Kamiesberg Project, Namaqualand, South Africa

Health Impact Assessment

Project Number:
COA2012

Prepared for:
Zirco Roode Heuwel (Pty) Ltd

On behalf of:
Coastal & Environmental Services
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EXECUTIVE SUMMARY

INTRODUCTION AND PROJECT DESCRIPTION

Zirco Roode Heuwel (Pty) Ltd (hereafter referred to as Zirco) currently holds the prospecting right to the Roode Heuvel and Leeuvlei deposits, located approximately 500 km north of Cape Town in the Northern Cape Province of South Africa. They are also in the process of acquiring prospecting rights for a further deposit immediately east of and adjacent to Roode Heuvel, referred to as “Sabies”. The proposed Project area is situated in the magisterial district of the Kamiesberg Local Municipality (KLM) and within the Namakwa District Municipality (DM).

Based on the drilling program completed, mineral resource estimates and mining studies undertaken at the Roode Heuvel deposit show that the deposit alone has an estimated mineral reserve of 270 million tons at 4.8% Total Heavy Mineral (THM) which could support 20 years of mining at a rate of 1 500 to 2 300 tons per hour (tph). The mining operations are proposed to cover approximately 3 500 hectares.

Dry mining, using front end loaders is the most likely scenario. It is a low risk option and does not require as much water as a dredge mining operation. The latter could also be unsuitable given the high amounts of slimes in the deposit. Initial mining will target the higher grade areas at an initial rate of 1 000 to 1 500 tph. After year 6, the operation will move to the lower grade areas and the mining rate will increase to 1 800 to 2 300 tph to maintain an average output of about 520 000 tons per annum (tpa) of heavy mineral concentrate. Over a 20 Life of Mine (LoM) a total of some 270 million tons would be mined.

The mineralised sand will first be concentrated in the Primary Concentrator Plant (PCP) to produce a Heavy Mineral Concentrate (HMC). The HMC will then be processed in a Mineral Separation Plant (MSP) where the final products - ilmenite, monazite, zircon and rutile - will be produced.

HEALTH IMPACT ASSESSMENT METHODOLOGY

A Health Impact Assessment (HIA) is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. An HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population. The methodology of this HIA was based on the Good Practice Note (GPN) for HIAs as supported by the International Finance Corporation (IFC). The IFC has published a set of Performance Standards (PS) for large projects that will require international funding. PS4 which deals specifically with Community Health, Safety and

IFC Performance Standard 4 “Community Health, Safety and Security”

“The client will evaluate the risks and impacts to the health and safety of the Affected Communities during project life-cycle and will establish preventive and control measures consistent with Good International Industry Practice (GIIP), such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognised sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favour the prevention or avoidance of risks and impacts over minimization.”
Security, recognises that project activities result in both positive and negative impacts to communities. The GPN has been developed specifically to provide guidance on community health for this Standard.

This approach was supported by a systematic and consistent approach to collecting and analysing baseline health data through the Environmental Health Areas (EHA) framework. Twelve different EHAs are described, which provide a linkage between project-related activities and potential positive or negative community-level impacts. This incorporates a variety of biomedical and key social determinants of health. Through this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of focusing primarily on disease-specific.

Specific Potentially Affected Communities (PACs) and health impacts related to different activities of the Project have been described.

COMMUNITY HEALTH IMPACT ASSESSMENT ACTIVITIES

The specific activities of the community HIA (cHIA) included:

- A desktop literature review outlining the host country and community health profile;
- Collecting primary data by participatory means with the use of semi-structured questionnaires and key informant interviews with relevant stakeholders;
- Collecting additional secondary information that was not available in the public domain that is available in published and grey data;
- Understanding proposed Project designs, present and planned work activities, project schedule and location of PACs;
- Considering the potential future health impact that the proposed Project will have on the health of the respective communities;
- Determining the existing health needs of the community based on health strategies, infrastructure, programs, service priorities, delivery plans and challenges; and
- Developing evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the proposed Project at the relevant project stage.

The field work was performed by cHIAs specialists from Digby Wells. The desktop work was completed in March 2014. The field work took place from the 2nd to 8th of March 2014.

The cHIA team consulted a broad range of stakeholders. Key informant interviews were conducted with district health authorities and medical personnel at the local health facilities and hospitals. Focus Group Discussions (FGDs) were held in five (5) communities that are in close proximity to the proposed Project including:

- Stofkraal;
- Molsvlei;
- Lepelsfontein;
- Garies; and
KEY FINDINGS AND RECOMMENDATIONS

Access to the Healthcare facilities is a challenge for the communities in the proposed Project area as many reside more than 20 km from a health service point and have to rely on public or private transport to access care. In the area surrounding the proposed Project footprint healthcare provision is mainly in the form of mobile clinics which visit the communities once in two weeks. Emergency services are limited, especially after clinic operating hours (4 pm). Services are free substantiated by more than 90% of respondents claiming not to pay for medical services. Some respondents claimed to have to pay for the state ambulance. The communities have a relatively high dependency ratio due to the high levels of poverty and unemployment.

Under the light of Healthcare services and infrastructure, the proposed Project impacts need to be considered in two tangents. One, being a positive impact whereby there is the potential for the proposed Project to support the development of improved health services through direct and indirect interventions; and the second, being a negative impact whereby the proposed Project may stretch the already burdened capacity of the Healthcare services in the KLM and communities in the vicinity of the proposed Project area.

An influx of people into the proposed Project area can be expected and may have specific health impacts. The spontaneous migration and settlement of labourers and their families may introduce a wide range of concerns into the proposed Project area. These include:

- Increased use of and demand for already inadequate community housing, water, sanitation, food, and medical services can mean that health needs go unmet and new health challenges arise (with a likely increase in cost);

- Housing inflation and potential increase in communicable diseases including tuberculosis (TB) and Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS). This can, however, be mitigated by Health Systems Strengthening (HSS) to improve TB case detection and case management in local dispensaries; developing and maintain site based TB and HIV/AIDS policies and programs; as well as TB outbreak preparedness and response plans;

- Emergency services are already limited in the area and an increase in trauma and accidents will place additional burdens on the health infrastructure; and

- The potential for an increase in accidents and injuries due to changes in road traffic, may significantly and adversely affect levels of accidents in the area.

Poverty and high levels of illiteracy and unemployment play a key role in local social challenges within the KLM. The youth are especially at major risk for social ills such as alcoholism and drug abuse. These in turn play a major role in domestic violence and high risk sexual behaviour. There is a high degree of hopelessness in communities, which is especially pronounced amongst the youth.

There is the possible impact due to increased demand on limited services and an increased potential for environmental contamination. Zirco could support local authorities with sanitation programs in Project affected communities.
A number of determinants can influence the potential for an increase in HIV/AIDS in the proposed Project area. These are generally as an indirect influence of the Project but some direct impacts from the workforce do exist. Some mitigation measures to abate these include: developing an HIV/AIDS and STI policy and program that incorporates both the workplace and community considerations; developing a community based HIV and Sexually Transmitted Illness (STI) strategy; implementing HIV/AIDS education programs.

An influx of people during the construction and operational phases of the proposed Project may result in food inflation, increasing food deprivation and nutrition-related diseases. If long term food inflation occurs, food deprivation may affect susceptible sub-populations such as the children and marginalised groups. Poor food hygiene practices may also increase food-related illnesses. More consumption of fast food related to increased income may increase non-communicable (lifestyle) diseases such as obesity and diabetes. This can be mitigated through curbing food inflation and assisting with food and sanitation awareness materials. Providing education on lifestyle behaviours, including eating habits, exercise, etc. would also lessen the health impacts thereof. Zirco, together with the communities, can improve food security by assisting with school feeding programs, including education on food gardens, nutrition, and good nutritional habits.

The proposed Project may lead to increased traffic loads on primary and access roads and has thus the potential to increase the number of traffic accidents. This can be abated through improving road safety by collaborating with the district road-safety unit to establish and maintain pictorial road-safety signage near the site in local language (Afrikaans) and English language (if needed); clearly demarcated pedestrian crossings in appropriate places etc. This could be achieved by establishing and implementing a Traffic Management Plan.

With regards to the social determinant of health, the expected influx of people and increased income may result in illegal substances being available more freely. It is difficult to speculate whether the prevalence of tobacco smoking and or substance abuse will increase due to the presence of the proposed Project. However, it is likely that it will increase as there will be an increase in the number of young people with more than adequate incomes, who will be in a position to afford these commodities. Zirco may be in a position to conduct substance-abuse prevention education programs in the workplace and within the already affected (by drugs and alcohol) communities.

When discussing the exposure of people to potentially hazardous materials, noise and malodours, one needs to be cognisant of the in-migration of people. An influx of people into the proposed Project area may increase domestic activities, including the use of domestic fuels. This may result in an increase in air pollution exposure, followed by associated increases in the prevalence of related respiratory illnesses. The clearing of the site (construction phase) and vehicular movement are the main activities and may have potential impacts on the ambient noise levels—affecting surrounding farmers. Increased activity of vehicles and heavy machinery may also have some contribution to the increased local noise levels on surrounding farmers. There is sufficient evidence that noise causes adverse health effects such as cardiovascular effects.
SUMMARY HEALTH IMPACT ASSESSMENT

The major health impacts of concern and outcomes of the impact assessment are presented in the table below.
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<tr>
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<tr>
<td>EHA#9: Social determinants of health – Social Cohesion and</td>
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<td>Temporal Scale</td>
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<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<tr>
<td>ANC</td>
<td>Antenatal Care</td>
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<tr>
<td>APPA</td>
<td>Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)</td>
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<tr>
<td>ARV</td>
<td>Antiretroviral Drugs</td>
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<tr>
<td>BoD</td>
<td>Burden of Disease</td>
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<tr>
<td>BUR</td>
<td>Bed Utilisation Rate</td>
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<tr>
<td>CARMMA</td>
<td>Campaign on Accelerated Reduction of Maternal Mortality in Africa</td>
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<td>cHIA</td>
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<td>CHMP</td>
<td>Community Health Management Plan</td>
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<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
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<td>DEA</td>
<td>Department of Environmental Affairs</td>
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<td>DG</td>
<td>Director General</td>
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<td>DoH</td>
<td>Department of Health</td>
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<td>HAART</td>
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<td>HIV</td>
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<td>Health Professions Council of South Africa</td>
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<td>Key Performance Indicator</td>
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<td>Abbreviation</td>
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<td>LM</td>
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<td>M&amp;E</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>XDR-TB</td>
<td>Extensively Multidrug Resistant TB</td>
</tr>
<tr>
<td>YLLs</td>
<td>Years of Life Lost</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Project Location

The proposed Project is located near Groenriviermond, approximately 500 km north of Cape Town, in the Kamiesberg Local Municipality (KLM), within the Namakwa District Municipality (DM). The town of Garies, located approximately 35 km northeast of the site, is the closest town from the proposed Project area. The town of Bitterfontein, with a suitable railway siding, is located 65 km south of Garies. Springbok, the regional administration centre for the Namaqua area, is located 117 km north of Garies.

1.2 Terms of Reference

Digby Wells Environmental (Digby Wells) has, on behalf of Zirco, been subcontracted by Coastal and Environmental Services (CES) to conduct a community Health Impact Assessment (cHIA) for a proposed heavy mineral sands mine Project in the Northern Cape. A cHIA was conducted as a specialist study for the compilation of the Environmental and Social Impact Assessment (ESIA). This study evaluated the different types of evidence from readily available information, in order to assess the health impacts associated with the Project on the population of concern. In so doing, the project aimed to adhere to the relevant provisions contained in the Equator Principles (IFC, 2006). These provisions had been derived from the principles themselves and the International Finance Corporation (IFC)’s Performance Standards and Environmental Health and Safety (EHS) Guidelines.

The Terms of Reference for the cHIA comprised the following:

- Desktop literature review in order to:
  - Outline the country and regional health status; and
  - Review country-specific health regulations.

- A field visit in order to:
  - Undertake primary participatory data collection in the form of Focus Group Discussions (FGDs), interviewing women in the different Potentially Affected Communities (PACs);
  - Gather additional information that was not available in the public domain during the desktop review. This includes collection of information from health facilities, from the national health information management system, as well as from unpublished reports and documents;
  - Identify key informants and conduct interviews using a semi-structured questionnaire;
  - Assess the standards of the local health facilities and functionality of the health management information system; and
Visualise the project and location of communities in relation to planned project activities.

Impact assessment process which involved:

- Considering the potential future health impacts that the proposed project will have on the health of the respective communities;
- Determining the existing health needs of the community based on health strategies, infrastructure programs, service priorities, delivery plans and challenges;
- Based on the existing evidence, rating the likelihood and consequence of different health impacts to outline their significance and prioritisation for mitigation; and
- Considering recommendations for mitigation/management of priority impacts. Recommend measures to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant project stage.

2 Project Description

2.1 Current Status of the Project

Zirco holds the prospecting rights to the Roode Heuvel and Leeuvlei deposits, and are also in the process of acquiring prospecting rights for a further deposit immediately east of and adjacent to Roode Heuvel, referred to as “Sabies”. This report deals with all three areas which combined form Zirco’s Kamiesberg Project (Project). Information regarding the deposits has been based on a drilling program on the Roode Heuvel and Leeuvlei portions, as Zirco has not drilled the Sabies deposit yet.

To date Zirco has completed 12 843 m of air core drilling and fully delineated the deposits on Roode Heuvel and Leeuvlei. Drilling was extended to the basement rock to fully define the depth of the deposit. Global Total Heavy Mineral grades (THM) are in the order of 3%, with both deposits together projected to contain some 1 400 million tons of mineralised sand. These sands consist of surface aeolian sand (referred to as Red Aeolian Sands - RAS), and higher slimes, mineralised sand (referred to as Orange Feldspathic Sands – OFS). These make up the bulk of the deposit. Basal grits and conglomerates are locally developed immediately above the basement.

2.2 Project Activities

Based on the drilling program completed, mineral resource estimates and mining studies undertaken at the Roode Heuvel deposit alone has an estimated mineral reserve of 270 million tons at 4.8% THM which could support 20 years of mining at a rate of 1 500 to 2 300 tons per hour (tph). Mining operations are planned to cover approximately 3 500 hectares.

Dry mining using front end loaders is the most likely scenario. It is a low risk option and does not require as much water as a dredge mining operation. The latter could also be unsuitable
given the high amounts of slimes in the deposit. Initial mining will target the higher grade areas at an initial rate of 1 000 to 1 500 tph. After year 6 the operation will move to the lower grade areas and the mining rate will increase to 1 800 to 2 300 tph to maintain an average output of about 520 000 tons per annum (tpa) of heavy mineral concentrate. Over a 20 year mine life a total of some 270 million tons would be mined.

The mineralised sand will first be concentrated in the Primary Concentrator Plant (PCP) to produce a Heavy Mineral Concentrate (HMC). The HMC will then be processed in a Mineral Separation Plant (MSP) where the final products - ilmenite, monazite, zircon and rutile - will be produced.

It is important to be aware that the heavy mineral sands will be concentrated through the production of the HMC and may therefore be considered to be above the naturally background radiation levels.

Two options exist for the transport of products from the mining operation to the markets:

- A combination of rail and road haulage; and
- Road transport only.

While the Project has been designed to minimise overall infrastructure requirements, mineral sands mining and processing plants require substantial quantities of water and energy (both in the form of fuel and electricity) to operate. Either groundwater or sea water will be used for the wet separation of HMC from sand in the PCP. The amount of sea water required for the PCP is estimated at 12 million m³ per annum. Three types of sea water intake works have been proposed as a source of water for the mine, these include:

- Open water intake in Khnyp Bay as a stand-alone installation;
- An open water intake in Khnyp Bay as part of the envisaged new harbour development; and
- Gully intakes.

The quantity of freshwater that will be required was estimated at 690 000 m³ per annum. This will be used for potable water and to remove salt from the HMC prior to it going into the MSP.

To provide this fresh water, a reverse osmosis desalination plant is planned to be constructed at the mine site. The desalination plant will either treat brakish ground water or sea water brought to the mine site as process water. A small quantity of this seawater will be bled off to supply the desalination plant with raw water. The freshwater produced from the desalination plant will be used to wash salt from the HMC prior to separation in the MSP. Water used to wash HMC will be recycled into the process water.

Feasibility study project managers and international experts in heavy mineral mining, TZ Minerals International, have estimated a power requirement of 15 MW, to be sourced from the National power grid. This line would need to be constructed from the Frontier Rare Earths project at Zandkops Drift. TZMI intend to construct a high voltage transmission line to
service the project. The 35 km line from Frontier Rare Earth project to Roode Heuwel would be subject to a separate Environmental Impact Assessment undertaken directly on behalf of Eskom, and therefore does not fall part of this Project.

Approximately 10 million litres of fuel will be required for the MSP and related Project use per annum. Both diesel and paraffin will be required, necessitating the need for constructing a fuel depot. This will be done by a fuel supply company who will sell fuel on site to the mine.

2.3 Proposed Infrastructure

In addition to the mining and associated infrastructure (mineral separation plant, primary concentrator plant, tailings dam, offices, workshops and stores, for example.), the Project will also require the construction of various ancillary infrastructures such as, but not limited to, the following:

- Seawater intake, desalination plant, pumping station and pipeline;
- Waste water treatment works;
- Product transfer stations;
- Airstrip;
- Upgrade of the provincial road to and junction with the N7 road;
- Fuel depot; and
- Construction and operation accommodation.

3 Statutory Requirements

This section provides an overview of legislation pertaining to the undertaking of an impact assessment specific to the health of surrounding communities.

3.1 South African legislation pertaining to community Health

3.1.1 The Constitution

Sustainable development discourse is used in this guideline document. The over-arching legislation is the Constitution of South Africa, in particular Section 24, which places people and their needs at the forefront of environmental management. The Constitution provides a right to “an environment that is not harmful to [human] health or well-being” and to have the environment protected, for the benefit of present and future generations, through reasonable legislative measures. These measures include the prevention of pollution and ecological degradation, the promotion of conservation, the securing of ecologically sustainable development and the utilisation of natural resources while promoting justifiable economic and social development.
3.1.2 The National Health Act (Act 61 of 2003)

The National Health Act, 2003 (Act No. 61 of 2003) (NHA) provides a framework for a structured uniform health system in South Africa, taking into account the obligations with regard to health services imposed on the national, provincial and local governments by the Constitution and other laws. Section 20 gives legal effect to the functions of Environmental Health with regard to environmental health management. The Director General (DG) should issue and promote adherence to, norms and standards on health matters, including conditions that constitute a health hazard and facilitate the provision of indoor and outdoor environmental pollution control services. The Act also provides for environmental health investigations in Section 88.

3.1.3 National Ambient Air Quality Standards

The Department of Environmental Affairs (DEA) issued ambient air quality guidelines for several criteria pollutants, including particulates, sulphur dioxide, oxides of nitrogen, lead, ozone and carbon monoxide. The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) adopted these guidelines as National ambient air quality standards. On 2 June 2006, the Minister of Environmental Affairs and Tourism announced his intention of setting new ambient air quality standards in terms of Section 9(1)(a) and (b) of the NEM:AQA. The proposed new standards were published for public comment in the Government Gazette of 9 June 2006. Since then, updated draft National standards with allowable frequencies of exceedance and compliance timeframes have been proposed.

The prevailing legislation in the Republic of South Africa with regards to the Air Quality field is the NEM:AQA. The NEM: AQA serves to repeal the Atmospheric Pollution Prevention Act (Act no. 45 of 1965) (APPA) and various other laws dealing with air pollution.

The purpose of NEM: AQA is to set norms and standards that relate to:

- Institutional frameworks, roles and responsibilities;
- Air quality management planning;
- Air quality monitoring and information management;
- Air quality management measures; and
- General compliance and enforcement.

Guidelines provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human health and wellbeing World Health Organization (WHO, 2000). Once the guidelines are adopted as standards, they become legally enforceable. These standards prescribe the allowable ambient concentrations of pollutants which are not to be exceeded during a specified time period in a defined area. If the air quality guidelines/standards are exceeded, the ambient air quality is poor and the potential for health effects is greatest.
Air quality legislation comprises primary standards which protect human health and secondary standards which protect property, vegetation, climate and aesthetic values. The development of new industries that increase air pollution through the emission of gases in the atmosphere should be managed.

### 3.2 International Management Standards

There are a number of international guidelines or best practice guidelines that refer to community health in developing projects. The World Bank Group’s standards and norms, in particular those developed by its private sector arm, the International Finance Corporation (IFC), are generally considered as the benchmark. The IFC has published a set of Performance Standards for large projects that will require international funding. Performance Standard 4 (PS4): Community Health, Safety and Security, recognises that project activities result in both positive and negative impacts to communities (IFC, 2012). The objectives of this PS4 are:

- To avoid or minimise risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances; and
- To ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimises risks to the community’s safety and security.

The general PS4 community health and safety requirement states that the client will evaluate risks and impacts to the health and safety of the affected community during all stages of a project, and will establish preventative measures to mitigate and manage the identified health impacts. An Action Plan is to be disclosed and on-going engagement with affected communities is to be established (ibid.).

In addition to being considered the benchmark standards for major projects, the IFC’s Performance Standards are applicable to projects seeking financing from either the IFC or other Equator Principles funding institutions.

South Africa is a signatory to certain international conventions that may be applicable to the project and these may be seen to provide additional direction in the absence or limitation of local legislation or policy. Those relevant to health include the following:

- The United Nations Declaration on Rights of the Indigenous Peoples;
- Stockholm Convention on Persistent Organic Pollutants;
Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal; and

United Nations Agencies including:

- United Nations Environmental Program;
- International Health Regulations as promulgated by the World Health Organization; and

3.3 Company Management Standards

Normally, company management standards with regard to community health would also be included in this chapter of a cHIA report. However, Zirco is a new company, and Company Management Standards pertaining to community health have not yet been formulated.

4 Health Impact Assessment Methodology

4.1 Introduction and Definition

A Health Impact Assessment (HIA) is a practical, multi-disciplinary process, combining a range of qualitative and quantitative evidence in a decision-making framework. An HIA seeks to identify and estimate the lasting or significant changes of different actions on the health status of a defined population (Winkler et al., 2010). An HIA may be defined as “a combination of procedures, methods and tools by which a project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population”. The objective of an HIA is to deliver evidence-based recommendations to maximize potential positive health benefits and prevent or mitigate any detrimental health impacts that a project may have on the potentially affected communities (PAC) (WHO/ECHP, 1999, IAIA, 2006).

The WHO defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This is influenced through complex interaction of social, economic, genetic, and environmental factors (WHO, 2010c).

The holistic model of health used in the HIA process acknowledges that the health status of a population is affected by factors known as health determinants (e.g. education, income level, health services, etc.). All of these are closely interlinked and differentials in their distribution lead to health inequalities. These include both biophysical and social determinants of health as well and not just purely health outcomes. The methodology allows HIA practitioners to consider how a project affects these determinants of health, as well as health outcomes.

4.2 Definition of the Study Areas

The aim of this section is to define the geographical regions affected by the proposed Project.
4.2.1 Country Specific
For the purpose of this Report, the term “country specific” refers to South Africa, as country – national information.

4.2.2 Project Region
For the purpose of this Report, the term “project region” refers to the Namakwa District Municipality.

4.2.3 Local Level
For the purpose of this Report, the term “local level” refers to the KLM, inclusive of communities engaged with during the site visit (Section 4.7.1.3).

4.2.4 Project Area
The “Project area” is the geographic area (near Groenriviermond, KLM) in which Zirco plans to mine heavy minerals. The affected farm portions included within the Project area are detailed in Table 4-1 below.

Table 4-1: Farm names of Project area

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Affected Farm Portions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roode Heuvel</td>
<td>Portion 1 of Roode Heuvel 502</td>
</tr>
<tr>
<td></td>
<td>Portion 5 of Roode Heuvel 502</td>
</tr>
<tr>
<td></td>
<td>Portion 6 of Roode Heuvel 502</td>
</tr>
<tr>
<td></td>
<td>Portion 9 of Roode Heuvel 502</td>
</tr>
<tr>
<td></td>
<td>Remaining Extent Klipdam 633</td>
</tr>
<tr>
<td>Leeuvlei</td>
<td>Remaining Extent Leeuvlei 642</td>
</tr>
<tr>
<td></td>
<td>Portion 1 of Soutkraal 437</td>
</tr>
<tr>
<td></td>
<td>Portion 9 of De Klipheuvei 435</td>
</tr>
<tr>
<td></td>
<td>Portion 10 of De Klipheuvei 435</td>
</tr>
<tr>
<td>Sabies</td>
<td>Portion 11 of De Klipheuvei 435</td>
</tr>
<tr>
<td></td>
<td>Portion 2 of Sabies 505</td>
</tr>
<tr>
<td></td>
<td>Portion 8 of Sabies 505</td>
</tr>
</tbody>
</table>
4.3 Overview of the HIA Process

A standardised approach was considered for the chIA to ensure that evidence based recommendations supported the impact assessment. To ensure compliance with the IFC performance standards, and especially PS4, the methodology outlined in the Good Practice Note for HIA from the IFC, was adopted (IFC, 2012, International Finance Corporation (IFC), 2008). The main elements of this are discussed briefly below so that the context of the HIA is understood.

The framework that is commonly used for an HIA follows a 6-step process (IFC, 2009):

- Screening (preliminary evaluation to determine the necessity of an HIA);
- Scoping (identifying the range of potential project-related health impacts and defining the terms of reference for the HIA, based on published literature, local data and broad stakeholder consultation and how these may be influenced by the proposed project);
- Risk assessment (qualitative and quantitative appraisal of the potential health impacts in relation to defined communities and the project development, including stakeholder participation);
- Appraisal and mitigation (development of a Community Health Management Plan (CHMP) based on the findings of the risk assessment);
- Implementation and monitoring (realisation of the CHMP including monitoring activities that allow for adaptation); and
- Evaluation and verification of performance and effectiveness (key step to analyse the chIA process as a whole).

4.4 Assessment of the chIA

The chIA for the proposed Project is being conducted at the exploration stage and as a prospective assessment. It will thus be available to influence design and inform the construction, operation and decommissioning phases of the proposed Project. As HIAs are dynamic iterative processes they do require flexibility in their methodologies and tools, so that they can be fit for purpose for different projects.

Thus, the form of the chIA for the proposed Project needed to be defined from the outset based on the three levels of HIA that are currently performed as described in Table 4-2 (IFC,
Based on the scope of work proposed by Zirco; a rapid appraisal approach was considered the most suitable based on the nature of the project.

Performing a rapid appraisal HIA does not mean that the level of effort or analysis of the HIA is minimised, or that the potential for significant health impacts is missing. It only implies that new primary data (especially biomedical indicators) are not collected (IFC, 2009). The activities undertaken in the rapid HIA are highlighted in Table 4-2.

**Table 4-2: Levels of HIA (IFC, 2009)**

<table>
<thead>
<tr>
<th>Level of HIA</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop HIA</td>
<td>Provides a broad overview of possible health impacts;</td>
</tr>
<tr>
<td></td>
<td>Analysis of existing and accessible data;</td>
</tr>
<tr>
<td></td>
<td>No new project specific survey data collection.</td>
</tr>
<tr>
<td>Scoping/Rapid Appraisal HIA</td>
<td>Provides more detailed information of possible health impacts;</td>
</tr>
<tr>
<td></td>
<td>Analysis of existing data;</td>
</tr>
<tr>
<td></td>
<td>Stakeholder and key informant analysis; and</td>
</tr>
<tr>
<td></td>
<td>No new project specific survey data collection.</td>
</tr>
<tr>
<td>Comprehensive HIA</td>
<td>Provides a comprehensive assessment of potential health impacts;</td>
</tr>
<tr>
<td></td>
<td>Robust definition of impacts;</td>
</tr>
<tr>
<td></td>
<td>New project specific survey data collection; and</td>
</tr>
<tr>
<td></td>
<td>Participatory approaches involving stakeholders and key informants.</td>
</tr>
</tbody>
</table>

A rapid appraisal uses information already available or easily accessible. A field visit confirms the literature review and acts as “ground-truthing” verification. New data collection is not considered and this is a defining characteristic of a rapid appraisal. Some type of limited workshop or discussion with key internal and external stakeholders is planned. Specific and relatively narrow boundaries or parameters are specified. A qualitative assessment is performed and documented.

### 4.5 Stratification into Potentially Affected Communities

To identify and quantify potential health impacts, an accurate population profile needs to be determined. This is important to distinguish between differences in exposure and susceptibility (Mindell, 2001). Therefore, besides a demographic profile of the at-risk population and the identification of the most vulnerable groups, it is essential to understand how the development, construction and operation activities are likely to impact at both a household and community level.

The relevant overall population is divided into Potentially Affected Communities (PACs). A PAC is a defined community within a clear geographical boundary where project-related health impacts may reasonably be expected to occur.
The PACs which have been identified for this project are:

- Stofkraal;
- Molsvlei;
- Lepelsfontein;
- Kharkhams;
- Kamieskroon;
- Groenriviermond (farmers);
- Garies; and Spoegrivier.

PACs are inherently prospective and simply represent best professional judgments. PACs are likely to change over the course of project implementation; and there may be changes in the project design, and thus its longer term implications are never fully known. This implies that the definition of PACs may need changing as more is known about the project (Winkler, 2010). Mitigation strategies also require specific considerations for the different PACs (ibid.).

4.6 Impact Categorisation: Environmental Health Areas (EHAs) Framework

The IFC methodology makes use of twelve Environmental Health Areas (EHAs) to support the systematic analysis of health considerations. These are summarised in Table 4-3. The set of EHAs provides a linkage between project-related activities and potential positive or negative community-level impacts and incorporates a variety of biomedical and key social determinants of health. In this integrated analysis, cross-cutting environmental and social conditions that contain significant health components are identified instead of an HIA focusing primarily on disease-specific considerations – as is frequently done in many biomedical analyses of potential project-related public health impacts. The EHA framework is based on an analysis performed and published by the World Bank (IFC, 2009).

**Table 4-3: Environmental Health Areas**

<table>
<thead>
<tr>
<th>Environmental Health Areas (EHAs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Vector-related diseases</strong> – Mosquito, fly, tick and lice-related diseases (e.g. malaria, dengue, yellow fever, lymphatic filariasis, rift valley fever, human African trypanosomiasis, onchocerciasis, etc.)</td>
</tr>
<tr>
<td>2. <strong>Acute respiratory infections and respiratory effects from housing</strong> – Transmission of communicable diseases (e.g. acute respiratory infections, pneumonia, tuberculosis, meningitis, plague, leprosy, etc.) and respiratory infections that can be linked to overcrowding and housing inflation. It also considers indoor air pollution related to use of biomass fuels.</td>
</tr>
<tr>
<td>3. <strong>Veterinary medicine and zoonotic issues</strong> – Diseases affecting animals (e.g. bovine tuberculosis, swinepox, avian influenza) or that can be transmitted from animal to human (e.g. rabies, brucellosis, Rift Valley fever, Lassa fever, leptospirosis, etc.)</td>
</tr>
</tbody>
</table>
### Environmental Health Areas (EHAs)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Sexually-transmitted infections, including Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) – Sexually-transmitted infections such as syphilis, gonorrhoea, chlamydia, hepatitis B and, most importantly, HIV/AIDS. Linkages of TB will be discussed where relevant under HIV, but often linked to EHA1.</td>
</tr>
<tr>
<td>5</td>
<td>Soil-, water- and waste-related diseases – Diseases that are transmitted directly or indirectly through contaminated water, soil or non-hazardous waste (e.g. diarrheal diseases, schistosomiasis, hepatitis A and E, poliomyelitis, soil-transmitted helminthiases, etc.)</td>
</tr>
<tr>
<td>6</td>
<td>Food- and nutrition-related issues – Adverse health effects such as malnutrition, anaemia or micronutrient deficiencies due to e.g. changes in agricultural and subsistence practices, or food inflation; gastroenteritis, food-borne trematodiases, etc. This will also consider feeding behaviours and practices. Access to land plays a major role in developing subsistence farming contexts.</td>
</tr>
<tr>
<td>7</td>
<td>Accidents/injuries – Road traffic or work-related accidents and injuries (home and project related); drowning</td>
</tr>
<tr>
<td>8</td>
<td>Exposure to potentially hazardous materials, noise and malodours – This considers the environmental health determinants linked to the project and related activities. Noise, water and air pollution (indoor and outdoor) as well as visual impacts will be considered in this biophysical category. It can also include exposure to heavy metals and hazardous chemical substances and other compounds, solvents or spills and releases from road traffic and exposure to mal-odours. There is a significant overlap in the environmental impact assessment in this section. Ionizing radiation also falls into this category.</td>
</tr>
<tr>
<td>9</td>
<td>Social determinants of health – Including psychosocial stress (due to e.g. resettlement, overcrowding, political or economic crisis), mental health, depression, gender issues, domestic violence, suicide, ethnic conflicts, security concerns, substance misuse (drug, alcohol, smoking), family planning, health seeking behaviours, etc. There is a significant overlap in the Social Impact Assessment (SIA) in this section.</td>
</tr>
<tr>
<td>10</td>
<td>Cultural health practices – Role of traditional medical providers, indigenous medicines, and unique cultural health practices</td>
</tr>
<tr>
<td>11</td>
<td>Health systems issues – Physical health infrastructure (e.g. capacity, equipment, staffing levels and competencies, future development plans); program management delivery systems (e.g., malaria-, TB-, HIV/AIDS-initiatives, maternal and child health, etc.)</td>
</tr>
<tr>
<td>12</td>
<td>Non-communicable diseases – Cardiovascular diseases, cancer, diabetes, obesity, etc.</td>
</tr>
</tbody>
</table>

### 4.7 Impact Assessment

The core activity of an HIA is the prediction, evaluation and mitigation of impacts (IFC, 2009). The significance of identified health impacts can be evaluated by drawing on: (i) the available health data from the literature review; (ii) the information generated through stakeholder consultation; (iii) the knowledge of the project context and developments; (iv)
input from other specialist studies that inform the elements of the ESIA and (v) experience of previous HIAs in similar settings (Winkler et al., 2010).

To ensure consistency across the different EHAs, a standardised impact assessment guideline was adopted for this study (IFC, 2009).

The Impact Assessment Process:

- Considers the potential future health impacts that the Project will have on the health of these respective communities;
- Determines the existing health needs of the community based on health strategies, infrastructure, programs, service priorities, delivery plans and challenges;
- Is based on the existing evidence rank, the likelihood and consequence of difference health impacts to outline their significance and prioritisation for mitigation. A confidence ranking will be applied based on the available evidence; and
- Develops evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant project stage.

4.7.1 Baseline Data Collection

The data collection activities of the cHIA included a desktop literature review, participatory data collection (stakeholder input – questionnaire and Focus Group Discussions (FGD)) and direct observation. This method allows for the triangulation of data and provides a robust description of data as shown in Figure 4-1 (Winkler et al., 2011).

![Figure 4-1: Triangulation of data (Winkler et al., 2011)]
4.7.1.1 Desktop Work

This involved a literature review of health related data in the public domain as well as a review of existing project documentation and related secondary data. The literature review was completed before the field visit so that data gaps could be identified and questioning routes for Key Informant Interviews (KII) and questionnaires could be developed. Priority was given to topics that contributed the most towards the burden of disease in South Africa and the proposed Project area and also to health-related incidents related to mining.

The desktop work included an extensive literature review to inform the health profiling of the region and where possible the population in the proposed Project area. The desktop work described the broad health status of the population, based on a systematic review of the 12 EHAs. It must be noted that there is limited information in the public domain regarding the health profile in the Northern Cape, especially at the local level.

The outcomes of the literature review are presented in Section 6 of this Report and have been combined with the information that was acquired during the field visit and subsequent project documentation review.

4.7.1.2 Questionnaire Design

Participatory tools were used in data collection. These tools included a semi structured interview with key informants, and a questionnaire. The questionnaires were designed to assist in the identification of the major health concerns for the community (HIV/AIDS, TB, arthritis, diabetes etc.), institutional issues (satisfaction or lack thereof with health facilities), socio-economic aspects and environmental concerns. While not all these concerns are directly related to human health, they do provide useful insight into the communities served by the healthcare facilities.

These questionnaires and discussions also sought to establish Knowledge, Attitudes, Practices, and Belief (KAPB) for specific diseases such as HIV/AIDS. The questionnaires used for the purpose of this study have been appended to this Report, see Appendix A for the Focus Group Discussion Questionnaire, and Appendix B for the Key Informant Interview Questionnaire.

4.7.1.3 Field Visit

A field visit was conducted in order to collect primary participatory data in the form of interviews with men (farmers) and women (FGD and farmers wives) in the different project affected communities. The field work took place from the 2nd to 8th of March 2014. This was conducted by Ms Vumile Dlamini, a member of the cHIA Unit of Digby Wells.

A crucial part of the field visit was to consult stakeholders who have special knowledge of the health status as well as socio/cultural behaviours and norms of the PACs. The aim was to gain a comprehensive picture of the general health situation and to better understand potential health impacts of the proposed Project. It is acknowledged that broad stakeholder engagement is an important element throughout the cHIA process and the district health authorities were consulted to support this.
The field visit also provided an opportunity to visualise and assess the prevailing situation in the communities and their relation to the proposed Project. This was important in order to understand the potential areas of influence of the project and also the general living conditions in the communities living in the proposed Project area.

4.7.1.3.1 Key Informant Interviews

Interviews were conducted with key Healthcare personnel from five (5) Healthcare facilities (Appendix A). The objective of these interviews was to gain a better understanding of the structure and capacity of the local health system and also to enquire what health statistics were available at the local level and where possible obtain authorised copies of statistics and reports. KIs were conducted with the health personnel at these facilities, using a semi-structured questionnaire. This included specific questions about health, social and environmental determinants but with a different emphasis, depending on the level and role of each key informant being interviewed. Interviews and discussions were open and conducted in English and Afrikaans.

The key informants consulted during the field visit are detailed in Table 4-4.

<table>
<thead>
<tr>
<th>Date:</th>
<th>Facility name:</th>
<th>Name of person interviewed:</th>
<th>Designation:</th>
<th>Contact details:</th>
<th>Location (village/town):</th>
<th>Type of facility:</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 March 2014</td>
<td>Stofkraal Community Health Centre</td>
<td>Berlina Andrews</td>
<td>Community Home Based Carer</td>
<td>0743288 526</td>
<td>Stofkraal</td>
<td>Clinic</td>
</tr>
<tr>
<td>06 March 2014</td>
<td>Garies Clinic</td>
<td>Sister Magda van Rooyen</td>
<td>Professional Nurse</td>
<td>0276521025</td>
<td>Garies</td>
<td>Clinic</td>
</tr>
<tr>
<td>07 March 2014</td>
<td>Kamieskroon Clinic</td>
<td>Sister S.M Adams</td>
<td>Professional Nurse</td>
<td>0276721619</td>
<td>Kamieskroon</td>
<td>Clinic</td>
</tr>
<tr>
<td>07 March 2014</td>
<td>Kharkhams Clinic</td>
<td>Maria Damons</td>
<td>Facility Manager</td>
<td>0276822043</td>
<td>Kharkhams</td>
<td>Clinic</td>
</tr>
<tr>
<td>07 March 2014</td>
<td>Joe Slovo Community Health Centre</td>
<td>Sister Bekeur</td>
<td>Professional Nurse</td>
<td>0276528100</td>
<td>Garies</td>
<td>Hospital</td>
</tr>
</tbody>
</table>

4.7.1.3.2 Focus Group Discussions

A questionnaire was designed (discussed above) and formal FGDs were conducted (Appendix B). This method was selected for the purpose of this study as semi-structured questionnaires and it was decided to only include women groups during the FGD as they are generally considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level.

In addition to visiting the local health facilities, FGDs were conducted within the Project area and surrounds (Table 4-5), See Plan 1 (Appendix C). It was decided to only include women groups during the field visit as they are generally considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level. This allows for a high level understanding of the health
challenges, from both a biophysical and social health perspective. The discussions were conducted in Afrikaans, as this is the most widely spoken language in the Region.

Table 4-5: Female Focus Group Discussions (Communities Visited)

<table>
<thead>
<tr>
<th>Date</th>
<th>Communities Visited</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-Mar-14</td>
<td>Stofkraal</td>
</tr>
<tr>
<td>05-Mar-14</td>
<td>Molsvlei</td>
</tr>
<tr>
<td>05-Mar-14</td>
<td>Lepelsfontein</td>
</tr>
<tr>
<td>06-Mar-14</td>
<td>Garies</td>
</tr>
<tr>
<td>06-Mar-14</td>
<td>Spoegrivier</td>
</tr>
</tbody>
</table>

4.8 Data Gaps and Limitations of the cHIA Study

This cHIA has focused on understanding the high level health issues in the proposed Project area. The cHIA also assessed health data gaps that may exist and determined whether additional information would be required to inform a more comprehensive health evidence base.

The gap analysis included a critical appraisal of data quality of sources identified during the cHIA process.

The following are the recognised limitations of the cHIA study:

- The cHIA study often refers to local level data which has some limitations that need to be understood and respected. Recording and reporting of the health data within the visited Healthcare facilities is completed manually, and it is likely that the recording may lack required accuracy. However, this information is invaluable in understanding the health challenges in the area, although the limitation must be considered when evaluating information, as the ability to use it as a robust baseline and to use it to monitor relevant health impacts is limited; and

- Interviews and FGDs are normally based on respondents’ self-declaration which may be prone to recall or response bias. Moreover, when it comes to questions on one’s private life, study participants tend to be affected by a social desirability bias, where they may choose to give answers that are socially acceptable.

5 Community Health Profile

5.1 An Introduction to the Most Common Illnesses

Prior to elaborating on the community health profile of the Country, Region, and the proposed Project area (as well as any key findings of this study), it is imperative to explicitly define some of the most important and common diseases as reported by the respondents within the PACs. This section aims to give a succinct explanation of these main diseases.
These diseases are not listed in any particular order of importance, relevance or prevalence. These definitions provided below are medically accepted and used by South Africa’s National Department of Health and the WHO.

5.1.1 Arthritis

Arthritis is a form of joint disorder that involves inflammation of one or more joints. The main symptoms of arthritis are joint pain and stiffness, which typically worsen with age. The two most common types of arthritis are osteoarthritis and rheumatoid arthritis. Osteoarthritis is usually caused by normal wear and tear, while rheumatoid arthritis is an autoimmune disorder. Other types of arthritis can be caused by uric acid crystals, infections or even an underlying disease, such as psoriasis or lupus. Treatments vary depending on the type of arthritis.

5.1.2 Asthma

Asthma is a disease that affects individual’s lungs. It causes repeated attacks of wheezing, breathlessness, chest tightness and night time or early morning coughing. During an asthma attack the sides of the airways in the lungs swell and the airways shrink. Less air gets in and out of the lungs. The mucus that one’s body produces clogs up the airways. The attack may include coughing, chest tightness, wheezing and trouble breathing. Asthma is generally hereditary and can also be triggered by exposure to environmental factors such as dust mites and tobacco smoke.

5.1.3 Cancer

Cancer is not just one disease, but a large group of almost one hundred diseases. Its two main characteristics are uncontrolled growth of the (abnormal) cells in the human body and the ability of these cells to migrate from the original site and spread to distant sites. If the spread is not controlled, cancer can result in death. As stated, there are various kinds of cancer with various causes, such as excessive intake of alcohol, smoking, harmful or hazardous substances in the air, exposure to too much sunlight etc. The symptoms of cancer depend on the kind of cancer that one has, and on which organ the cancer cells are attacking. Lung, stomach, liver, colon, and breast cancer cause the most cancer deaths each year. The most frequent types differ between men and women. About 30% of cancer deaths are due to the five leading behavioural and dietary risks:

- High body mass index;
- Low fruit and vegetable intake;
- Lack of physical activity;
- Tobacco use; and
- Alcohol use.
5.1.4 Chronic Obstructive Pulmonary Disease

Chronic Obstructive Pulmonary Disease (COPD), also known as chronic obstructive lung disease (COLD), and chronic obstructive airway disease (COAD), among others, is a type of obstructive lung disease characterized by chronically poor airflow. It typically worsens over time. Most people who have COPD smoke or used to smoke. Long-term exposure to other lung irritants, such as air pollution, chemical fumes, or dust, also contributes to COPD. The main symptoms include shortness of breath, cough, and sputum production. Cigarette smoking is the leading cause of COPD.

5.1.5 Diabetes

A disease characterised by an inability to process sugars in the diet, due to a decrease in or total absence of insulin production. Most of the food we eat is turned into glucose or sugar for our bodies to use as energy. The pancreas makes a hormone called insulin to help glucose to get into the cells of our bodies. When one has diabetes, their body either does not make enough insulin or cannot use its own insulin. This causes sugar to build up in the blood. Diabetes can cause serious health complications including heart disease, blindness, kidney failure and lower-extremity amputations. There are two types of diabetes, type 1 (characterised by abrupt onset of symptoms (often in early adolescence), insulinopenia, and dependence on exogenous insulin; it is due to lack of insulin production by the pancreatic beta cells) and type 2 (peaking in onset between 50 and 60 years of age, characterised by gradual onset with few symptoms of metabolic disturbance (glycosuria and its consequences) and control by diet, with or without oral hypoglycaemics but without exogenous insulin required).

5.1.6 HIV/AIDS

HIV is the Human Immunodeficiency Virus. This virus can lead to Acquired Immune Deficiency Syndrome or AIDS. HIV destroys white blood cells called CD4+ T cells. These cells help the body fight diseases. This means that HIV stops one’s body from fighting diseases.

HIV spreads when body fluids like blood or semen from an HIV positive person come into contact with broken skin from another person. The most common ways to get HIV is through unprotected (without a condom) sex with someone who is HIV positive, sharing needles, syringes and other equipment used to inject drugs, as well as from an infected mother. HIV cannot be contracted by casual contact like hugging, shaking hands or sharing dishes, closed mouth or “social” kissing, saliva, tears or sweat, insects like mosquitoes and air or water.

Men, money, and mobility, commonly known as the three M’s may have been among the most important drivers of the epidemic in its early days, but increasingly now poverty underpins the main risk factors. Bryceson et al. (2004) make an interesting observation on this: certain social groups, despite knowing the risks, continue to engage in high-risk behaviours. They do so to affirm their social identity. The transmission of HIV/AIDS may also
be influenced by considering the “three M’s” detailed in the sub-sections below (IFPRI, 2005).

5.1.6.1 Gender

Women are biologically, socioeconomically, and socio-culturally more at risk of HIV infection than men. Gender inequity shapes power relations and sexual relations and thus risk. The subservient status of women is a central feature of the risk environments of southern and eastern Africa, and HIV/AIDS exacerbates these inequalities (UNAIDS 1999). From a biological point of view, women are more susceptible to HIV infection than men. Evidence indicates that the pathogenesis of HIV-1 infection in women cannot be entirely inferred from what is known about HIV-1 infection in men.

There is mounting evidence that the female genital tract can serve as a reservoir for HIV infection (Burger and Weiser 2001; Hart et al. 1999; Kovacs et al. 1999). Male-to-female transmission of HIV is two to four times more efficient than female-to-male (Mastro and de Vincenzi 1996; de Vincenzi 1994; Nicolosi et al. 1994). Hayes et al. (1995) calculated the cofactor effect of genital ulcer diseases to be approximately five times higher for male-to-female than for female-to-male transmission. There is strong evidence that both ulcerative and nonulcerative Sexually Transmitted Diseases (STDs) promote HIV transmission by augmenting HIV infectious ness and HIV susceptibility through a variety of biological mechanisms.

5.1.6.2 Money

Economically, women’s dependence on men and their unequal access to resources, opportunities, and assets, including land, often place them at high risk. Low socioeconomic status not only increases the likelihood of a woman’s exchanging sex for money or goods; it also raises female chances of experiencing coerced sex and male and female odds of having multiple sexual partners. In addition, it lowers female chances of abstinence, female and male age at sexual debut, condom use at last sex, and communication with most recent sexual partner about sensitive topics.

5.1.6.3 Mobility

Mobility is a marker for enhanced risk. The movement of people itself is not inherently risky, but when single people move or families are split up—often as a consequence of poverty—the likelihood of their engaging in risky sexual practices tends to increase (Decosas and Adrien 1997; Barnett and Whiteside 1999; Whiteside et al. 2003; Hope 2001). Many of the points of intersection between households and services represent opportunities for the spread of infection. A recent study of HIV infection among women in urban South Africa showed that HIV prevalence was significantly higher among migrant women than non-migrant women (Zuma et al. 2003).
5.1.6.4  **Domestic Violence**

Violence against women, especially forced or coerced sex, increases women’s vulnerability to HIV/AIDS. In South Africa, Jewkes and Abrahams (2002) found that in the 17-to-48 age group there are 2,070 rape incidents per 100,000 women per year. Non-consensual sex in marriage and dating relationships is believed to be very common but is usually not well reported in surveys. Forced sexual initiation is reported by almost a third of adolescent girls. In addition, coerced sex is a common problem in schools and workplaces and among peers. The threat of violence affects women’s power and ability to negotiate the conditions of sexual intercourse, especially condom use. The threat of violence may also affect women's use of services such as testing for HIV and the extent to which they feel able to discuss their serological status with others and seek social support.

5.1.7  **Hypertension**

Hypertension (HTN) or high blood pressure, sometimes called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is elevated. Blood pressure is the force of blood pushing up against the blood vessel walls. The higher the pressure the harder the heart has to pump. Hypertension is a major risk factor for stroke, myocardial infarction (heart attacks), heart failure, aneurysms of the arteries (e.g. aortic aneurysm), peripheral arterial disease and is a cause of chronic kidney disease. Even moderate elevation of arterial blood pressure is associated with a shortened life expectancy. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of associated health complications, although drug treatment is often necessary in people for whom lifestyle changes are not enough or not effective.

The exact cause of hypertension is usually unknown. There are, however, some factors associated with the condition. These are: smoking, obesity or being overweight, diabetes, lack of physical activity, high levels of salt intake, insufficient calcium, potassium and magnesium intake, vitamin D deficiency, high levels of alcohol consumption, stress; aging medicines such as birth control pills, genetics and family history, chronic kidney disease and adrenal and thyroid problems.

5.1.8  **Tuberculosis**

Tuberculosis, or TB (*Tubercle Bacillus*) is a common, and in many cases lethal, infectious disease caused by various strains of mycobacteria, usually *Mycobacterium tuberculosis* (Kumar, 2007). Tuberculosis typically attacks the lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit respiratory fluids through the air. People nearby or in close proximity may breathe in these bacteria and become infected. The classic symptoms of active TB infection are a chronic cough with blood-tinged sputum, fever, night sweats, and weight loss (the latter giving rise to the formerly prevalent term "consumption").
5.1.9 Upper Respiratory Tract Infections

Acute Upper Respiratory Tract Infections (URTI) include rhinitis, pharyngitis/tonsillitis and laryngitis often referred to as a common cold, and their complications: sinusitis, ear infection and sometimes bronchitis (though bronchi are generally classified as part of the lower respiratory tract.) Symptoms of URTI's commonly include cough, sore throat, runny nose, nasal congestion, headache, low grade fever, facial pressure and sneezing. Onset of symptoms usually begins 1–3 days after exposure. The illness usually lasts 7–10 days.

Over 200 different viruses have been isolated in patients with URTIs. Probiotics may be useful in preventing URTIs. Vaccination may even help prevent URTIs, mostly against influenza viruses, adenoviruses, streptococcus pneumonia etc. Treatment depends on the underlying cause (Smith et al., 2008). There are currently no medications or herbal remedies which have been conclusively demonstrated to shorten the duration of the illness. Treatment comprises symptomatic support usually via analgesics for headache, sore throat and muscle aches.

5.2 General Health Profile: Country Specific

South Africa had an estimated population of 50.3 million people in 2011, of which slightly less than one million were under one year of age. The population density and the age-gender structure of the population vary dramatically across districts in the country. The aging index (ratio of the number of people 65+ to the number under the age of 15 years) gives an indication of how far districts are in the demographic transition and, thus, where the greatest burden on health services is likely to fall in the future. Districts in the Northern and Western Cape have the highest aging index (DoH, 2012).

5.2.1 Public and Private Health Sector

South Africa has a large public sector and a smaller but fast growing private sector. The country’s Healthcare system comprises a network of health facilities providing primary health care, supported by several higher levels of care. Health care in South Africa varies from the most basic primary health care, offered free by the state, to highly specialised, hi-tech health services available in the both the public and private sector.

The public health sector is stretched and under-resourced in several places. While the state contributes about 40% of all expenditure on health, the public health sector is under pressure to deliver services to about 80% of the population. The private sector, on the other hand, is run largely on commercial lines and caters to middle- and high-income earners who tend to be members of medical schemes (South Africa Info, 2013). It also attracts most of the country's health professionals.

This two-tiered system is not only inequitable and inaccessible to a large portion of South Africans, but institutions in the public sector have suffered poor management, underfunding and deteriorating infrastructure. While access has improved, the quality of health care has fallen. The situation is compounded by public health challenges, including the burden of diseases such as HIV and Tuberculosis (TB), and a shortage of key medical personnel.
5.2.2 South African Health Care System

The South African government is responding with a far-reaching reform plan to revitalise and restructure the South African health care system, including:

- Fast-tracking the implementation of a National Health Insurance scheme, which will eventually cover all South Africans;
- Strengthening the fight against HIV and TB, non-communicable diseases, as well as injury and violence;
- Improving human-resource management at state hospitals and strengthening co-ordination between the public and private health sector;
- Deploying "health teams" to communities and schools;
- Regulating costs to make health care affordable to all; and
- Increasing life expectancy from 56.5 years in 2009 to 58.5 years in 2014.

5.2.3 Healthcare Facilities

There are 4 200 public health facilities in South Africa. People per clinic is 13 718, exceeding WHO guidelines of 10 000 per clinic. However, figures from March 2009 show that people averaged 2.5 visits a year to public health facilities and the usable bed occupancy rates were between 65% and 77% at hospitals (South Africa Info, 2013).

Since 1994, more than 1 600 clinics have been built or upgraded. Free health care for children under the age of 6 and for pregnant or breastfeeding mothers was introduced in the mid-1990s (ibid.).

The National Health Laboratory Service (NHLS) is the largest pathology service in South Africa. It has 265 laboratories, serving 80% of South Africans. The laboratories provide diagnostic services as well as health-related research (ibid.).

5.2.4 Doctor Shortages

In March 2012, 165 371 qualified health practitioners in both public and private sectors were registered with the Health Professions Council of South Africa (HPCSA), the health practitioner watchdog body. This includes 38 236 doctors and 5 560 dentists (ibid.).

The doctor-to-population ratio is estimated to be 0.77 per 1 000. Due to the vast majority of General Practitioners – 73% – work in the private sector, there is approximately one practising doctor for every 4 219 people (ibid.). In response, the Department of Health (DoH) has introduced clinical health associates, midlevel health-care providers, to work in underserved rural areas.

Approximately 1 200 medical students graduate annually. In some communities, medical students provide health services at clinics under supervision (ibid.). Newly graduating doctors and pharmacists complete a year of compulsory community service in understaffed hospitals and clinics.
5.2.5 Quality of Services

Public health facilities in South Africa collectively scored less than 50% compliance with vital measures in two out of the six ministerial priority areas. These measures included: Patient safety and security (34%) and Positive and caring attitudes (30%) (DoH, 2012). The priority area waiting times scored the highest compliance to vital measures at 68%. Primary care facilities on average scored lower than hospitals in all priority areas. Overall, the facilities in Gauteng province obtained the highest compliance score on quality (69%) while the Northern Cape reflected the lowest (40%) (ibid.).

5.2.6 Functionality of Services

In terms of performance in the five functional areas (Clinical Services, Infrastructure, Management, Patient Care, Support Services and Clinical Care), the compliance score obtained by the country’s facilities is the lowest for Clinical Services (38%) (DoH, 2012). Within Clinical Services, the area of Health Technology recorded the lowest compliance for both Primary Health Care (PHC) and hospital facilities followed by Pharmacy. This, and the low number of pharmacists working in public health facilities, needs urgent attention.

5.2.7 HIV/AIDS

HIV/AIDS and other poverty-related diseases such as TB and cholera place a tremendous strain on South Africa’s health care system. According to Statistics South Africa, in 2011:

- The overall HIV prevalence rate was 10.6%. About one-fifth of South African women in their reproductive ages were HIV positive;
- There were 5.38 million people living with HIV. This was up from 4.21 million in 2001;
- 16.6% of the adult population (aged 15–49) years was HIV positive;
- There were about 2.01 million orphans due to HIV;
- New HIV infections for 2011 among adults was estimated at 316 900; and
- An estimated 1.06 million adults and 105 123 children were receiving antiretroviral treatment in 2010. This was up from 101 416 and close to 12 000 children in 2005.

In May 2012, the government reported to having cut the mother-to-child transmission rate from 3.5% in 2010 to less than 2%. It also stated that the rate of new infections had dropped from 1.4% to 0.8% in the 18 to 24 age groups (South Africa Info, 2013).

5.2.8 Tuberculosis

Fuelled by the concomitant hyper-endemic TB and HIV epidemic, South Africa now has the highest incidence of TB in the world (981 per 100 000) and the third largest burden of TB, after China and India (DHB, 2011/12). TB management remains a challenge in South Africa; especially it’s co-morbidity with HIV/AIDS. South Africa has one of the highest incidence rates of TB in the world. In 2010, the incidence rate for all types of TB was 805 per 100,000.
HIV and TB are so closely related that their relationship is often described as a co-epidemic: the co-infection rates exceed 70%, with TB being the most common opportunistic infection in HIV-positive patients.

Due to late detection, poor treatment management and drug-resistant forms of TB (known as DR-TB or multidrug-resistant TB; and XDR-TB or extensively drug-resistant TB) have increased significantly, with about 5 500 cases diagnosed during 2009 (ibid.).

Integrating the double scourge of HIV/AIDS and TB for the first time, the government has launched the National Strategic Plan for HIV/AIDS and TB for 2012 – 2016. It is shored up by a provincial implementation program.

The plan seeks to address the social structural drivers of HIV/AIDS, STD and TB care, prevention and support; to prevent new infections; to sustain health and wellness; and to protect human rights and access to justice of sufferers.

The HIV Counselling and Testing (HCT) campaign was launched in April 2010 – by mid-2012, almost 20 million people had been tested and knew their status. Millions were also screened for TB.

Increasing the number of anti-retroviral sites as well as Nurses certified to initiate Antiretroviral (ARV) treatment has seen 1.7 million people placed on ARV treatment, from 1.1 million in 2009. South Africa has the largest ARV therapy program in the world, and an improved procurement process has seen a 50% decrease in the prices of ARV drugs (ibid.).

5.2.9 Maternal Health

South Africa is a signatory to several international commitments such as the United Nation's Millennium Development Goals (MDGs), which seeks to address the health needs of women and children. However, in South Africa the health of mothers and children remains poor.

According to statistics from WHO, South Africa has a maternal mortality ratio of 310 deaths per 100 000 live births. The infant (under the age of 1) mortality rate in 2010 was 41 deaths per 1 000 live births, while the under the age of 5 mortality rate was 57 per 1 000 live births (ibid.).

Under the national Prevention of Mother-to-Child Transmission (PMTCT) program, every pregnant woman is offered HIV testing and counselling. If a woman tests positive for HIV, she is put on to a regime of anti-retroviral therapy to avoid transmitting the virus to her baby, and is offered a continuum of treatment, care and support for herself and her infant.

But it is really access and utilisation of Antenatal Care (ANC) services that most influence pregnancy outcome, child survival and maternal health. The renewed focus on primary health and the improving and expanding the health system infrastructure should go some way to addressing the high mortality rates – and get South Africa closer to the MDG target of reducing infant mortality to 20 by 2015.

The Department of Health has a strategic plan in place which identifies “priority interventions” that will have the greatest influence on reducing mortality rates, as well as
enhancing gender equity and reproductive health. The campaign on Accelerated Reduction of Maternal Mortality in Africa (CARMMA), an African Union initiative, was launched in May 2012 and aims to reduce maternal and infant mortality rates (South Africa Info, 2013).

5.2.10 Child Health

Immunisation is a significant barrier against disease and death, and the rates of children receiving their primary vaccines have steadily been increasing under immunisation programs. These aim to protect children against vaccine-preventable diseases, such as measles, TB, cholera and pertussis.

Measures to improve child health also include the expansion and strengthening of school health services and the establishment of district clinical specialist teams. Other prevention services, such as regular deworming and growth monitoring, help protect children's health.

The Health of our Children report in 2010, which surveyed 8 966 children, found that HIV prevalence among infants (age 0 to 2 years) was 2.1%, lower than the 3.3% average in the age 0 to 4 years, suggesting a positive impact of the national Prevention of Mother-to-Child Transmission program, begun in 2006 (South Africa Info, 2013).

5.2.11 Traditional Medicine

Traditional healers have a crucial role to play in building the health system in South Africa. The WHO observes that it is difficult to assign one definition to the broad range of characteristics and elements of traditional medicine, but that a working definition is essential. It thus concludes that traditional medicines: “[Include] diverse health practices, approaches, knowledge and beliefs incorporating plant, animal and/or mineral based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness” (WHO, 2002).

Traditional healers are generally divided into two categories – those that serve the role of diviner-diagnostician (or diviner-mediums) and those who are healers (or herbalists). The diviner provides a diagnosis usually through spiritual means, while the herbalist chooses and applies relevant remedies.

The WHO estimates that up to 80% of the population in Africa makes use of traditional medicine. In Sub-Saharan Africa, the ratio of traditional healers to the population is approximately 1:500, while medical doctors have a 1:40 000 ratio to the rest of the population (Abdool Karim, 2002). It is clear that traditional healers play an influential role in the lives of African people and have the potential to serve as crucial components of a comprehensive health care strategy. The Medical Research Council (MRC) founded a traditional medicines research unit in 1997 to introduce modern research methodologies around the use of traditional medicines. It also aims to develop a series of patents for promising new entities derived from medicinal plants.
5.2.12 Health Legislation in South Africa

The National Health Act, 2003 (Act No. 61 of 2003), provides a framework for a single health system for South Africa. The Act provides for a number of basic health care rights, including the right to emergency treatment and the right to participate in decisions regarding one's health.

The implementation of the Act was initiated in 2006, and some provinces are engaged in aligning their provincial legislation with the national Act.

Other legislation relating to health care includes laws which aim to:

- Ensure all health establishments comply with minimum standards through an independent entity (National Health Amendment Bill, 2010);
- Make drugs more affordable and provide for transparency in the pricing of medicines (Medicines and Related Substances Amendment Act (Act no. 59 of 2002));
- Regulate the medical schemes industry to prevent it from discriminating against "high risk" individuals like the aged and sick (Medical Schemes Act, 1998);
- Legalise abortion and allow for safe access to it in both public and private health facilities (The Choice on Termination of Pregnancy Act, (Act No. 92 of 1996);
- Limit smoking in public places, create public awareness of the health risks of tobacco by requiring certain information on packaging, and prohibit the sale of tobacco products to anyone younger than 18 (Tobacco Products Control Amendment Act (Act no. 23 of 2007));
- Provide for the introduction of mandatory community service for Nurses (Nursing Act, 2005);
- Introduce a process to develop and redesign mental health services so as to grant basic rights to people with mental illnesses (Mental Health Care Act, 2002); and
- Allow non-pharmacists to own pharmacies, with the aim of improving access to medicines (Pharmacy Amendment Act, 2000). This came into effect during May 2003.

Other important developments in health care policy and legislation include:

- The Health Professions Amendment Bill of 2006;
- The Traditional Health Practitioners Act (Act no. 35 of 2004); and
- Regulations relating to the Labelling and Advertising of Foodstuffs came into effect in May 2012, and aim to empower citizens to make healthy food choices.

5.3 General Health Profile: Project Region Specific

The Namakwa district is the Northern Cape's largest district geographically but has a population density of only one person per km² – the lowest in the country. The district has a population of 125 159 people, representing 10.8% of the province's population (Massyn et
al., 2012). Twenty-two percent (22%) of the population belong to a medical aid scheme, the highest coverage in the province.

5.3.1 Burden of Disease

The district's 2009 Burden of Disease (BoD) profile is considered from an analysis of the causes of death. Namakwa's 2009 quality of death certification was relatively poor, with 34.5% of the certificates submitted not being useful for public health analysis. This is above the South African mean of 30.2% and a long way from the internationally recognisable standard of 10%. Of the unusable classifications, 10.0% of deaths were assigned to ‘ill-defined’ causes and 24.5% to ‘garbage codes’ (Massyn et al., 2012). An analysis of the Years of Life Lost (YLLs) after redistribution of the deaths by four broad cause groups reflects that the highest proportion of YLLs was due to non-communicable diseases (53.5%), followed by injuries (17.1%). HIV and TB (14.8%) ranked third whilst the lowest proportion (14.6%) of YLLs was due to communicable diseases (together with maternal, perinatal and nutritional conditions) (ibid.). This BoD profile is to be expected in an area with a low deprivation index (SEQ5).

![Percentage of total YLLs](chart)

**Figure 5-1: Leading causes of Years of Life Lost (YLLs): Namakwa District Municipality**

5.3.2 Usable Bed Utilisation Rate

The Northern Cape has 18 district hospitals with 728 usable beds (Massyn et al., 2012). The district has 0.7 district hospital beds per 1 000 population. The bed utilisation rate for 2011/12 was 83.8% and has increased annually from 2009/10 when it was 76%. The average length of stay was 2.2 days, the second lowest in the country (ibid.). The average
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Kamiesberg Project, Namaqualand, South Africa
COA2012

expenditure per PDE was R2 013, an increase from R1 727 in 2010/11 and much higher than both the provincial average of R1 875 and the national average of R1 653.

5.3.3 HIV/AIDS

HIV prevalence (routine data)\(^1\) in facility at 4.1% was lower than the HIV prevalence obtained from the 2010 Antenatal Sero-prevalence Survey of 11.8%. The rate of antenatal clients initiated on Highly Active Antiretroviral Therapy (HAART)\(^2\) of 45.5% is lower than the 51.2% of 2010/11 and is the lowest in the province and also well below the 2011/12 national average of 80.4% (Massyn et al., 2012).

The uptake rate for babies Polymerase Chain Reaction\(^3\) (PCR) tested around 6 weeks was 98.6%, according to the routine data. The percentage of babies that tested PCR-positive six weeks after birth was 8.2%, a pleasing decrease from 14.9% in 2009/10. Data from the NHLS shows that the early infant HIV diagnosis coverage was 85.1%, a marked increase from 55.3% in 2010/11. The proportion of infants under two months of age that tested positive was 3.3%, a decrease from 7.3% in 2010/11 (ibid.).

5.3.4 Tuberculosis

Although there was a slight increase of 0.9 percentage points for the TB two-month Smear Conversion Rate (SCR)\(^4\) for Namakwa from 64.4% in 2010 to 65.3% in 2011, the SCR remains the second lowest in the Northern Cape. The new smear-positive TB cure rate improved from 72.4% in 2009 to 74.0% in 2010 but the new smear-positive TB defaulter rate increased from 5.1% to 7.1% in the same period.

5.3.5 Child Health

The incidence of diarrhoea in children under the age of 5 years old was 48 per 1 000 children, the lowest in the province and a decrease from 115.7 in 2010/11. The mortality rate among children under the age of 5 years due to diarrhoea with dehydration was 3.5%.

---

1 Routine data can be defined as data that are routinely recorded without any specific research question in mind. A range of national and local routine data are widely available, such as: health outcome data e.g. deaths, hospital admissions and primary care consultations or prescriptions, levels of well-being from national surveys; exposures and health determinant data e.g. smoking, air pollution, crime statistics; disease prevention data e.g. screening uptake; demographic data e.g. Census population counts; and geographical data e.g. health authority boundaries, location of GP practices.

2 Antiretroviral Therapy (ART) is the combination of several antiretroviral medicines used to slow the rate at which HIV replicates in the body. This is what is known as combination therapy. The term Highly Active Antiretroviral Therapy (HAART) is used to describe a combination of three or more anti-HIV drugs. The general recommendation is to use a minimum of two antiretroviral drugs.

3 The Polymerase Chain Reaction (PCR) is a biochemical technology in molecular biology used to amplify a single or a few copies of a piece of DNA across several orders of magnitude, generating thousands to millions of copies of a particular DNA sequence. PCR is now a common and often indispensable technique used in medical and biological research laboratories for a variety of applications including the detection and diagnosis of respiratory infectious diseases.

4 The Smear Conversion Rate (SMR) is defined as the percentage of new smear positive Pulmonary TB cases who are smear negative after two months of anti-TB treatment and are therefore no longer infectious.
The vitamin A coverage for children 12 to 59 months was 27%, seriously lower than the national average of 43.4% and second lowest in the country. The immunisation coverage under the age of 1 year increased from 75.8% in 2010/11 to 80.9% in 2011/12. During the same period the pneumococcal vaccine 3rd dose coverage increased from 80.0% to 82.6%, the rotavirus 2nd dose coverage increased from 70.5% to 75.2% and the measles 1st to 2nd dose drop-out rate decreased from 12.7% to 7.5% in the same period (ibid.). There was a slight decrease in the measles 1st dose under the age of 1 year coverage from 82.0% in 2010/11 to 80.5%.

5.3.6 Non-communicable Diseases

The 2011/12 hypertension detection rate was 0.2%, a slight decrease from 0.3% in 2010/11. Mental health case load was 1.7% of total case load, which is above the national average of 1.4% (Massyn et al., 2012).

6 Baseline Health Status (Local Level)

The following section describes the baseline health status in the proposed Project area and at local level with reference to the EHAs. This is based on the national and regional baseline health data that was identified during the desktop review and primary data collected during the field visit from 2nd to the 8th of March 2014. Data at the local level is based on the aforementioned FGDs and KII that were carried out during the field visit.

It is important to note that only the EHAs relevant to the proposed project have been discussed in the section below. EHA #1 (vector-related diseases), EHA #3 (veterinary medicine and zoonotic diseases) and EHA #10 (Cultural health practices) have not been discussed as, during the field visit and analysis, these were found to be immaterial in the proposed Project area.

6.1 EHA #2: Acute Respiratory Infections and Respiratory Effects from Housing

Although all key informants interviewed listed TB as one of the top five most common illnesses treated at their respective Healthcare facilities, the spread of this disease may not be linked to housing design and overcrowding in this instance, as described below.

Tuberculosis is spread from person to person through the air. If another person breathes in these germs there is likelihood that they will become infected with TB. Repeated contact is usually required for infection. Individuals may contract the disease at their place of work or at social gatherings.

6.1.1 Respiratory Effects from Housing

Within the KLM, 77.1% of the population live in formal housing, with 5.5% of the population living in informal dwellings and 0.9% in traditional huts. Approximately 14% of the population reside in worker’s hostel accommodation (StatsSA, 2011). Figure 6-1 illustrates the living
conditions/ most common type of housing throughout the visited communities. This particular image was captured in Stofkraal.

![Image of housing and sanitation in Stofkraal Community](image)

**Figure 6-1: Housing and sanitation in the Stofkraal Community**

There are 3,143 households in this municipality, with an average household size of 3.7 persons per household (ibid.). From observation, discussions with key informants, as well as FGDs, it was evident that there is enough housing and that overcrowding was not a matter of concern in these communities. During the KII, one of the Registered Nurses stated that although there very little-to no overcrowding in the community, housing conditions are generally not very good. Based on this information, it is understood that the spread of TB is not as a result of overcrowding.

During the field visit, it was observed that, although the majority of the households have access to electricity for cooking and lighting (some solar power), a few households still use wood for cooking and heating that may cause a risk from indoor air pollution and associated respiratory health concerns.

As waste removal from households is a challenge many households burn waste that can emit harmful by-products especially with plastics. No illegal and uncontrolled dump sites were identified during the field visit.

### 6.2 EHA #4: Sexually-Transmitted Infections, Including HIV/AIDS

#### 6.2.1 HIV/AIDS: Knowledge, Attitude and Behaviour

All respondents in the FGDs reported to having heard about HIV/AIDS. With numerous respondents across the PACs stating that HIV/AIDS is a serious problem in their communities it is clear to see that HIV/AIDS has affected all levels of these communities –
from the youth to the elderly. Many people stated that the disease is one of grave concern as it is “killing the people and leaving orphans”. The community of Lepelsfontein asserted that HIV/AIDS is not a serious problem in their communities as nurses educate them about this disease, and therefore expect that everyone should have knowledge on this disease. This community also stated that because HIV positive people are secretive about their HIV status, it is difficult to see how the disease impacts on their lives and the lives of their loved ones.

FGD results suggest that the general levels of awareness and consistent knowledge on the disease and preventative behaviours is exceptionally good. However, the mere acknowledgement of the disease in the absence of the relevant preventative behaviours will not support any form of behaviour change or risk taking practices. With regards to family planning and contraceptives, the Stofkraal community reported that a lot of the men and women in their communities were opposed to the use of any form of contraceptives due to their religion – Catholicism. The Roman Catholic Church is opposed to artificial contraception and orgasmic acts outside of the context of marital intercourse. Such acts are considered intrinsically disordered because of the belief that all sexual acts must be both unitive (express love), and procreative (open to procreation). The only form of birth control permitted is abstinence. There is, somewhat, a paradox in their beliefs versus their behaviour as a lot of the young people engage in sexual activities, and even have children, but are not married. Others, such as residents of the Molsvlei community, refuse to use condoms, pleading ideas of trust – “we trust each other, so there is no need to use condoms” said one of the respondents during the FGD.

There are high levels of stigma in the communities with associated discrimination as, although individuals were willing to purchase food from someone who they knew was HIV positive, three out of the five communities engaged with during FGDs stated that they would keep their HIV positive family member’s status a secret – mainly due to the stigma attached to the disease. Apart from this being attributable to a general respect for their family member’s privacy, part of this is due to the poor levels of knowledge and beliefs. Religious beliefs make it difficult to inform behavioural change information. The high levels of illiteracy also makes behavioural change communication somewhat challenging.

Information collected during the FGDs shows that a large proportion of respondents know the two main ways to prevent HIV, namely condom use, abstaining and having one uninfected sexual partner (monogamy – being faithful).

Four out of five of the interviewed key health personnel listed HIV/AIDS as one of the top five major illnesses facing their respective communities. Joe Slovo CHC was the only Healthcare facility that did not mention this disease. When probed as to why this was the case, the key informant, stated that all the HIV positive patients obtain their ARV treatment from their respective clinics, and not that HIV/AIDS was not a major illness of concern as it may have seemed.
6.2.2 Commercial Sex

Transactional sex is increasingly being incorporated into casual labour on a global scale. With regard to the negative impacts of the proposed Project development it was reported by key health personnel that there are no known commercial sex workers in the broader Project area. This aligned with the situation as described by the respondents during FGD. All five communities reported that commercial sex was not common in their respective communities and thus not rendered as a community challenge. Given that commercial sex has not been reported in the study communities, the challenge going forward will be to maintain this situation when the practice is considered to be a challenge in the broader community. Should the proposed mine lead to the emergence of prostitution in these communities, there would be negative social and health connotations. The concern of the specialist is that an influx of (single) male workers from outside the area may place a burden on scarce resources and may also cause an increase in the incidence of HIV and STI. It is anticipated that disadvantaged young girls and child-headed households could be extremely vulnerable to single men with disposal income.

6.3 EHA #5: Soil-, Water- And Waste-Related Diseases

The proposed Project area is drained by the Bitter and Outeep rivers to the north of the Leeuveli prospecting area. The Outeep River is a tributary of the Bitter River. To the south is the Groen River, which defines the southern border of the Roode Heuvel prospecting area. All these rivers are ephemeral, which means that they only flow temporarily after heavy rainfall. Water is obtained from subterranean sources. Some of the water is pumped up by windmills, but most of the water to the communal areas comes from natural springs. Many of these springs are semi-perennial and the salt content of the water can vary from year to year, causing unpredictable, unstable water supply. Table 6-1 illustrates the relationship between various water sources within the Project Region, and the percentage of people obtaining water from these sources.
Table 6-1: Source of Water in the Kamiesberg LM

<table>
<thead>
<tr>
<th>Source of water</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional/Local water scheme (operated by municipality or other water services provider)</td>
<td>75,1%</td>
</tr>
<tr>
<td>Borehole</td>
<td>18,1%</td>
</tr>
<tr>
<td>Spring</td>
<td>0,3%</td>
</tr>
<tr>
<td>Rain water tank</td>
<td>3,3%</td>
</tr>
<tr>
<td>Dam/Pool/Stagnant water</td>
<td>1,1%</td>
</tr>
<tr>
<td>River/Stream</td>
<td>0,3%</td>
</tr>
<tr>
<td>Water vendor</td>
<td>0,4%</td>
</tr>
<tr>
<td>Water tanker</td>
<td>0,5%</td>
</tr>
<tr>
<td>Other</td>
<td>0,8%</td>
</tr>
</tbody>
</table>


During FGDs, respondents claimed to receive borehole water, which is piped to their respective dwellings by the municipality. Most respondents in the communities also said that they have their own latrines in their yards and do not share with other households. An example of the type of latrines built and used in the communities is depicted in Figure 6-1.

Water is recognised as a scarce resource in the district and municipal area and management systems are generally poor. The KLM achieved a relatively low blue drop grading at 126 out of 153 Local Municipalities. A municipality's Blue drop status refers to the safety of water, which is made available for human consumption. Concerns were raised by farmers about the availability of water for the proposed Project area to support the mine and related operations, as well as the needs for agriculture and domestic use.

During FGDs, it was noted that when there has been heavy rainfall, children play and swim in open water bodies. This correlates to information provided by two KIIIs, that during rainy season, children are often brought to the Healthcare facilities, and diagnosed with Schistosomiasis, also known as Bilharzia –a disease caused by parasitic trematode schistosome worms. No relevant schistosomiasis statistics for the KLM, not the Northern Cape were found to support the respondents’ claims.

The availability of sanitation facilities not only improves the dignity of people, but also promotes their health. Areas without proper sanitation systems give rise to water borne diseases including cholera and diarrhoea. Observation and FGDs indicated that the majority of households do not have access to adequate sanitation services. With the exception of Garies, households in all communities visited use pit latrines and Ventilated Improved Pit-latrine (VIP) toilets in their own yards. Households in Garies were observed to have adequate sanitation facilities (flush toilets) inside their houses and yards. Table 6-2 clearly illustrates the shortage of proper sanitation such as flush toilets, and the low percentage of households with access to piped water inside their dwellings.
### Table 6-2: Household services in the Kamiesberg LM

<table>
<thead>
<tr>
<th>Household services</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush Toilet Connected To Sewerage</td>
<td>38.8%</td>
</tr>
<tr>
<td>Weekly Refuse Removal</td>
<td>79.4%</td>
</tr>
<tr>
<td>Piped Water Inside Dwelling</td>
<td>41.7%</td>
</tr>
<tr>
<td>Electricity For Lighting</td>
<td>87.4%</td>
</tr>
</tbody>
</table>


### 6.4 EHA #6 Food- And Nutrition-Related Issues

Food security has a profound impact on health. Food security incorporates several aspects: food availability, individual access to food, utilisation of food and stability of food availability. Under-nourishment is a key impact indicator of food security and is defined as having an energy consumption that is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out light physical activity (SAHR, 2008).

Nutritional status is determined by the degree of nourishment. Under-nourishment, an indicator of food security, means consumption is continuously below. Food security is an important consideration in understanding potential health impact of development projects. This EHA is affected by influx of people resulting in increased demand for food.

Based on the key informant interviews and FGDs, food shortage is a serious problem in the area. Surprisingly and somewhat contradictory, malnutrition was not rendered as a serious disease. A few respondents stated that malnutrition was a problem. This was for both children and also the elderly as vulnerable groups. Much of this was linked to poverty and general unemployment in the communities. Food shortage has been noted as one of the main health needs in the area. Malnutrition is linked to poverty and food security issues, as the population cannot afford basic foodstuffs, or that towns and decent grocery stores are not accessible (as transport costs are also unaffordable). Most children in the visited communities are fed bread and tea throughout the day, with little or no fresh fruit or vegetables. Poor feeding practices related to poor education and illiteracy are bound to worsen the existing situation.

### 6.5 EHA#7: Accidents/Injuries

As mentioned above, two options exist for the transport of products from the mining operation to the markets:

- A combination of rail and road haulage; and
- Road transport only.

It is probable that the majority of materials and equipment required for construction will be transported by road. Road transport is also the preferred option for transporting the mined product from the Project site to the port at Saldanha.
Accidents and injuries were only reported in one out of the five KIIs. The PHC facilities (clinics) reported that if an individual was involved in a Road Traffic Accident (RTA), that individual would go straight to Joe Slovo CHC as they would not receive any form of medical assistance in the clinics. RTAs are not very common in the communities. Gender-based violence and crime related injuries such as assault are more common. There is a strong link to alcohol in domestic violence and assault accidents as “people like to fight when they are drunk” (Kamieskroon Clinic).

6.6 EHA #9: Social Determinants of Health

Substance misuse such as alcohol, tobacco or other drugs is not only an important health determinant but also closely linked to mental health (Prince et al., 2007) – the use of the drug Cannabis sativa, referred to as “dagga” by the locals, was reported (during the KIIs and FGDs) to being heavily misused in four out of the five communities (with the exception of Lepelsfontein). Substance misuse is associated with assault and domestic violence. Several respondents admitted that most members of their communities drink a lot of alcohol, especially during the weekends and at the end of the month when individuals have received their wages and salaries. The key health personnel validated this by asserting that alcohol and drug abuse was a major contributor of disease in several communities.

6.7 EHA #11: Health Systems Issues

Five Healthcare facilities within the proposed Project Region were visited with the aim of identifying the major health concerns for the community. These facilities are listed below:

- Stofkraal Community Health Centre;
- Garies Clinic;
- Kamieskroon Clinic;
- Kharkhams Clinic; and
- Joe Slovo Community Health Centre

Some of these Healthcare facilities are depicted in Figure 6-2 below.
Stofkraal Primary Healthcare Clinic
Joe Slovo Community Health Centre

Figure 6-2: Some of the Healthcare facilities visited

Generally, management of the facility infrastructure requires attention, especially at PHC level. The quality of physical infrastructure has a major impact on the functioning of services and patients’ satisfaction with the healthcare services they receive. Facility Infrastructure Management needs the most improvement. Prioritised attention should be given to those facilities without provision for a constant and stable supply of water and electricity at the time of the field visit – Garies Clinic and Kharkhams Clinic. Some of the visited facilities are subject to intermittent interruption of these services or seasonal interruptions where the electricity supply is dependent on wind and rainfall – “when there is too much rain and wind, the lights go off and we do not have a generator here” said one of the interviewed key informants.

Three out of the visited five Healthcare facilities were observed to have carpeted flooring, and not tiled. The floor is the place where bacteria normally gather. This increases the risk of infection in Healthcare facilities where, if floors are not properly cleaned and sanitised. This is because carpeted or un-cleaned floors may facilitate the easier spread of disease and contaminate other patient. Numerous epidemiological and microbiological studies have been conducted (worldwide) in hospital rooms with carpeted floors and those with bare flooring/tiles. Microbiological profiles were determined with specimens obtained from patients admitted to these rooms. Patient records were then reviewed to note infection status and other case identities. In each sampling period, higher microbial counts per square meter were measured for the carpet that the bare floor (Gray, 2010).

The Joe Slovo CHC and all the PHC facilities visited show a high percentage success in compliance to the vital measure dealing with the availability of medicines as per the
Essential Drug List, with Stofkraal CHC being the only Healthcare facility which reported to experiencing shortages in medication. The rest of the Healthcare facilities stated that it was very unusual that medication ran out, and in the rare event that a shortage was experienced; the respective facility would obtain/ “borrow for” medication from neighbouring clinics. This was said to be a common practice.

The availability of functional and essential medical technology equipment in three out of five visited facilities needs priority attention. Garies Clinic and Joe Slovo CHC were the only two Healthcare facilities which reported to having adequate supply of functional equipment to serve the needs of the facility. Some of the vital equipment required in the other three Healthcare facilities is listed below:

- Blood pressure machines;
- Blood for transfusion purposes (Blood bank);
- Refrigeration for vaccine and blood samples;
- Pap smear equipment - disposal speculums;
- Glucometers;
- Knowledgeable technicians to maintain broken equipment;
- Suction machinery (which may be used to clear the passageways/ airway for saliva, blood, or other secretions so that a patient may breathe; and
- Immobile oxygen machines.

The key informant at Joe Slovo CHC did however raise a few structural needs, such as the need for an operating theatre, more beds in the labour ward (as the facility currently has only two), as well as a pathology lab as it wastes unnecessary time sending bloods to Springbok for analysis in emergency cases. She further indicated that the facility was experiencing a shortage in staff as one of the Professional Nurses had died, and since not been replaces, as well as the need for a Pharmacist to control the dispensing of vital medication.

All Healthcare facilities do not provide the full spectrum of PHC services. The likely reason for this is that two out of five of the visited Healthcare facilities are owned by local government and many of these do not provide the same spectrum of services expected of provincially owned and managed facilities. Dental and optometric services are only offered by Garies Clinic and Joe Slovo CHC – those owned by provincial government. Figure 6-3 clearly illustrates the correlation between the types of services offered by the various Healthcare facilities visited, and the proportion of those facilities thereof. All five visited Healthcare facilities offer the majority PHC services such as ARV therapy, antenatal care, and TB treatment. This is a great positive for the communities serviced by these facilities.
The chief chronic conditions observed in the visited communities include chronic diseases such as hypertension, diabetes, and cancer. This is also asserted by information obtained during the KII, where all five interviewed key health personnel listed diabetes and hypertension in their top five major illnesses facing their respective communities. Table 6-3 shows the Rankings of various illnesses as informed by the key health personnel interviewed (key informants).

**Table 6-3: Ranking of diseases per Healthcare facility**

<table>
<thead>
<tr>
<th>Healthcare facility</th>
<th>Ranked 1(^{st})</th>
<th>Ranked 2(^{nd})</th>
<th>Ranked 3(^{rd})</th>
<th>Ranked 4(^{th})</th>
<th>Ranked 5(^{th})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garies Clinic</td>
<td>HIV/AIDS</td>
<td>TB</td>
<td>Hypertension</td>
<td>Diabetes</td>
<td>URI</td>
</tr>
<tr>
<td>Kharkhams Clinic</td>
<td>HIV/AIDS</td>
<td>TB</td>
<td>Hypertension</td>
<td>Diabetes</td>
<td>Cancer</td>
</tr>
<tr>
<td>Stofkraal CHC</td>
<td>HIV/AIDS</td>
<td>TB</td>
<td>Diabetes</td>
<td>Arthritis</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Kamieskroon Clinic</td>
<td>HIV/AIDS</td>
<td>TB</td>
<td>Hypertension</td>
<td>Diabetes</td>
<td>Asthma</td>
</tr>
<tr>
<td>Joe Slovo CHC</td>
<td>Diarrhoea</td>
<td>Hypertension</td>
<td>Diabetes</td>
<td>TB</td>
<td>Asthma, COPD</td>
</tr>
</tbody>
</table>

### 7 Impact Assessment

#### 7.1 Key Issues and Related Health Impacts

This section provides an analysis of the potential impacts associated with the proposed Project and has included the analysis of potential negative impacts and their mitigation measures, but also includes potential positive impacts and measures to enhance these. This is based on the evidence presented in the baseline health description, the planned project activities and information obtained from the other available specialist studies.
The key health impacts and needs have been described in the EHA framework. While it is recognised that some of these existing health needs will be inherited by the proposed Project, and may be regarded as the responsibility of the government, they may influence the impacts and need to be considered for mitigation/management. Project interventions are required to mitigate and enhance the impacts that the proposed Project may have on the PACs.

### 7.2 Impact Assessment Methodology

Five factors need to be considered when assessing the significance of impacts, namely:

1. **Relationship of the impact to temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. **Relationship of the impact to spatial scales** - the spatial scale defines the physical extent of the impact.
3. **The severity of the impact** - the severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party.
4. **The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but includes concepts of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.**
5. **The likelihood of the impact occurring** - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned as presented in Table 7-1 to determine the overall significance of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 7-2, to determine the overall significance of the impact. The overall significance is either negative or positive.

The environmental significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.
7.2.1 Prioritising

The evaluation of the impacts, as described above is used to prioritise which impacts require mitigation measures. Negative impacts that are ranked as being of “VERY HIGH” and “HIGH” significance will be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. numerous HIGH negative impacts may bring about a negative decision.

For impacts identified as having a negative impact of “MODERATE” significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed.

For impacts ranked as “LOW” significance, no investigations or alternatives will be considered. Possible management measures will be investigated to ensure that the impacts remain of low significance.

Table 7-1: Ranking of Evaluation Criteria

<table>
<thead>
<tr>
<th>Temporal Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term</td>
<td>Less than 5 years</td>
</tr>
<tr>
<td>Medium term</td>
<td>Between 5-20 years</td>
</tr>
<tr>
<td>Long term</td>
<td>Between 20 and 40 years (a generation) and from a human perspective also permanent</td>
</tr>
<tr>
<td>Permanent</td>
<td>Over 40 years and resulting in a permanent and lasting change that will always be there</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spatial Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localised</td>
<td>At localised scale and a few hectares in extent</td>
</tr>
<tr>
<td>Study Area</td>
<td>The proposed site and its immediate environs</td>
</tr>
<tr>
<td>Regional</td>
<td>District and Provincial level</td>
</tr>
<tr>
<td>National</td>
<td>Country</td>
</tr>
<tr>
<td>International</td>
<td>Internationally</td>
</tr>
<tr>
<td>Severity</td>
<td>Benefit</td>
</tr>
<tr>
<td>Slight</td>
<td>Slightly beneficial to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderately beneficial to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Severe/</td>
<td>A substantial benefit to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Beneficial</td>
<td>A very substantial benefit to the</td>
</tr>
<tr>
<td>Very Severe/</td>
<td></td>
</tr>
</tbody>
</table>

For impacts identified as having a negative impact of “MODERATE” significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed.
Beneficial affected system(s) or party(ies) | affected system(s) and party(ies)
--- | ---

**Likelihood**

- **Unlikely**: The likelihood of these impacts occurring is slight
- **May Occur**: The likelihood of these impacts occurring is possible
- **Probable**: The likelihood of these impacts occurring is probable
- **Definite**: The likelihood is that this impact will definitely occur

*In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don’t know/Can’t know*

**Table 7-2: Matrix used to determine the overall significance of the impact based on the likelihood and effect of the impact.**

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3</strong></td>
<td><strong>4</strong></td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 7-3: Description of Environmental Significance Ratings and associated range of scores**

<table>
<thead>
<tr>
<th>Significance Rate</th>
<th>Description</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.</td>
<td>4-7</td>
<td>4-7</td>
</tr>
<tr>
<td>Moderate</td>
<td>An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation.</td>
<td>8-11</td>
<td>8-11</td>
</tr>
</tbody>
</table>
These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &amp;/or social) environment and result in severe effects or beneficial effects.</td>
<td>12-15</td>
</tr>
<tr>
<td>Very High</td>
<td>A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, or very beneficial effects.</td>
<td>16-20</td>
</tr>
</tbody>
</table>

### 7.3 Impact Analysis, Mitigation and Enhancement

Analysing health impacts is often based on a broad range of factors, as described above in Section 4.6. The impact analysis considers the baseline health, as described above in Section 6.

#### 7.3.1 EHA #2: Acute Respiratory Infections and Respiratory Effects from Housing

Influx/In-migration to the area has been mentioned as a potential impact in the SIA. The project has the potential to attract outsiders and returning families. Population influx has the potential to contribute to the prevalence of respiratory problems in two ways. First, newcomers may carry strains of respiratory diseases (e.g. seasonal influenza viruses) to which the local population has limited resistance due to a lack of previous exposure.

Second, in the absence of adequate and affordable housing, newcomers may settle in informal settlements without services such as water, electricity, etc. This may force them to rely on wood fires for cooking and indoor heating. As mentioned in Section 6.1.1, some of the households currently residing in the Project area use wood for cooking and heating, and this has been identified as a potential cause of indoor air pollution and associated respiratory health concerns.
7.3.1.1 Respiratory Diseases

Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA #2</th>
<th>Acute respiratory infections and respiratory effects from housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction and into operations and closure</td>
</tr>
<tr>
<td></td>
<td>Temporal scale</td>
</tr>
<tr>
<td>Before Management</td>
<td>2</td>
</tr>
</tbody>
</table>

Management measures

Project impact mitigation

- Social management measures should include measures to discourage uncontrolled influx of job-seekers and proliferation of informal settlements.

| After Management | 2 | 3 | 2 | 2 | 9 |

No-go Option

General Impact | No Change – existing status will not be affected

7.3.2 EHA #4: Sexually-Transmitted Infections, Including HIV/AIDS

7.3.2.1 Transmission of STIs and HIV/AIDS

HIV/AIDS and STI are significant existing public health challenges nationally and within the proposed Project area. STIs, if present and untreated, have been found to increase the risk of transmission of HIV, if one partner is infected. HIV’s link with TB and its importance has been discussed above.

The potential influx and movement of labour (including contract workforce) into the area may pose an increased risk for STIs. There may be more disposable income either as a direct or indirect consequence of the project. Commercial sex workers are more likely to establish in Garies, but may also be attracted to the immediate proposed Project area and surrounding communities such as Molsvlei and Stofkraal, where local community may be vulnerable to opportunistic sexual liaisons. The probable effect of the Project employing a number of relatively well-paid employees may also increase the risk for transactional sex, especially if they are away from their normal family unit. Economic upliftment and settlement in the proposed Project area may also lead to the adoption of “urban” values and lifestyle changes, which may also play a role in casual sexual engagement.
Women and young girls are extremely vulnerable and have limited negotiating power for safe practices and family planning. Gender based sexual violence is common and there is not much support for victims.

HIV/AIDS should be considered a major risk for the Project and the community and interventions should be implemented on a broad base in the workforce and the community. It may also be influenced by considering the “3 M’s” detailed above in Section 5.1.6.

7.3.2.1.1 Money

There will be adequate amounts of disposable income in the area which will increase during the duration of the project which may result in individuals partaking in transactional sex.

7.3.2.1.2 Mobility

The transport corridors which will be improved with the development of the Project may increase traffic to the Project area, which may result in high risk sexual activity along the whole transport route, including Garies and Hondeklipbaai as an end destination.

There was no confirmed accurate data on HIV prevalence and very little in the way of data to understand practices and behaviour linked to HIV. The cumulative impacts of HIV, STIs and TB need to be considered.

Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA# 4</th>
<th>Sexually transmitted infections including HIV/AIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction and into operations and closure</td>
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<tr>
<td></td>
<td>Temporal scale</td>
</tr>
<tr>
<td>Before Management</td>
<td>4</td>
</tr>
</tbody>
</table>

Management measures

Project impact mitigation:

- Develop a HIV/AIDS policy that incorporates both the workplace and community considerations;
- Support the local health authorities in extending care and treatment programs in the area. Support the local health authorities with the establishment of Voluntary Counselling and Testing (VCT) centres in the area;
- Support community based condom distribution centres;
- Providing women and young people with basic HIV/AIDS education;
- Collaborate with local schools as schools are a well-established point of contact through which young people can receive AIDS education;
Use the media as it is a powerful way of reaching large numbers of people with HIV and AIDS information and prevention messages

Support information campaigns and community based peer educator programs in both the workforce and community. These need to use locally acceptable tools and based on the finding of the KAP study;

Support equal employment opportunities for women and support livelihood programs to reduce risk for opportunistic sexual encounters. This will enable them to be financially independent;

Support community based information campaigns related to TB symptoms and the need to seek care. The campaign should address the risk of co-infection between HIV and TB. This can be managed through community-based peer health educators;

Develop partnerships to support the community based TB control programs in conjunction with the authorities and any agencies/NGO;

Support the health management information system and collect longitudinal (spatial/over time) data on key TB indicators. This will require health systems strengthening to get this essential data; and

Support NGO groups active in area on gender-based sexual violence.

<table>
<thead>
<tr>
<th>After Management</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>2</th>
<th>11</th>
</tr>
</thead>
</table>

**No-go Option**

| General Impact  | No Change – existing status will not be affected |

### 7.3.3 EHA #5: Soil-, Water- And Waste-Related Diseases

#### 7.3.3.1 In-migration, Unplanned Settlements and the Spread of Soil-, Water- and Waste-Related Diseases

The communities in the proposed Project area have good access to clean or improved water supplies. There is a heavy reliance on non-protected wells as a primary source of drinking water.

Influx may also play a role in availability of water due to increased demand, which may ultimately negatively affect water quality. Pressure on existing limited services in terms of water supply and sanitation could dramatically increase the risk of water related diseases. Water-borne diseases such as diarrhoea were noted during KIIIs and are linked to contaminated water and poor sanitary conditions.

There is little data on basic water and sanitation practices or burden of disease linked to specific water and sanitation indicators. There is the potential for the proposed Project to be accused of polluting the water bodies in the surrounding communities from plant or domestic water and thus it is important to establish firm baselines for mitigation. Water and sanitation...
are significant existing needs in the community and if Zirco supports any initiatives they should be linked to specific indicators to measure impact.

Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA# 5</th>
<th>Soil, water and waste related diseases</th>
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</thead>
<tbody>
<tr>
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<tr>
<td></td>
<td>Pre-construction and into operations and closure</td>
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<tr>
<td></td>
<td>Temporal scale</td>
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<tr>
<td>Before Management</td>
<td>2</td>
</tr>
</tbody>
</table>

Management measures:

Project impact mitigation

- The quality of groundwater and surface water must be monitored to ensure that the proposed Project does not have any detrimental effects on community water sources;
- Influx management;
- Restrict access to Project created water bodies;
- Perform end user analysis of water quality. This serves as an indicator for monitoring water quality where it is consumed and determines the level of general sanitation and hygiene even if water is collected from clean sources;
- Ensure proper disposal of human waste that is generated from the Project; and
- Ensure proper waste management from Project generated waste according to waste management principles.

| After Management | 2 | 3 | 2 | 2 | 9 |

No-go Option

General Impact

No Change – existing status will not be affected

7.3.4 EHA #6: Food- And Nutrition-Related Issues

7.3.4.1 Malnutrition

The possible influx of people into the proposed Project area may result in a reduction to agricultural yields as well as space available for grazing livestock. Inflation could reduce food security in a situation of already high food prices that communities cannot afford.
Changes in practices also need to be considered over the medium term. The community may start buying more food in the form of refined products as a result of economic upliftment. A reduction in physical exertion may also result as a result of changing livelihoods. Ironically, the final result could be an increased incidence in obesity.

Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA #6</th>
<th>Food and Nutrition related issues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operations and closure</td>
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<tr>
<td></td>
<td>Temporal scale</td>
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<tr>
<td>Before Management</td>
<td>2</td>
</tr>
</tbody>
</table>

Management measures

Project impact mitigation:
- Support sustainable livelihood programs through increased use of agriculture. The financial benefit of farming over other practices will be essential to support. An example of this could be community gardens;
- Support maternal and child health programs; and
- Favour local procurement of food items in combination with incentives to increase local production.

| After Management | 2 | 2 | 2 | 1 | 7 |

No-go Option
- General Impact: No Change – existing status will not be affected

7.3.5 EHA#7: Accidents/Injuries

7.3.5.1 Road traffic Accidents and other Accidental Injuries

The proposed Project may lead to increased traffic loads on primary and access roads and has thus the potential to increase the number of traffic accidents. Some community members may be relatively naïve to risks from road traffic accidents and the larger volumes of traffic may increase their exposure risk. This is especially relevant for small children.
The risks and impacts related to project-generated traffic during construction and operation of the mine were identified as:

- Increased traffic on DR2938;
- Increased risk of vehicle collisions and personal injuries;
- Increased dust generation;
- Increased traffic noise; and
- Increased traffic and disruption of traffic flows on the N7 highway and provincial roads between the N7 and the port at Saldanha.

The health facilities within the communities have very limited capacity to respond and manage any form of complex trauma or multiple casualty situations (See Section 6.7). In addition, there are limited emergency services so delays to care can be significant and inappropriate movement has the potential to exacerbate injuries.

**Impact evaluation and management measures:**

<table>
<thead>
<tr>
<th>EHA #7</th>
<th>Accidents and Injuries</th>
<th>Construction and into operations and closure</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Temporal scale</td>
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<tr>
<td>Before</td>
<td>Management</td>
<td>3</td>
</tr>
</tbody>
</table>

**Project impact mitigation:**

- Improving road safety by collaborating with the district road-safety unit to establish and maintain pictorial road-safety signage near the site in local language (Afrikaans) and English language (if needed);
- Clearly demarcated pedestrian crossings in appropriate places etc. This could be achieved by establishing and implementing a Traffic Management Plan;
- Develop and implement an Emergency Preparedness and Response Plan for construction and operation, including provisions to deal with traffic accidents, particularly accidents involving personal injuries. All drivers must be made aware of the procedures to be followed;
- Develop community security and safety management structures (such as the Security Community Liaison Forum – a liaison body between the affected farmers and security personnel, through which security arrangements are discussed with affected farmers) for the Project related to the different activities. This should include emergency response plans for both community related accidents and also for the workplace. This must include a fire, rescue
and chemical spill response capability, as well as medical emergency response strategies;

- Conduct a traffic impact assessment to assess the impact of increased traffic within the proposed Project area;
- Develop a clear policy for the management of emergencies or accidents in the community as a direct result of the projects activities;
- Support with local safety and security as addressed in these specialist studies.

<table>
<thead>
<tr>
<th>After Management</th>
<th>3</th>
<th>2</th>
<th>2</th>
<th>2</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No-go Option</strong></td>
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</tbody>
</table>

**General Impact**

If the project does not proceed – the No-Go Alternative - there will be no increase in traffic on DR2938, the N7 highway or provincial roads between the port at Saldanha and the N7, and no project-related impacts in respect of traffic and transport.

### 7.3.6 EHA #8: Exposure to Potentially Hazardous Materials, Noise and Malodours

#### 7.3.6.1 Radiation

As mentioned in Section 2.2 the heavy mineral sands will be concentrated through the production of the HMC and may therefore be considered to be above the naturally background radiation levels. In addition, certain scrap types may be contaminated with radionuclide-containing ore/ product (Naturally-Occurring Radioactive Materials (NORM)). Used vehicles tyres together with components from the processing plants such as metal sheets, rubber-lined parts of the process and fibreglass trays, are particularly prone to this type of contamination. As such, radiation levels should be assessed, and if necessary, monitored. At the time of completing this CHIA Report, a detailed Radiation Assessment has been commissioned but not yet been completed.

In the absence of adequate mitigation, radiation exposure resulting from project activities constitutes one of the most significant potential health impacts of the Project.

Any living tissue in the human body can be damaged by radiation in a unique manner. The body attempts to repair the damage, but sometimes the damage is of a nature that cannot be repaired or it is too severe or widespread to be repaired. Also mistakes made in the natural repair process can lead to cancerous cells. The most common forms of ionizing radiation are alpha and beta particles, or gamma and X-rays.

In general, the amount and duration of radiation exposure affects the severity or type of health effect. There are two broad categories of health effects: stochastic and non-stochastic.
Stochastic Health Effects: Stochastic effects are associated with long-term, low-level (chronic) exposure to radiation. ("Stochastic" refers to the likelihood that something will happen.) Increased levels of exposure make these health effects more likely to occur, but do not influence the type or severity of the effect. Cancer is considered by most people the primary health effect from radiation exposure.

Non-Stochastic Health Effects: Non-stochastic effects appear in cases of exposure to high levels of radiation, and become more severe as the exposure increases. Short-term, high-level exposure is referred to as 'acute' exposure. Many non-cancerous health effects of radiation are non-stochastic. Unlike cancer, health effects from 'acute' exposure to radiation usually appear quickly. Acute health effects include burns and radiation sickness. Radiation sickness is also called 'radiation poisoning.' It can cause premature aging or even death. If the dose is fatal, death usually occurs within two months. The symptoms of radiation sickness include: nausea, weakness, hair loss, skin burns or diminished organ function.

7.3.6.2 Solid Waste (General and Hazardous)

Waste streams likely to be produced during the construction phase will include both general (non-hazardous) and hazardous wastes and are expected to be similar in composition to the non-process wastes or co-products produced during the operational phase. The domestic waste stream will be comprised predominantly of non-hazardous waste types including paper, plastic, cloth and some food waste. In addition, relatively insignificant quantities of hazardous wastes may be included in this waste stream, including batteries, empty containers for cleaning chemicals, fluorescent light tubes, pesticide aerosol cans, medical / clinic wastes etc.

The construction and rehabilitation activities will also result in the generation of hazardous wastes including chemicals associated with machine and vehicle maintenance, oily rags and filters, empty containers for hazardous chemicals (paints, solvents, lubricants, herbicides, pesticides / herbicides) and electrical and electronic equipment.

The clinic or first aid station that will be located at the mine will most likely generate some medical waste (bio-hazards). Medical waste is classified as Hazard Rating 1 or Extreme Hazard waste and must be incinerated before disposal at a landfill. Alternative methods for disposal are pre-treatment by sterilisation, direct irradiation or micro-waving to render inactive, prior to its final disposal by landfilling at a hazardous waste landfill site.

The impacts related to the management of scrap items with elevated levels of radiation will be assessed in the radiation specialist report and will therefore not be covered here.

7.3.6.3 Air pollution, Water, Noise and Mal-odours

Exposures and environmental health determinants as a result of the Project will be covered in a number of specialist reports. These include air quality, water, noise and soil studies.

Noise is also a factor to consider and the health impacts of noise are well described at both a physical and psychosocial level. The noise related to transport and use of equipment will also need to be assessed.
Air quality and odours have been addressed in detail in the Air quality report. Dust generation was highlighted as a potential impact especially in operations. The pollutant of concern under the current land-use would be particulates that would result in elevated levels of dustfall, as well as elevated PM10 and PM2.5 concentrations. The likely emissions sources would be wind erosion of areas where vegetation cover is limited and vehicle entrainment of particulates from the unpaved district and farm roads.

Hydrological and geohydrological studies have been commissioned for the Project but their final results were not available at the time of writing this report. Currently available information indicates, however, that Project activities will not have any appreciable adverse impact on the quantity and quality of potable groundwater.

**Impact evaluation and management measures:**

<table>
<thead>
<tr>
<th>EHA #8</th>
<th>Environmental health determinants: Radiation, Air, water, noise pollution and malodours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction and into operations and closure</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Temporal scale</th>
<th>Spatial scale</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before Management</strong></td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

**Management measures**

- Implement mitigation measures as specified in the radiation and air quality assessment reports;
- The quality of groundwater and surface water must be monitored to ensure that the proposed Project does not have any detrimental effects on community water sources;
- Evaluate and manage air, water and noise issues as part of the environmental impact assessment and environmental management plan requirements. Human health considerations should be considered based on results of the surveillance activity.

<table>
<thead>
<tr>
<th></th>
<th>Temporal scale</th>
<th>Spatial scale</th>
<th>Severity</th>
<th>Likelihood</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After Management</strong></td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

**No-go Option**

- General Impact: No Change – existing status will not be affected
7.3.7  EHA #9: Social Determinants of Health

7.3.7.1  Gender-based Violence, Alcohol and Drugs

Gender-based violence occurs commonly and is often related to substance abuse. Women and young girls are often the most vulnerable.

Drug and alcohol abuse are currently a major problem in the local study area, and these have the potential to increase during the lifespan of the proposed Project. The SIA confirms this through the discussion of substance abuse (alcohol- and drug-use), and how this reinforces and accounts for a range of social pathologies, such as intra-household violence, women abuse, rape, teenage pregnancies and crime. This would be due to the increase in income and mobility, affording individuals who previously could not afford these 'luxuries', to now indulge.

Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA #9</th>
<th>Social determinants of health: Gender-based violence, alcohol and drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction and into operations and closure</td>
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<td>Temporal scale</td>
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<td>Before Management</td>
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</table>

Management measures

Project impact mitigation:

- Social management plans and recommendations as part of the social impact assessment; and
- Gender empowerment should be considered.

| After Management | 2 | 2 | 2 | 2 | 8 |

General Impact

No Change – existing status will not be affected

7.3.7.2  Social Cohesion and Well-being

Influx into the proposed Project area will play a major role in lifestyle and perceptions of wellbeing.

Employment is a major need in the proposed Project area. The SIA highlights the potential benefits that the proposed Project may bring for employment opportunities. There are distinct direct and indirect health benefits related to this.
Education is also a major existing need in the community. The level of education in the proposed Project area is described as low. It was cited as a priority developmental need in the community. Women’s literacy is extremely important to enhance health needs in the family unit as they are the gatekeepers to health.

There is a lot of mining expertise in the area such as former diamond, copper and base metal miners. Zirco expects to employ numerous local skilled and unskilled labour. Zirco will also make use of skilled workers from outside the KLM. Once the mine becomes operational, several permanent jobs will be created, constituting of skilled, semi-skilled and unskilled labourers. Many of the highly-skilled workers may come from outside of the Proposed Project area which may result in community tension and a reduced sense of well-being.

Impact Evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA #9</th>
<th>Social determinants of health: Social cohesion and well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-construction and into operations and closure</td>
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<td>Temporal scale</td>
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<td>Before Management</td>
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</tbody>
</table>

Management measures

Project impact mitigation

- Gender empowerment and equity. This should include programs as well as employment opportunities.

Corporate Social Investment

- Supporting education programs with a gender equity focus;
- Support cultural activities and sports especially in schools;
- Support vulnerable groups; and
- Support graduate training programs for the youth in the community.

| After Management | 2 | 3 | 2 | 3 | 10 |

No-go Option

| General Impact | No Change – existing status will not be affected |
7.3.8 EHA #12: Non-Communicable Diseases

These diseases are poorly described in the country and district. This is due to the high burden of communicable diseases in the country that have focussed the human and economic resources to this sector.

NCD may play a major role in the economics of the country as it is well recognised that poor adult health negatively affects economic well-being at an individual and household level, but also at a macro level. Labour productivity will fall, and the social and medical costs of managing chronic diseases as well as an ageing population, will increase.

The proposed Project will in all likelihood enhance the socio-economic conditions in the area either from direct or cumulative benefits. As the Project starts to uplift health programs in the area through direct or indirect means, it will hopefully increase the life expectancy in the area and also the productive time of breadwinners. The short term effects may be an increased spending ability and adoption of more western sedentary lifestyle and diet. With prosperity and organised settlement may come a degree of urbanism with associated changes in values and behaviour, which predisposes the community to an increase in lifestyle related diseases such as obesity, hypertension, diabetes, and some forms of cancers. This may place an additional burden on the local health care facilities that may not have an ability to diagnose and appropriately manage these conditions.

The proposed Project will employ a number of permanent and temporary workers. Diet and lifestyle will need to be monitored in this sector as they will have access to increased incomes and potentially free meals on the project site. This is a workplace health as well as a community health concern.

In terms of the significance of the proposed Project on the communities the following can be considered:

- Social and environmental factors that increase stress and unhealthy behaviours; and
- Increase pressure on existing health care facilities that only practice limited preventive health care.

These conditions are chronic in nature and difficult to predict at the local level. The cumulative impacts of the economic upliftment of the Region will need to be considered and such the impacts cannot solely be ascribed to the Project. Mitigation and management at the local level is however important.
Impact evaluation and management measures:

<table>
<thead>
<tr>
<th>EHA #12</th>
<th>Non-communicable diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operations and closure</td>
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<tr>
<td></td>
<td>Temporal scale</td>
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<tr>
<td>Before Management</td>
<td>3</td>
</tr>
</tbody>
</table>

Management measures

Project impact mitigation:
- Collect indicator data on NCD in area. Focus on hypertension and diabetes as most common conditions;
- Support the local health care personnel with training on disease management programs and the recognition of NCD symptoms and associated management; and
- Support health education programs as part of a community based peer health educator program. These should focus on lifestyle risk factors such as diet, exercise, smoking and alcohol consumption.

| After Management | 3 | 3 | 2 | 2 | 10 |

No-go Option

General Impact

8 Conclusion

In conclusion, Zirco and their proposed Project need to consider two major factors related to community health. The first is the existing health needs of the community. These existing health needs are present regardless of the proposed Project and represent the current health status of the community. Second, the proposed Project will need to consider the future health impacts that it (the proposed Project) may exert on the community.

This cHIA has outlined the significant changes on the health status of the local community that may be caused by the proposed Project. An attempt has been made to give a comprehensive outlook of the baseline health status of the proposed Project area (where possible) and also to understand and prioritise future Project health impacts, based on the available evidence. Mitigation and management measures have been recommended and it is advised that these measures are incorporated into the overall environmental and social management plan for the Project.
9 References


Gray, K., Infection Control: Flooring and Anti-Microbial Additives in Healthcare Facilities. 2010


Smith, SM; Schroeder, K; Fahey, T; Smith, Susan M (2008). "Over-the-counter medications for acute cough in children and adults in ambulatory settings". In Smith, Susan M. Cochrane database of systematic reviews (Online) (1): CD001831. doi:10.1002/14651858.CD001831.pub3. PMID 18253996

South Africa Info: http://www.southafrica.info/about/health/health.htm#.Ukrbt9Knru0#ixzz2gU5ve0Ll Retrieved in October 2013


Appendix A: Key Informant Interview Questionnaire
Appendix B: Focus Group Discussion Questionnaire
Appendix C: Plans