



Nomamix (Pty) Ltd Vygenhoek Platinum Mine

Health Impact Assessment (HIA)

(Scoping)

Prepared for: Anandi Alers

On Behalf of: Environmental Management Assistance (EMA)

Date: 28 June 2020

This document has been prepared by Adaptera Strategic Support Services (Pty) Ltd

Report Type:	Health Impact Assessment (Scoping)		
Project Name:	Nomamix (Pty) Ltd Vygenhoek Platinum Mine		
Name	Responsibility	Company	Date
Eugene Dabner	Risk Specialist Input	Eukeda Risk Management Services	10/07/2020
Philip Dukas	Report Writer	Adaptara Strategic Support Services	10/07/2020

This report is provided solely for the purposes set out in it and may not, in whole or in part, be used for any other purpose without Nomamix (Pty) Ltd and/or Adaptera Strategic Support Services (Pty) Ltd prior written consent.

EXECUTIVE SUMMARY

Nomamix (Pty) Ltd (the Applicant) intends developing a new platinum mine called the Vygenhoek Platinum Mine Project in the Mpumalanga Province of South Africa. The project falls within the Thaba Chweu Local Municipality with the nearest town being Lydenburg (Mashishing) located 30km east. The project also falls within a region dominated by other mining operations, mostly located within the Limpopo Province, adjacent to the proposed project site.

The mining operations will take place by means of opencast mining method with the open pit mining operations commencing after the site establishment has been completed. Initially, the removal of overburden will take place for a period of 6 months before any mining of ore is done, with the first ore planned to be mined in month 8 which will be stockpiled to build up sufficient stock to supply the preferred Concentrator with a constant 15,000 tons per month.

As part of the Environmental Authorisation's screening process, a Health Impact Assessment (HIA) was identified as one of the specialist studies in support of the Environmental Impact Assessment (EIA) process. A Health Impact Assessment is a systematic approach to predicting and managing the potential positive and/or negative health effects of policies, plans, programs and projects on local communities and the wider society.

The primary objective of such a Scoping Report is to present key stakeholders (including affected organs of state) with an overview of the project and key issues that require assessment during the EIA Phase and allow the opportunity for the identification of additional issues that may require assessment.

As such, this report provides the initial scoping phase of the Health Impact Assessment whereby an overview of the Environmental Health Areas and their potential impacts on health, both positive and/or negative are provided. It should be noted that no site visit or stakeholder engagement with regards to health has taken place as part of this report but is envisaged to be conducted prior to the Risk Assessment and Health Action Plan.

LIST OF TABLES

Table 1. Land Ownership of the Vygenhoek Project.....	7
Table 2. Health Impact Assessment Process (International Finance Corporation, 2009).....	27
Table 3. Global Environmental Health Areas (EHAs)	44
Table 4. Environmental Health Impact Issues Matrix.....	45

LIST OF FIGURES

Figure 1. Locality Map of the Vygenhoek Project near Lydenburg, Mpumalanga Province, South Africa.	7
Figure 2. Locality Map of Vygenhoek Project within the Bushveld Igneous Complex.	8
Figure 3. Comparison of a Health Impact Assessment (HIA) in relation to other types of impact assessment relevant to the mining and metals sector (International Council for Mining and Metals, 2010).	10
Figure 4. Locality Map of the Vygenhoek Mine Project bordering the Mpumalanga and Limpopo Province.	13
Figure 5. The proposed Vygenhoek Mine Project layout.	14
Figure 6. Locality Map of the Vygenhoek Mine Project in relation to other established mines in the area.	15
Figure 7. Locality Map of the Thaba Chweu Local Municipality.	16
Figure 8. Thaba Chweu population pyramid, StatsSA (2011).	17
Figure 9. Proposed Project Timeframe.....	19
Figure 10. The project location in relation to nearby towns – radius of 10km, 20km, 30km respectively.....	31
Figure 11. Potentially Affected Communities (PACs) within the 10km radius.	32
Figure 12. The 17 Sustainable Development Goals (SDGs), United Nations (2020).	46

LIST OF ACRONYMS

ANC Antenatal Care	HIV/AIDS Human Immunodeficiency Virus, Acquired Immunodeficiency Syndrome
APPA Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)	HNA Health Need Assessment
ARV Antiretroviral Drugs	HRA Health Risk Assess
BoD Burden of Disease	HSS Health Systems Strengthening
BUR Bed Utilisation Rate	IFC International Finance Corporation
CARMMA Campaign on Accelerated Reduction of Maternal Mortality in Africa	KII Key Informant Interviews
CDC U.S. Centres for Disease Control	KPI Key Performance Indicators
CHMP Community Health Management Plan	LM Local Municipality
Chronic Obstructive Pulmonary Disease	LSMS Living Standard Measurement Survey
COVID-19 Coronavirus Disease 2019	MDG Millennium Development Goals
CWIQ Core Welfare Indicators Questionnaire	MICS Multiple Indicator Cluster Survey
DQO Data Quality Objectives	MOH Ministry of Health
DEA Department of Environmental Affairs	M&E Monitoring and Evaluation
DG Director General	NCD Noncommunicable Disease
DoH Department of Health	NEM:AQA National Environmental Management: Air Quality Act
DM District Municipality	NGO Nongovernmental Organization
DSS Demographic Surveillance Sites	NHA National Health Act, 2003 (Act No. 61 of 2003)
DR Dependency Ratios	NHLS National Health Laboratory Service
E&S Environmental and Social	NRC National Research Council
EHA s Environmental Health Areas	PAC Potentially Affected Community
EHS Environmental Health and Safety	PM&E Participatory Monitoring and Evaluation
EIA Environmental Impact Assessment	QA/QC Quality Assurance/Quality Control
ECMG External Compliance Monitoring Groups	ROM Run of Mine
ESIA Environmental and Social Impact Assessment	SIA Social Impact Assessment
FGD Focus Group Discussions	SDH Social Determinants of Health
GIS Geographical Information System	SEIA Social Environmental Impact Assessment
HCT HIV Counselling and Testing	STI Sexually Transmitted Illness
HDI Human Development Index	TB Tuberculosis
HAART Highly Active Antiretroviral Therapy (HAART)	TALK Traditional and Local Knowledge
HAP Health Action Plan	THM Total Heavy Mineral
HIA Health Impact Assessment	TOR Terms of Reference
HIS Health Information System	URTI Upper Respiratory Tract Infections
HIV Human Immunodeficiency Virus	VIP Ventilated Improved Pit-latrine
	WHO World Health Organization

Table of Contents

1. INTRODUCTION	7
1.1. Project Background.....	7
1.2. Terms of Reference (ToR)	9
2. PROJECT DESCRIPTION	11
2.1. Project Details.....	11
2.2. Project Location	13
2.3. Demographic Profile	17
2.4. Municipal Challenges:	19
2.5. Anticipated Project Timeframes	19
3. STATUTORY REQUIREMENTS	20
3.1. South African Legislation	20
3.2. International Best-Practice Management Standards	23
3.3. Internal Company Management Systems	25
4. HEALTH IMPACT ASSESSMENT METHODOLOGY	26
4.1. Introduction to HIA	26
4.2. Key Concepts	29
4.3. Scope of the HIA.....	30
4.4. Environmental Health Areas (EHAs)	43
5. CONCLUSION	46
6. REFERENCES.....	49

1. INTRODUCTION

This chapter provides a brief background to the project and outlines the terms of reference for conducting the Scoping Phase of a Health Impact Assessment (HIA).

1.1. Project Background

Nomamix (Pty) Ltd (the Applicant) intends developing a new (Greenfields) platinum mine (Vygenhoek Platinum Mine) in the Mpumalanga Province of South Africa (see Figure 1 below). The project falls within the Thaba Chweu Local Municipality with the nearest town being Lydenburg (Mashishing) located 30km east.

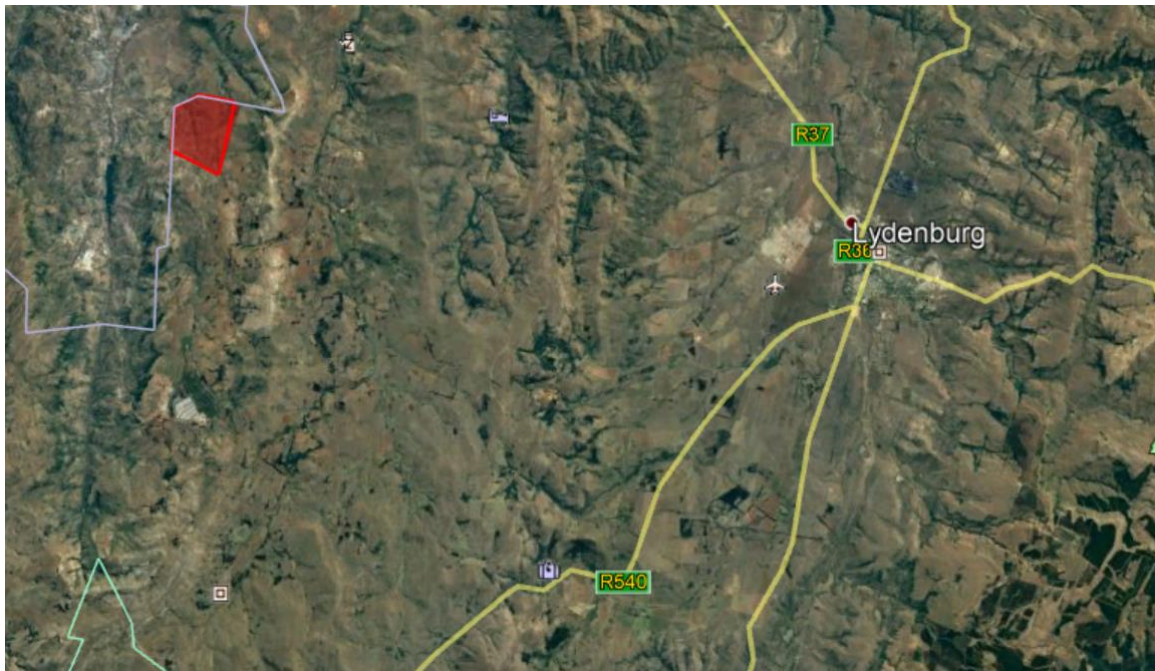


Figure 1. Locality Map of the Vygenhoek Project near Lydenburg, Mpumalanga Province, South Africa.

Nomamix (Pty) Ltd does not currently hold any surface rights over any of the project area indicated above. The Government of the Republic of South Africa currently holds the surface property of portion 3 and 7 of the farm Vygenhoek 10 JT, as indicated in Table 01 below.

Land Ownership – Register of Deeds			
Vygenhoek 10 JT			
Title Deed	Portion	Owner	Comments
T28261/2005	3	RSA	
Not Yet Issued	7		The Survey General approved a subdivision diagram for Portion 7, with no record of the existence of Portion 7.

Table 1. Land Ownership of the Vygenhoek Project.

To ensure the economic success of the project - due to the small size of the Vygenhoek Project (the mining area is estimated to be approximately 720.65ha and associated infrastructure approximately 18ha) the mine aims to only produce ore and sell and transport the ore to one of the existing processing plants.

The Vygenhoek Project is located within the Eastern Limb of the Bushveld Igneous Complex (BIC) (see Figure 2) Chromitite Layers are situated in the Middle Group (MG) and Upper Middle Group (UMG) being UG2, UG1, MG4, MG3, MG2, MG1 and MG0 which occur in the Upper and Lower Critical zones of the BIC. The UG2 Chromitite Layer will be the main target

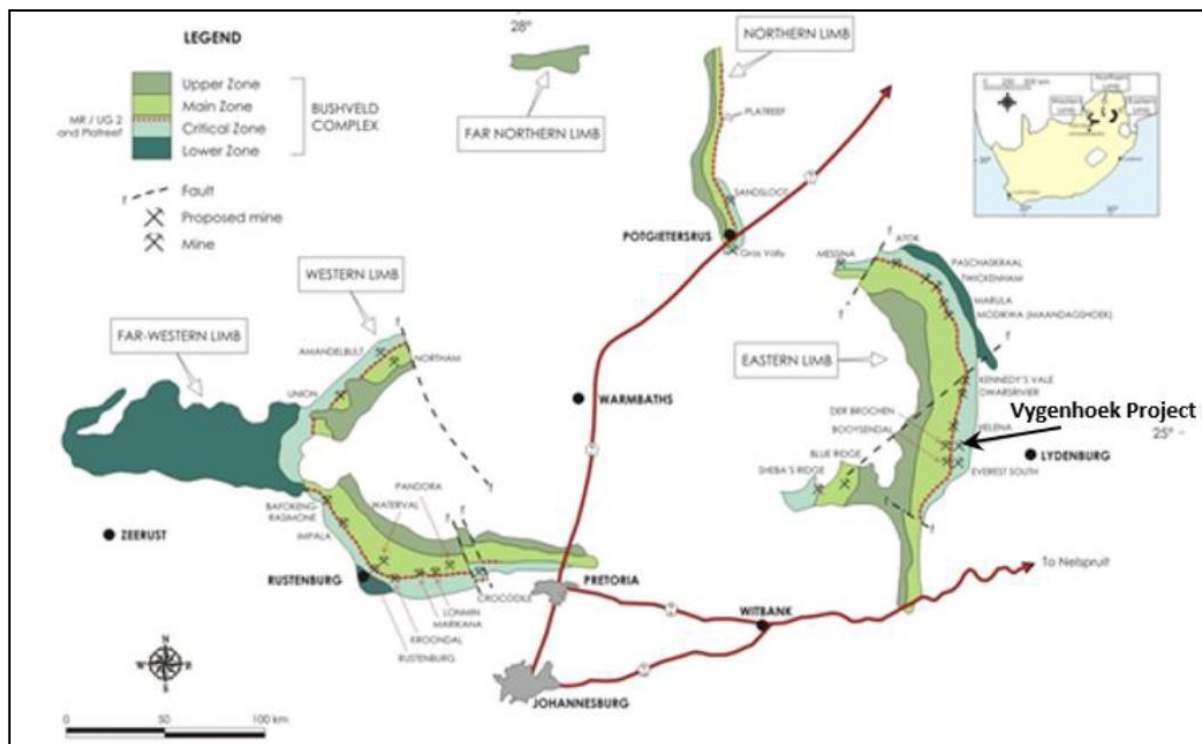


Figure 2. Locality Map of Vygenhoek Project within the Bushveld Igneous Complex.

The following type of minerals are anticipated to be extracted:

Platinum Group Metals	Other Precious Metals	Base Metals
<ul style="list-style-type: none"> Platinum (Pt) Palladium (Rh) Iridium (Ir) Ruthenium (Ru) 	<ul style="list-style-type: none"> Gold (Au) Silver (Ag) 	<ul style="list-style-type: none"> Nickel (Ni) Copper (Cu) Iron (Fe) Vanadium (V) Chromite (Chrome Ore)

1.2. Terms of Reference (ToR)

Adaptera Strategic Support Services (Pty) Ltd (**Adaptera**) has, on behalf of Nomamix (Pty) Ltd, been subcontracted by Environmental Management Assistance (Pty) Ltd (**EMA**) to conduct a desktop-based scoping exercise for a Health Impact Assessment (HIA) for the proposed Vygenhoek Platinum Mine project. This HIA is intended to be conducted as a specialist study in support of the Environmental Impact Assessment (EIA) process. See Figure 3 below for how HIA relates to other impact assessments in the mining and metals sector.

The primary objective of such a Scoping Report is to present key stakeholders (including affected organs of state) with an overview of the project and key issues that require assessment during the EIA Phase and allow the opportunity for the identification of additional issues that may require assessment.

The Scoping Phase of an EIA (HIA) refers to the process of determining the spatial and temporal boundaries for the EIA. In broad terms, the objectives of the Scoping Process in terms of the 2017 NEMA EIA Regulations (GN R326) are to:

- Confirm the process to be followed and opportunities for stakeholder engagement
- Clarify the project scope to be covered
- Identify and confirm the preferred activity and technology alternatives
- Identify and confirm the preferred site for the preferred activity
- Identify the key issues to be addressed in the impact assessment phase and the approach to be followed in addressing these issues
- Confirm the level of assessment to be undertaken during the impact assessment

The above is achieved through parallel initiatives of consulting with:

- The lead authorities involved in the decision-making for this EIA application
- The public to ensure that local issues are well understood
- The EIA specialist team to ensure that technical issues are identified

This desktop-based scoping exercise will consider the following information:

- Statutory Requirements (The Constitution and relevant Acts and/or Regulations)
- International best-practice guidelines such as the International Finance Corporation (IFC) Performance Standards and Environmental Health and Safety (EHS) Guidelines.
- Project related information as presented by the Applicant (Nomamix (Pty) Ltd)

Figure 3. Comparison of a Health Impact Assessment (HIA) in relation to other types of impact assessment relevant to the mining and metals sector (International Council for Mining and Metals, 2010).

Aspect	Health Impact Assessment (HIA)	Environmental Impact Assessment (EIA)	Social Impact Assessment (SIA)	Environmental and Social Impact Assessment (ESIA)	Environmental, Social and Health Impact Assessment (ESHIA)
Policy context	Voluntary, good practice, recommended by the WHO, EU, WB, UNEP, ILO, FAO, IFC	Often required by in-country legislation	Can be legislatively based but usually carried out voluntarily as part of good practice	Can be legislatively based but usually carried out voluntarily as part of good practice	Can be legislatively based but usually carried out voluntarily as part of good practice
Focus	Human health in its widest sense - transgenerational and health equity/inequality impacts	Impact on the environment (soil, air, water, flora, fauna and human populations) Health focus generally on pollutants emitted by the project into the air, water and soil	Impact on communities (socio-economic, culture, religion, vulnerable groups, beliefs and values, organization)	Focus on environmental and community impacts. Health focus similar to EIA	As in EIA, SIA and HIA
Health definition	Both biomedical and the wider social and environmental determinants of health. State of complete physical, mental, social and spiritual wellbeing. Health is influenced by the determinants of health (a multiplicity of factors including socio-economic and environmental factors)	Biomedical with a focus on direct biophysical health impacts. Focus on environmental health determinants air, water, soil, noise etc.	Biomedical with a focus on medical care, equity, access, migration, economics	As in EIA and SIA	As in EIA, SIA and HIA
Community participation	Community participation important and integral part of the process	Consultation step often legislated	Consultation required all through the process and as a tool to collect baseline information	As in EIA and SIA	As in EIA, SIA and HIA
Values	Explicit, aims promote <ul style="list-style-type: none"> • A democratic process • Equity/Reducing inequality • Sustainable development • Ethical use of evidence • There are also professional association codes of conduct at national and international levels e.g. International Association for Impact Assessment (IAIA) statement of professional conduct 	Implicit <ul style="list-style-type: none"> • Objectivity • There are also professional association codes of conduct at national and international levels e.g. International Association for Impact Assessment (IAIA) statement of professional conduct 	Implicit <ul style="list-style-type: none"> • Objectivity • There are also professional association codes of conduct at national and international levels e.g. International Association for Impact Assessment (IAIA) statement of professional conduct 	As in EIA and SIA	As in EIA, SIA and HIA

2. PROJECT DESCRIPTION

This chapter outlines what the project entails, where the project is located, who will likely be affected by the project (including local demographic profile), and the anticipated timeframes.

2.1. Project Details

The mining operations will take place by means of opencast mining method. The open pit mining operations will commence after the site establishment is completed. Initially, the removal of overburden will take place for a period of 6 months before any mining of ore is done. The first ore will be mined in month 8 and will be stockpiled to build up sufficient stock to supply the preferred off-site Processing facility at a constant 15 000 tons per month.

The ore and waste mining will take place concurrently and the pit will be mined from the north in a southerly direction, with backfilling of the mined-out areas taking place behind as the pit advances. At a later stage, underground mining might commence and eventually substitute the opencast production. A feasibility study will determine the future underground mining.

Factors that were considered in the mine design strategy included:

- Formal and informal settlements in relation to the planned open pit mining area as well as existing mining activities. A mining restriction zone of 600m was used for design purposes which correlates to the 600m blast radius.
- Waste dumps to be placed away from UG2 sub-outcrop positions, on the highwall side of the maximum highwall position.
- Monthly production of approximately 15,000tpm of ROM ore.
- The weathering profile of the near-surface material.
- Backfilling of mined out areas as soon as possible to minimize dust and aid in rehabilitation, minimize haulage costs and double handling.
- Operating costs – for mining and administration.
- Selling costs - for the UG2 ROM.
- Mining dilution of 22% was applied after the in-situ resource estimates.
- Due to surface weathering an overall slope angle of 7° from vertical was used to ensure pit stability. The angle could be further steepened in the deeper solid zones, however a safety factor of 7° is preferred with a bench at 20m.

Seeing as the Vygenhoek Platinum Mine Project has a small footprint, it will not support the construction of a processing plant, however it will require some support facilities and infrastructure to operate.

The supporting infrastructure requirements are:

- Waste management: temporary handling and storage of general and hazardous waste, on-site change houses/ablution facilities with sewage treatment plant, possible incinerator for treating sewage screenings
- Surface water management: water supply dams, mine residue facility returns water dams, pollution control dams, clean and dirty storm water controls, river crossings
- Storage and handling of hazardous substances: fuel, lubricants, processing will be done off-site, raw material stockpiles/bunkers, dust (incl. silica), gas, burning oils, explosives
- Security and access control
- Refuelling facilities
- Lay down and storage yard areas
- Workshops and wash bays
- Offices
- Contractor camps
- Medical station
- Diesel generators

2.2. Project Location

The Vygenhoek Project is located near the town of Lydenburg (Mashashing), in the Mpumalanga Province of South Africa (see Figure 4 below). The Project is also located on the Provincial border of Mpumalanga and Limpopo. A copy of the proposed mine layout is featured below in Figure 5). In addition, the project falls within a region dominated by other mining activities (see Figure 6 below), mostly located within the Limpopo Province, adjacent to the proposed project site. According to (Thaba Chweu Local Municipality, 2017) there are more than 30 mines in both Lydenburg and Steelpoort, including Glencore, Mototolo, Impala Platinum, Anglo Platinum, Aquarius, Dwarsrivier, Everest Platinum, etc.

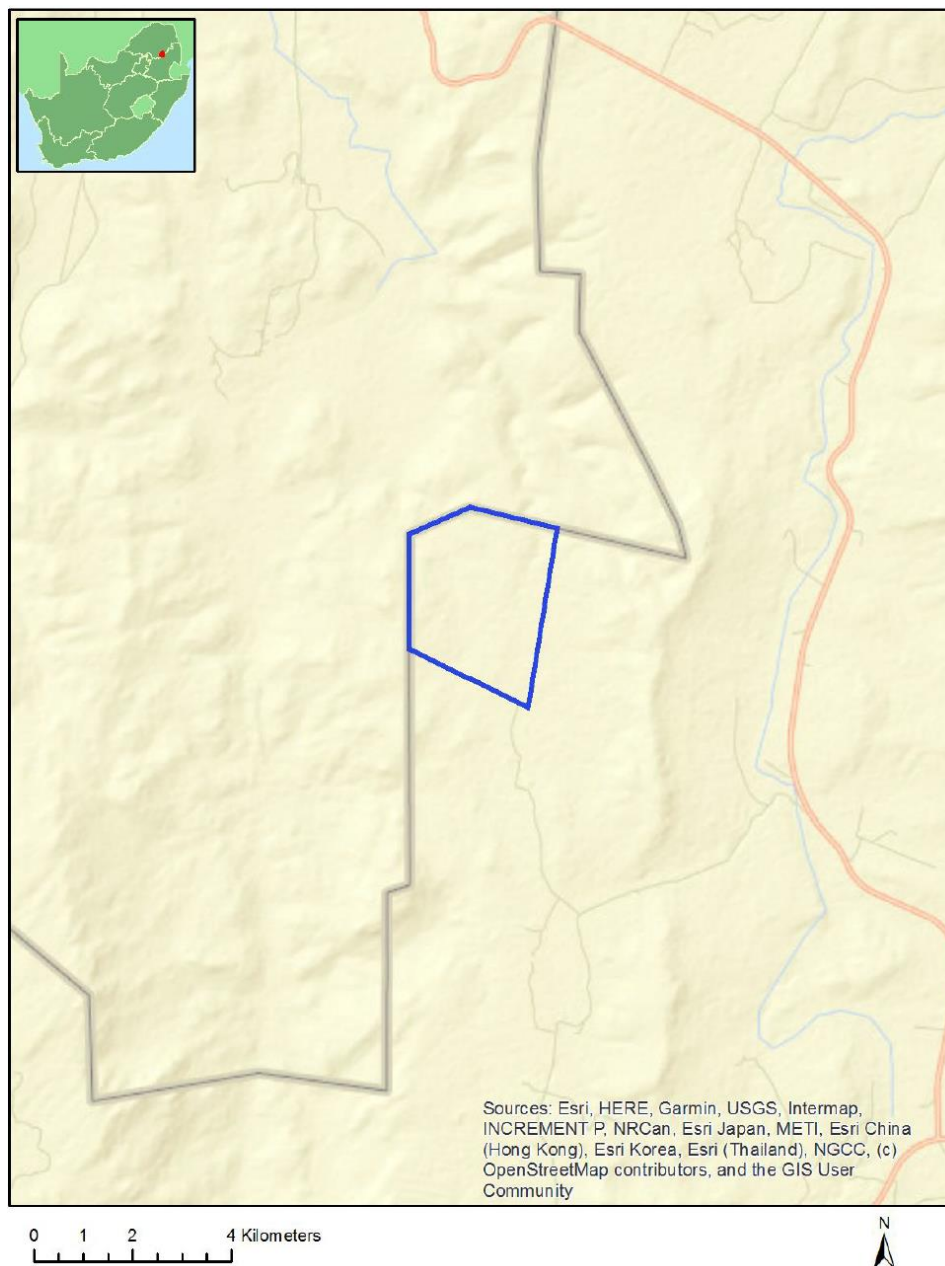
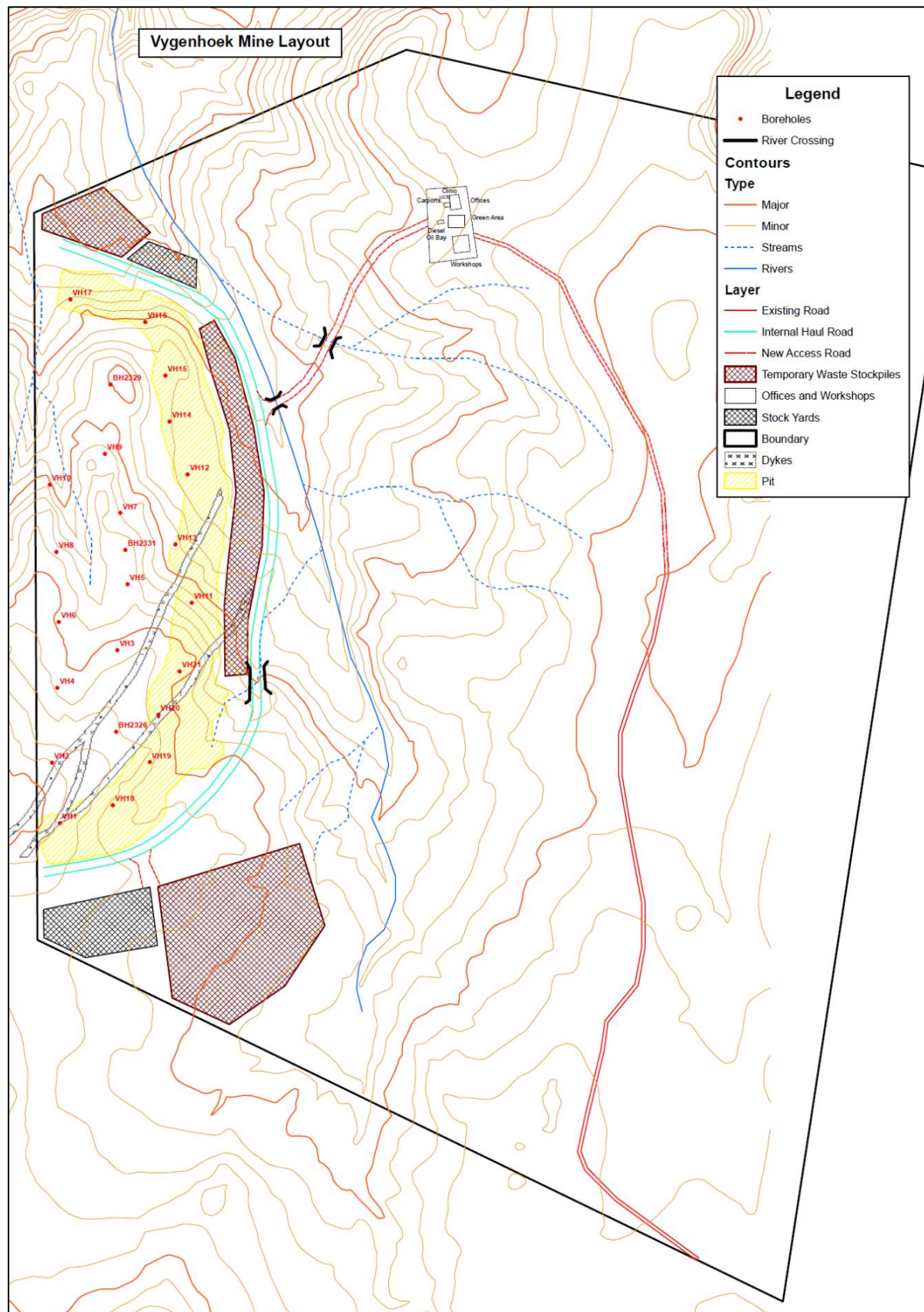


Figure 4. Locality Map of the Vygenhoek Mine Project bordering the Mpumalanga and Limpopo Province.

Figure 5. The proposed Vygenhoek Mine Project layout.



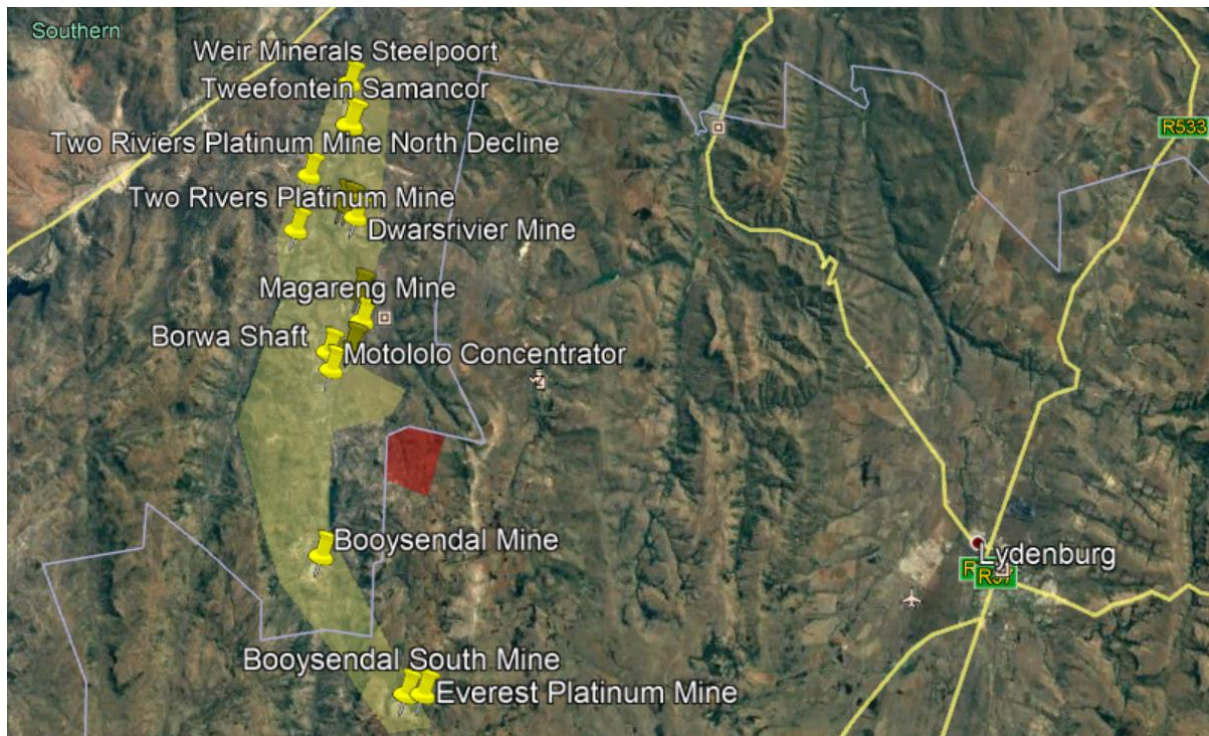


Figure 6. Locality Map of the Vygenhoek Mine Project in relation to other established mines in the area.

The project falls within the Thaba Chweu Local Municipality (TCLM) (see Figure 6 below) which is a Category B municipality located in the north-western region of the Mpumalanga Province in the Ehlanzeni District. The municipality is on the Lowveld escarpment of Mpumalanga, with an average elevation of 1,400m above sea level and altitudes varying from 600 to 2,100m with an area of 5,719km².

The main economic sectors in the area are forestry, agriculture, mining, business services and tourism. The western side (Lydenburg Town) is dominated by agricultural and farming activities, while forestry is the main economic activity of the eastern side (Sabie and Graskop Towns). The municipality is one of the major tourist attraction areas in South Africa. Mashishing (previously known as Lydenburg) is the oldest town in the province (Thaba Chweu Local Municipality, 2017).

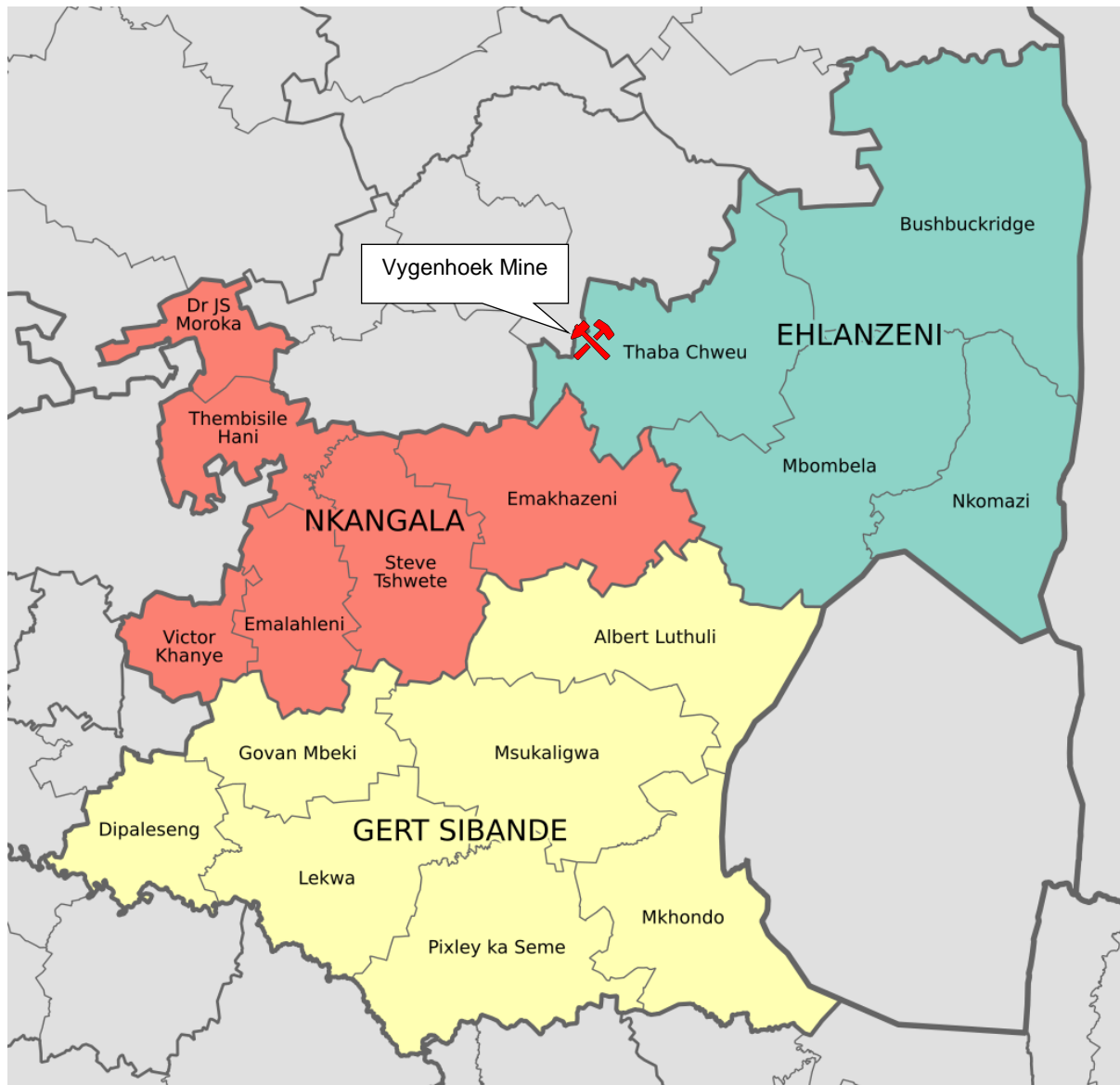


Figure 7. Locality Map of the Thaba Chweu Local Municipality.

2.3. Demographic Profile

The following section outlines the current demographics of the Thaba Chweu Local Municipality.

Population:

According to StatsSA (2016) the population in 2016 was 101,895 across the Thaba Chweu Local Municipality, with a projected growth forecast to 113,920 in 2030. The population of Thaba Chweu Local Municipality shows a typical age structure of a different age group distribution in the year 2011. Figure 8 below presents a high proportion of the age group of between 25-29 to be highest and 0-4 to be the second highest of both female and male. The number decreases as the age goes up. The age group of 80+ has the lowest proportion compared to the rest of the other groups. In terms of gender balance, the females have the highest proportion in almost all the age groups. Figure 8 demonstrates the municipality has its higher concentration of younger age groups (Thaba Chweu Local Municipality, 2017).

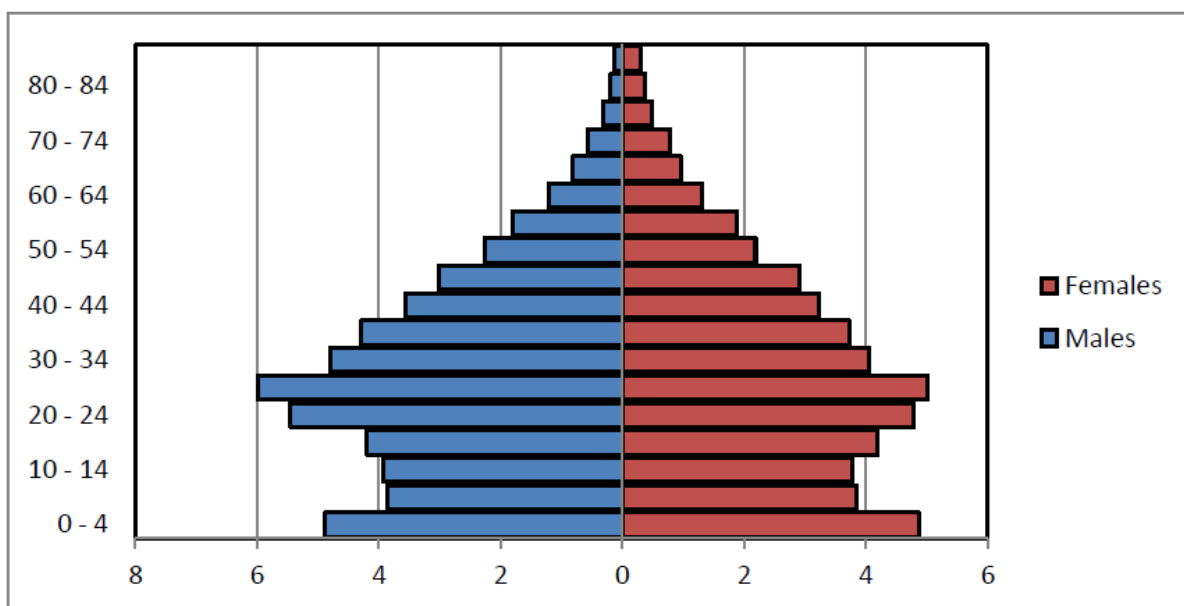


Figure 8. Thaba Chweu population pyramid, StatsSA (2011).

Racial Makeup:

The following list represents the 2011 racial makeup of the Thaba Chweu Local Municipal region (StatsSA, 2016).

- Black African – 81.6%
- White – 14.5%
- Coloured – 2.6%
- Indian/Asian – 0.6%

Language:

The following list represents the 2011 primary languages in the Thaba Chweu Local Municipal region (StatsSA, 2011).

- Northern Sotho – 36.2%
- Swazi – 17.8%
- Afrikaans – 15.2%
- Zulu – 7.7%
- Other – 23.1%

Employment:

According to (Thaba Chweu Local Municipality, 2017) the following list represents the industry employment ratio.

- Mining – 23.9%
- Trade – 18.2%
- Community Services – 14.7%
- Agriculture – 14.0%
- Private Household – 8.1%
- Manufacturing – 7.0%
- Construction – 6.0%
- Finances – 4.7%
- Transport – 3.1%
- Utilities – 0.4%

The job driver with the highest potential for mass employment creation identified in the Thaba Chweu IDP Growth Plan include improved job creation within the mining value chain as well as economic enrichment for the entire region (Thaba Chweu Local Municipality, 2017).

Housing:

According to StatsSA (2020), over four-fifths (84,7%) of the population in 2016 reside in formal dwellings and 10,9% in informal dwellings. Mpumalanga recorded a (19,5%) proportion of households who reported that their main dwelling was a RDP/Government subsidised dwelling as compared to other provinces. Over three-fifths (62,5%) of the households in the Mpumalanga reported that their dwellings were owned and fully paid off.

2.4. Municipal Challenges:

According to (Thaba Chweu Local Municipality, 2017) the following represents the key health related challenges facing the municipality.

- **Water:** illegal connections of water, dilapidated infrastructure, lack of household water meters, non-existence of water infrastructure in informal settlements, poor water quality.
- **Sanitation:** illegal connections of sewer, dilapidating infrastructure, non-existence of sewer infrastructure in informal settlements. Taking into consideration the recent population growth in Mashashong and potential boom both residential and business which has been triggered by the mining sector - there is a need for bulk network capacity and sewer treatment works upgrades in the town centre.
- **Waste Management:** widespread littering, non-collection of waste in informal settlements and rural communities, illegal dumping, lack of pollution control monitoring, poor management of landfill sites, lack of coordination for recycling.
- **Social Programs and Services:** lack of youth development programs, insufficient coordination of HIV/AIDS programs, inadequate mainstreaming of transversal issues (women, children, youth, senior citizens, and disabled people), growing population.
- **Spatial Planning:** escalating informal settlements, land invasions, poor planning for housing developments, uninformed infrastructure development.

2.5. Anticipated Project Timeframes

The following Figure 9 represents the proposed project implementation timeframes to develop the Vygenhoek Mine with key milestones.

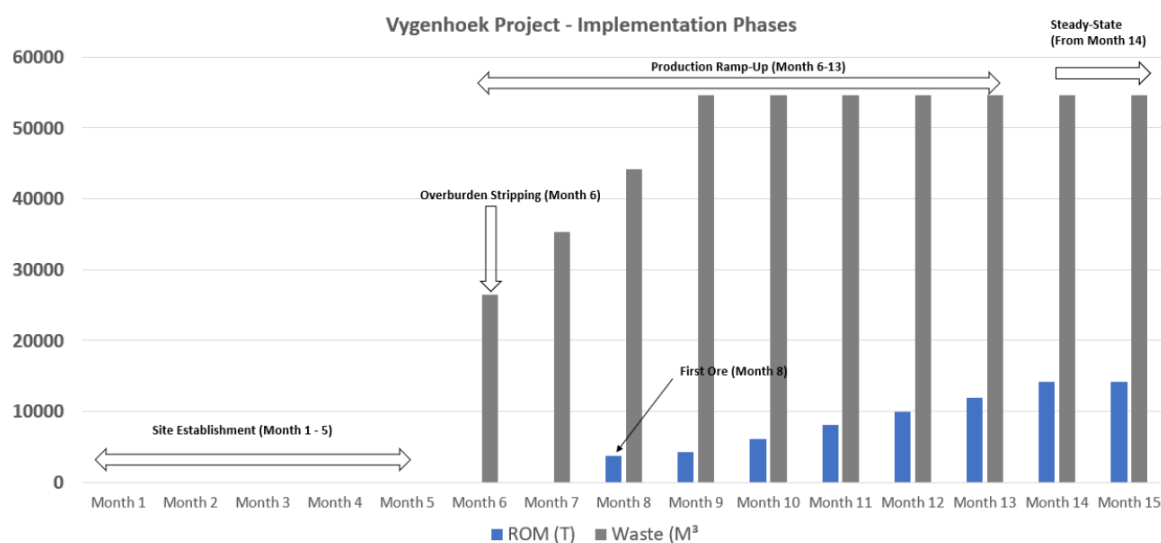


Figure 9. Proposed Project Timeframe.

3. STATUTORY REQUIREMENTS

The following chapter outlines the statutory requirements relating to health which include South African legislation, international best practice management standards and internal company management systems.

3.1. South African Legislation

The Constitution

The over-arching legislation is the Constitution of South Africa, which includes the following key sections related to health and well-being:

- **Section 24: Environment** – which provides everyone with the right to an environment that is not harmful to their [human] health or well-being and “to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that 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.
- **Section 27: Health care, food, water and social security** – which provides everyone with the right to have access to health care services, including reproductive health care, sufficient food and water, and social security, including, if they are unable to support themselves and their dependents, appropriate social assistance.

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 regards 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 Occupational Health and Safety Act and Regulations (Act 85 of 1993)

The Occupational Health and Safety Act and Regulations (Act 85 of 1993) provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

The Act also includes the following Regulations:

- **General:** General Administrative Regulation (2003), General Safety Regulations, Major Hazard Installation Regulations, Regulations for Hazardous Biological Agents, Explosives Regulations (2002), Construction Regulations (2014), Health and Safety of Children at Work Regulations, BCEA Regulations on Hazardous Work by Children.
- **Health:** Asbestos Regulations (2001), Diving Regulations (2009), Environmental Regulations for Workplaces (1987), Facilities Regulations (2004), Regulations for Hazardous Chemical Substances (1995), Lead Regulations (2001), Noise-Induced Hearing Loss Regulations.
- **Mechanical:** Driven Machinery Regulations (2015), National Code of Practice for the Training Providers of Lifting Machine Operators (2015), General Machinery Regulations (1998), Lift, Escalator and Passenger Conveyor Regulations (2010), Regulations Concerning the Certificate of Competency (1990), Pressure Equipment Regulations (2009).
- **Electrical:** Electrical Installation Regulations (2009), Electrical Machinery Regulations (2011).

The Mine Health and Safety Act (Act 29 of 1996)

The Mine Health and Safety Act (Act 29 of 1996) provides a structured framework for the management and implementation of all mining activities, including mine health and safety in South Africa, taking into account the obligations with regards to health services imposed on the national, provincial and local governments by the Constitution and other legislation.

Section 1 outline the objectives of this Act in terms of Health and Safety as follows:

- a) to protect the health and safety of persons at mines*
- b) to require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines*
- c) to give effect to the public international law obligations of the Republic that concern health and safety at mines*

- d) *to provide for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at mines*
- e) *to provide for effective monitoring of health and safety conditions at mines*
- f) *to provide for enforcement of health and safety measures at mines*
- g) *to provide for investigations and inquiries to improve health and safety at mines*
- h) *to promote:*
 - a. *a culture of health and safety in the mining industry*
 - b. *training in health and safety in the mining industry; and*
 - c. *co-operation and consultation on health and safety between the State, employers, employees and their representatives.*

Section 2 of the Act requires that:

1. The employer of every mine that is being worked must:
 - a) *ensure, as far as reasonably practicable, that the mine is designed, constructed and equipped:*
 - a. *to Provide conditions for safe operation and a healthy working environment; and*
 - b. *with a communication system and with electrical, mechanical and other equipment as necessary to achieve those conditions*
 - b) *ensure, as far as reasonably practicable, that the mine is commissioned, operated, maintained and decommissioned in such a way that employees can perform their work without endangering the health and safety of themselves or of any other person*
 - c) *compile an annual report on health and safety at the mine including the statistics on health and safety that must be kept in terms of this Act and the annual medical report referred to in section 16*
 - d) *if the employer is a body corporate, and employs more than 50 employees, publish and distribute the report referred to in paragraph (c), in an appropriate form, to the body corporate's shareholders or members.*
2. The employer of a mine that is not being worked, but in respect of which a closure certificate in terms of the Minerals and Petroleum Resources and Development Act has not been issued. must take reasonable steps to continuously prevent injuries, ill-health, loss of life or damage of any kind from occurring at or because of the mine.

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
- 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, 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 (Dlamini, 2014).

3.2. International Best-Practice Management Standards

There are several international guidelines or best practice guidelines that refer to 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 projects that 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). 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.

The objectives of PS4 are:

- To anticipate and avoid adverse impacts on health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with the relevant human rights principles and in a manner that avoids or minimises risks to the Affected Communities.

PS4 requires that the Client (Applicant) evaluate the risks and impacts to the health and safety of the Affected Community during the project lifecycle and shall establish preventative and control measures consistent with good international industry practice (GIIP) such as the World Bank Group's EHS Guidelines. The Client (Applicant) shall identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures should favour the avoidance of risks and impacts over minimisation.

In addition, PS4 requires the Client (Applicant) to:

- take safety risks to third parties and Affected Communities into consideration in the design, construction, operation and decommission of the project
- avoid or minimise the potential for community exposure to hazardous materials and substances that may be released by the project
- avoid adverse impacts on related ecosystem services that could result in the adverse safety and health of Affected Communities
- avoid or minimise the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases and communicable diseases that could result from project activities
- assist and collaborate with the Affected Communities, local government agencies and other relevant parties with regards to the emergency preparedness and response planning
- assess the risk posed by security personnel/arrangements to the Affected Communities when appointing such contracted workers

Dlamini (2014) adds that South Africa is also 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
- United Nations Agencies including:
 - United Nations Environmental Program
 - International Health Regulations as promulgated by the World Health Organization
 - United Nations Development Program

3.3. Internal Company Management Systems

Ideally the Applicants internal health related management systems would be included in this chapter however Nomamix (Pty) Ltd is a new company and as such the internal Company management systems, processes and procedures pertaining to health have not yet been formulated.

4. HEALTH IMPACT ASSESSMENT METHODOLOGY

This chapter introduces the Health Impact Assessment and outlines the processes and methodologies involved including identifying the potential project specific impacts and/or opportunities on health.

4.1. Introduction to HIA

A Health Impact Assessment (HIA) is a systematic approach (see Table 2 below) to predicting and managing the potential positive and/or negative health effects of policies, plans, programs and projects on local communities and the wider society (International Council for Mining and Metals, 2010).

According to the International Council for Mining and Metals (2010), the assessment and management of community health, safety and well-being impacts is increasingly considered part of the risk management and social responsibility of mining and metals operators. A range of industrial sectors e.g. oil and gas, chemical manufacturing and transportation are increasingly looking to embed HIA within their organizational and project management structures.

Most communities have existing health problems and health assets. Similarly, all development projects have the potential to generate positive and negative health and well-being impacts. It is within this wider context that the community health impacts of mining operations should be considered. Both positive and negative impacts occur because a project can change the economic, social, sanitary, and natural environments within which communities live and work, however good design and management can help to maximize the positive health and safety impacts and avoid or minimize the negative ones (International Council for Mining and Metals, 2010).

The core activity of an HIA is the prediction, evaluation, and mitigation of impacts (IFC, 2009) and according to Winkler *et al.* (2010), 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
- v. experience of previous HIAs in similar settings

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

Table 2. Health Impact Assessment Process (International Finance Corporation, 2009)

Key Steps	Description	Comments	Future Actions
Screening	This step in the process is a preliminary evaluation by specialists where projects requiring environmental or social impact assessments are likely to have potential health impacts, the need for an HIA can be determined.	Completed. The Screening Report was generated using the DEA online tool on the 18 th June 2020.	N/A
Scoping	This step in the process aims to outline the range and types of health-related hazards and beneficial impacts. Ideally the input of key stakeholders and relevant health authorities should be included so that the HIA adequately addresses a realistic range of health concerns. This stage also defines the Terms of Reference (TOR) for the scoping which should be “fit for purpose” and suitably match the complexity of the project.	The focus of this report. Currently conducted as a desktop study and excludes a site visit and any stakeholder engagement.	Recommended to conduct a site visit inclusive of initial key stakeholder engagement to verify and focus the relevant health impacts.
Risk Assessment	This step in the process should include the key set of activities to investigate, evaluate and rank the impacts the project is likely to have, on the health of the defined communities.	Not included in this report.	To conduct as follow-up to the Scoping. Client and Stakeholder input will be critical.
Health Action Plan	This step in the process considers the ranking developed in the risk assessment and develops a written Health Action Plan (HAP) to establish the proposed actions needed to mitigate identified impacts and promote health opportunities in the project. Review and analysis by key stakeholders is critical.	Not included in this report.	To development as follow-up to the Scoping and Risk Assessment. Stakeholder review will be critical.
Implementation and Monitoring	This step in the process occurs after the HAP is developed. At this point it is necessary to establish the roles and responsibilities of the companies and key stakeholders. During this process, the project should establish action frameworks and allocation of resources, and it should design monitoring systems to ensure that mitigation progress is satisfactory. The monitoring plan should include appropriate key performance indicators.	Not included in this report.	To include the mitigation and management measures into the Health Action Plan.
Evaluation & Verification of Performance & Effectiveness	This step in the process ensures a system for determining that implementation has been accomplished and is achieving the intended results.	Not included in this report.	To include in the Health Action Plan and monitor and report as part of operations.

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.
- Develops evidence-based recommendations to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant project stage.

The International Council for Mining and Metals (2010) states that for new mining operations and modifications, or acquisitions of existing projects, HIA can:

- Identify and maximize the positive community health and wellbeing impacts and opportunities that a mining operations can bring.
- Identify, avoid, and minimize, through changes to the project design and implementation, the unintended negative community health and wellbeing impacts that can arise.
- Identify existing community health problems, which could amplify the impact of a proposed project and affect its viability.
- Identify country-specific health regulations which may affect the proposed project.
- Provide a process through which the project can work in partnership with local health, social care, and welfare services to jointly alleviate these health problems.
- Form one part of a broader community and local stakeholder involvement and engagement process that can build trust, draw out any community concerns and generate a dialogue about the best ways that the project can benefit local communities.
- Help to make explicit the potential trade-offs between community health and wellbeing and other economic, environmental, and social objectives of the proposed project.
- Provide an equitable, transparent, and evidence-based approach to planning and funding community health infrastructure and development activities to protect and enhance sustainable local livelihoods.
- Help to jointly negotiate those aspects of community health and wellbeing which are the responsibility of the project and those aspects which are the responsibility of local government and local public services.
- Help to manage project sustainability and obtain a long-term licence to operate.

The International Council for Mining and Metals (2010) also states that a proactive approach to preventing ill health and maximizing health and wellbeing benefits can improve the financial performance of a project and parent company. Key bottom line benefits include:

- Quicker achievement of a mining operation's licence to operate
- Lower planning and associated legal and consultancy costs
- Access to international funding
- Lower risk of disruptive protest or sabotage
- Lower risk of damage to a project and parent company's reputation
- Lower risk of future community-led liability and litigation
- Reduced absenteeism and health care costs for employees from local communities
- Improved general employee morale.

4.2. Key Concepts

- **Health** – a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.
- **Well-being** – a state of being with others that arises where human needs are met and where one can act meaningfully to pursue one's goals and where one can enjoy a satisfactory quality of life.
- **Quality of life** – an individual's perception on their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. It is a broad ranging concept affected in a complex way by the persons physical health, psychological state, personal beliefs, social relationships, and their relationship to salient features of their environment (World Health Organisation).
- **Social Impacts** – something that is experienced or felt, in a perceptual or corpo-real sense at the level of an individual, social unit (family, household, community), or community/society. Social impacts are changes to one or more of the following: people's way of life, their culture, their community, their political systems, their environment, their health and well-being, their personal and property rights, their fears and aspirations.
- **Social change** – any change in social relations and is an ever-present phenomenon in any society.
- **Human rights** – those rights, which are inherent in our nature and without which we cannot live s human beings. Human rights and fundamental freedoms allow us to satisfy our spiritual and other qualities, our intelligence, our talents, and our conscience and to satisfy our spiritual and other needs. Human rights are based on mankind's increasing demand

for a life in which the inherent dignity and worth of each human being will receive respect and protection. (United Nations)

- **Environmental and social justice** – the fair treatment and meaningful involvement of all people regardless of ethnicity, income, or nationality and ensuring resources are equitably distributed.
- **Public participation and stakeholder engagement** – the involvement of individuals and groups that are positively or negatively affected by a proposed intervention (e.g. project, programme, plan, policy) subject to a decision-making process, or are interested in it. Stakeholders include all individuals and groups who are affected by; or can affect a given operation.

4.3. Scope of the HIA

The aim of this section is to define the scope and geographical regions affected by the proposed Project.

At this stage, only the scoping phase of the HIA is being conducted via desktop research. Scoping, according to the International Finance Corporation (2009) is a process of outlining the range and types of hazards and beneficial impacts and setting the geographical, timescale and population boundaries to the assessment. This stage of the HIA process also establishes TOR, if needed. The overall types and categories of questions that should be addressed are defined at this stage. And it is essential to develop a description and general knowledge of the project, covering location, size, workforce, surrounding communities, operations, and likely exposures.

Timeframe:

For the purpose of this report, the scope of the study includes the following phases:

- **Construction:** Site establishment is predicted from 0 - 6 months with overburden stripping commencing from month 6 onwards
- **Operations:** First ore production anticipated from month 8 with a steady state of production from month 14 onwards. Anticipated lifespan of the mine to be confirmed by Life of Mine Plan.
- **Decommissioning:** TBC
- **Rehabilitation:** TBC
- **Sign off:** TBC

Geographical:

For the purpose of this report, the scope of the study encompasses the project area (see Figure 10) which includes a 10km, 20km and 30km radius around the project, as situated near the main town of Lydenburg (Mashashing), Mpumalanga Province, South Africa.

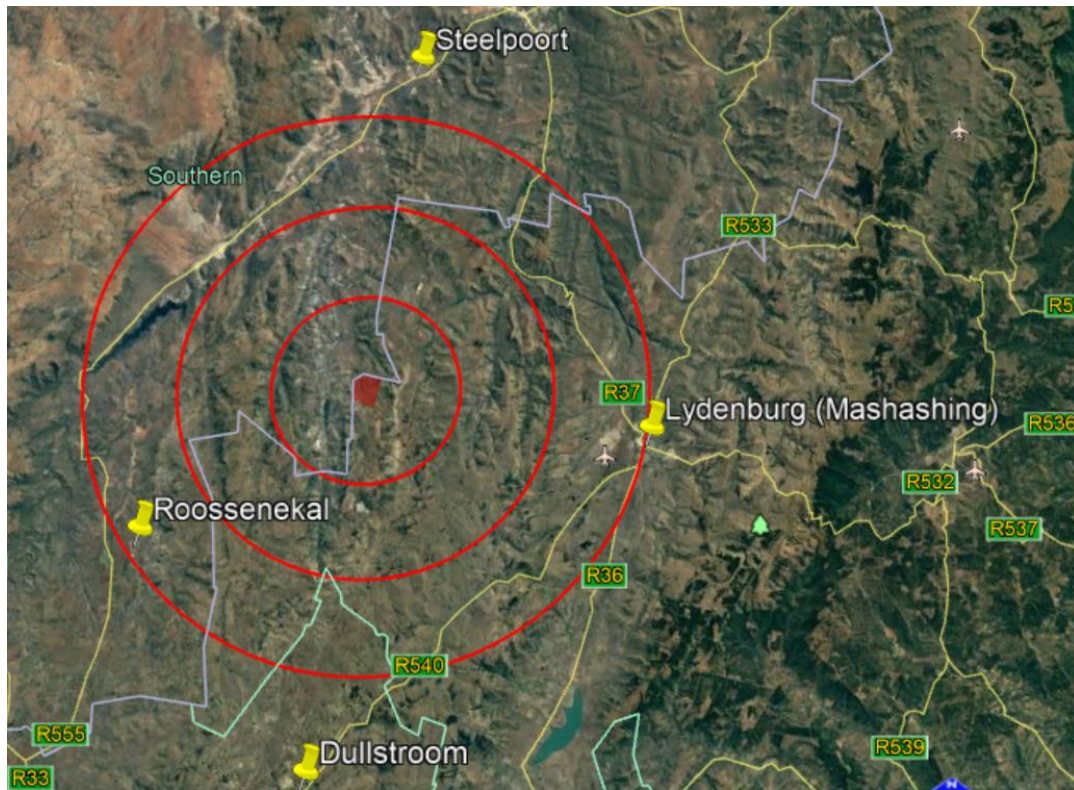


Figure 10. The project location in relation to nearby towns – radius of 10km, 20km, 30km respectively.

Potentially Affected Communities:

A Potentially Affected Community (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:

- Farming Communities (agriculture and livestock) = <10km+
- Steelpoort (Ga-Mapodila, Pelaneng, Matholeng, Ga-Matate, Ga-Mampuru, Ga-Masha, Kokwaneng, Mmaphoko) = 20-30km
- Lydenburg (Mashashing) = 30km
- Roossenekal = 30km
- Dullstroom (Sakhelwe) = 40km

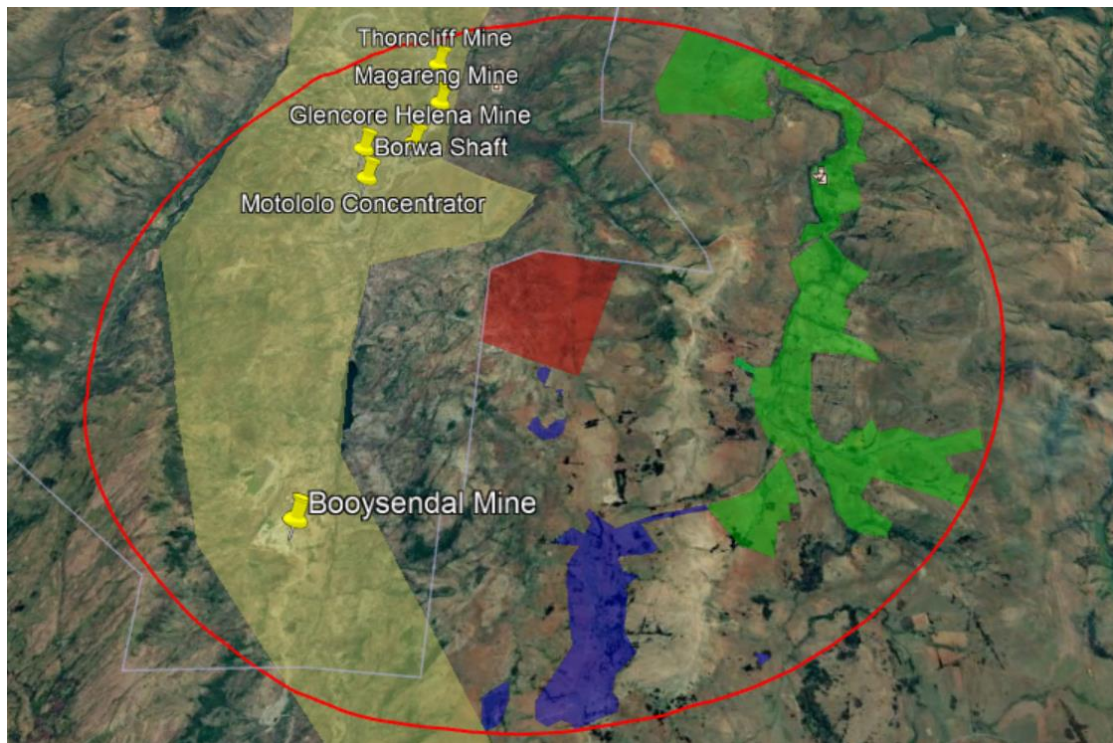


Figure 11. Potentially Affected Communities (PACs) within the 10km radius.

Stakeholder Engagement:

Effective stakeholder engagement is integral to the quality of health impact assessment and to the success of associated mitigation actions (IFC, 2007). Although stakeholder engagement was not included during this reporting process, it is highly recommended as part of the follow-up and HIA process. Key stakeholders to engage with include, but is not limited to:

- The farming community (livestock and agricultural farmers)
- Local communities residing within, adjacent to and potentially impacted by the project footprint
- Local Municipal Health and Labour Departments (Lydenburg/Mashashing)
- Other Mining Operations in the Area
- Any other relevant/key stakeholders who may potentially be impacted upon by the project

Limitations to the Scope:

For the purpose of this report, the following limitations are highlighted:

- COVID-19 is currently rapidly increasing across South Africa.
- No site visit was conducted.
- No community/stakeholder engagements were conducted.

Potential Health Impacts:

The health and wellbeing impacts described here can occur at any time during the mining and metals lifecycle from exploration and construction to operation and closure.

These impacts can be classified into:

1. Health outcomes
2. Health determinants
3. Health equity/inequality
4. Cumulative impacts

1. Impacts of mining and metal projects on health outcomes

Health outcomes are measurable changes in the health status of an individual, group or population which are attributable to an intervention or series of interventions. Health outcomes may be intended or unintended and may not become apparent for many years.

The following represents the types of *health outcomes* considered during a HIA:

- Infectious diseases: Malaria, HIV and Influenza, COVID-19
- Chronic diseases: Heart disease, cancer, bronchitis, asthma, silicosis, pneumonocniosis
- Nutritional disorders: Malnutrition, vitamin deficiencies and obesity
- Physical injury: Accidents, heavy metals and chemical poisoning, hearing loss, community unrest often resulting in violence
- Mental health and wellbeing: Suicide, depression, stress, and anxiety

2. Impacts of mining operations on health determinants

Health determinants (also known as the wider environmental and social determinants of health and wellbeing) are the social, economic, environmental, and cultural factors, the living conditions that indirectly influence health and wellbeing. They include what we eat and drink; where we live and work; and the social relationships and connections we have with other people and organizations. Some determinants such as sex, age, family history of illness is unmodifiable while others are modifiable through community interventions. It is the modifiable determinants that are the focus of HIA.

HIA assesses both the direct physical health impacts on community health, for example traffic injury, emissions into the air, water and soil, and the indirect impacts on health via health determinants. The following sub-sections outline the various ways a mining operations can influence the wider environmental and social determinants of health and wellbeing.

- ***Employment and economy:***

- Mining operations can bring prosperity and new goods and services to an area and thereby help improve the quality of life and living standards of local people. The increase in income, development of new local businesses linked to the project, access to new markets for local goods and produce and access to new services and amenities can have a significant beneficial effect on individual and community health and wellbeing.
- However, new goods and services can negatively impact some sectors of the local economy. Employment opportunities in a new project may also preclude people from carrying out other important roles that they previously fulfilled e.g. childcare, food gathering, and leadership roles in the community. The employment of women may have particularly significant effects on family and community social relationships and thus appropriate support mechanisms should be considered. Similarly, an increase in commercial sex workers (CSW) while having short term benefits for clients and CSWs can have significant, long term, negative individual and community health and wellbeing impacts.
- The potential peaks and troughs in international demand for mined materials and the limited lifespan of such projects (10-20 years) can have significant social, economic, and personal costs. For example, when a mine closes and migrant workers leave, it is not only the mining jobs that are lost, but local businesses, supplying goods and services to the mine and its workers, are also affected in ways that cannot be reversed when the project closes. In such a situation a return to traditional industries (e.g. agriculture) may not be possible if land use has changed and skills have not been passed on from one generation to the next.
- Good enhancement and mitigation measures with a focus on local recruitment, enhancing local skills and developing plans for what will happen as and when the project closes are likely to minimize the potential negative impacts.

- ***Housing and shelter:***

- Mining operations can help to support local housing markets by building new accommodation; providing higher employment incomes with which local people can buy land and/or improve their existing homes; and by increasing private sector rental opportunities.
- Hostel accommodation and camps are commonly constructed to house project workers. This can bring with it a range of risks and opportunities in relation to health and wellbeing (e.g. water supply, sanitary installations, ventilation, and the control of infectious diseases). The influx of unemployed persons seeking work can also create pressures on existing housing leading to higher land and house prices,

higher rents, housing shortages for existing residents, land invasions, informal settlements and overcrowding.

- In addition, existing local housing can be affected physically through vibration effects both during construction and operation that, in severe cases, can lead to subsidence and physical damage. In some cases, local communities may need to be resettled away from the project site and this too can have negative health impacts from the social, economic, and cultural dislocation that occurs.
- Good planning and close working with local communities and local government can help to reduce the potential negative impacts on local housing.

- ***Water supply and sanitation:***

- Access to clean water and good sanitation are a fundamental determinant of health and can be positively or negatively affected by mining operations. Projects can be heavy users of local water and can also release materials into existing water sources. Similarly, projects can place pressures on existing sanitation and water supply systems because of the increase in population in the area.
- A water supply and sanitation plan for workers is vital. This can include separate water supply and sanitation systems and/or social investment in upgrading existing local water supply and sanitation systems. Such enhancement can improve local public health as well as the productivity of workers through reduced sickness absence and reduced demand on both project and community health and social care services.

- ***Transport and connectivity:***

- Mining operations can lead to the construction of new road, airport, rail and port connections. These can have positive health impacts because they create easier access to public and commercial goods and services (e.g. health care) as well as enabling people to access new economic and educational opportunities in other villages, towns and cities.
- However, they can have negative health effects through traffic injuries, chemical spillages, air pollution, noise pollution, oil/fuel run offs, and reduced physical activity due to the use of motorised transport in place of walking and cycling. They can also facilitate human and animal pest migration in ways that can increase the transmission of new and existing infectious diseases. Heavily trafficked roads can also become a barrier to the free movement of people within a community (severance) if traffic flows are high, there are few safe crossing points and roads are damaged by heavy lorries.
- These potential negatives can be minimized through good design, transport planning and appropriate transport mitigation measures.

- ***Learning and education:***

- Skills learnt in the mining industry, and related businesses, can help to make local people more employable in the other industries. In addition, mining operations may bring wider prosperity that improves local infrastructure such as schools and libraries and increases the educational opportunities and resources that parents can afford for their children.
- However, as identified earlier, there can be a loss of traditional skills in agriculture and local crafts as young people focus on getting jobs linked to the operation.
- Support for local schools and for local industries through funding, volunteering, and the teaching of more cost-effective methods for existing activities, can ensure that the diversity of local sources of employment and traditional skills are maintained and enhanced.

- ***Crime and safety:***

- The increased income and economic opportunities that a mine brings can reduce the potential for crime and enhance community safety as more legitimate economic opportunities develop. However, the influx of new people also has the potential to increase crime and anti-social activities. The mixing of communities from separate ethnic groups and cultures may lead to tensions or the weakening of social controls that have traditionally maintained order in local communities. The project itself, as well as the increase in the local population, may stretch the capacity of local police, fire, and other related services to deal with incidents.
- Understanding the local context, good communication and working in partnership with local communities and the local police service can ensure that many crime and safety issues are prevented from happening.

- ***Health, social care, and public services:***

- Mining operations can have a positive impact on health and social care services, whether provided by the public, voluntary or private sectors by identifying existing community health problems and needs, putting additional funding into local services and infrastructure, and working jointly with local health, social care and community development workers to address local needs. Due to increased prosperity and other improvements, the proportion of households requiring assistance may also be reduced.
- However, mining operations may also place additional pressures on local health, social care and public services (including emergency services) due to the increase in population that they can bring, particularly if they also cause disruption and lead to new, or exacerbate existing, health and social problems.

- Most mines have their own medical facilities and services available to the workforce. These can be overwhelmed by local people demanding to be treated in them if existing local health services are seen to be inadequate, inaccessible, or expensive.
- Developing a good baseline profile of the existing health and wellbeing status of local communities and the capacity of local health services is critical in minimizing any potential pressures on local public services. There also needs to be close partnership with local health, social care and NGO welfare services in order to develop a plan to manage demand, enhance service capacity (medical supplies, equipment and personnel), and most importantly, develop and implement preventative public health measures.
- A health facilities audit can help to get a clear understanding of the capacity of the local health system to deliver health and social care. Such an audit should consider the private as well as the public health system - in many countries most of the primary and secondary health care may be provided by private specialists who charge a fee. Traditional medical practices and individual and family health seeking behaviours should also be assessed. Traditional practitioners are often important health actors and act as gatekeepers to some community sub-groups.
- Alongside building local health service capacity and funding health promotion and disease prevention programs it is also important to develop effective health information systems and health management systems to help monitor and evaluate the positive and negative health and wellbeing impacts of the project. It may also be useful to allow limited public access to the project's medical services so that capacity building within local health services can take place.
- ***Commercial goods and services:***
 - The increase in access to a wider range of goods and services (e.g. medicines, food and household supplies) that a mining operation can bring could lead to positive health and wellbeing impacts through reducing exposure to risks, enhancing individual and community resilience, speeding up recovery from illnesses and stabilizing existing health problems.
 - However, high demands on existing local goods and services could increase costs for local people. Any price increases for basic items will disproportionately impact on those on low incomes. There is also a risk that 'junk' food, cigarettes, gambling, alcohol, and drugs may become more available and affordable to local communities, thus increasing their risk to new health and social problems. In addition, demand for prostitution may increase, leading to long term psychosocial harm for those forced into the sex industry, as well as increased transmission of

sexually transmitted infections and other social harms associated with commercial sex work.

- Many of these can be mitigated through good planning and working closely with local communities, NGOs, local government and health and social care agencies.
- ***Social capital and community cohesion:***
 - The stimulus that a mining operation can bring to a local economy can help to strengthen and deepen social ties by increasing the prosperity of the community and providing resources for people to take on a wider range of social and community activities.
 - However, community tensions can arise if there is conflict between those who support and those who oppose a proposed project. In addition, the new people who come into the area may further affect the cohesion of local communities. For example, as young people are exposed to new ideas, new ways of doing things and different perspectives they may clash with existing social structures, traditions, and norms. There may also be tensions between skilled and unskilled workers and discrimination against migrants.
 - To deal with these issues effectively there needs to be a detailed understanding of the local social and cultural context and good links with local communities, religious institutions, and local NGOs.
- ***Spirituality, faith, and traditions:***
 - Mining operations generally do not have any direct effects on people's spirituality, faith and traditions. However, spiritual, and traditional activities and events (e.g. festivals, religious ceremonies and birth, death and marriage rites) may be disrupted by construction and operation activities. For communities whose spirituality and identity are strongly connected to the land, damage to the landscape caused by a project's activities or loss of access to sacred sites may harm their spiritual wellbeing. In such communities, relocation is likely to be doubly damaging to their sense of self and mental wellbeing.
 - Here again good links and communication with local communities, religious institutions and NGOs alongside good training of project staff can help to ensure that sacred places are not inadvertently desecrated and that spiritual customs are respected.
- ***Arts and cultural activities:***
 - Mining operations may expand the audience for local arts and crafts and help to develop commercial markets for traditional arts and culture. Projects may also

bring in new forms of art and culture e.g. movies and new forms of dance. Conversely, they may disrupt communal artistic or cultural activities.

- Good links with local communities and local NGOs can help to ensure that cultural activities are not disrupted, and are even potentially enhanced through support of these activities through money, staff time and other resources e.g. building materials, paints, skills, etc.
- ***Leisure and recreation:***
 - There can also be both positive and negative effects on local leisure and recreational activities because of the changes that a mining operations brings. Of particular interest, from a public health perspective, are changes to levels of physical activity. Small daily changes in walking, cycling or sporting activity can have significant effects on a range of health outcomes including heart disease, certain cancers and mental wellbeing.
 - Good links with local communities and community health and development workers can help to ensure that any such disruption is kept to a minimum.
- ***Lifestyle and daily routines:***
 - There can be temporary or long-term changes to people's lifestyles and daily routines because of mining operations, especially in isolated indigenous communities. Many of these changes have already been discussed and include changes to livelihoods, food supply, access to goods and services, means of transport, faith and traditions, educational opportunities and exposure to chemicals and infectious diseases.
 - The greater the collective incidence of such factors, which interfere with and disrupt lifestyles and everyday routines, the greater the mental, emotional and community nuisance and turmoil that the project is likely to generate. These in turn can manifest in physical and mental ill health, stress, anxiety, and opposition to the project.
 - Developing an integrated approach to mitigation and enhancement and good communication can ensure that disruption is kept to a minimum and is tolerated by local communities.
- ***Governance and public policy:***
 - Large mining operations can have a major influence on national and local governance and public policy. In turn, existing governance structures and public policies can have a significant effect on how a mining operations is implemented, and on the impact the project is likely to have on community health and wellbeing. Strong, stable and transparent local government and other public institutions are

more likely to be proactive in developing project partnerships to protect and enhance local communities' health and wellbeing. In contrast, weak, unstable, less participative, and less transparent public institutions can make it harder for projects to work with local agencies.

- Whatever the local structures, proactive engagement of, and partnership with, local government can help to improve the likely overall benefits of a project for local people - and help to plan once the project ends. In addition, approaches such as having a clear and explicit anti-corruption policy for project workers and partners can also help to reduce individual and institutional corruption.
- ***Energy and waste:***
 - The choice of energy sources used by a mining operation and the project's approach to dealing with waste can have important long term and transgenerational effects on a local community's health and wellbeing. This can occur, for example, through soil and water contamination from landfills affecting local agriculture and fisheries and the depletion of local fossil fuel stocks increasing heating and cooking costs.
 - Projects should, as much as possible, use sustainable energy sources and manage waste in a safe way, using the 3R principles, both to protect local communities and the wider environment.
- ***Land and spatial:***
 - Mining operations can change the quality of local landscapes, soils and waterways both directly through their activities, and indirectly as the project becomes a focal point for the local and regional economies.
 - Land use changes cannot always be easily reversed and, as discussed earlier, can increase insect vectors and overcrowding leading to an increase in infectious diseases. The transmission of disease can be from human to human, insect to human and domestic animals to human as land and spatial changes make some or all these routes more favourable. It also includes emissions of various chemicals, including heavy metals, into the air, water, and soil. Lastly, when a project closes a community may be left with unproductive land.
 - Understanding the implication of land and spatial changes, and the relation of communities to each other and to key resources such as water, fuel, services and employment, can ensure that changes to local land and the spatial configuration of transport connections and settlements do not have negative health and wellbeing impacts. Lastly, a good closure plan, together with the appropriate financial resources to implement it, is important to have in place from the early design stage

of a proposed project to ensure that the project leaves a positive and sustainable legacy.

3. Impacts of mining operations on health equity

Health equity (or health inequality) impacts are the avoidable health differences between different groups within a given population. Health inequalities are largely caused by differential exposure to health risks (e.g. pollution, violence, stress) and unequal access to factors that are associated with good health such as good quality housing, supportive social relationships, adequate and stable income, access to health care, clean water, good nutrition and education.

Most industrial projects can result in marked changes in these factors, both positive and negative. Therefore, one of the most important tasks in HIA is to analyse how the positive and negative health impacts are likely to be distributed within and across local communities.

Often the negative effects of a project, e.g. loss of land, air and water pollution and increased food costs, disproportionately affect those on low incomes, women, children, those with existing disease/disability and the elderly; whereas the positive effects, such as profits, employment opportunities, accrue to groups who are already better off. This leads to greater health inequality, and a wider health equity gap between the 'have' and have nots' within and between communities.

On the positive side, small improvements in health determinants can have significant beneficial effects on vulnerable individuals and groups. For example, immunization programs and disease and vector control programs, when applied across a community, will have significantly greater beneficial effects on these vulnerable individuals and groups. Similarly, investment in female literacy can have a positive effect on the health and wellbeing of the whole community and not just the women who become literate. In contrast, small increases in the prices of local goods, for example, can have significant negative health and wellbeing impacts on vulnerable groups because they are less physically and socially resilient i.e. their bodies are less able to adapt and fight off disease and they have fewer social resources to cushion the negative change.

4. Cumulative impacts of mining operations on health outcomes, determinants, and equity

Cumulative impacts result from the additive or synergistic effects of two or more health impacts, from one or more projects in an area, over the short, medium, or long term and can occur at the local, regional, national, and global level.

These can be very significant impacts and it is important therefore to consider both the cumulative positive impacts and the cumulative negative impacts to gain a more holistic view of the potential impacts of a project.

At the local level, cumulative impacts are the collective set of health impacts that arise from the mining operation, over time, and all the other projects located nearby. For a project, the cumulative health impacts might include the impacts on individuals and groups caused from emissions released into the air, water and soil, and an increased prevalence of malaria mosquitoes and trematode snails due to changes in habitat. While each on their own may pose a low or minor negative health and wellbeing impact together they may have a major adverse effect on individual and community health and wellbeing. Similarly, the provision of local jobs, skills training and improvements to local social infrastructure can have a greater cumulative positive impact than each intervention on its own. The cumulative impacts of a project may be exacerbated by other industrial projects in an area. This can mean, for example, that lorries on roads and road traffic emissions or strains on local goods supply chains from each of the projects give rise to greater traffic injuries, greater malnutrition and greater social unrest than the sum of each of the project on their own.

Examples of local cumulative health impacts:

- **Positive Impacts:** One or several projects provide jobs, stimulate the creation of new businesses and are customers to other local businesses leading to improved incomes and access to goods and services (e.g. food and medicines leading to improved nutrition, alleviation of acute and chronic diseases).
- **Negative Impacts:** One or several projects in an area each emitting pollutants into the air, water and soil that individually are not significant but cumulatively have the potential to lead to physical illness and chronic disease.

4.4. Environmental Health Areas (EHAs)

The environmental health areas (EHA) framework defines the types of health impacts and provides a structure for organizing and analysing potential project impacts on the community. Table 3 and 4 presents a list of generic EHAs. The EHAs can be used for both comprehensive and rapid appraisal HIAs (International Finance Corporation, 2009).

Based on experience in analyzing and mitigating the key burden of health impacts (for example, respiratory problems, vector-borne diseases, accidents and injuries, diarrheal diseases, and so on), the HIA should identify the environmental health areas that are likely to broadly capture the vast majority of linkages between project-related activities and community-level impacts.

Potential health impacts are considered in 1) the broad perspective associated with development and mitigation of adverse environmental conditions, and 2) the narrower context of diseases and injuries associated with water, sanitation, solid waste, housing, vector control, and hazardous materials. Thus, the potential linkages between infrastructure-related activities and overall environmental health conditions need to be emphasized. These linkages are useful when considering the range of potential mitigation strategies for project impacts.

World Bank research has demonstrated that a significant percentage (as much as 44% in Sub-Saharan Africa) of the typical burden on health can be mitigated by infrastructure improvements in four sectors: housing, water and sanitation, transportation, and communication.

The project should identify the specific populations affected by each environmental health area. These population categories are designed to be consistent with the age groupings used in common demographic health surveys.

Although not every EHA may be relevant for a given project, experience indicates that the project should consider EHAs while preparing the HIA. The EHA approach also captures some workforce issues that could impact relevant communities, for example, housing and respiratory issues (such as communicable respiratory diseases that could spread from construction camps to local communities), but it primarily focuses on the relationship between potential project impacts and communities. The EHA framework covers a broad view of environmental health, and encompasses a wide spectrum of health determinants, including social and institutional issues.

Table 3. Global Environmental Health Areas (EHAs)

Environmental Health Areas (EHAs) (International Finance Corporation, 2009)	
Vector-Related Diseases	Mosquito, fly, tick, and lice related diseases such as: Malaria, Dengue, Schistosomiasis, Onchocerciasis, Lymphatic Filariasis, Yellow Fever.
Respiratory and Housing Issues	Transmission of communicable diseases such as: Acute Respiratory Infections (bacterial and viral), Pneumonias, Tuberculosis, Meningitis, Plague, Leprosy and Respiratory effects from housing, overcrowding, housing inflation.
Veterinary Medicine and Zoonotic Issues	Diseases affecting animals such as: Bovine Tuberculosis, Swinepox, Avian Influenza; or diseases that can be transmitted from animals to people such as: Brucellosis, Rabies, Bovine TB, Bird Flu.
Sexually Transmitted Infections	Sexually transmitted infections such as: HIV/AIDS, Syphilis, Gonorrhoea, Chlamydia, Hepatitis B.
Soil- and Water-Sanitation-Related Diseases	Diseases that are transmitted directly or indirectly through contaminated water, soil or non-hazardous waste such as: Diarrheal, , Schistosomiasis, Hepatitis A and E, Poliomyelitis, Giardiasis, Worms.
Food- and Nutrition-Related Issues	Adverse health effects such as: Malnutrition, Anaemia (including deficiencies of Folate, Vitamin A, Iron, Iodine), Micronutrient Deficiencies due to changes in agricultural and subsistence practices or food inflation, Gastroenteritis (bacterial and viral), changes in agricultural and subsistence hunting, fishing, and gathering practices.
Accidents and Injuries	Road-traffic related, spills and releases, construction (home- and project-related) and drowning.
Exposure to Potentially Hazardous Materials	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. Pesticides, fertilizers, road dust, air pollution (indoor and outdoor, related to vehicles, cooking, heating, or other forms of combustion or incineration), landfill refuse or incineration ash, and any other project-related solvents, paints, oils or cleaning agents, by-products, or release events.
Social Determinants of Health (SDH)	Including psychosocial stress (due to resettlement, overcrowding, political or economic crisis), social production of disease, political economy of health, and eco-social issues such as resettlement or relocation, violence, gender issues, education, income, occupation, social class, race or ethnicity, security concerns, substance misuse (drug, alcohol, smoking), depression and changes to social cohesion.
Cultural Health Practices	Role of traditional medical providers, indigenous medicines, and unique cultural health practices.
Health Services Infrastructure and Capacity	Physical health infrastructure, staffing levels and competencies, technical capabilities of health care facilities at district levels; program management delivery systems; coordination and alignment of the project to existing national- and provincial-level health programs (for example, TB, HIV/AIDS), and future development plans.
Noncommunicable Diseases (NCDs)	Hypertension, diabetes, stroke, cardiovascular disorders, cancer, and mental health.

Table 4. Environmental Health Impact Issues Matrix

HEALTH IMPACT ISSUES (International Finance Corporation, 2009)							
Environmental Health Areas	Influx <i>Camp followers job seekers, family, service workers</i>	Resettlement / Relocation	Water Management <i>Including creation of new water bodies, altering existing water bodies & changes in drainage patterns</i>	Linear Features <i>Roadways, transportation routes, transmission lines</i>	Hazardous Materials Control & Disposal <i>Including waste containers (drums)</i>	Changes in Income & Expenditure Consumption <i>Including food/housing inflation</i>	Infrastructure / Facilities <i>Including onsite housing, catering facilities, housing & laundry, sewerage treatment plants, surface water runoff control, dams & containment facilities</i>
Vector-Related	Increasing human parasite burdens (e.g. malaria)	Movement to different prevalence area	Creation & movement of breeding grounds	Improper drainage, temporary water pool creation	Creation of breeding sites with drums at household level		Creation & movement of breeding grounds, improper drainage, temporary water pool creation
Respiratory & Housing	Crowded housing, both work camps & community	Number of occupants per room, mix of occupant's children/elderly/adults		Facilitating mixing/interaction of different groups		Housing inflation triggered crowding	Crowded housing in work camps, spread of ectoparasites
Veterinary Medicine	Movement & migration of livestock due to influx of new groups (incl. COVID-19)	Movement & migration of livestock due to influx of new groups (incl. COVID-19)	Creation and/or movement of livestock watering locations		Inadvertent water source contamination of streams/ivers		Changes in movement & migration of livestock
Sexually Transmitted Infections / HIV/AIDS	Mixing of high & low prevalence groups	Mixing of high & low prevalence groups		Facilitating movement of high-risk groups into rural settings		Men with money mixing with vulnerable women	Inappropriate access to project housing by local community members
Soil, Water & Sanitation	Overburdening existing services/systems, explosive food-borne epidemics	Failure to anticipate extended family influx in initial design	Changes in surface water flows/quality, potential groundwater drawdown		Releases into surface water, long-term impacts to groundwater		Releases into surface water from STP, changes in surface water flows, quality, potential groundwater drawdown
Food & Nutrition	Influx of extended family, more mouths to feed	Shift from subsistence to peri-urban living, petty trading	Changes in crop/garden selection & planting cycle	Changes in access to gardens or local markets		Food inflation further marginalisation vulnerable groups	Food inflation, food related illnesses, changes in local dietary habits
Accidents & Injury	Overcrowding, falls, burns, road traffic		Drownings, boats accidents	Road traffic, increased pedestrian activity	Unplanned releases/emissions		Overcrowding, falls, burns, road traffic
Hazardous Materials Exposure	Squatter developments adjacent to industrial facilities with unplanned releases			Movement via trucks of hazardous materials across communities to project areas	Use of project drums & containers for water & food storage, inadequate incinerator design		Release of contaminants into local community streams & rivers
Social Determinants of Health, Psychological, Gender Issues	Cultural shock due to rapid social change	Transformation of rural to peri-urban / urban lifestyle		Greater ease of mixing of different social/ethnic groups		Sudden money influx into a barter-based economic structure	Greater ease of mixing of different social/ethnic groups
Cultural Health Practices	Introduction of new practices &/or elimination of existing practices	Introduction of new practices and/or elimination of existing practices				Shift to western medicine	Introduction of new practices and/or elimination of existing practices
Health Services Infrastructure & Capacity	Increased visits for outpatient and inpatient services	Increased visits for outpatient & inpatient services if access improves				Attraction of additional private providers/increase in insurance enrolment	Changes in access
Noncommunicable Hypertension, Diabetes	Changes in diet	Peri-urban living versus high-intensity subsistence farming				Shift from high physical activity to sedentary lifestyle	Changes in diet
LEGEND	LOW RISK POTENTIAL	MEDIUM RISK POTENTIAL	HIGH RISK POTENTIAL				

5. CONCLUSION

Globally, humanity is increasingly recognising its dependence on a healthy planet to underpin and sustain human's social well-being and ultimately, survival. More than ever, international agencies are highlighting our dependence on healthy ecosystems, healthy oceans and clean air and water as prerequisites for healthy human lives that underpin social development (King, et al., 2018).

Sustainable development has become a worldwide aspiration with the United Nations resolution *'The Future We Want'* stating that *"We recognise that people are at the centre of sustainable development and in this regard we strive for a world that is just, equitable and inclusive, and we commit to work together to promote sustained and inclusive economic growth, social development and environmental protection and thereby benefit all"*.

The 2030 Agenda for Sustainable Development encompasses the 17 Sustainable Development Goals (SDGs) agreed upon by the United Nations (UN) General Assembly in September 2015 (see Figure 12 below). The SDGs has brought all of this understanding together and highlighted the critical links between development, global to local environmental health, human well-being and the full enjoyment of a wide range of human rights, including the rights to life, health, food, water and sanitation.

The opportunity exists to align this Project with the SDGs and be part of a global network of governments and organisations striving towards achieving a shared blueprint for sustainable development.



Figure 12. The 17 Sustainable Development Goals (SDGs), United Nations (2020).

Nomamix (Pty) Ltd and their proposed Platinum Mining 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 HIA (Scoping) has outlined the project context with potential health related impacts (changes) to the status of the local communities 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 to understand the Projects health impacts, based on the available evidence.

Fatal Flaws and/or Red Flags:

Through the desktop research, and considering the magnitude of related mining activities in the adjacent area, no fatal flaws are envisaged, although depending on the timing of the project the potential red flags that relate to health include:

- The current global pandemic known as Coronavirus Disease 2019 (COVID-19) may well impact the short-term timeframes including the 6-month site establishment and potentially the operational 8-month ore production milestone and 14-month steady state production milestone.
- The existing local health infrastructure systems may be negatively impacted by the above COVID-19 pandemic which is currently already under strain and may remain under severe strain in the coming months to a year or two. This could result in a medium-term impact to the local health infrastructure depending on the severity of COVID-19 in the local and provincial settings.
- Potential informal settlements (residents) that have apparently taken up occupancy on the proposed land (as per other Specialists site visit), including neighbouring communities which may be directly adjacent to the proposed project and negatively affected in terms of health.

Recommended Terms of Reference for the EIA:

- **Site Visit** – to conduct a physical site visit of the proposed area to verify the information gained through the desktop research and ensure a baseline record is available of key stakeholders and potential health impacts not identified during the desktop research. This site visit should ideally span the 30km radius as indicated in the above report and identify the status of local health infrastructure systems which may be impacted by the Project.
- **Stakeholder Engagement** – to conduct initial stakeholder engagements (possibly together, or in conjunction with the social impact assessment) to introduce the project and receive valuable input from key stakeholders as to the potential health impacts envisaged from their perspective. This may or may not include engagement with similar mining projects in the adjacent area to streamline stakeholder input and/or comments.
- **Risk Assessment** – to assess, rank and prioritise the various health impacts that were identified during both the desktop research and site visit in order of severity and likelihood.
- **Health Action Plan** – to develop a Health Action Management Plan that includes the mitigation and management measures needed for Project implementation. This plan will need stakeholder review and input and should also include the following aspects:
 - **Implementation and Monitoring** – to identify and include the roles and responsibilities of the various parties involved and establish an action framework and allocation of resources as well as the design of a monitoring system (including key performance indicators) to ensure that mitigation progress is satisfactory.
 - **Evaluation & Verification of Performance & Effectiveness** – to be implemented during the project lifecycle to ensure that implementation of the Health Action Plan has been accomplished and is achieving the intended results.

6. REFERENCES

Dlamini, V., 2014. *Kamiesberg Project, Mamasqualand, South Africa - Health Impact Assessment*, Gauteng: Digby Wells.

International Council for Mining and Metals, 2010. *Good Practice Guidance on Health Impact Assessment*, London: International Council for Mining and Metals.

International Council on Mining & Metals, 2016. *Good practice guidance on occupational health risk assessment*, London: International Council on Mining & Metals.

International Finance Corporation, 2009. *Introduction to Health Impact Assessment*, Washington: International Finance Corporation.

King, N., Strydom, H. & Retief, F., 2018. *Environmental Management in South Africa*. 3rd ed. Cape Town: Juta.

StatsSA, 2020. *Statistics South Africa*. [Online]
Available at: <http://www.statssa.gov.za/?p=8150>
[Accessed 08 July 2020].

Thaba Chweu Local Municipality, 2017. *Integrated Development Plan 2017 - 2022 Term*, Thaba Chweu Local Municipality: Thaba Chweu Local Municipality.