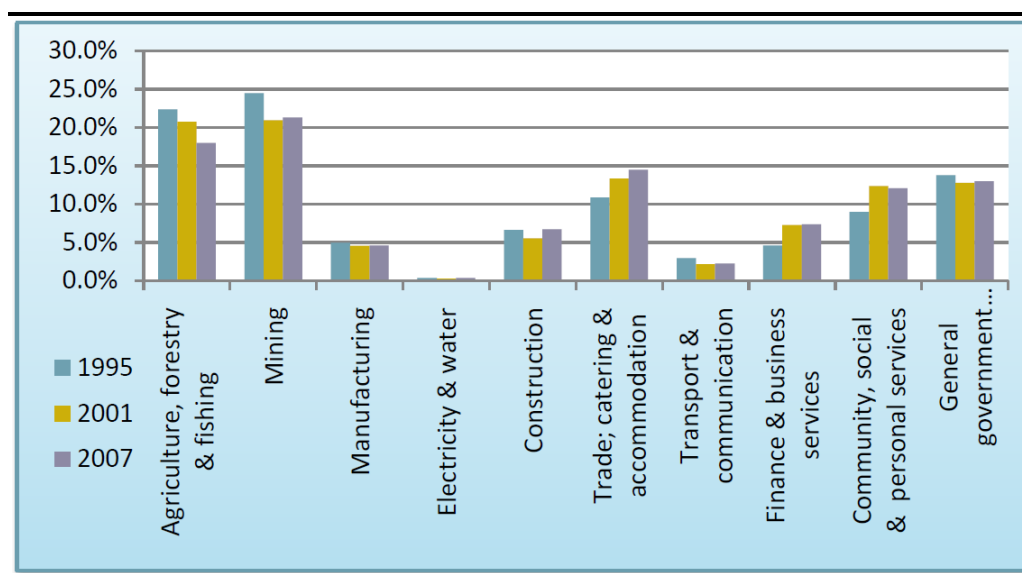
Source: Census 2011

### 3.3

#### EMPLOYMENT COMPOSITION

With regard to the sectoral division of employment opportunities, for the Namakwa District as a whole, the dominant sector in terms of employment provision is mining which provided 21.3% of all employment opportunities in 2007 followed by agriculture and fishing which provided 18% of all jobs (see Figure 3-2 below). Whilst remaining the major sources of employment, the relative contribution made by these sectors declined between 1995 and 2007 by roughly 5% for each of them. The wholesale retail trade, catering and accommodation sector showed the greatest proportional increase in job creation over the period up from 11% of employment in 1995 to 14% in 2007.

**Figure 3-2 Sectoral employment in the Namakwa District (1995 - 2007)**



Source: Census 2001 in Urban-Econ, 2009

Data from Census 2011 indicates that formal sector employment currently accounts for roughly 70% of jobs in the Namakwa District and Khâi-Ma Local Municipalities followed by informal sector employment at 20% to 23% and jobs in private households (see Table 3-3).

**Table 3-3**      *Employment per Sector in the Wider Study Area for 2011*

Sector	Northern Cape	Namakwa District	Khâi-Ma Municipality	Khâi-Ma Municipality Ward 1	Khâi-Ma Municipality Ward 2	Khâi-Ma Municipality Ward 3	Khâi-Ma Municipality Ward 4	Nama Khoi Municipality
Formal sector	73%	71%	70%	78%	86%	85%	59%	79%
Informal sector	16%	20%	23%	15%	13%	13%	29%	9%
Private household	11%	9%	7%	7%	2%	1%	12%	12%
Total	100%	100%	100%	100%	100%	100%	100%	100%

*Source: Census 2011*

Unfortunately it is not possible to get an accurate estimate of current jobs in the tourism sector on the basis of Census statistics as they do not include a separate category for tourism. Tourism is, however, recognised as a key sector in the local area and region. As a general rule, the tourism sector is reflected primarily in the transport, retail trade, personal services and business services sectors. These sectors have shown robust growth which is probably at least partially attributable to growth in the tourism sector.

With regard to the skills levels of employees, the Namakwa District is characterised by relatively high percentages of people working in elementary occupations (38.4% of workers) and other relatively low skill occupations (13.2% in craft and related trades, 11% as clerks and 10.4% as service and sales workers). Only 6.5% are employed as legislators, senior officials and managers and 2.6% as professionals. These statistics indicate the need for local skills development programmes (Urban-Econ, 2009).

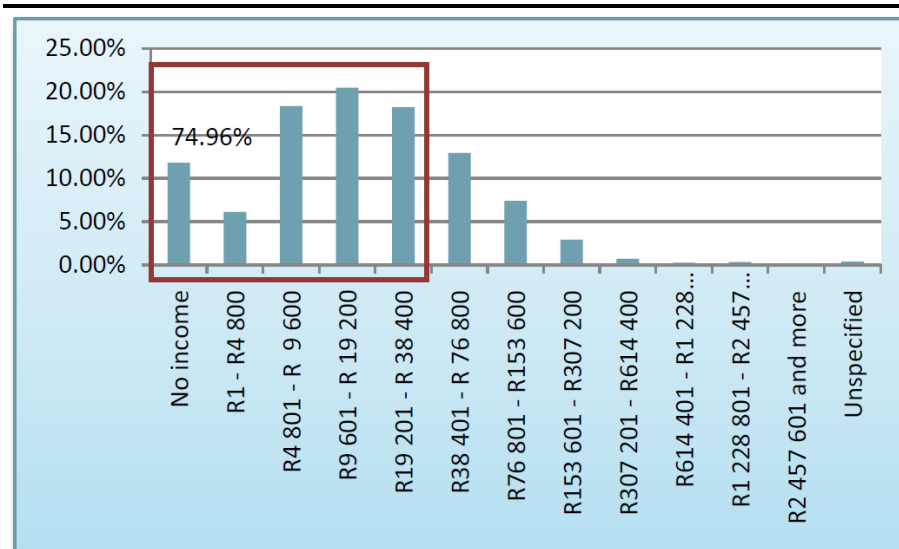
### 3.4

#### *INCOME LEVELS*

Figure 3-3 shows the annual household income levels within the Namakwa District municipal area for 2001. The following key trends can be identified (Urban-Econ, 2009):

- 11.8% of households in the District earned no income making them dependent on state grants, charity and possibly extended family/ social networks for survival.
- 75% of households in the District earned below R 38,400 per annum.
- Very few households had high spending power – just 1.8% of the households were classified as high-income.

**Figure 3-3 Household Incomes for the Namakwa District (2001)**



Source: Census 2001 in Urban-Econ, 2009

Table 3-4 reports on household income levels in the Study Area for 2011. Approximately 36% of households in the Namakwa District and 34% of households in the Khai Ma Municipality had incomes below R19,600 per year in 2011. Roughly 9% of household had no income at all. As in the case of better employment, better household income are also be found in the Nama Khoi Municipality by comparison where 15% of household had incomes below R19,600 per year.

**Table 3-4 Percentage of Household per Income Category in the Wider Study Area for 2011**

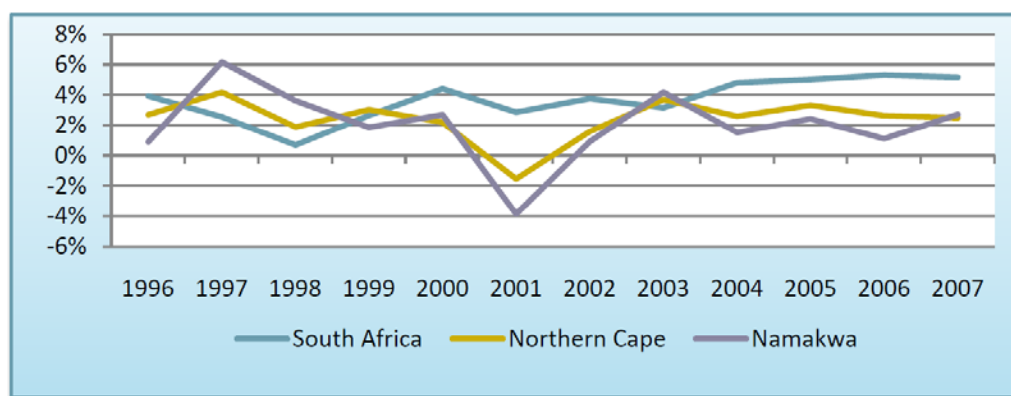
Annual income level	Northern Cape	Namakwa District	Khâi-Ma Municipality	Khâi-Ma Municipality Ward 1	Khâi-Ma Municipality Ward 2	Khâi-Ma Municipality Ward 3	Khâi-Ma Municipality Ward 4	Nama Khoi Municipality
No income	12%	9%	9%	8%	6%	14%	10%	5%
R 1 - R 4800	4%	3%	3%	3%	3%	4%	3%	1%
R 4801 - R 9600	6%	5%	5%	5%	5%	7%	7%	2%
R 9601 - R 19 600	19%	19%	17%	18%	22%	19%	23%	7%
R 19 601 - R 38 200	21%	22%	21%	22%	28%	25%	23%	13%
R 38 201 - R 76 400	15%	17%	18%	19%	24%	16%	22%	12%
R 76 401 - R 153 800	10%	12%	13%	13%	8%	14%	9%	24%
R 153 801 - R 307 600	7%	8%	8%	7%	2%	2%	2%	20%
R 307 601 - R 614 400	4%	4%	4%	4%	2%	0%	1%	12%
R 614 001 - R 1 228 800	1%	1%	1%	1%	0%	0%	0%	2%
R 1 228 801 - R 2 457 600	0%	0%	0%	0%	0%	0%	0%	1%
R 2 457 601 or more	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Census 2011

Aside from very low income levels, the situation in the local area and district with regard to grants gives further credence to high levels of poverty. Roughly 36% of households in the Namakwa District are registered as indigent and an even larger portion (65% and the highest in the District) are registered as indigent in the Khâi-Ma Local Municipality as measured in 2005 (Urban-Econ, 2009).

The Namakwa District Municipality's regional gross domestic product (GDP) amounted to R3.77 billion in 2007. The Khâi-Ma Local Municipality was responsible for roughly 10.3% of this GDP with mining operations in Aggeneys making the most significant contribution (Urban-Econ, 2009). With regard to the rate of economic growth, Figure 3-4 presents the GDP growth rates of the Namakwa District municipal area in comparison to the Northern Cape and country for the period 1996 to 2007. It shows that the Namakwa District's economy grew modestly at an annual average rate of 2% over the period whilst the provincial average was 2.4% and the national average was 4%.

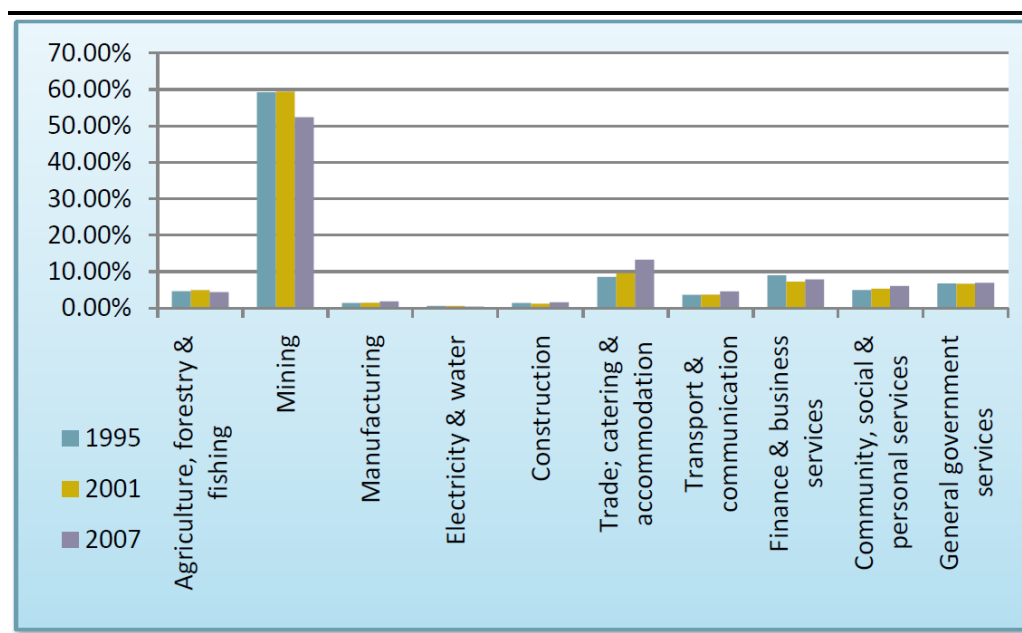
**Figure 3-4** *Economic Growth Rates in the Northern Cape and Namakwa District (1996 - 2007)*



Source: Quantec data in Urban-Econ, 2009

Figure 3-5 shows the sectoral contribution to the Namakwa District's regional GDP over time. Mining played the major role contributing 52.4% in 2007 although this contribution decreased from roughly 59% in 2001. After mining wholesale and retail trade, catering and accommodation was the next largest GDP contributor at 13.2%. This sector has also showed the greatest growth between 1995 and 2007 some of which is likely to be associated with growth in tourism.

Figure 3-5 Sectoral Contributions to GDP in the Namakwa District (1995 to 2007)



Source: Quantec data in Urban-Econ, 2009

Looking to future development trends, in its consideration of areas of economic opportunity, the Northern Cape Provincial Growth and Development Strategy was revised in 2011 with a view to sharpening its focus. The Strategy emphasises the need for growth, diversification and transformation of the provincial economy and poverty eradication through social development (PGNC, 2011). At the Namakwa District level, the IDP raises concern regarding low economic growth and calls for the establishment of a development - oriented and economically viable region to ensure sustainable growth (NDM, 2006). The 2009 District Municipality Local Economic Development (LED) Strategy identifies a number of key opportunities including:

- Institutional Development for Investor Readiness
- SMME Development
- Agricultural Sector Development
- Mining Sector Development (including the beneficiation projects, One-Stop Mining Centre and the implementation of new technologies)
- Industrial Development
- Renewable Energy Development (including wind, wave, solar, and biogas energy)
- Space Research and Development Spin-offs
- Tourism Development
- Quality of Life Improvement

In a similar vein, the local Khâi-Ma Municipality LED strategy has a vision, 'To improve the living standards and conditions of residents through fully utilising its limited resources and to strengthen the local economy by creating an economically sustainable environment.' Its objectives are as follows (KMLM, 2011):

- Poverty relief through effective basic service delivery and job creation.



- Ensure effective service delivery through transformation, capacity building and infrastructure development.
- Form linkages in order to facilitate skills development.
- Promote business and investment attraction and retention.
- Assist with economic interventions in sector development (agricultural, mining, tourism and renewable energy)

### 3.6

#### **SURROUNDING LAND USES**

The land use types found nearby the proposed project site can be summarised as follow:

##### **Agriculture**

The primary land use in the area surrounding the site is agriculture mostly in the form of stock farming with sheep, goats and cattle. As a result of sparse vegetation and limited water, carrying capacities are low reaching 14 to 18 hectares per large stock unit (LSU). Successful farms tend to be particularly large as a consequence of these low carrying capacities.

##### **Mining and other commercial uses**

The existing Black Mountain Mine adjacent to Aggeneys is the dominant mine in the area although there are also other minor quarries and diggings (such as the dormant mine nearby the Oase in de Wilderness Lodge about 15km to the north east of the proposed site). On the site itself, a small mining operation is currently operational roughly half way up the northern slope of the Gamsberg and visible from the N14.

Aside from mining, a number of solar energy projects have been proposed for land parcels nearby the site. They are significantly driven by the presence of the sub-station nearby Aggeneys. They are part of a trend in the wider region and province and are in keeping with the earmarking of a wide strip of land along the N14 as a Solar Corridor in Local and District Municipality planning (see *Section 4.2 on Compatibility with Planning* for map of this corridor).

##### **Recreation and Tourism**

Tourism is a key land use in the wider area and particularly along the Orange River and in the adjacent mountain ranges. As outlined and mapped in more detail in *Section 4.5 on Tourism Impacts*, tourism uses nearby the proposed site are less prominent at present.

##### **Residential**

Aggeneys town is the nearest residential areas and its eastern boundary is approximately 7-8 km from the site. Pella (25km from the site) and Pofadder (40km from the site) are the two other main towns relatively nearby the site.

Aside from financial viability (and associated zinc market considerations) and compatibility with planning, the following impacts were identified as relevant for assessment based on the guidelines for economic specialist input (van Zyl et al., 2005), information from consultations with I&APs and nature of the project and receiving environment:

1. Impacts on jobs and incomes linked to expenditure on the construction and operation of the project
2. Impacts on key macro-economic variables focused on foreign exchange earnings and taxes
3. Impacts on tourism
4. Impacts on other surrounding land uses
5. Impacts on municipal finances

These impacts were rated using accepted EIA conventions for determining their significance (see Appendix 1). Note that significance ratings were not appropriate or necessary for the sections discussing compatibility with planning and financial viability.

#### 4.1

#### *FINANCIAL SUSTAINABILITY AND ZINC MARKET IMPLICATIONS*

Financial sustainability and associated implications of the project for the South African zinc market are important considerations for discussion before proceeding to the assessment of impacts.

##### 4.1.1

##### *Financial Sustainability Considerations*

Long term positive economic impacts can only flow from a project that is financially sustainable (i.e. financially viable in the long term with enough income to cover costs). Projects that do not meet this criterion of private financial viability are thus not worth investigating further unless their lack of financial viability stems from distortions that make them artificially unviable. With this in mind the viability of the project alternatives are briefly considered in this section before continuing with the assessment of impacts.

As has been outlined in detail in the Scoping Report (ERM, 2012), the rationale for Vedanta's proposal to establish a zinc mine and concentrator plant at the Gamsberg is based on a number of commercial considerations. These can be divided into the following:

- The size, quality and relative accessibility of the zinc deposit at the Gamsberg site.
- Anticipated regional and global zinc demand levels particularly when considering the expected life of mines for other large zinc mines and associated concentrate plants. As pointed out in ERM (2012: p 43), the

latest research indicates that current global zinc metals production exceeds supply. However, the Gamsberg project would only commence in 2015 when a recovery in global demand is expected and by which time some large zinc mines like Century in Australia and Lisheen in Ireland are expected to close and others like Rampura-Agucha in India would experience fall in production. It is anticipated by Vedanta that this should result in adequate demand for concentrate produced from Gamsberg.

- Potential synergies with other mines and plants in the Vedanta global network.
- The longer term potential to further beneficiate zinc concentrate to zinc metal products depending on market conditions.

The above factors have been taken into account in the independent financial feasibility assessment of the project conducted by Amec for Vedanta. This assessment is assumed to be accurate and has weighed up the risks and rewards associated with the project and found that it should be financially viable to the degree required to make the necessary investment (L. Ahuja, Vedanta, pers com). Aside from financial viability risks associated with demand, other recognised and accounted for risk factors would also apply such as those related to minimising the costs of construction and operation (electricity and fuel costs in particular), technical and other risks. The Amec study also investigated the financial viability of establishing an underground mine at Gamsberg as opposed to the currently favoured open pit mine. It found that the underground option would not be sufficiently viable to justify the risks associated with it. Vedanta has consequently confirmed that they are not considering the underground mining option further on the basis of the Amec study (L. Ahuja, Vedanta, pers com).

It is important to bear in mind that financial sustainability/viability is never a certainty as is the case for virtually all commercial ventures. As a rule, applicants can only assess risks to the degree possible and make an informed decision on whether they are worth taking relative to the rewards on offer. In essence, Vedanta has considered financial feasibility issues in detail and a broad review of the reasoning and assumptions used by Vedanta indicate that the calculated risk that they are willing to take is not misplaced. The available evidence provides no reason to clearly suspect financial failure and, as such, provides no clear basis to argue against the desirability of the development on this basis. The balance between financial benefits and costs are thus likely to be positive for Vedanta and its shareholders. The remainder of this report focuses on the costs and benefits that would accrue to wider society in order to provide information on the overall economic desirability of the project.

#### 4.1.2

#### *Implications for the South African Zinc Market*

The nature of the proposed project relative to the zinc market in South Africa dictates that it is likely to have significant implications for the development of the local market.

Table 4-1, based on information provided by Vedanta, outlines the current status of the zinc concentrate and metals market in South Africa and Namibia showing annual production, expected life of mines and ownership structures. It shows that zinc production is likely to be constrained beyond 2020 based on currently expected life of mines. In essence, even if one considers the potential for life of mine extensions, new mining ventures such as that proposed by Vedanta will be needed if production is to continue beyond 2020.

**Table 4-1** *Current Status of the Zinc Concentrate and Metals Market in Southern Africa*

Mine/plant and nature of production	Annual production of zinc product in tpa	Expected year when resource exhausted and mine closed	Current ownership / shareholding
Black Mountain Aggenys - Zinc concentrate	65,000	2019	Vedanta - 74%, Exxaro - 26%
Rosh Pinha Namibia - Zinc concentrate	100,000	2018 with possibility of extension	Glencore - 80%, 20% Employee scheme and
Scorpion Namibia - Zinc metal ingots	150,000	2017 with possibility of extension. Metal production may continue with alternative source of concentrate.	Vedanta - 100%
Zincor Springs pre closure (zinc metal sheets etc.)	90,000	Closed in 2011	N/A
Gamsberg (potential maximum) - Zinc concentrate	1,000,000	20-30 years after commencement	Vedanta - 74%, Exxaro - 26%

With regard to beneficiation in South Africa, prior to 2011 when it closed, Zincor in Springs was the only plant producing zinc metal. Before its closure, it had an annual operational budget of approximately R860 million and employed roughly 820 full-time employees and contractors (van Zyl, 2011). In order to manufacture zinc metal, Zincor sourced zinc concentrate primarily from Rosh Pinah in Namibia (+/- 100,000 tpa) and from Black Mountain in Aggeneys (+/- 65,000 tpa). With regard to sales, the Zincor customer base was as follows (van Zyl, 2011):

- Roughly 1/3 of production went to Mittal in Vanderbijlpark
- Roughly 1/3 of production went to Duferco in Saldanha
- Roughly 1/3 of production went to local galvanizers many of whom were located relatively close to the Zincor plant.

After the 2011 closure of the Zincor plant in Springs there has been no production of zinc metal products in South Africa. In the longer term, this closure has arguably created a potential gap in the South African market for the production of zinc metal and further metal beneficiation and value addition with its attendant economic benefits. The likelihood that this gap will be filled at some point will also arguable be increased should the Vedanta project go ahead given the significant production levels anticipated (zinc concentrate production volumes at Gamsberg should exceed the combined current production of all existing facilities in southern Africa by orders of magnitude). In addition, international cost efficiency trends are towards metals production in close proximity to concentrate production. It is thus highly likely that metals production in close proximity to the Gamsberg will be given serious consideration should metals production in South Africa be the subject of detailed feasibility studies. Of course there will be other

considerations such as market trends, electricity prices, the availability of supporting infrastructure, labour market trends, etc that will influence whether and where zinc metals production may occur in South Africa. It is not possible to speculate at this time on how these factors may interplay in the future. One can, however, conclude that the possibility of zinc metal production in South Africa in the medium to longer term would be given a significant boost should the Gamsberg project go ahead as planned.

Note that the nearest currently operational zinc metal production facility outside South Africa is adjacent to the Scorpion Mine in Namibia. At this site concentrate production is constrained and may only continue for another five years unless extended (see Table 4-1). Should concentrate production come to a halt at Scorpion, metals production may be able to continue if an alternative source of concentrate is found. This may provide an additional market for concentrate from Gamsberg.

On the whole, the above findings indicate that the project should result in significant positive implications for the development of the South African zinc market. Initially benefits would be focused on increasing exports the magnitude of which are presented and assessed in Section 4.4 . The presence of the project would, however, also increase the chances that at some point local production of zinc metal would be possible.

## 4.2

### *COMPATIBILITY WITH EXISTING PLANNING GUIDANCE*

Economic development imperatives inform spatial planning imperatives. A critical aspect of economic desirability is thus whether the proposed development complements economic planning as reflected in spatial development planning. Spatial Development Frameworks (SDFs) in particular are central to economic development planning and are drawn up in order to guide overall development in a direction that local and provincial authorities see as desirable. Indeed, the basic purpose of an SDF is to specify the spatial implications of Integrated Development Plans (IDPs) designed to optimise economic opportunities. Specifically, a SDF has the following objectives and characteristics (DMP, 2003):

- It expresses government policy and the views and aspirations of all I&APs.
- Government departments and other authorities and institutions involved in future development and land use planning in the municipality will be bound by the SDF proposals.
- It provides certainty to the affected communities regarding future socio-economic and spatial development in the area.
- It provides a basis for co-ordinated decision-making and policy formulation related to future land use.
- It creates opportunities for preparing development and action plans to which financial budgets can be linked.

The proposed project thus ideally needs to be compatible or 'fit' with what is envisaged in SDFs, structure plans and other planning documents in order for

it to be compatible with the optimal spatial distributions of economic activity as envisaged in these plans. Or, if it doesn't obviously fit with existing planning, there need to be clear and compelling reasons why a deviation from planning should be considered.

With this in mind, the following provincial, district and local planning documents were reviewed:

- Northern Cape Provincial Growth and Development Strategy (NCPGDS) 2005 updated in 2011 and drawing on the National New Growth Path of 2010.
- Northern Cape Provincial Spatial Development Framework (SDF) 2012
- Namakwa District Integrated Development Plan (IDP) and Spatial Development Framework (SDF) 2012.
- Khâi-Ma Local Municipality Integrated Development Plan (IDP) and Spatial Development Framework (SDF) 2010.
- Khâi-Ma Local Economic Development (LED) Strategy 2011

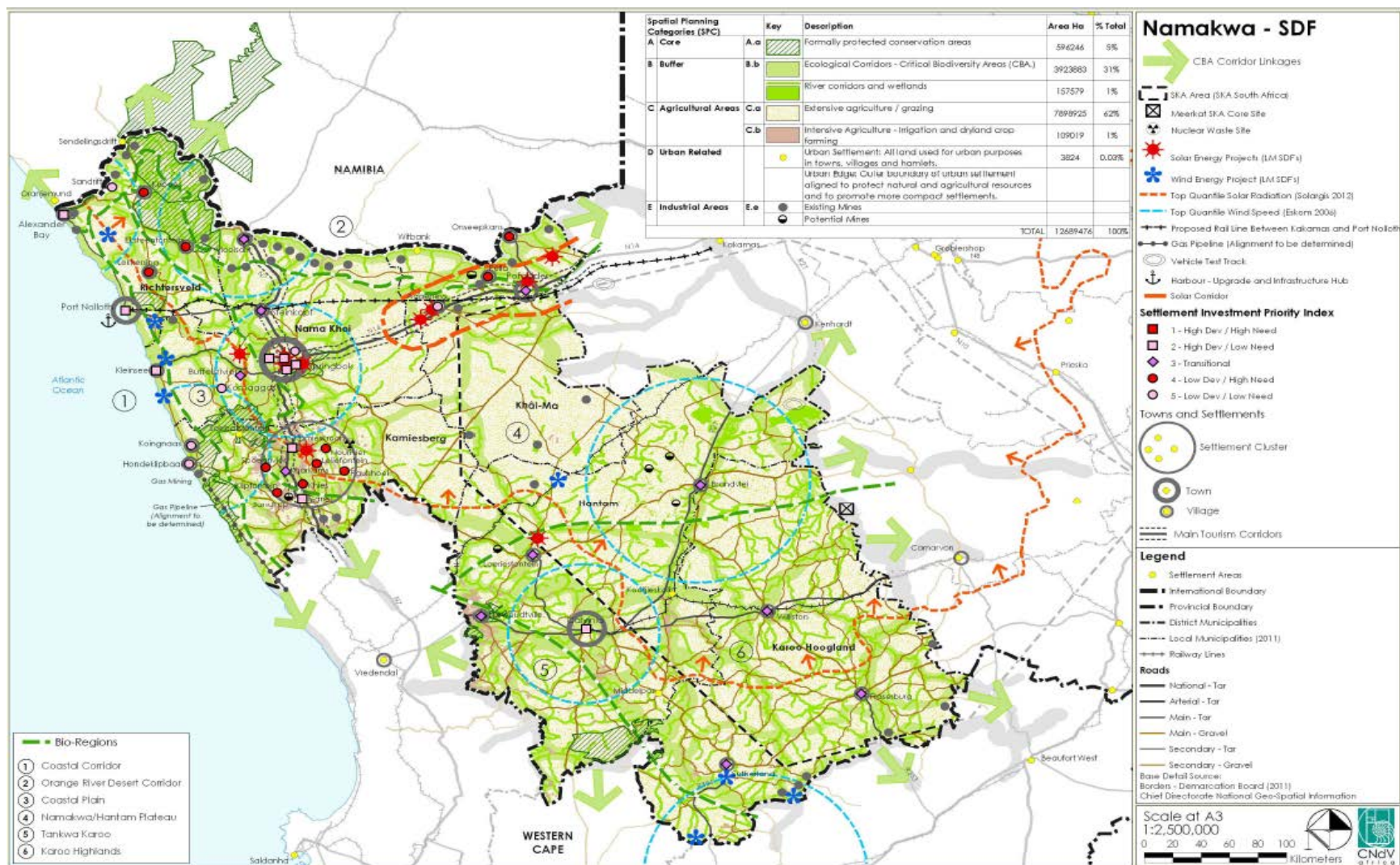
Considered as a whole these documents recognise the importance of integrated and diversified economic development that makes optimal use of each area's comparative advantages including their natural resources, sense of place and human capital. Emphasis is also placed on the optimal management of economic benefits from developments.

At the broadest spatial scale, the Northern Cape SDF recognizes Aggeneys and surrounds as a mining focus area whilst also recognizing the conservation worthiness of habitat in the area particularly that associated with inselbergs. Similarly, but in more detail, the Namakwa District SDF addresses these key trends in the area (Figure 4-1 shows the composite map produced in the Namakwa District SDF). In addition, it proposes a conceptual Solar Corridor consisting of a roughly 30km wide strip of land with the N14 at its centre encompassing Aggeneys as well as Pofadder and surrounds.

At the local level, the Khâi-Ma SDF similarly explicitly recognises the mining opportunity presented by the zinc deposit at the Gamsberg as reflected on its overall composite plan (Figure 4-2). It does not detail solar energy project opportunities, but this is probably as the SDF was completed in 2010 before the potential for these kinds of projects was realised. With regard to tourism, it recognises the importance of Pella and surrounds and identifies two primary tourism corridors between Pofadder and Witbank along the Klein Pella Road and between Pofadder and Onseepkans. In general, particular emphasis is placed on the protection of tourism assets and the development of tourism in areas north of the N14, along the Orange River and the mountainous areas relatively close to the Orange River. The Khâi-Ma LED Strategy also refers to the potential of the zinc deposit at the Gamsberg and other mining and tourism opportunities in the area drawing on the spatial recommendations in the SDF (see KMLM, 2011).

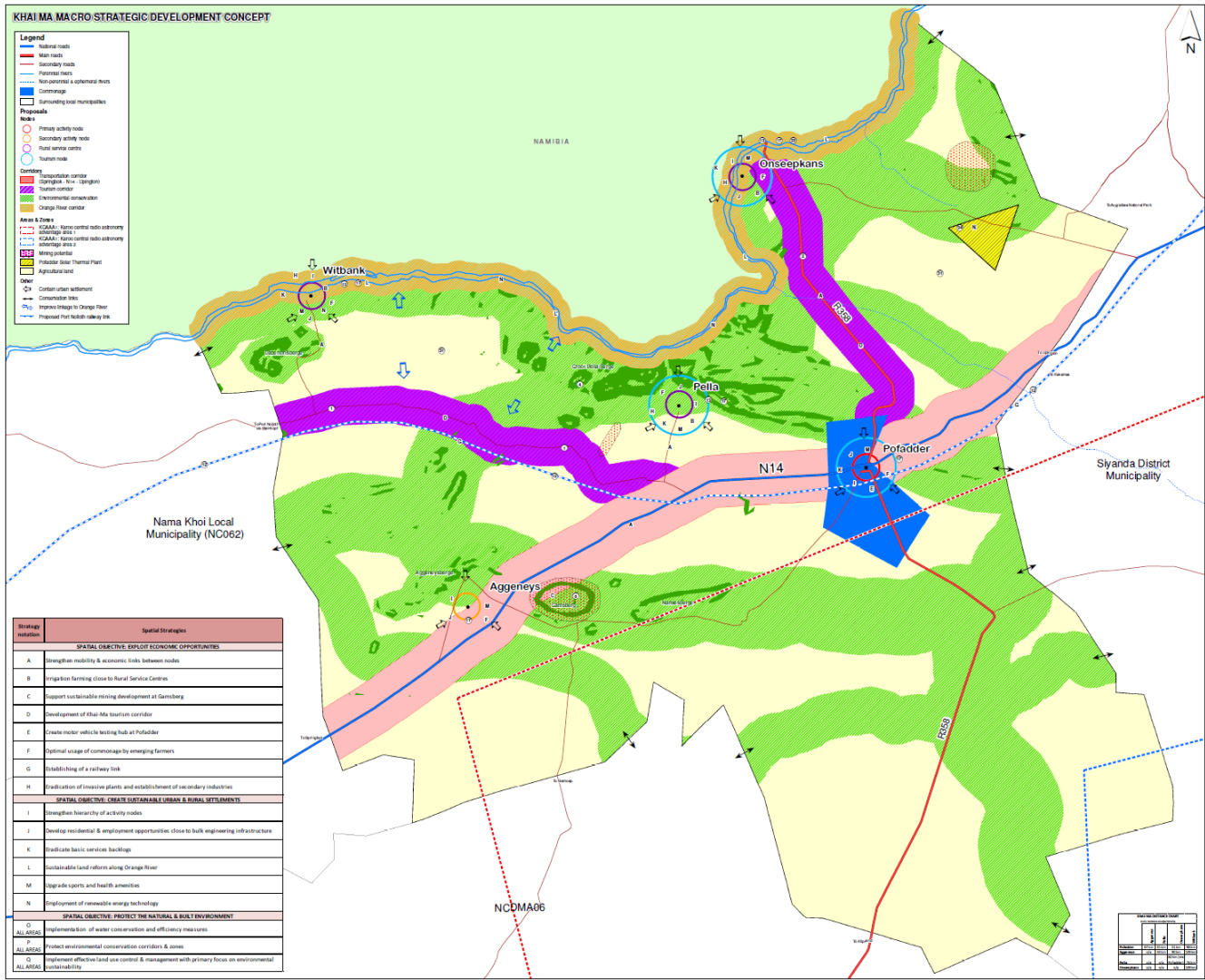


Figure 4-1 Namakwa District Municipality Spatial Development Framework Composite Map (2012)



Source: NDM, 2012

Figure 4-2 Khâi-Ma Local Municipality Spatial Development Framework Composite Map (2010)



Source: KMLM, 2010



With regard to the future efforts in the municipality aimed at developing towns, the focus of the SDF is to encourage growth in Pofadder to the degree possible and restrict growth in other towns such as Aggeneys where possible. Table 4-2 expands on the rationale provided for this in the SDF. Note that this goal was also set before the degree of solar potential in the area was realised particularly nearby Aggeneys. One could argue that the solar energy projects expected near Aggeneys should help to diversify its economic base and somewhat dilute argument for restricting growth in Aggeneys.

**Table 4-2** *Nodal classification in the Khâi-Ma Local Municipality Spatial Development Framework 2010*

Classification	Characteristics	Interventions
<b>Primary activity node*</b>		
Pofadder	<ul style="list-style-type: none"> <li>• Main economic centre</li> <li>• Provide a variety of services and functions</li> <li>• Accommodate a variety of developments and social support infrastructure</li> <li>• Strategic located on the main N14</li> <li>• Largest population size</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitate the development of Pofadder into an economic growth centre</li> <li>• Attract private and public investments</li> <li>• Promote urban renewal strategies</li> <li>• Increase economic and social opportunities</li> <li>• Accommodate regional and sub-regional growth</li> <li>• Provide a full range of services and goods</li> </ul>
<b>Secondary activity node*</b>		
Aggeneys	<ul style="list-style-type: none"> <li>• Mining town with limited economic opportunities</li> <li>• Provides housing for mine workers</li> <li>• Limited diversity in economy</li> <li>• Mainly serves local population</li> </ul>	<ul style="list-style-type: none"> <li>• Restrict further expansion outside the existing urban edge</li> <li>• Channel further growth and development to Pofadder</li> </ul>
<b>Rural service centres*</b>		
Onseepkans, Witbank and Pella	<ul style="list-style-type: none"> <li>• Little economic base</li> <li>• Provide basic services and goods</li> <li>• Isolated with poor road access</li> <li>• Crippled by a lack of engineering and social infrastructure services</li> <li>• Relatively small population</li> </ul>	<ul style="list-style-type: none"> <li>• Allow business development to exploit the historic significance of Pella</li> <li>• Provide facilities to tourists to compliment the border-post function of Onseepkans</li> <li>• Should not be viewed as focus areas for future growth</li> <li>• Restrict development within urban edge</li> <li>• Improve the status quo of these settlements through focused CRDP projects, improved road access, human resource development, and upgrade of engineering and social infrastructure to basic service level.</li> </ul>

Source: KMLM, 2010.

Given the above, it is clear that the proposed project achieves in-principle compatibility with the key thrusts of planning documents for the province, district and local municipality. These documents also do, however, call for caution regarding the conservation status of the mining site in particular.

### 4.3

### IMPACTS LINKED TO CONSTRUCTION AND OPERATIONAL EXPENDITURE

#### 4.3.1

#### Impact Description and Assessment

**Table 4.3**

**Impact Characteristics: Construction and Operational Expenditure**

Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	This phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes.	This phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes.	This phase of the project would result in a withdrawal of spending injections that would lead to decreased economic activity relative to the operational phase.
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect
Stakeholders/ Receptors Affected	Direct and indirect beneficiaries of project expenditure	Direct and indirect beneficiaries of project expenditure	Direct and indirect beneficiaries of project expenditure

The construction and operational phase of the project would result in spending injections that would lead to increased economic activity best measured in terms of impacts on employment and associated incomes focusing on the local area and region.

Spending by Vedanta on both the construction and operation phases would be new spending as it would not displace or substitute for spending by other companies given that there are no other existing competing production facilities in the country. All expenditures would lead to linked direct, indirect and induced impacts on employment and incomes. Taking employment as an example, impacts would be direct where people are employed directly on the project in question (e.g. jobs such as construction workers), indirect - where the direct expenditure associated with a project leads to jobs and incomes in other sectors (e.g. purchasing building materials maintains jobs in that sector) and induced where jobs are created due to the expenditure of employees and other consumers that gained from the project. Direct impacts are the most important of these three categories as they are the largest and more likely to be felt in the local area. Their estimation also involves the lowest level of uncertainty. The quantification of indirect and induced impacts is a far less certain exercise due to uncertainty surrounding accurate multipliers particularly at a local and regional level. This uncertainty makes it inadvisable to quantify indirect employment unless an in-depth analysis of this aspect is absolutely essential to decision making. Potential direct employment and income impacts are consequently quantified here and likely indirect impacts are borne in mind qualitatively when providing overall impact ratings.

#### *Construction phase impacts*

#### Project construction expenditure/investment

Construction expenditure would constitute a positive injection of new investment. The applicant's preliminary estimates indicate that a total of approximately R8.235 billion would be spent on all aspects of the construction phase over roughly four years (see Table 4-4 below).<sup>1</sup>

**Table 4-4**      *Construction phase expenditure*

Construction component	Costs in 2013 rands (excl inflation)				
	Year 1	Year 2	Year 3	Year 4	Total
Mine & Pre-Stripping	R 1 068 750 000	R 1 068 750 000	R 832 500 000	R 840 000 000	R 3 810 000 000
Concentrator plant	R 405 000 000	R 405 000 000	R 360 000 000	R 397 500 000	R 1 567 500 000
Housing	R 206 250 000	R 206 250 000	R 63 750 000	R 63 750 000	R 540 000 000
Infrastructure	R 438 750 000	R 438 750 000	R 228 750 000	R 1 211 250 000	R 2 317 500 000
<b>Total</b>	<b>R 2 118 750 000</b>	<b>R 2 118 750 000</b>	<b>R 1 485 000 000</b>	<b>R 2 512 500 000</b>	<b>R 8 235 000 000</b>

The project has the potential to have a significantly positive impact on commercial activity in the local area during construction given its size and the expenditure associated with it outlined above. During the construction phase the building construction, civil and other construction and specialist industrial machinery sectors would benefit substantially. The structural metal products, wholesale and retail trade and construction materials sectors would also stand to gain due to indirect linkages. The project would provide a major injection for contractors and workers in the local area, region and province leading to positive impacts.

Table 4-5 provides a tentative indication from the applicant of what proportions of construction expenditure would go to suppliers from the Khâi-Ma municipal area, the rest of the Namakwa District, rest of the Northern Cape, rest of the country and what would be imported. Imports would primarily come in the form of specialised machinery, equipment and spares and some electrical inputs that are not available in South Africa. It is anticipated that approximately R40.5 million should be spent on suppliers/contractors from within the Khâi-Ma Municipality the majority of which would be for housing construction. A further R1.74 billion is expected expenditure in the rest of the Namakwa District and expenditure of roughly R1.14 billion is expected for the rest of the Northern Cape. Note that these projects have been kept conservative at the local level and the intention of the applicant is to ensure that local suppliers are given preference where possible.

<sup>1</sup> Note that all data on Vedanta expenditure during construction and operation and its likely geographic spread were sourced from Vedanta and found to be reasonable.

**Table 4-5** *Construction phase expenditure per geographic area*

Construction component	Anticipated spend on Khai-Ma municipal area suppliers	Anticipated spend on suppliers from the rest of the Namakwa District	Anticipated spend on suppliers in the rest of the Northern Cape	Anticipated spend on suppliers in the rest of SA	Anticipated spend on imports
Mine & Pre-Stripping	R 0	R 762 000 000	R 381 000 000	R 2 667 000 000	R 0
Concentrator plant	R 0	R 313 500 000	R 156 750 000	R 1 097 250 000	R 0
Housing	R 40 500 000	R 202 500 000	R 135 000 000	R 162 000 000	R 0
Infrastructure	R 0	R 463 500 000	R 463 500 000	R 1 158 750 000	R 231 750 000
<b>Total</b>	<b>R 40 500 000</b>	<b>R 1 741 500 000</b>	<b>R 1 136 250 000</b>	<b>R 5 085 000 000</b>	<b>R 231 750 000</b>

### Employment during construction

In order to estimate direct temporary employment during construction, standard construction industry estimates for labour required per spend were sourced from Vedanta. Bear in mind that the estimates are not to be regarded as highly accurate and are meant to give an indication of potential employment impacts. Table 4-6 outlines the total construction phase employment that would be associated with the project. It is anticipated that approximately 3,200 contract jobs with an average duration of 19 months each would be associated with all construction expenditure the majority of which would be medium and low skilled positions in keeping with the nature of the construction required. This magnitude of employment would be equivalent to roughly 5,065 person years of employment spread over the construction period.

**Table 4-6** *Estimated direct temporary employment during construction*

Construction component	Total number of workers needed				Ave duration of each employment contract within overall 36 to 42 month construction period
	Highly skilled	Medium skilled	Low skilled	Total	
Mine & Pre-Stripping	150	375	675	1200	19 months
Concentrator plant	120	300	550	970	
Housing	50	125	225	400	
Infrastructure	80	200	350	630	
<b>Total</b>	<b>400</b>	<b>1000</b>	<b>1800</b>	<b>3200</b>	

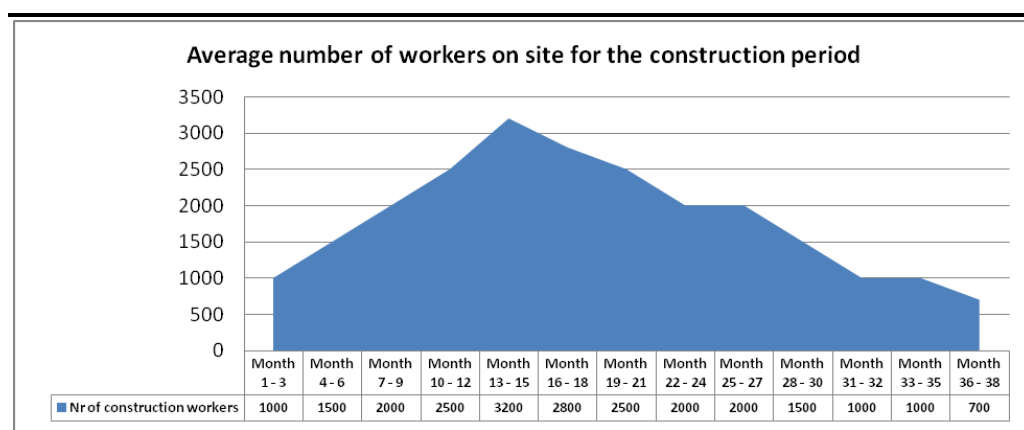
Based on the likely availability of labour and the experience of the applicant in the area and at other sites, approximately 357 workers would probably come from within Khâi-Ma Municipality, a further 1,335 workers from the rest of the Namakwa District and 960 workers from the rest of the Northern Cape (see Table 4-7). Note that these estimates are based largely on a fairly broad assessment of the availability of labour in these areas and it is the proponent's intention to use a greater proportion of labour from Khâi-Ma Municipality and the Namakwa District if people are available and/or willing to be trained.

**Table 4-7**      *Likely spread of construction jobs per area*

Worker origin	Highly skilled		Medium skilled		Low skilled		All skill levels
	Likely % of workers	Nr of workers	Likely % of workers	Nr of workers	Likely % of workers	Nr of workers	Nr of workers
Khai-Ma municipal area	3.0%	12	7.5%	75	15%	270	357
Rest of the Namakwa District	15.0%	60	37.5%	375	50%	900	1 335
Rest of the Northern Cape	30.0%	120	30%	300	30%	540	960
Rest of South Africa	42.0%	168	25%	250	5%	90	508
Overseas	10.0%	40	0%	-	0%	-	40
<b>Total</b>	<b>100.0%</b>	<b>400</b>	<b>100.0%</b>	<b>1 000</b>	<b>100.0%</b>	<b>1 800</b>	<b>3 200</b>

In terms of the spread of construction activity over time, Table 4-8 shows that worker numbers on site would build gradually reaching their maximum of roughly 3,200 during months 13 to 15 of construction and staying above 2,000 workers until months 25 to 27 and thereafter gradually reducing until construction is completed.

**Table 4-8**      *Average number of construction workers on site over the construction period*



### Incomes from wages during construction

Direct household income impacts would flow from all wages paid during construction. These were estimated by multiplying the projected number of direct jobs associated with the project estimated above by assumed average monthly salaries for each skill category (i.e. R7,000 for low skilled, R22,500 for medium skilled and R52,000 for highly skilled employees). Again, these estimates are to be treated as indicative. The results of this exercise shows that total incomes of R1.01 billion would be associated with the construction phase (see Table 4-9). Approximately R80 million of this total would probably accrue to workers currently resident in Khâi-Ma Municipality, a further R339 million to workers in the rest of the Namakwa District and R319 million to workers from the rest of the Northern Cape (see Table 4-10).

**Table 4-9** *Direct household income impacts during construction (2013 Rands)*

Construction component	Total salaries per skill level over construction period			
	Highly skilled	Medium skilled	Low skilled	Total
Mine	R 148 200 000	R 160 312 500	R 89 775 000	R 398 287 500
Concentrator plant	R 118 560 000	R 128 250 000	R 73 150 000	R 319 960 000
Housing	R 49 400 000	R 53 437 500	R 29 925 000	R 132 762 500
Infrastructure	R 79 040 000	R 85 500 000	R 46 550 000	R 211 090 000
<b>Total</b>	<b>R 395 200 000</b>	<b>R 427 500 000</b>	<b>R 239 400 000</b>	<b>R 1 062 100 000</b>

**Table 4-10** *Direct household income impacts during construction per area (2013 Rands)*

Worker origin	Total salaries over construction phase			
	Highly skilled	Medium skilled	Low skilled	All skill levels
Khai-Ma municipal area	11 856 000	32 062 500	35 910 000	79 828 500
Rest of the Namakwa District	59 280 000	160 312 500	119 700 000	339 292 500
Rest of the Northern Cape	118 560 000	128 250 000	71 820 000	318 630 000
Rest of South Africa	165 984 000	106 875 000	11 970 000	284 829 000
Overseas	39 520 000	-	-	39 520 000
<b>Total</b>	<b>395 200 000</b>	<b>427 500 000</b>	<b>239 400 000</b>	<b>1 062 100 000</b>

#### Indirect opportunities during construction

In addition to the above direct employment and associated income opportunities, a significant number of temporary indirect opportunities would be associated with the project. These would stem primarily from expenditure by Vedanta in the local area and region as well as expenditure by workers hired for the construction phase.

#### Overall impacts and impact significance

An assessment of the significance of the combined impacts of project-related expenditure based on the findings above is presented in the Box below.

### Summary of Construction Phase Impact: Impacts Linked to Construction Expenditure

**Nature:** Expenditure on construction would result in a **positive impact** on the economy, increasing commercial activity, creating jobs and increasing incomes.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Low**

**Irreplaceability:** The impact will **not** include the loss of **irreplaceable** resources

**Impact Magnitude – High**

- **Extent:** The extent of the impact is **national** (though impacts would be proportionately greater at a regional and local scale)
- **Duration:** The expected impact will be **short-term (i.e. reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor (i.e. the economy)
- **Frequency:** The frequency of the impact will be **Once-off** but for the duration of construction
- **Likelihood:** Impacts from expenditure are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **high**.

#### Construction Phase Mitigation:

The objective of mitigation is to maximise economic benefit from jobs and expenditure particularly at a local and regional scale.

Vedanta's social and labour plan (SLP) should act as a departure point and take the lead when considering and enforcing benefit enhancement measures. This plan will have to deal with and provide specific guidance on actions such as giving preference to local and historically disadvantaged individuals and companies. It will need to be drawn up with care and in full consultation with all relevant stakeholders and as per the requirements of the Department of Mineral Resources. It will also need to recognise and deal with perceptions in the area that mines operating in it could do more for local economic development. For example, The Khâi-Ma Municipality LED Strategy mentions that "The mines are seen as important stakeholders and partners in LED. The SLP's of the mining corporations should be more vigorously enforced." (KMLM, 2011, p 64). Some of the broad types of measures that should be considered and detailed in the SLP are discussed below.

Formal targets should preferably be set (in tender documents, for example) for how much local labour should be used based on the needs of the proponent and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities during construction and operation should be maximized. Local sub-contractors should be used where possible and contractors from outside the local area that tender for work should also be required to meet targets for how many locals are given employment. Decisions will be required from the applicant in consultation with local communities, the authorities and building contractors as to the percentage of jobs that are to be earmarked for the local community, and the percentage of jobs that are to be granted to

residents of the wider region. Employment forums have proven effective in this regard. The recently formed Khâi-Ma LED Forum should also play a role here and in the process of unlocking opportunities for local businesses

Vedanta's existing database of potential local suppliers should be updated prior to any procurement. All companies on the list should be invited to tender for work. Tender forms need to be kept as simple as possible so as not to act as a barrier to entry and Vedanta must be willing to provide assistance with tendering where required.

Note that the social specialist study also deals with similar measures for local benefit enhancement while achieving the minimum social disruption (see January, 2013 for details of the measures).

### *Operational phase impacts*

#### Project expenditure/investment during operations

The key operational phase impacts associated with the project would flow from expenditure on operations at the mine and plant. Operational costs would increase in line with production from approximately R528 million in during the first year of production to R1.76 billion in the fifth year of production at which point it is anticipate that full production levels would achieved (Table 4-11).

**Table 4-11**     *Estimated operational expenditure*

Cost categories	Operational costs in 2013 rands (excluding inflation)	
	<i>1st year of production</i>	<i>5th year - full production</i>
Staff	R 132 187 500	R 440 625 000
Fuels	R 105 750 000	R 352 500 000
Electricity	R 42 300 000	R 176 250 000
Water	R 15 862 500	R 52 875 000
Transport	R 15 862 500	R 52 875 000
Chemicals	R 15 862 500	R 52 875 000
Maintenance	R 79 312 500	R 264 375 000
Overheads	R 37 012 500	R 123 375 000
Outsourced activities	R 84 600 000	R 246 750 000
<b>Total</b>	<b>R 528 750 000</b>	<b>R 1 762 500 000</b>

Table 4-12 shows the likely spread of the above operational costs per geographical area focusing on the situation three years after the start of each phase. It is predicted that once full production is reached, roughly R436 million per annum will be spent in the Khâi-Ma Municipality area, R180



million in the rest of the Namakwa District and R121 million in the rest of the Northern Cape.

**Table 4-12** *Operational expenditure at full production per geographical area*

Cost component	Anticipated spend in the Khai-Ma municipal area	Anticipated spend in the rest of the Namakwa District	Anticipated spend in the rest of the Northern Cape	Anticipated spend in the rest of SA	Anticipated spend on imports
Staff	R 352 500 000	R 44 062 500	R 22 031 250	R 22 031 250	R 0
Fuels	R 0	R 0	R 0	R 352 500 000	R 0
Electricity	R 0	R 0	R 0	R 176 250 000	R 0
Water	R 52 875 000	R 0	R 0	R 0	R 0
Transport	R 5 287 500	R 21 150 000	R 5 287 500	R 21 150 000	R 0
Chemicals	R 0	R 0	R 10 575 000	R 42 300 000	R 0
Maintenance	R 13 218 750	R 52 875 000	R 52 875 000	R 145 406 250	R 0
Overheads	R 0	R 12 337 500	R 6 168 750	R 98 700 000	R 6 168 750
Outsourced activities	R 12 337 500	R 49 350 000	R 24 675 000	R 148 050 000	R 12 337 500
<b>Total</b>	<b>R 436 218 750</b>	<b>R 179 775 000</b>	<b>R 121 612 500</b>	<b>R 1 006 387 500</b>	<b>R 18 506 250</b>

### Employment during operations

Table 4-13 outlines the operational phase employment opportunities that would be associated with the project. During the first year of production (planned for 2015) approximately 630 jobs would be created (of which, roughly 195 would be outsourced to contractors) increasing to 1,230 jobs (of which, 380 would be outsourced to contractors) once full production is reached by the 5<sup>th</sup> year of production.

**Table 4-13 Operational employment**

Component of project and job type	Number of operational employees					
	1st year of production			5th year - full production		
	In house	Contractors/outsourced	Total	In house	Contractors/outsourced	Total
<b>Mine</b>						
Managers & supervisors	41	19	60	62	28	90
Operators	97	43	140	173	77	250
Admin	7	3	10	28	12	40
Cleaners	7	3	10	21	9	30
Security	7	3	10	21	9	30
Other operational workers	55	25	80	173	77	250
Total	214	96	310	477	213	690
<b>Concentrator plant</b>						
Managers & supervisors	28	12	40	55	25	80
Plant operators	97	43	140	138	62	200
Admin	7	3	10	21	9	30
Cleaners	7	3	10	10	5	15
Security	7	3	10	10	5	15
Other operational workers	55	25	80	104	46	150
Total	200	89.6	290	339	151	490
<b>Transport to port</b>						
Loaders	7	3	10	7	3	10
Drivers	14	6	20	28	12	40
Total	21	9	30	35	15	50
<b>TOTAL</b>	<b>435</b>	<b>195</b>	<b>630</b>	<b>850</b>	<b>380</b>	<b>1230</b>

Table 4-14 shows the likely allocation of jobs to people from different areas within the Northern Cape for both Phases once they are in full operation. Note that these estimates are based largely on a fairly broad assessment of the availability of labour in these areas and it is the proponent's intention to use a greater proportion of labour from Khâi-Ma Municipality and the Namakwa District if people are available and/or willing to be trained. It is anticipated that:

- Khâi-Ma Municipality residents would benefit from 127 jobs in the first year of production and 258 jobs once full production is reached.
- Residents in the rest of the Namakwa District would benefit from 276 jobs in the first year of production and 540 jobs once full production is reached.
- Residents in the rest of the Northern Cape would benefit from 112 jobs in the first year of production and 220 jobs once full production is reached.

**Table 4-14 Operational Employment per Geographical Area**

Component of project	Workers from Khai-Ma		Workers from the rest of the Namakwa District		Workers from the rest of the Northern Cape	
	<i>1st year of production</i>	<i>5th year - full production</i>	<i>1st year of production</i>	<i>5th year - full production</i>	<i>1st year of production</i>	<i>5th year - full production</i>
Mine	60	146	134	304	54	123
Concentrator plant	60	100	129	213	52	87
Transport to port	8	13	14	23	6	10
<b>Total</b>	<b>127</b>	<b>258</b>	<b>276</b>	<b>540</b>	<b>112</b>	<b>220</b>

#### Incomes from salaries during operations

Direct household income impacts would flow from all salaries paid during operations. These were estimated by multiplying the projected number of direct jobs associated with the project above by assumed average yearly salaries for each skill category. Again, these estimates are to be treated as indicative. The results of this exercise in Table 4-15 below indicate that at the start of production approximately R138 million in salaries and sub-contractor payments would be made yearly increasing to R256 million once full production is reached by the 5<sup>th</sup> year of production.

**Table 4-15** *Income from Operational Employment*

Component of project and job type	Total salaries paid including contractors		Average annual salary range for job category
	1st year of production	5th year - full production	
Mine			
Managers & supervisors	R 36 000 000	R 54 000 000	500 000 to 700 000
Operators	R 23 100 000	R 41 250 000	150 000 to 180 000
Admin	R 1 650 000	R 6 600 000	150 000 to 180 000
Cleaners	R 700 000	R 2 100 000	60 000 to 80 000
Security	R 1 000 000	R 3 000 000	80 000 to 120 000
Other operational workers	R 10 800 000	R 33 750 000	120 000 to 150 000
Total	R 73 250 000	R 140 700 000	
Concentrator plant			
Managers & supervisors	R 24 000 000	R 48 000 000	500 000 to 700 000
Plant operators	R 23 100 000	R 33 000 000	150 000 to 180 000
Admin	R 1 650 000	R 4 950 000	150 000 to 180 000
Cleaners	R 700 000	R 1 050 000	60 000 to 80 000
Security	R 1 000 000	R 1 500 000	80 000 to 120 000
Other operational workers	R 10 800 000	R 20 250 000	120 000 to 150 000
Total	R 61 250 000	R 108 750 000	
Transport to port			
Loaders	R 1 350 000	R 1 350 000	120 000 to 150 000
Drivers	R 2 700 000	R 5 400 000	120 000 to 150 000
Total	R 4 050 000	R 6 750 000	
TOTAL	R 138 550 000	R 256 200 000	

Approximately R23 million of salaries and payments to contractors should accrue to workers from Khâi-Ma Municipality during the first year of production increasing to R44 million once full production is reached. A further R50 million of salaries and payments to contractors should accrue to workers from the rest of the Namakwa District during the first year of production increasing to R94 million at full production (see Table 4-16).

**Table 4-16** *Incomes from Operational Employment per Geographical Area*

Component of project	Total annual salaries to workers from Khai-Ma		Total annual salaries to workers from the rest of the Namakwa District		Total annual salaries to workers from the rest of the Northern Cape	
	1st year of production	5th year - full production	1st year of production	5th year - full production	1st year of production	5th year - full production
Mine	R 11 200 000	R 24 555 000	R 25 745 000	R 52 545 000	R 10 880 000	R 22 230 000
Concentrator plant	R 10 682 500	R 17 842 500	R 22 662 500	R 39 187 500	R 9 680 000	R 16 695 000
Transport to port	R 1 215 000	R 2 025 000	R 1 620 000	R 2 700 000	R 810 000	R 1 350 000
<b>Total</b>	<b>R 23 097 500</b>	<b>R 44 422 500</b>	<b>R 50 027 500</b>	<b>R 94 432 500</b>	<b>R 21 370 000</b>	<b>R 40 275 000</b>

### Indirect opportunities during operations

In addition to the above direct employment and associated income opportunities, indirect opportunities would be associated with the operational phase of the project. These would stem primarily from increased expenditure by Vedanta and its employees in the local area and region.

### Overall impacts and impact significance

An assessment of the significance of the combined impacts of project-related expenditure based on the findings above is presented in the Box below.

#### **Box 4-2**

#### ***Summary of Operational Phase Impact: Impacts Linked to Operational Expenditure***

**Nature:** Expenditure on operations would result in a **positive impact** on the economy, increasing commercial activity, creating jobs and increasing incomes.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Low**

**Irreplaceability:** The impact will **not** include the loss of **irreplaceable** resources

#### **Impact Magnitude – High**

- **Extent:** The extent of the impact is **national** (though impacts would be proportionately greater at a regional and local scale)
- **Duration:** The expected impact will be **long-term for the life of mine (i.e. reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor (i.e. the economy)
- **Frequency:** The frequency of the impact will be **periodic** with a very high frequency making it virtually constant for the period of operations as expenditure will flow on a ongoing basis
- **Likelihood:** Impacts from expenditure are a **certainty** in the economy

#### **IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **high**.

### Operational Phase Mitigation:

The objective of mitigation is to: maximise economic benefit from jobs and expenditure particularly at a local and regional scale.

Mitigation measures would be the same as for the construction phase focused on local employment and procurement as outlined in more detail in construction phase mitigation section.

#### **4.3.2**

#### ***Decommissioning and Post Closure Phase Impacts***

Decommissioning and closure would essentially result in no more operational expenditure or jobs associated with the project which would result in negative impacts as the project is withdrawn from the economy. The impacts of this withdrawal could be mitigated somewhat with careful planning and a focus on supporting the creation of sustainable businesses while the mine is

operational. A highly significant decrease in economic activity in the area would, however, not be avoidable given the large size of the project.

**Box 4-3**      *Summary of Decommissioning Phase Impact: Impacts Linked to Withdrawal of Expenditure*

**Nature:** Decommissioning and closure would essentially result in no more operational expenditure or jobs associated with the project which would result in **negative** impacts as the project is withdrawn from the economy.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

**Irreplaceability:** The impact include the loss of mine expenditure in the area which would be **irreplaceable** to a degree

**Impact Magnitude – High**

- **Extent:** The extent of the impact is **national** (though impacts would be proportionately greater at a regional and local scale)
- **Duration:** The expected impact will be **permanent (i.e. irreversible)**
- **Scale:** The impact will result in **notable changes** to the receptor (i.e. the economy)
- **Frequency:** The frequency of the impact will be **once-off**
- **Likelihood:** Impacts from expenditure are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MAJOR**

**Degree of Confidence:** The degree of confidence is **medium**.

Decommissioning Phase Mitigation:

The objective of mitigation is to: minimise the negative impacts of the withdrawal of project expenditure form the local area and region.

Mitigation measures will have to be developed and refined with time as part of the Vedanta SLP. These will probably include training and assistance with the establishment of local businesses that can continue to provide opportunities post-mining (i.e. businesses that do not rely on mining directly or indirectly through their customers being Vedanta or its employees).

**4.3.3**      *Residual Impact*

The implementation of the above mitigation measures would increase the positive construction phase impacts from **Moderate** to **Major** significance and the operation phase impacts from **Moderate** to **Major**. The implementation of the decommissioning phase mitigation measures would probably reduce the significance of negative impacts from **Major** to **Moderate** if they are particularly well resourced and executed. The pre- and post-mitigation impacts are compared in Table 4-17 below.

**Table 4-17**      *Pre- and Post- Mitigation Significance: Impacts Associated with Project Expenditure*

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	MODERATE (+ve)	MAJOR (+ve)
Operation	MODERATE (+ve)	MAJOR (+ve)
Decommissioning and Post Closure	MAJOR (-ve)	MODERATE (-ve)

The no-go would result in no construction and operational phase impacts as outlined above. The opportunities created by the positive impacts associated with expenditure on the project would thus not materialise.

#### 4.4 IMPACTS ON KEY MACRO-ECONOMIC VARIABLES

##### 4.4.1 Impact Description and Assessment

**Table 4.18 Impact Characteristics: Impacts on Key Marco-Economic Variables**

Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	This phase of the project would require imported machinery and other materials resulting in relatively limited foreign exchange outflows (when compared with inflows during operations).	This phase of the project would result in significant net foreign exchange and tax earnings with positive macro-economic implications.	The closure of the project would result in decreased foreign exchange and tax earnings with negative macro-economic implications.
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect
Stakeholders/ Receptors Affected	Those with a stake in the macro-economic health of the country	Those with a stake in the macro-economic health of the country	Those with a stake in the macro-economic health of the country

Key economic impacts associated with project expenditure have been assessed in the preceding section. These are the positive impacts with the greatest potential to affect communities in the local area and wider region. Aside from these impacts, positive impacts are also expected to flow primarily from project income and profits which are best measured using the following macro-economic indicators:

- Increased foreign exchange earnings (current project planning is for all of the zinc concentrate produced at the Gamsberg to be exported).
- Increased tax revenues from income taxes and minerals royalty payments associated with the project.

Table 4-19 shows the highly significant annual flows of foreign exchange revenues and associated taxes anticipated by Vedanta for the project. These flows are then converted into present value (PV) terms in Table 4-20 using a range of discount rates.

Foreign exchange revenues are expected to start at roughly USD385 million/yr (for 360,000 tonnes of concentrate production) in the first year of production, increasing to USD750 million/yr (for 735,000 tonnes of

concentrate production) in the third year and stabilising at roughly USD1.257 billion/yr (for 1,225,000 tonnes of concentrate production) from the fifth year onwards. The present value of the sum of these flows over the project's life should be roughly USD10.2 billion (or R76.7 billion) using a base case discount rate of 6%. Note that during the construction phase, foreign exchange outflows would occur in order to import key project components. However, these outflows would be minor when compared to inflows during operations (i.e. outflows would be less than 5% - 10% of the magnitude of total inflows over time).

Tax payments consisting of income taxes and royalties are expected to start at roughly R142 million/yr (for 360,000 tonnes of concentrate production) in the first year of production, increasing to R277 million/yr in the third year, R277 million/yr in the fifth year and stabilising at roughly R1.52 billion/yr from the seventh year onwards. The present value of the sum of these flows should be roughly R10.8 billion using a base case discount rate of 6%.

**Table 4-19** *Likely Foreign Revenue and Tax Flows Associated with the Project*

	2015	2017	2019	2021	2025	2030	2031	2032
Mine production volumes - tpa	3 000 000	6 000 000	10 000 000	10 000 000	10 000 000	10 000 000	10 000 000	2 100 000
Concentrate sales volumes - tpa	367 751	735 503	1 225 838	1 225 838	1 225 838	1 225 838	1 225 838	257 426
Revenue / turnover in USD millions	388.1	754.5	1 257.5	1 257.5	1 257.5	1 257.5	1 257.5	264.1
Revenue / turnover in ZAR millions	2 910.9	5 658.9	9 431.5	9 431.5	9 431.5	9 431.5	9 431.5	1 980.6
Income tax in USD millions	-	-	93.8	140.8	140.8	151.3	152.8	32.1
Royalties in USD millions	19.0	37.0	61.6	61.6	61.6	61.6	61.6	12.9
Total taxes in USD millions	19.0	37.0	155.5	202.4	202.4	212.9	214.4	45.0
Total taxes in ZAR millions	142.6	277.3	1 166.0	1 517.8	1 517.8	1 596.6	1 607.9	337.6

**Table 4-20** *Present Values of Likely Foreign Revenue and Tax Flows Associated with the Project*

Discount rate	Present Value of all revenues		Present Value of all taxes	
	USD millions	ZAR millions	USD millions	ZAR millions
2%	15 212	114 088	2 222	16 666
4%	12 402	93 015	1 778	13 333
6%	10 226	76 696	1 437	10 778
8%	8 523	63 919	1 173	8 798
10%	7 174	53 808	967	7 249

### Overall impacts and impact significance

An assessment of the significance of the impacts of the project on key macroeconomic variables based on the findings above is presented in the Box below.



### Summary of Operational Phase Impact: Impacts on Key Macroeconomic Variables

**Nature:** Foreign exchange flows and tax revenues would result in a **positive impact** on the macro-economy improving the balance of payment and taxes collected.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Low**

**Irreplaceability:** The impact will **not** include the loss of **irreplaceable** resources

**Impact Magnitude – High**

- **Extent:** The extent of the impact is **national**
- **Duration:** The expected impact will be **long-term for the life of mine (i.e. reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor (i.e. the economy)
- **Frequency:** The frequency of the impact will be **periodic** with a very high frequency making it virtually constant for the period of operations as Foreign exchange and taxes will flow on an ongoing basis
- **Likelihood:** Impacts from expenditure are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MAJOR**

**Degree of Confidence:** The degree of confidence is **high**.

#### Operational Phase Mitigation

No scope for mitigation within EIA.

#### 4.4.2

#### *Decommissioning and Post Closure Phase impacts*

Decommissioning and closure would essentially result in no more foreign exchange earnings and tax revenues associated with the project which would result in negative impacts (or a cessation of positive impacts) as the project is withdrawn from the economy.

An assessment of the significance of the impacts of the project on key macroeconomic variables based on the findings above is presented in the Box below.

### Summary of Decommissioning Phase Impact: Impacts Linked to Withdrawal of Macroeconomic Project Benefits

**Nature:** Decommissioning and closure would result in no more foreign exchange earnings or tax revenues associated with the project which would result in **negative** impacts as the project is withdrawn from the economy.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

**Irreplaceability:** The activity will result in the loss of mine related benefits which would be **irreplaceable** to a degree

**Impact Magnitude – High**

- **Extent:** The extent of the impact is **national**
- **Duration:** The expected impact will be **permanent (i.e. irreversible)**
- **Scale:** The impact will result in **notable changes** to the receptor (i.e. the economy)
- **Frequency:** The frequency of the impact will be **once-off**
- **Likelihood:** Impacts from expenditure are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MAJOR**

**Degree of Confidence:** The degree of confidence is **medium to high**.

### Decommissioning Phase Mitigation

No scope for mitigation within EIA.

#### 4.4.3 *Residual Impact*

No mitigation is recommended so impact significance ratings would stay the same without and with mitigation (ie **Major** positive during operations and **Major** negative during decommissioning) as per Table 4-21 below.

**Table 4-21** *Pre- and Post- Mitigation Significance: Impacts on Key Macroeconomic Variables*

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Operation	MAJOR (+ve)	MAJOR (+ve)
Decommissioning and Post Closure	MAJOR (-ve)	MAJOR (-ve)

## 4.5 *IMPACTS ON TOURISM*

### 4.5.1 *Impact Description and Assessment*

**Table 4.22** *Impact Characteristics: Impacts on Tourism*

Summary	Construction	Operation	Decommissioning/ Post Closure
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Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	All project aspects and activities that could impact on characteristics of the area which support tourism (ie visual quality, air quality, biodiversity, noise, etc.).	All project aspects and activities that could impact on characteristics of the area which support tourism (ie visual quality, air quality, biodiversity, noise, etc.).	Closure and rehabilitation of project aspects and activities that could impact on characteristics of the area which support tourism (ie visual quality, air quality, biodiversity, noise, etc.).
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect
Stakeholders/ Receptors Affected	Tourists and those that rely on them for their livelihoods.	Tourists and those that rely on them for their livelihoods.	Tourists and those that rely on them for their livelihoods.

As was outlined in the overall economic context section, tourism plays an important role in the economy of the wider area and has the potential to play an increasingly prominent role as a driver of economic development. It is thus important to consider the potential impacts of the proposed development on this sector.

In order to assess tourism impacts, information on current tourism use and potential future use focusing on the wider area surrounding the site was gathered. In order to verify and augment tourism issues raised during scoping, discussions were also held with tourism authorities and tourism stakeholders in order to get their views on potential impacts. These discussions confirmed that visual, air quality and traffic impacts combined with a loss of conservation worth land were the key concerns for tourism. Sources of positive impacts would stem from increased potential business-related visitors to the project. Pertinent information from other specialist studies was examined, discussions were held with the specialists where necessary and an assessment of impacts made. Where possible, a distinction has been made between impacts on tourism in the vicinity of the project sites (i.e. primarily on neighbouring properties and within close proximity to the sites) and on tourism in the wider area recognising that impacts at these scales overlap substantially.

#### *The Tourism Development Context*

The provincial, district and local municipality IDPs and SDFs all point out the importance of tourism in the wider area and focus on its future potential. Specifically at a local level the Khâi-Ma Local Municipality SDF (KMLM, 2010: p 114) reports that ‘the Khâi-Ma environment is characterised by vast open land, unique topographical features (i.e., mountain ranges, Bushmanland, Inselberg, wilderness areas along the Orange River, etc.) and rich heritage of the Khoi San/Nama people as well as the cathedral at Pella provides ample eco-tourism, adventure tourism and cultural tourism opportunities.’ With regard to tourism corridors, the SDF advocates the prioritisation of the ‘Pofadder-Onseepkans’ and ‘Pofadder-Witbank’ tourism routes for tourism development with Pofadder, Onseepkans and Pella the identified tourism nodes (see Figure 4-2 for a map of these routes). It also points out that, ‘The tourism of Khâi-Ma should be promoted and marketed through a well-

developed tourism strategy. Such a strategy should focus on tourism attractions offered by the towns, mainly Pofadder, Onseepkans and Pella, tourism possibilities along the Orange River and proper roads linking these tourist attractions' (KMLM, 2010: p 140).

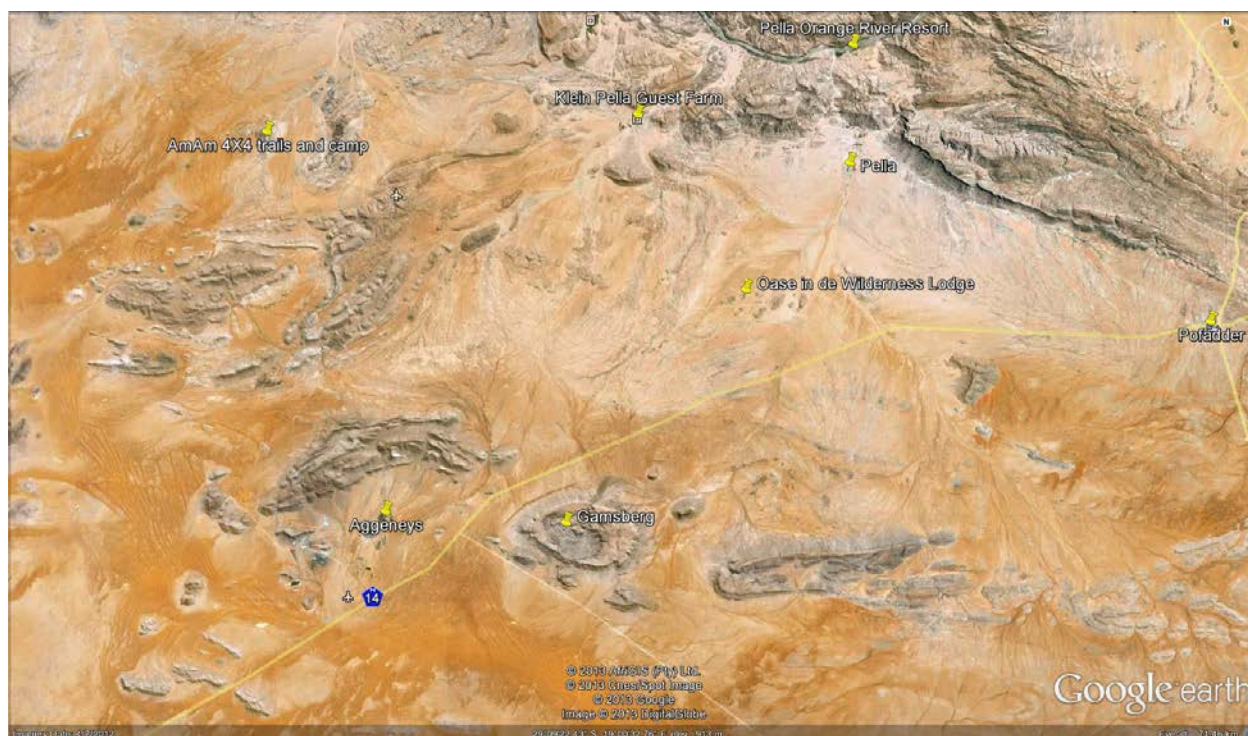
Discussions with the local tourism authorities confirmed that the focus of current tourism activity and future potential in the area near the proposed mine site was along the identified corridors and in general along the Orange River and in the mountainous areas around Pella and Klein Pella to the north of the N14 (L van Wyk, Khâi-Ma Municipality, pers com). Much of this area is best accessed by 4X4 and 4X4 trails within the area are a particular attraction. The Namaqua Eco Trail, for example, starts near Pella and runs roughly along the Orange River to the West ending at the sea near Alexander Bay. There are also 4X4 trails between Pella and Pofadder and hiking trails in the mountains. The N14 itself is also recognised as the most important tourism route in the area. Note that it is likely that ad-hoc specialised tours are taking place in the area to specific sites particularly in the mountains nearer the project site (e.g. Aggeneys and Namies mountains). However, they are likely to be small in number and have not been brought to the attention of the tourism authorities in the local municipality.

Key tourism establishments in the wider area around the site are listed in Table 4-23 along with their basic details (room and bed numbers) and their distances from the nearest project components. Their locations are indicated in Figure 4-3. The only tourism accommodation facilities identified within 15 km of the site boundaries would be guest houses in Aggeneys (roughly 8km from the site) and the Oase in de Wilderness Lodge between 9km and 11km to the north-east of the site along the road connecting the N14 to Klein Pella.

**Table 4-23**      *Key tourism establishments nearby the site*

Area and name of establishment	Nr units/rooms	Nr of beds	Distance to closest element of project in km
<i>Aggeneys</i>			
Guest houses and B&Bs	20 - 30 rooms	40 to 60	8
<i>Pella &amp; Klein Pella area</i>			
Pella River Resort	20+ rooms and camping	40+	25
Klein Pella Guest Farm	7 rooms, 4 rondavels, 20 camp sites	30	17 to 19
Oase in de Wilderness	6 -10 rooms	12 to 20	9 to 11
AmAm Lodge	2 units	8	25
<i>Pofadder</i>			
Pofadder Hotel	34 rooms	70	33
Guest houses and B&Bs	30 - 40 rooms	60 - 80	33
<b>Total</b>		<b>284</b>	

**Figure 4-3**      *Location of key tourism establishments nearby the site*



### *Visual impacts*

A review of the visual specialist study alongside the tourism context revealed that the following points made in the visual specialist study are particularly important when considering tourism impacts (NLA, 2013):

#### Visual resource value / scenic quality and sense of place

- The overall study area can be regarded as having a high visual resource value with its relatively unspoilt, vast, arid plains and rugged, rocky koppies contrasting dramatically with the striking blue skies. It is this vast, desolate landscape with its hues of brown and backdrop of magnificent skies that give the area its unique character.
- Although the study area evokes a distinct sense of place, it is not unique to the district or region. Nevertheless, the landscape quality or visual resource of the study area is considered to be high.

#### Sensitive receptors

- The vast majority of the views to the proposed project will be experienced from the N14 as motorists travel past the site in an easterly or westerly direction. This makes views from the N14 road important and perhaps the most sensitive to the proposed intervention. The total volume of the N14 is, however, relatively low.
- Other primary views of the proposed project would be from the mining town of Aggeneys, to the west of the proposed project, and from farmsteads nearby.
- Sensitive viewer locations would be views from tourists travelling along the N14 and views from the farmstead of the farm Achab.
- Views from the town of Aggeneys are not regarded as being sensitive since it is a mining town and most residents are employed by a mining company.

- The potential sensitivity of visual receptors have be rated as high overall.

#### Landscape Impact

- The landscape impact (i.e. the change to the fabric and character of the landscape caused by the physical presence of a development) of the proposed project will be high as the physical impact of the construction, operation, decommissioning and closure of the mining activities will disturb a great percentage of the proposed study site.

#### Visibility and visual exposure levels

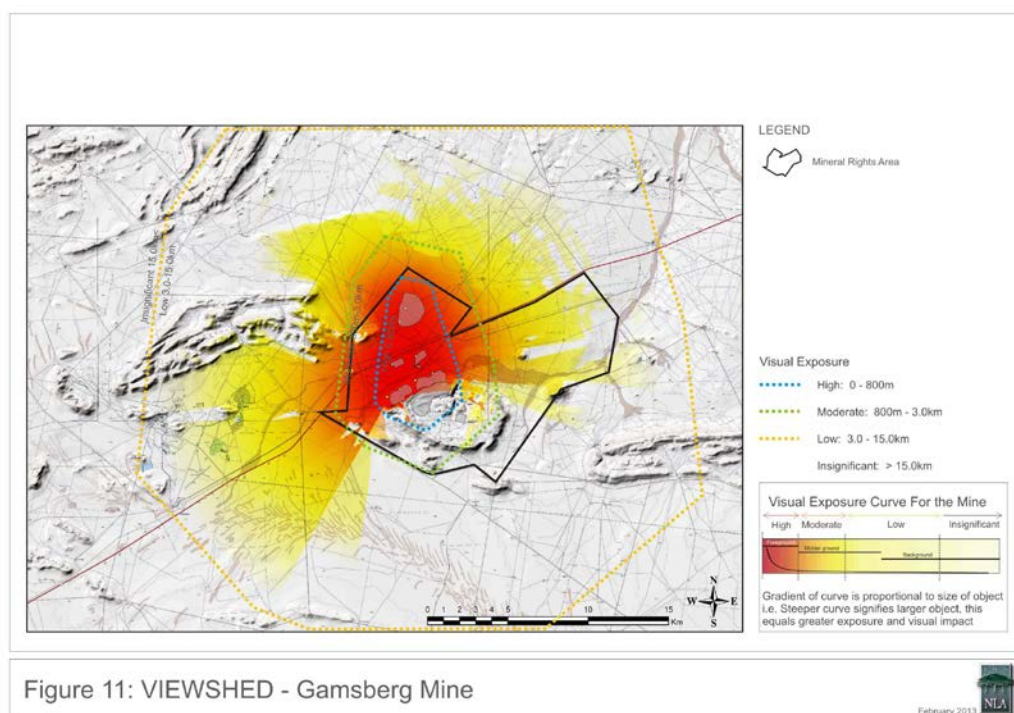
- The project's 'zone of potential influence' was established at 15km by the visual specialist noting that beyond 15km the impact of the proposed activities would have diminished due to the diminishing effect of distance (the project recedes into the background), atmospheric conditions (haze) and visual absorption on visibility.
- Figure 4-4 shows the viewshed analysis for the project. From the map it can be seen that all high visual exposures would be contained to areas within the project site and a 5-6km stretch of N14 as is passes the project. Moderate exposure would extend up to 3km from the project components (this implies moderate impacts would not extend further than 2km from the site boundary particularly to the north of the site) and affect a 10-11km stretch of the N14.

#### Overall significance of impacts

- The overall significance of the visual impact is rated as being high.
- Even after mitigation measures are implemented, the significance of the visual impact will remain high. The main reason for this is the fact that waste rock dumps and tailings dam would remain. It would still be intrusive to the study area and contribute to the negative visual impact after closure.



**Figure 4-4 Viewshed analysis from visual specialist study**



Source: NLA, 2013.

Drawing on the above findings in particular in the visual impact assessment combined with tourism usage patterns and potential in the area, the following observations are made with regard to impacts for areas of tourism sensitivity:

#### **Pella, Klein Pella including the gravel road to Klein Pella**

None of these areas would be within the 15km visual impact 'zone of potential influence' as outlined in the visual specialist study. Impact are therefore likely to be minimal and restricted to temporary impacts on those visitor that drive past the project site on the N14 in order to access these areas.

#### **Aggeneys and surrounds**

Aggeneys would fall within the low exposure area of the projects visual 'zone of potential influence'. This along with the mining town nature of Aggeneys should limit impacts. Tourists exploring the Aggeneys Mountains would, for the most part, be shielded from views of the project. Where views are possible they would be more than 3km distant (ie low visual exposure) and often be combined with views of the existing mining activities and development in Aggeneys.

#### **The N4**

Visual risks along this key route would be particularly prominent. Impacts would be mitigated by the temporary nature of visual exposure, i.e. they would be limited to a relatively short period of time when motorists are passing the project area. Visual exposure would be moderate or higher for a 10-11km stretch of the road (ie for 5-7 minutes of driving time) and low beyond this distance implying lower impacts.

## Overall

The combined scale of the project elements and their visual impacts indicate that overall changes to the visual sense of place which supports tourism will be highly significant. Impacts on specific tourism facilities and key tourism areas would be limited, however, given the project's location relative to these. Visual exposure from the N14 would be high although temporary in nature for passing motorist who would largely still be able to enjoy the key attractions and tourist facilities in the wider area which are relatively far removed and screened from the project.

Considering the above factors, overall risks to tourism stemming from visual changes would probably be medium to high and localised without mitigation reducing to medium with mitigation.

### *Loss of conservation worthy land and conservation off-sets*

Any significant loss of highly conservation worthy land such as that found on the site and particularly on the Gamsberg Inselberg has potential implications for tourism. This is because conservation worthy lands have appeal to tourists and are becoming increasingly scarce. As outlined in the vegetation specialist study, the mine and plant site's high species diversity and number of rare species are of high conservation value and are reflected in its importance in local and regional conservation planning (see Desmet, 2013).<sup>1</sup> Should the project proceed on the site, a significant portion of highly conservation worthy land would be sacrificed. This is a highly significant loss as recognised in the vegetation specialist study and will trigger the need for a biodiversity/conservation offset which conserves and safeguards appropriate conservation worthy land elsewhere. With pro-active planning there may be possibilities to allow controlled eco-tourism activities on an offset site. An investigation of appropriate options in this regard should ideally form part of offset selection and planning.

Without the project and its conservation offset one can only speculate regarding future use of the site and its potential implications for tourism. For example, if the status quo is maintained, the most likely scenario is that the land would probably remain private with no access for tourists, but with views of the site in an undisturbed state. This scenario would limit tourism risks from aesthetic degradation of the area but is not likely to secure tourism opportunities through access to the site. Setting aside the entire site for conservation through purchase is another potential scenario. However, it seems highly unlikely that the land would become available for purchase at a reasonable value by state conservation agencies or conservation NGOs while there remains any potential for zinc mining to be approved at some point in the future. In the longer term this potential for future mining seems set to

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<sup>1</sup> Note that the fauna and flora specialist report concentrated on assessing the impacts of supporting infrastructure (such as extension to the waste water treatment works, housing, switching yard, power lines, offtake water pipeline) and found that impacts would be low with mitigation as the areas affected have relatively low conservation status (see Todd, 2013).



remain given the size and quality of the deposit and as zinc reserves continue to be depleted elsewhere thereby increasing pressure for the mining of the site.

#### *Air quality and noise considerations*

Negative impacts on air quality have the potential to impact on the experience of tourists particularly if significant direct nuisance is caused (primarily from dust) and if decreased air quality feeds into deteriorated visual quality in the area. With regards to overall air quality impacts, the key findings of the air quality specialist study is that with mitigation, air quality impacts would be negligible during construction and minor during operations implying minimal risks for tourism (see DDA, 2013).

It should be recognised that some level of nuisance from dust outside the boundaries of the project site would be unavoidable. Considering the above findings, however, it seems reasonable to conclude that risks specific to tourism from air quality impacts would be of a low significance with mitigation.

Noise impacts also have the potential to impact on tourism if they are shown to be particularly severe and to affect tourism receptors. The key findings of the noise specialist study indicate that, with mitigation, noise impacts are expected to be of a very low significance and generally highly localised within the project site with no impacts on sensitive tourism receptors identified (DDA, 2013a). If any, very low risks associated with noise are therefore predicted for tourism.

#### *Potential for increased business tourism*

Experience indicates that a number of technical, management and sales staff generally associated with the numerous companies involved in the construction of a project of the large and complex nature proposed by Vedanta are required to periodically visit the project site to conduct business. These staff generally fall into middle to higher income brackets and will require accommodation for their stays thereby creating opportunities for accommodation and other tourist facilities and services such as restaurants, transport, retail, etc. These opportunities would primarily be available to businesses in the Khâi-Ma Municipality area and in larger towns such as Springbok.

Although the short term magnitude of impacts are likely to be greater during construction given the level of activity at the site, increased business tourism flows are also likely during operations particularly given the presence of new technology requiring suppliers, servicing, etc. This positive impact should be taken into account although it is difficult to accurately estimate the number of business visitors that would need to go to site and the durations of their stays. At a minimum the positive impacts associated with business tourism will act as a partial counter to negative impacts on tourism. Bear in mind also that trips for business purposes can also lead to return visits for leisure as business people are exposed to the attractions of the area.

### *Overall Impacts and Significance*

An assessment of the significance of the un-mitigated impacts of the construction and operation of the project on tourism based on the findings above is presented in the Boxes below.

The no-go alternative would not result in impacts on tourism as it would maintain the status quo.

#### **Box 4-6**      *Summary of Construction Phase Impacts: Impacts on Tourism*

**Nature:** Biophysical impacts would impact on the tourism appeal of the area resulting in overall **negative impacts** notwithstanding the potential for increased business tourism.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

Irreplaceability: The activity will result in the loss of tourism resources with medium level of **irreplaceability**

**Impact Magnitude – Medium**

- Extent: The extent of the impact is **local**
- Duration: The expected impact will be **short-term (i.e. reversible)**
- Scale: The impact will result in **notable changes** to the receptor
- Frequency: The frequency of the impact will be **once-off**
- Likelihood: Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

#### **Box 4-7**      *Summary of Operational Phase Impact: Impacts on Tourism*

**Nature:** Biophysical impacts would impact on the tourism appeal of the area resulting in overall **negative impacts** notwithstanding the potential for increased business tourism.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

Irreplaceability: The activity will result in the loss of tourism resources with medium level of **irreplaceability**

**Impact Magnitude – High**

- Extent: The extent of the impact is **local**
- Duration: The expected impact will be **long-term for the life of mine (i.e. reversible)**
- Scale: The impact will result in **notable changes** to the receptor
- Frequency: The frequency of the impact will be **periodic**
- Likelihood: Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE TO MAJOR**

**Degree of Confidence:** The degree of confidence is **medium**.

### Construction and Operational Phase Mitigation:

Impacts on tourism are primarily dependent on how Vedanta's operations are designed, constructed and operated to minimise negative biophysical and social impacts and enhance positive ones. The measures recommended in other specialist studies to minimise negative impacts (primarily visual, air quality, noise, traffic and botanical measures) and enhance positive impacts would thus also reduce impacts on tourism and should be implemented. These measures are not repeated here.

With pro-active planning there may be possibilities to allow controlled eco-tourism activities on the biodiversity offset site. An investigation of appropriate options in this regard should ideally form part of offset selection and planning.

#### 4.5.2 *Decommissioning and Post Closure Phase impacts*

Decommissioning would essentially result in the reduction or removal of tourism risks as project elements are closed. The eventual significance of impacts will be highly dependent on rigorous rehabilitation of the project sites. Closure would also result in a reduction in business tourism to the area that would be linked to the presence of the project. An assessment of the significance of the impacts based on the findings above is presented in the Box below.

#### *Box 4-8 Summary of Decommissioning Phase Impacts: Impacts on Tourism*

**Nature:** Biophysical impacted that affected the tourism appeal of the area would cease and/or reduce resulting in overall **positive impacts** notwithstanding the potential for decreased business tourism.

##### **Sensitivity/Vulnerability/Importance of Resource/Receptor - Medium**

**Irreplaceability:** The activity will result in the loss of tourism resources with medium level of **irreplaceability**

##### **Impact Magnitude - Low**

- **Extent:** The extent of the impact is **local**
- **Duration:** The expected impact will be **permanent (ie not reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor
- **Frequency:** The frequency of the impact will be **periodic**
- **Likelihood:** Impacts are a **certainty** in the economy

##### **IMPACT SIGNIFICANCE (PRE-MITIGATION) - MINOR**

**Degree of Confidence:** The degree of confidence is **medium**.

#### Decommissioning Phase Mitigation:

If one takes a sample of mines throughout South Africa it is clear that rehabilitation effort and the success associated with it can be highly variable even if all mines are required to abide by the same regulations (see van Zyl et

al., 2012). This variability can be seen when comparing both operating and closed mines. It therefore stands to reason that, with regards to minimising impacts, much will depend on how Vedanta's EMP is conceived and implemented in partnership with the DMR and other local stakeholders. If rehabilitation is rigorously applied and well funded both concurrently and at closure to avoid visual scarring along with air pollution control measures, impacts are likely to be significantly less than the case of Vedanta simply doing the minimum to satisfy DMR requirements.

#### 4.5.3 *Residual Impact*

The implementation of the above mitigation measures would decrease the negative construction phase impacts from **Moderate** to **Minor** significance and the operation phase impacts from **Moderate/Major** to **Moderate**. The implementation of the decommissioning phase mitigation measures would probably introduce positive impacts of a **Moderate** significance if they are particularly well resourced and executed. The pre- and post-mitigation impacts are compared in Table 4-24 below.

**Table 4-24** *Pre- and Post- Mitigation Significance: Impacts on Tourism*

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	<b>MODERATE (-ve)</b>	<b>MINOR (-ve)</b>
Operation	<b>MODERATE TO MAJOR (-ve)</b>	<b>MODERATE (-ve)</b>
Decommissioning and Post Closure	<b>MINOR (+ve)</b>	<b>MODERATE (+ve)</b>

## 4.6 *IMPACTS ON SURROUNDING LAND USES*

### 4.6.1 *Impact Description and Assessment*

**Table 4.25** *Impact Characteristics: Impacts on Surrounding Land Uses*

Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	All project aspects and activities that could impact on the current and future use and economic potential of surrounding lands.	All project aspects and activities that could impact on the current and future use and economic potential of surrounding lands.	Closure and rehabilitation of project aspects and activities that could impact on the current and future use and economic potential of surrounding lands.
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect
Stakeholders/ Receptors Affected	Surrounding land owners and those that rely on them for their livelihoods.	Surrounding land owners and those that rely on them for their livelihoods.	Surrounding land owners and those that rely on them for their livelihoods.

Current use of lands immediately surrounding the site (and therefore potential impacted on due to activities on the site) is focused on agriculture primarily in the form of low potential grazing. Although projects are yet to be

established, the potential for surrounding lands and those in the wider area to be used for solar energy projects has also been recognised. Among others, there is an application pending for the use of a portion of Farm RE 1/57 adjacent to the site for a solar energy project. Given these land use options, this section focuses on potential risks to agriculture and solar development potential in particular. It also comments on potential risks to property values.

In order to provide context, Figure 4-5 shows the location of farmsteads on properties surrounding those owned by Vedanta on which the proposed project would be established.

**Figure 4-5**     *Location of Farmstead nearby the Gamsberg Site*



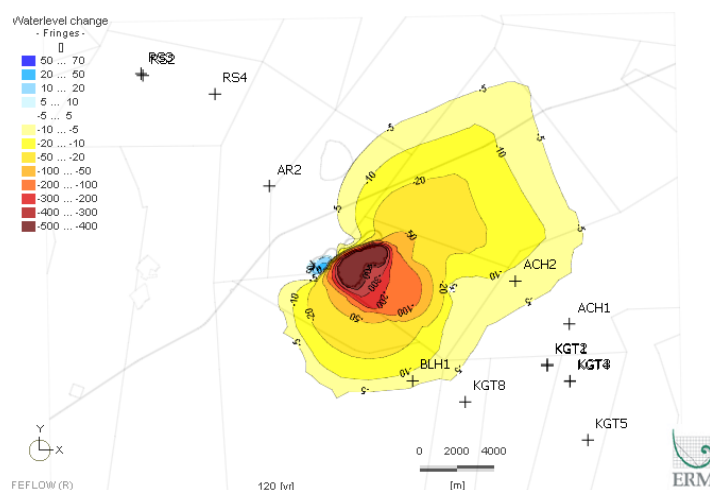
### *Hydrological and hydrogeological impacts*

Impacts on the hydrological environment can have implications for agricultural production and, if severe enough, for access to water for households. The findings of the hydrogeological specialist study indicate that (ERM, 2013a):

- No decreases in groundwater depths are predicted on neighbouring farm lands during the anticipated life of mine (ie 20 years).
- Decreases in groundwater depths of between 5 and 10m are anticipated 50 years after mine closure but would be confined to the neighbouring land up to 2,000m to the south of the site boundary. There are currently no existing boreholes in this area that would be potentially affected.
- Decreases in groundwater depths of between 5 and 10m are anticipated 100 years after mine closure extending up to 3,000m from the site

boundary in all direction excluding to the west (see Figure 4-5). There are currently two existing boreholes in this area that would be potentially affected.

**Figure 4-6** *Predicted Water Level Changes 100 Years After Mine Closure*



Source: ERM, 2013a

Given the above findings, overall risk to groundwater levels with serious implications for farming on adjacent lands area are considered low and mostly expected to manifest in the long term.

The findings of the hydrological specialist study indicates that, with adequate mitigation, impacts on surface water flows on neighbouring farms are likely to be minor (HHO Africa, 2013). It therefore stands to reason that the risk of negative impacts on current agricultural practice or production would be minor.

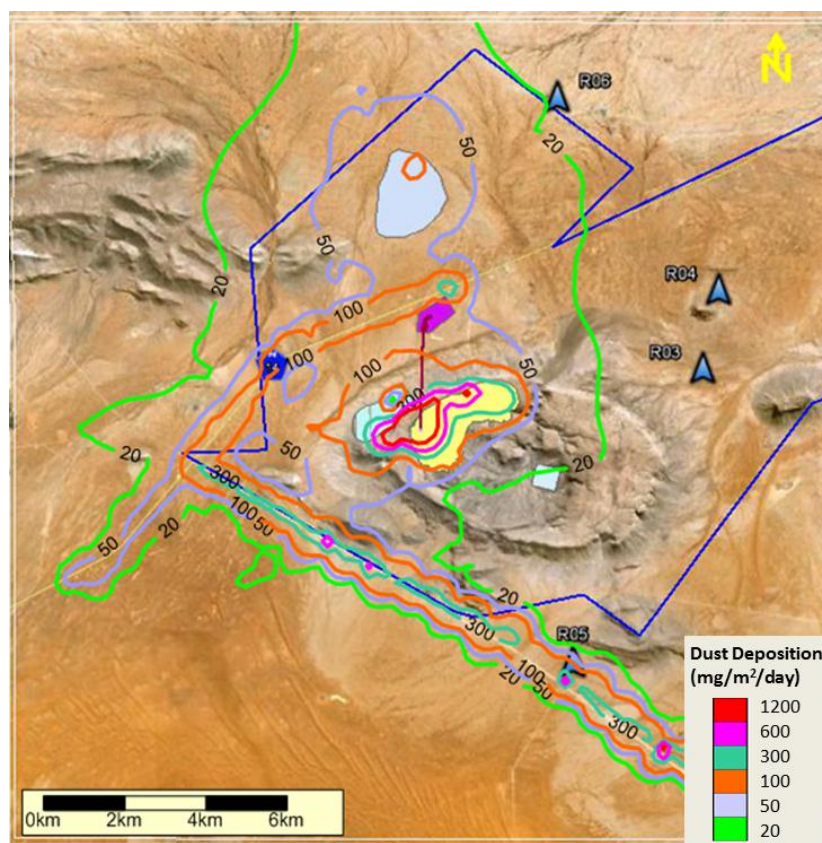
#### *Air quality impacts*

With regard to air quality impacts on neighbouring lands, the air quality specialist study has divided impact into those associated with particulate matter and dust deposition. For dust, Figure 4-6 show that (DDA, 2013):

- Dust deposition was light ( $< 250 \text{ mg/m}^2/\text{d}$ ) around the N14, and moderate ( $250\text{-}500 \text{ mg/m}^2/\text{d}$ ) around the Loop 10 road.
- Heavy dust fall ( $> 500 \text{ mg/m}^2/\text{d}$ ) occurred mainly within the mining area and along the haul roads.
- The SANS residential guideline of  $600 \text{ mg/m}^2/\text{d}$  was not exceeded at any of the sensitive receptors.



**Figure 4-7** Averaged Daily Dust Deposition at the Site



Source: DDA, 2013

For PM<sub>10</sub>, the air quality study found that the South African guideline of 75 µg/m³ was exceeded more than 4 times a year at the mine, in close proximity to the N14 and the Loop 10 road (DDA, 2013). No farmsteads which are considered sensitive receptors would be affected.

Based on these findings it is considered unlikely that air quality impacts (mainly from dust deposition) would translate into material impacts on the grazing potential of land outside the project boundaries. Impacts on the potential of neighbouring lands to be used for solar projects are also considered minor and confined to the narrow areas along the Loop 10 Road (where dust deposition was found to be moderate) and, to a lesser degree, the N14 (where dust deposition was found to be light). The possibility of impact should not, however, be ignored and the environmental quality monitoring plan should include the monitoring of air quality and any associated impacts.

#### *Noise and social impacts*

The noise specialist study found that noise impacts would have a very low overall significance and that the project did not pose significant noise risks to sensitive receptors nearby. In summary it found that (DDA, 2013a):

During construction:

- For receptors located at greater distances than a 1.5 km radius, the construction noise will be barely audible. Since the closest receptor is more than 5 km away this impact is expected to be Insignificant.

- The vibration during the site construction is not considered to have a significant impact on the surrounding receptors.

During operations:

- The 45 dB(A) daytime and 35 dB(A) night-time noise levels will be primarily contained within the Gamsberg concession area.
- The daytime and night-time guidelines will not be exceeded in any of the scattered farm houses around the mine nor the Aggeneys community.
- Along the Loop 10 road, most of the scattered farm houses are located more than 500 m from the alignment, and as such the expected level contribution due to the trucks will be below 34 dB(A), which is considered to be of Low significance.

Based on these findings, unacceptable noise and related nuisance impacts on surrounding farms are not predicted. There is also no reason to suspect that noise impacts would translate into property value impacts particularly with respect to farm houses.

The social specialist study conducted an assessment of the potential for the influx of people associated with the project to result in an increase in so-called social pathologies (see ERM, 2013). It found that the significance of this group of impacts would be moderate without mitigation and minor to moderate with mitigation. Among the risks identified, a general increase in crime including stock theft would be of particular concern to neighbouring land owners. Based on experiences elsewhere it stands to reason that some level of stock loss would be inevitable. Mitigation including compensation mechanisms would thus be important in this regard.

#### *Visual impacts*

Visual impacts will not impact on productive potential of surrounding lands. These impacts do, however, have the potential to impact on the amenity value of surrounding land and farmsteads in particular. Based on a matching of the visual exposure map produced by the visual specialist (see Figure 4-4) with mapped farmstead locations (see Figure 4-6), two farmsteads belonging to neighbours would be within the visual zone of influence of the project and close enough to be affected as follows:

- The farmstead on Portion 1/57 would be roughly 2.8km to the south-west of the tailings dam and was found to have a medium significance visual exposure by the visual specialist.
- The farmstead on Portion 2/57 would be roughly 7.5km to the north-east of the tailings dam and was found to have a low significance visual exposure by the visual specialist.

Other farmstead to the east of the site such as those on RE/59, Portion 1/87, Portion 2/87 and RE/87 would be shielded from views of the site.



### *Property value implications of impacts*

The value of surrounding agricultural land is primarily driven by the productive potential of the land and, to a lesser degree, by its other 'lifestyle' or non-productive factors which essentially determine how pleasant it is to live on the land. These can include visual appearance, noise levels, pollution levels, etc.

Based on the synopsis of impacts above, it seems most reasonable to conclude that there would be a minor to moderate risks of decreases in value related to losses in production or productive potential with mitigation. While risks to neighbouring land owners with mitigation seem manageable, uncertainties regarding these risks remain. It is therefore clear that risks would need to be monitored and systems put in place to deal with impacts should they arise. It will be particularly important that these systems are devised with inputs from neighbouring land owners and that they are highly explicit regarding actions required from the applicant should negative impacts arise.

With respect to non-productive factors, the findings of the air quality and noise specialist studies do not indicate significant concern regarding impacts on neighbouring farmsteads. Visual impacts are a relatively greater source of concern as they would result in impacts on the overall sense of place of the area that would change significantly given the introduction of a large mining/industrial project in an area dominated by agriculture. For the whole surrounding area, risk from this source should be low to medium in magnitude given the extensive size of farms. They would be particularly focused on the farmsteads on Portion 1/57 (roughly 2.8km to the south-west of the tailings dam) and, to a lesser degree, on Portion 2/57 (roughly 7.5km to the north-east of the tailings dam) which would have views over the project site.

The value of farms adjacent to the site may also be impacted on due to negative perceptions. Portion 1/57 would be particularly at risk as it would effectively be 'sandwiched' between the Gamsberg project and the existing mining operations at Black Mountain. Even in the absence of verifiable negative environmental impacts from the project, this position is likely to result in the risk of significant property values loss primarily as it would be associated with negative perceptions among potential buyers. These would probably include perceptions regarding pollution levels as well as concerns regarding social nuisances such as perceived increased potential for stock theft. On the whole, the actual change in the character of the area that will be associated with the mine combined with negative perceptions should result in very limited interest in nearby properties from buyers that place importance on lifestyle factors.

### *Overall Impacts and Significance*

An assessment of the significance of the un-mitigated impacts of the construction and operation of the project on surrounding land uses based on the findings above is presented in the Boxes below.

The no-go alternative would not result in impacts on surrounding land uses as it would maintain the status quo.

**Box 4-9**      *Summary of Construction Phase Impacts: Impacts on Surrounding Land Uses*

**Nature:** Biophysical and social impacts would impact on current and future potential land uses surrounding the site resulting in overall **negative impacts**.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Low**

**Irreplaceability:** The activity will result in the loss of surrounding land use potential and resources with a low level of **irreplaceability**

**Impact Magnitude – Medium**

- **Extent:** The extent of the impact is **local**
- **Duration:** The expected impact will be **short-term (i.e. reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor
- **Frequency:** The frequency of the impact will be **once-off**
- **Likelihood:** Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

**Box 4-10**      *Summary of Operational Phase Impact: Impacts on Surrounding Land Uses*

**Nature:** Biophysical and social impacts would impact on current and future potential land uses surrounding the site resulting in overall **negative impacts**.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

**Irreplaceability:** The activity will result in the loss of surrounding land use potential and resources with a low level of **irreplaceability**

**Impact Magnitude – Medium**

- **Extent:** The extent of the impact is **local**
- **Duration:** The expected impact will be **long-term for the life of mine (i.e. reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor
- **Frequency:** The frequency of the impact will be **periodic**
- **Likelihood:** Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

Construction and Operational Phase Mitigation:

Impacts on surrounding land uses and land owners are primarily dependent on how Vedanta's operations are designed, constructed and operated to minimise negative biophysical and social impacts and enhance positive ones. The measures recommended in other specialist studies to minimise negative impacts (primarily visual, air quality, ground and surface water, noise, traffic

and social measures) and enhance positive impacts would thus also reduce impacts on surrounding land uses and should be implemented. These measures are not repeated here.

Note that, as per the recommendations of the transport specialist study, the road to Loop 10 would need to be surfaced by the fifth year of operations to eliminate the dust and cost of grading the gravel road on a continuous basis (Pretorius, 2013). This would be an important mitigation measure if external costs associated with dust along the road are to be avoided.

Although significant impact on surrounding lands are not predicted at present, it should be recognised that these may arise in time and that principles and systems to deal with such eventualities should ideally be established before mining commences in consultation with those potentially affected. In other mining areas (Sishen, for example), a lack of clarity regarding who is responsible for impacts combined with unclear processes for dealing with compensation for impacts (without landowners having to resort to legal action) has caused high levels of tension between mines and surrounding land owners.

Vedanta should therefore actively engage with surrounding land owners and establish a clear policy for dealing with complaints. At a minimum this will require a forum that could meet regularly to discuss concerns.

In order to avoid confusion and contention regarding the source of impacts, it will also be critically important to set up monitoring systems for impacts such as those that may affect ground and surface water quantity/quality, air quality, etc. These systems need to be set up in such a way that, where impacts occur due to mining, these can be easily understood and ascribed to mining or not. Vedanta should also realise that they are introducing an activity with potentially high risks for surrounding land owners into the area. As such, risks should be transferred to Vedanta where possible. A memorandum of understanding and clear protocols for dealing with potential impacts should also be established. This should be between Vedanta and surrounding land owners, but should also include relevant authorities such as those in agriculture, water affairs who have an interest and can play a role in policing and/or conflict resolution if needed. This should ensure that all relevant parties are sure of what is expected of them and lessen the chances of acrimony and costly legal disputes. For example, it should be agreed that if farmer's boreholes lose pressure or need to be drilled deeper then Vedanta should carry out the necessary work or provide adequate funds. There should also be a protocol established that makes it clear to all parties under what conditions and how the purchase of surrounding lands will be handled should the need arise. This will ensure clarity and build trust with surrounding land owners.

#### 4.6.2 *Decommissioning and Post Closure Phase impacts*

Decommissioning would essentially result in the reduction or removal of risks to surrounding land uses as project elements are closed. The eventual significance of impacts will be highly dependent on rigorous rehabilitation of the project sites. Impacts on the recovery of groundwater in particular will be important to continued agriculture in the area. An assessment of the significance of the impacts based on the findings above is presented in the Box below.

##### **Box 4-11** *Summary of Decommissioning Phase Impacts: Impacts on Surrounding Land Uses*

**Nature:** Biophysical impacted that affected surrounding land uses would cease and/or reduce assuming adequate mitigation and closure resulting in overall **positive impacts**.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Medium**

**Irreplaceability:** The activity will result in the loss of surrounding land use potential and resources with a low level of **irreplaceability**

**Impact Magnitude – Small to medium**

- **Extent:** The extent of the impact is **local**
- **Duration:** The expected impact will be **permanent (ie not reversible)**
- **Scale:** The impact will result in **notable changes** to the receptor
- **Frequency:** The frequency of the impact will be **periodic**
- **Likelihood:** Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MINOR TO MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

#### Decommissioning Phase Mitigation:

If one takes a sample of mines throughout South Africa it is clear that rehabilitation effort and the success associated with it can be highly variable even if all mines are required to abide by the same regulations (see van Zyl et al., 2012). This variability can be seen when comparing both operating and closed mines. It therefore stands to reason that, with regards to minimising impacts, much will depend on how Vedanta's EMP is conceived and implemented in partnership with the DMR and other local stakeholders. If rehabilitation is rigorously applied and well funded both concurrently and at closure to avoid external environmental costs, impacts are likely to be significantly less than the case of Vedanta simply doing the minimum to satisfy DMR requirements.

#### 4.6.3 *Residual Impact*

The implementation of the above mitigation measures would decrease the negative construction phase impacts from **Moderate** to **Minor** significance and the operation phase impacts from **Moderate** to **Minor**. At an aggregate

level, risks could be reduced to a low level with mitigation although there are instances (such as farm Portion 1/57) where risks would be higher for specific reasons. The implementation of the decommissioning phase mitigation measures would probably result in positive impacts which could have a **Moderate** significance if they are particularly well resourced and executed. The pre- and post-mitigation impacts are compared in Table 4-24 below.

**Table 4-26** *Pre- and Post- Mitigation Significance: Impacts on Surrounding Land Uses*

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	<b>MODERATE (-ve)</b>	<b>MINOR TO MODERATE (-ve)</b>
Operation	<b>MODERATE (-ve)</b>	<b>MINOR TO MODERATE (-ve)</b>
Decommissioning and Post Closure	<b>MINOR (+ve)</b>	<b>MINOR TO MODERATE (+ve)</b>

#### 4.7 *IMPACTS ON MUNICIPAL FINANCES*

##### 4.7.1 *Impact Description and Assessment*

**Table 4.27** *Impact Characteristics: Impacts on Municipal Finances*

Summary	Construction	Operation	Decommissioning/ Post Closure
Project Aspect/ activity	Overall project has the potential to improve whilst also straining the financial position of the local and district municipality.	Overall project has the potential to improve whilst also straining the financial position of the local and district municipality.	Withdrawal of project has the potential to improve whilst also straining the financial position of the local and district municipality.
Impact Type	Direct and indirect	Direct and indirect	Direct and indirect
Stakeholders/ Receptors Affected	The municipality and those who finance it (primarily its residents and national government)	The municipality and those who finance it (primarily its residents and national government)	The municipality and those who finance it (primarily its residents and national government)

New development projects have the potential to improve the financial positions of local municipalities where they are located through net increases in rates and other income. The corollary is, however, also possible – i.e. these developments can place greater strain on services and lead to overall negative impacts on municipal finances. Note that cases where this has occurred are especially likely to be found in rapidly growing communities (see Altshuler et al. 1993, Ladd 1992 and RKG Associates 1989 cited in Fausold & Lilieholm 1996).

In order to assess what may happen to municipal finances it is necessary to understand the basics of the overall municipal financial planning process associated with new development projects. When a developer proposes a new project, a process of negotiation is entered into with the municipality aimed at determining the financial or other contribution needed from the developer in order to cover the increased cost of the provision of services to the site (i.e. to

extend the existing network of services and to account for increased use of existing services). Services may include roads, sewerage, water, electricity, waste collection, etc. The accurate estimation of this contribution by the municipality is a key to ensuring cost recovery – if it is an underestimation, some of the costs associated with the development will not be recovered from the developer and will have to be covered using other sources (most often municipal ratepayers in general). The ability of the municipality to negotiate favourable contributions and extract these contributions is also a key determinant of whether the overall financial position of the municipality improves, stays the same or deteriorates.

In addition to the estimation of the costs of additional services to the development site, it is necessary for the municipality to get an accurate understanding of the potential implications of the project for population movement in the municipality. How many workers from outside the municipality are expected?, where they will live?, etc are some of the key considerations in this regard that allow for municipal planning to proceed. This, in turn, determines how municipal services can be charged for and across what number of households. Thereby it provides the municipality with an understanding of how its rates base will be improved and where.

Based on the description above it is clear that in the case of the Gamsberg project, or any other large development project, the municipality bears ultimate responsibility for ensuring that the project contributes to the financial sustainability of the Khâi-Ma Municipality and the wider district and does not burden them with increased costs. These potential cost should be viewed at a broad scale and include costs associated with potential influxes of workers and job seekers as well as any other impacts that could impose costs on the municipality. Discussions with the Khâi-Ma Municipality revealed that they are well aware of the need to recover costs and would endeavour to ensure that Vedanta not only covers their own costs, but also make a contribution to the development of the area. The municipality has confirmed that they are currently in the early stages of a process of negotiation with Vedanta in this regard. They also have confirmed that no decisions have yet been made pending the outcome of the EIA process and the provision of more detailed project information to the municipality as it becomes available (P van der Merwe, Khâi-Ma Municipality, pers. com.). No clear conclusions regarding impacts on municipal finances are therefore possible at this stage. It is, however, safe to predict overall positive impacts on finances provided these negotiations proceed well and in-migration is managed. This kind of outcome would be consistent with other smaller municipalities that have benefited from increased incomes among its residents and an in-flux of new residents with jobs. With sound municipal management, both of these trends tend to increase municipal income from existing residents and provide municipalities with a wider rates resulting in healthier municipal finances.

#### *Overall Impacts and Significance*

An assessment of the significance of the un-mitigated impacts of the construction and operational phases of the project on municipal finances

based on the findings above is presented in the Boxes below. For both phases, inadequate management, limited co-operation between the municipality and Vedanta along with un-controlled in-migration could lead to overall moderate negative impacts on municipal finances.

The no-go alternative would maintain the status quo and not provide the opportunity to raise added funds for the municipality, but would also not introduce the risk of not covering increased service costs.

**Box 4-12**      *Summary of Construction Phase Impacts: Impacts on Municipal Finances*

**Nature:** Without mitigation the project has the potential to result in an overall **negative impact** on municipal finances notwithstanding its potential to also improve the financial position of the local and district municipality

**Sensitivity/Vulnerability/Importance of Resource/Receptor - Low**

Irreplaceability: The impact will **not** include the loss of **irreplaceable** resources

**Impact Magnitude - Medium**

- Extent: The extent of the impact is **local**
- Duration: The expected impact will be **short-term (i.e. reversible)**
- Scale: The impact will result in **notable changes** to the receptor
- Frequency: The frequency of the impact will be **once-off**
- Likelihood: Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) - MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

**Box 4-13**      *Summary of Operational Phase Impact: Impacts on Municipal Finances*

**Nature:** Without mitigation the project has the potential to result in an overall **negative impact** on municipal finances notwithstanding its potential to also improve the financial position of the local and district municipality

**Sensitivity/Vulnerability/Importance of Resource/Receptor - Low**

Irreplaceability: The impact will **not** include the loss of **irreplaceable** resources

**Impact Magnitude - Medium**

- Extent: The extent of the impact is **local**
- Duration: The expected impact will be **long-term for the life of mine (i.e. reversible)**
- Scale: The impact will result in **notable changes** to the receptor
- Frequency: The frequency of the impact will be **periodic**
- Likelihood: Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) - MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

Construction and Operational Phase Mitigation:

The municipality should continue to take responsibility for ensuring that the proposed project contribute to municipal financial sustainability and does not burden it with increased costs.

Vedanta will need to engage with the municipality in good faith and with the intention to ensure that it does not burden the municipality with additional costs.

The mitigation measures contained in the social specialist study aimed at limiting the influx of job seekers to the area would need to be implemented in order to ensure that their impacts on services provision costs remain as low as possible.

#### 4.7.2 *Decommissioning and Post Closure Phase impacts*

Decommissioning would essentially result in the reduction or removal of project related contributions to municipal finances as well as potential strains on these finances as project elements are closed. The eventual significance of impacts will be highly dependent on rigorous rehabilitation of the project sites as inadequate rehabilitation has the potential to transfer costs onto the local municipality (eg clean-ups). An assessment of the significance of the impacts based on the findings above is presented in the Box below.

#### **Box 4-14** *Summary of Decommissioning Phase Impacts: Impacts on Municipal Finances*

**Nature:** Without mitigation the withdrawal of project has the potential to result in an overall **negative impact** on municipal finances.

**Sensitivity/Vulnerability/Importance of Resource/Receptor – Low**

Irreplaceability: The impact will **not** include the loss of **irreplaceable** resources

**Impact Magnitude – Medium**

- Extent: The extent of the impact is **local**
- Duration: The expected impact will be **permanent (ie not reversible)**
- Scale: The impact will result in **notable changes** to the receptor
- Frequency: The frequency of the impact will be **periodic**
- Likelihood: Impacts are a **certainty** in the economy

**IMPACT SIGNIFICANCE (PRE-MITIGATION) – MODERATE**

**Degree of Confidence:** The degree of confidence is **medium**.

#### Decommissioning Phase Mitigation:

The principles that should govern adequate mine and plant decommissioning and closure as outlined in the section above on tourism impacts would also apply to limiting impacts on municipal finances.



Vedanta will need to ensure continuous engagement with the municipality and keep it informed of any closure plans well in advance of them occurring.

The municipality, in turn, should be pro-active and plan for changes well in advance of potential mine closure.

#### 4.7.3 *Residual Impact*

The implementation of the above mitigation measures would decrease the negative construction phase impacts from **Moderate negative** to **Moderate positive** significance and the operation phase impacts from **Moderate negative** to **Moderate positive**. The implementation of the decommissioning phase mitigation measures are relatively uncertain, not primarily under the control of Vedanta and in the distant future implying that impact would remain **Moderate negative** with mitigation if one takes a conservative view. The pre- and post-mitigation impacts are compared in Table 4-24 below.

**Table 4-28** *Pre- and Post- Mitigation Significance: Impacts on Municipal Finances*

Phase	Significance (Pre-mitigation)	Residual Significance (Post-mitigation)
Construction	<b>MODERATE (-ve)</b>	<b>MODERATE (+ve)</b>
Operation	<b>MODERATE (-ve)</b>	<b>MODERATE (+ve)</b>
Decommissioning and Post Closure	<b>MODERATE (-ve)</b>	<b>MODERATE (-ve)</b>

Relatively late in the assessment process, the following changes to the project were suggested in order to decrease impacts:

1. Relocation of the explosives magazine area from the top of the inselberg to an area located between the N14 and inselberg. Due to the impacts to three watercourses on the inselberg, this relocation was requested by the Specialist Team.
2. Increase in size of the waste rock dump from 270 hectares to 490 hectares. In order to reduce the slope angle of the waste rock dump (i.e. from 45° – 35° degree slope), the footprint of the waste rock dump has increased. This design refinement was in response to DMR requirements for a waste rock dump.

The following opinion is provided regarding the manner in which these changes influence the overall findings and recommendations of this specialist study:

The potential for the changes to introduce risks or enhance benefits was considered with reference to the inputs provided by the other specialists participating in the EIA. Having reviewed these inputs, it is not anticipated that the proposed changes would influence the nature of impacts, the impact ratings and associated mitigation measures already indicated in this report. While impact ratings do not change it should be noted that the visual specialist has observed that the proposed project changes “will increase the cumulative impact of the project’s activities, specifically on views from the N12 road.” This would, in turn, detract further from the experiences of tourists and others passing on the N12 requiring additional mitigation as outlined by the visual specialist.

When considering the quantifiable as well as more qualitative costs and benefits of the project it is considered more likely that it would achieve a net benefit at a provincial and national scale provided the financial projections of the applicants prove reasonably accurate and provided adequate mitigation measures are instituted.<sup>1</sup>

The achievement of a net benefit at a regional and local scale would be highly dependent on extensive mitigation as the key societal costs of the project would be felt at these scales. Particularly attention will need to be paid to mitigating water, air quality, visual, noise, traffic, social and botanical impacts as these have the potential to result in significant impacts on tourism, agriculture and overall development potential if left unmitigated. In addition, the economic benefits from Vedanta's expenditure in the local economy should be maximised by giving preference to local employees and suppliers during construction and operation building on Vedanta's social and labour plan.

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<sup>1</sup> Note that this funding is intended as a guide to decision makers who have the ultimate responsibility for weighing up the relative importance of the individual risks/impacts that make up the total economic impact of the project as assessed in this report.

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*Appendix 1: ERM method of assessing the environmental issues and alternatives*

The adequate assessment and evaluation of the potential impacts and benefits that will be associated with the proposed project necessitates the development of a scientific methodology that will reduce the subjectivity involved in making such evaluations. A clearly defined methodology is used in order to accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this the proposed project must be considered in the context of the area and the people that will be affected.

Nonetheless, an impact assessment will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and EIA practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental and community context. Ultimately, impact significance involves a process of determining the acceptability of a predicted impact to society.

The purpose of impact assessment is to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimize, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the proposed project component or by the execution of a proposed project related activity.

The nature of the project may determine whether one needs to assess both routine and non-routine impacts. Non-routine impacts generally relate to accidents and could include oil/chemical/fuel spills, emergency venting of noxious gases, etc. In most cases, it would be sensible to have separate chapters for the assessment of routine and non-routine impacts.

The types of impacts and terminology to be used in the assessment are outlined in *Table 7.1*.

Table 7.1 Defining the Nature of the Impact

Term	Definition
<b>Impact nature</b>	
<b>Positive</b>	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
<b>Negative</b>	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
<b>Direct impact</b>	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (eg. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
<b>Indirect impact</b>	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (eg. in-migration for employment placing a demand on resources).
<b>Cumulative impact</b> <sup>(1)</sup>	Impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

### Assessing Significance

There is no single accepted definition of '*significance*' and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the **magnitude** of the impact and the **likelihood** of the impact occurring. It is widely accepted that Impact Magnitude (or Severity) is a function of the extent, duration and intensity of the impact.

The criteria used to determine significance are summarised in *Table 7.2*. These criteria (specifically Extent and Duration) should be customised to suit individual projects.

**Table 7.2** *Significance Criteria*

<b>Impact magnitude – the degree of change brought about in the environment</b>	
<b>Extent</b>	<p><b>On-site</b> – impacts that are limited to the site boundaries.</p> <p><b>Local</b> – impacts that affect an area in a radius of 5 km around the site.</p> <p><b>Regional</b> – impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.</p> <p><b>National</b> – impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.</p> <p><b>Transboundary/International</b> – impacts that affect internationally important resources such as areas protected by international conventions.</p>
<b>Duration</b>	<p><b>Temporary</b> – impacts are predicted to be of short duration and intermittent/occasional.</p> <p><b>Short-term</b> – impacts that are predicted to last only for the duration of the construction period.</p> <p><b>Long-term</b> – impacts that will continue for the life of the Project, but ceases when the Project stops operating.</p> <p><b>Permanent</b> – impacts that cause a permanent change in the</p>

(1) The assessment of cumulative impacts is qualitative and is often discussed in a separate chapter in the ESIA Report. One should remember to include the assessment of cumulative impacts in the terms of reference to specialists.



	affected receptor or resource (eg. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
<b>Intensity</b> <sup>(1)</sup>	<p><b>BIOPHYSICAL ENVIRONMENT:</b> <i>Intensity can be considered in terms of the sensitivity of the biodiversity receptor (ie. habitats, species or communities).</i></p> <p><b>Negligible</b> – the impact on the environment is not detectable.  <b>Low</b> – the impact affects the environment in such a way that natural functions and processes are not affected.  <b>Medium</b> – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.  <b>High</b> – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.</p> <p><i>Where appropriate, national and/or international standards are to be used as a measure of the impact. Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.</i></p>
	<p><b>SOCIO-ECONOMIC ENVIRONMENT:</b> <i>Intensity can be considered in terms of the ability of project affected people/communities to adapt to changes brought about by the Project.</i></p> <p><b>Negligible</b> – there is no perceptible change to people’s livelihood  <b>Low</b> - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods.  <b>Medium</b> - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.  <b>High</b> - Those affected will not be able to adapt to changes and continue to maintain-pre impact livelihoods.</p>
<b>Impact likelihood – the likelihood that an impact will occur</b>	
<b>Unlikely</b>	The impact is unlikely to occur.
<b>Likely</b>	The impact is likely to occur under most conditions.
<b>Definite</b>	The impact will occur.

Once a rating is determined for magnitude and likelihood, the matrix in Table 7.3 can be used to determine the impact significance.

**Table 7.3** *Example of Significance Rating Matrix for Positive and Negative Impacts*

SIGNIFICANCE RATING				
	LIKELIHOOD	Unlikely	Likely	Definite
MAGNITUDE	Negligible	Negligible	Negligible	Minor
	Low	Negligible	Minor	Minor
	Medium	Minor	Moderate	Moderate
	High	Moderate	Major	Major

A colour scale for negative and positive ratings is given in Table 7.4

(1) The frequency of the activity causing the impact also has a bearing on the intensity of the impact, ie. the more frequent the activity, the higher the intensity.

**Table 7.4**      **Colour Scale for Ratings**

Negative ratings	Positive ratings
Negligible	Negligible
Minor	Minor
Moderate	Moderate
Major	Major

Table 7.5 outlines the various definitions for significance of an impact and is based on the significance rating matrix.

**Table 7.5**      **Significance Definitions**

Significance definitions	
<b>Negligible significance</b>	<p><i>An impact of negligible significance is where the magnitude is negligible, low or medium and the likelihood of the impact occurring is unlikely or likely.</i></p> <p>An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.</p>
<b>Minor significance</b>	<p><i>An impact of minor significance is where the magnitude of the impact is low but the likelihood is high or where the magnitude is high but the likelihood of occurrence is unlikely or likely.</i></p> <p>An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.</p>
<b>Moderate significance</b>	<p><i>An impact of moderate significance is where the magnitude is medium to high and the likelihood of the impact occurring is likely or definite.</i></p> <p>An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that “moderate” impacts have to be reduced to “minor” impacts, but that moderate impacts are being managed effectively and efficiently.</p>
<b>Major significance</b>	<p><i>An impact of major significance is where the magnitude of the impact is medium to high and the likelihood of the impact occurring is also likely or definite.</i></p> <p>An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.</p>

Once the significance of the impact has been determined, it is important to qualify the **degree of confidence** in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

## Mitigation Potential and Residual Impacts

It is expected that for the identified significant impacts, the project team will work with the client in identifying suitable and practical mitigation measures that are implementable. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts will be developed. A description of these mitigation measures should also be included within the Framework ESMP.

Residual impacts are those impacts which remain once the mitigation measures have been designed and applied. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process outlined above. The result is a significance rating for the residual impact.

The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in *Box 7-1*.

### ***Box 7-1*** ***Mitigation Hierarchy***

THE MITIGATION HIERARCHY FOR PLANNED PROJECT ACTIVITIES
<i>Avoid at Source; Reduce at Source</i> Avoiding or reducing at source is essentially 'designing' the project so that a feature causing an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimisation.
<i>Abate on Site</i> This involves adding something to the basic design to abate the impact - pollution controls fall within this category. Often called 'end-of-pipe'.
<i>Abate at Receptor</i> If an impact cannot be abated on-site then measures can be implemented off-site - an example of this would be to use the stand-by vessel to help control the level of interference with fishing activity.
<i>Repair or Remedy</i> Some impacts involve unavoidable damage to a resource, eg land disturbance. Repair essentially involves restoration and reinstatement type measures, such as base camp closure.
<i>Compensate in Kind</i> Where other mitigation approaches are not possible or fully effective, then compensation, in some measure, for loss, damage and general intrusion might be appropriate.

## *Appendix 2: Disclaimer*

The primary role of this study is to inform the decision-making processes being undertaken by the relevant environmental authorities with regards to the proposed project. Due care and diligence has been applied in the production of the study. However, ultimate responsibility for approving, denying or requiring changes to the proposed project application rests with the relevant environmental authorities (and other government bodies where relevant) who also bear responsibility for interrogating and determining how assessment information from this economic specialist study along with other information is to be used to reach their decisions. Independent Economic Researcher and Dr Hugo van Zyl can therefore not be held responsibility or liable for any consequences of the decisions made by the relevant environmental authorities with regard to the proposed project. This includes any financial, reputational or other consequences that such decisions may have for the applicant, the Environmental Assessment Practitioner responsible for conducting the Environmental Impact Assessment process or for the environmental authorities themselves.