SISHEN IRON ORE COMPANY (PTY) LTD: THABAZIMBI MINE – PROJECT INFINITY

FINAL SCOPING REPORT UNDER NEMA, 1998

Locality: Thabazimbi

Departmental Ref No: 12/1/9/2-W26, LIM/EIA/0000399/2012

SHANGONI
Management Services (Pty) Ltd

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PROJECT DETAILS

Limpopo Department of Economic Development, Environment and Tourism (LDEDET)

Reference No.: 12/1/9/2-W26, LIM/EIA/0000399/2012

Project Title: THABAZIMBI MINE – PROJECT INFINITY

Project Number: SIO-PHO-12-01-01

Compiled by: Lee-Anne Fellowes

Date: October 2013

Location: Thabazimbi

Technical Reviewer: Jan Nel

Signature

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DEFINITIONS

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and,
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Aspects

Elements of an organization's activities, products or services that can interact with the environment.

Environmental Degradation

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental Impacts

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

Environmental Impact Assessment

A study of the environmental consequences of a proposed course of action.

Environmental Impact Report

A report assessing the potential significant impacts as identified during the environmental impact assessment.

Environmental impact

An environmental change caused by some human act.

Land use

The various ways in which land may be employed or occupied. Planners compile, classify, study

and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution Prevention

Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

Public Participation Process

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

Topography

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

Vegetation

All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

Waste

Waste is unwanted or undesired material left over after the completion of a process. "Waste" is a human concept: in natural processes there is no waste, only inert end products.

ABBREVIATIONS

BID – Background Information Document
CRR – Comments Response Report
LDEDET – Limpopo Department of Economic Development, Environment and Tourism
DWA – Department of Water Affairs
EAP – Environmental Assessment Practitioner
ECA – Environmental Conservation Act of 1989
EIA – Environmental Impact Assessment
EIR – Environmental Impact Report
EMF – Environmental Management Framework
EMP – Environmental Management Programme
GN – Government Notice
I&AP – Interested and Affected Party
NEMA – National Environmental Management Act, Act 107 of 1998 as amended
PPP – Public Participation Process
R – Regulation
S&EIR – Scoping and Environmental Impact Reporting
BIF – Banded ironstone formations

EXECUTIVE SUMMARY

The Applicant:

Sishen Iron Ore Company (Pty) Ltd (SIOC) has re-assessed the Life of Mine (LOM) potential for the existing Thabazimbi Mine. As a result of this assessment the following project is proposed – Project Infinity – that will entail necessary changes and re-fitments to the current Thabazimbi beneficiation plant infrastructure, new infrastructure additions and re-opening of abandoned mining pits, for the production of iron ore product from high grade and low grade run-of-mine material, within the existing Thabazimbi Mine boundary area.

Background description:

The LOM of the existing Thabazimbi Mine is reaching its end in 2021. SIOC is investigating possibilities to extend the LOM by at least 20 years by exploiting the large low-grade iron ore resources in the form of banded ironstone formations (BIF). The current operational plant at Thabazimbi is not equipped to treat the banded ironstone earmarked for the Project Infinity.

Location:

The mining area is located within 16 km from the town of Thabazimbi, in a mountainous terrain. Thabazimbi Mine is situated in the Thabazimbi Local Municipality, which falls within the Waterberg District Municipality of the Limpopo Province. Thabazimbi is located 130 km north of Rustenburg, 140 km south of Lephalale (Ellisras), 140 km north-west of Brits, 130 km west of Bela-Bela (Warmbaths), and 220 km north-west of Tshwane (Pretoria).

Project description:

New developments **(all within the existing mining area)** associated with the Project Infinity include the following:

The following activities are related to Mining:

- Exploration within existing pit boundaries,
- Mining of Low Grade Material within the existing Kumba North and South Pits and re-entry to Vanderbijl pit);
- New access and haul roads (Vanderbijl pit),

The project consists of two main components namely the Retrofit Stand-alone Plant.

The Retrofit Plant:

1) The following activities are associated with the Processing Plant:
   (a) Removing old and fitting new 3-way chute between 1° & 2° crushing and washing & screening,

(b) Changing current 32mm top decks to 25mm top decks at 1°Screening,
(c) Removing old and fitting new 1mm classification circuit to existing washing and screening building,
(d) Changing current 8mm decks to 5mm decks at 3° screening,
(e) Upgrading of existing DMS Plant equipment for same throughput & media recovery from 2.8 t/m³ to 4.1 t/m³ circuit medium density,
(f) Installing new 1mm beneficiation circuit into existing refurbished structural steel above existing plant civils,
(g) Increasing existing fines product stockpiling capacity for increased fines: lump ratio from low grade run of mine.

The following infrastructure is associated with the Retrofit Plant:

2) (a) Upgrading existing plant discard system for increase Solid waste output from maximum future high & low grade
beneficiation circuits,
(b) Construction of a new slimes dam 5 before existing run out of capacity,
(c) Upgraded slimes handling system.

Stand-alone Plant:

(1) The following activities are associated with the Stand-alone plant:
(a) Stockpiling of 2014 unbeneficiated Low grade lump material,
(b) Constructing new stand Alone liberation, classification & beneficiation circuit for future Low grade lump material,
(c) Installing fines product blending ability to increased fines product stockpiling.

The following infrastructure is associated with the Stand-alone plant;

(a) Existing Thabazimbi rail yard to ensure a less than 12 hours turnaround time.

Possible construction of new 2° crushing circuit for partial feed to low grade circuit.

Most of the listed activities are associated with the slimes dam, pipeline and increase of the discard dump footprint. Retrofitting of the existing plant and construction of the stand alone plant are within a brown field area and no listed activities are triggered for those two activities.

Process:

As part of the mining and related activities associated with the Project Infinity, some new listed activities defined under the National Environmental Management Act, Act 107 of 1998 (NEMA, 1998) and the regulations there under will take place.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report (EIR) must be compiled as described in terms of Regulations 26 to 35 of the Environmental Impact Assessment Regulations, 2010 promulgated in terms of Section 24(5), 24M and 44 of the NEMA, 1998.

It is the intention of this Scoping Report (which has been compiled in terms of the NEMA, 1998) to provide the necessary information pertaining to the proposed activities associated with the Project Infinity, as required in terms of the Environmental Impact Assessment Regulations (EIA Regulations R543: EIA Regulations in terms of Chapter 5 of the NEMA, 1998, dated June 2010) under the NEMA, 1998. This Scoping Report intends to highlight all information relevant to the proposed additions to the current operation only, since the current existing operation has been fully described in the updated and revised Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) dated 2011 under the MPRDA, 2002.

Anticipated impacts:

The proposed project is a medium scale mining project that entails the additional exploration within existing mining areas and the construction of new infrastructure as well as the utilisation of existing infrastructure, within the existing Thabazimbi Mine boundary area. The main benefit of this project is to extend the LOM of the Thabazimbi Mine; this would in return continue creating employment and supplying ore to the Iron Ore market.

It is therefore anticipated that the proposed project will have impacts on some of the components of the environment.

Knowledge gaps:

The following knowledge gaps and uncertainties have been identified during the scoping process of the proposed Project Infinity and require further investigations that will be comprehensively carried out as part of the EIA process for the proposed Project, within the near future:

- Since the initial development of the EMP and EIA under the MPRDA, 2002 numerous specialist studies have been completed to improve the understanding of the environment and mitigation measures applied to minimise the impacts of the mining operations. As part of this Project Infinity additional specialist studies and the revision of some of the previous specialist studies are underway, therefore updated detailed background information of the current existing environment is thus not yet available for some of the new portions of the surface land use area relevant to the proposed Project Infinity.
- While impacts have been identified as part of the scoping process, it is required as part of the EIA Phase to fully quantify impacts to all aspects of the environment.

Content of the scoping report:

This Scoping Report (compiled in terms of the NEMA, 1998) is divided into the following parts:

- Part 1: Introduction.
- Part 2: Description of the project.
- Part 3: Description of the existing environment.
- Part 4: Public Participation Process.
- Part 5: Description of alternatives.
- Part 6: Identification of anticipated Environmental Impacts.
- Part 7: Identification of knowledge gaps and plan of study for EIA.
- Part 8: Discussion and Conclusion.

1. INTRODUCTION

Sishen Iron Ore Company (Pty) Ltd (SIOC) has re-assessed the Life of Mine (LOM) potential for the existing Thabazimbi Mine, and wishes to expand their current operation. As a result there will be changes to the existing, approved operation. The proposed project entitled 'Project Infinity' will entail the construction of new infrastructure and retrofitting of current Thabazimbi infrastructure and the mining of additional areas within the existing Thabazimbi Mining area.

The LOM of the existing Thabazimbi Mine is reaching its end in 2021. SIOC is investigating possibilities to extend the LOM by at least 20 years by exploiting the large low grade iron ore resources in the form of banded ironstone formations (BIF). The current operational plant at Thabazimbi is not equipped to treat the banded ironstone earmarked for Project Infinity. Therefore an additional upgraded plant is proposed to treat the banded ironstone, called Project Infinity.

1.1 Regulatory requirements

According to the Mineral and Petroleum Resource Development Act, Act 28 of 2002 (MPRDA, 2002) and the regulations there under, SIOC is required to update and revise the existing Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) for the Thabazimbi Mine to reflect the changes that would take place as a result of the proposed Project Infinity. An updated and revised EMP (including EIA) under the MPRDA, 2002 with reference numberLP30/5/1/3/2/1(45) and (47) EM, compiled by Shangoni Management Services (Pty) Ltd was submitted to the Department of Mineral Resources (DMR) on 29 July 2011.

As part of the mining and related activities associated with the Project Infinity, some new listed activities defined under the National Environmental Management Act, Act 107 of 1998 (NEMA, 1998) and the regulations there under will take place.

The Application for Environmental Authorisation for the mining and related activities associated with the Project Infinity was done in terms of the requirements of the NEMA, 1998. According to the respective Act, SIOC is required to submit an Application for Environmental Authorisation to the Limpopo Department of Economic Development, Environment and Tourism (LEDET). Subsequent to the initial application some changes have taken place mainly related to the extent of the project. As described below Project Phoenix has been placed on ice and replaced by a new retrofit project now called Project Infinity. As a result of the changes to this approach the initial listed activities identified in the application are not all relevant any longer. The effect of the changes has now been made to the list below. The proposed activities would involve the following listed activities as identified in terms of Section 24 and 24D of the NEMA, 1998:

Table 1: Listed Activities in terms of NEMA, 1998

Number and date of the relevant notice	Activity No	Description	Relevance to new project
LISTING NOTICE 1			
Government Notice R. 544 18 June 2010 Listing Notice 1	**Activity 9** The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	Construction of ±6 kilometres, two 150mm diameter (each) slimes pipelines delivering slimes from the new plant to the slimes dam and one 150mm diameter return water pipeline with a combined throughput of more than 120ℓ per second.	These activities were triggered when the scope of works changed and are now relevant to the Infinity project
Government Notice R544 18 June 2010 Listing Notice 1	**Activity 11**(ii) The construction of: (i) canals; (ii) channels; where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line	Stormwater canals or channels around the Slimes dam to collect all runoff water from the surrounding areas. Transportation of dirty water via a channel from the mine to the Slimes dam.	These activities were triggered when the scope of works changed and are now relevant to the Infinity project
Government Notice R544 18 June 2010 Listing Notice	**Activity 11 (xi)** The construction of: (xi) infrastructure or structures covering 50 square	The construction of infrastructure structures (upgrading of the existing conveyor) covering 50m² or	These activities were triggered when the scope of works changed and are now relevant to the Infinity project.

Number and date of the relevant notice	Activity No	Description	Relevance to new project
1	metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	more within a water course or within 32 meters of a watercourse.	LEDET identified this listed activity to be included in the amended application form.
Government Notice R544 18 June 2010 Listing Notice 1	**Activity 18 (i)** The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from: (i) a watercourse;	Removal of more than 5 cubic meters of soil from a watercourse for the construction of stormwater canals or channels around the Slimes dam to collect all runoff water from surrounding areas.	These activities were triggered when the scope of works changed and are now relevant to the Infinity project. LEDET identified this listed activity to be included in the amended application form.
Government Notice R. 544 18 June 2010 Listing Notice 1	**Activity 47** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas	Construction of haul roads Construction of new haul roads within the mining area.	These activities were triggered when the scope of works changed and are now relevant to the Infinity project
Government Notice R. 544 18 June 2010 Listing Notice 1	**Activity 23** The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail,	Stockpiling of low grade ore at various localities on the mining area (Buffelshoek west B1 & B2).	These activities were triggered when the scope of works changed and are now relevant to the Infinity project.

Number and date of the relevant notice	Activity No	Description	Relevance to new project
	commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares.		
Government Notice R. 544 18 June 2010 Listing Notice 1	**Activity 53** The expansion of railway lines, stations or shunting yards where there will be an increased development footprint – excluding: (i)railway lines, shunting yards and railway stations in industrial complexes or zones (ii) underground railway lines in mines (iii) and additional railway lines within the reserve of an existing railway line.	Lengthening of the existing railway lines by approximately 15m each.	These activities **were not triggered** when the scope of works changed and are now **not relevant** to the Infinity project anymore.
LISTING NOTICE 2			
Government Notice R 545 18 June 2010 Listing Notice 2	**Activity 5** The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59	Pipelines consisting of two slimes and one return water pipelines with diameter of 150mm (each) and length of ±6 kilometres for the purpose of delivering slimes from the new plant to the slimes dam and return water from the slimes dam.	Not relevant anymore to the Water Use License.
		Construction of slimes dam number 5. stormwater containment dams and an increase of footprint of the plant discard dump.	These activities were triggered when the scope of works changed and are now relevant to the Infinity project

Number and date of the relevant notice	Activity No	Description	Relevance to new project
	of 2008) in which case that Act will apply.		
Government Notice R 545 18 June 2010 Listing Notice 2	**Activity 5** The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	Various existing and future infrastructure e.g. haul roads, waste rock dumps and slimes dam facilities that alter storm water drainage lines originating in the Kwaggashoek, Van der Bijl, Bobbejaanwater, Donkerpoort, Buffelshoek and Meyer mine areas that require a water use license in terms of Section 21 (g) (disposing of waste in a manner which may detrimentally impact on a water resource).	These activities were triggered when the scope of works changed and are now relevant to the Infinity project
LISTING NOTICE 3			
Government Notice R 546 18 June 2010 Listing Notice 3	**Activity 14** The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required	Slimes dam disturbance larger than 20ha. Disturbance of 6 and 4 ha of stockpile storage areas at the primary crushers. Expansion of the plant discard dump and construction of the modular plant. Stockpiling of low grade ore at various localities on the mining area (Buffelshoek west B1 & B2).	These activities were triggered when the scope of works changed and are now relevant to the Infinity project.

The applicable Environmental Authorisation Application Form under NEMA, 1998 was submitted to LEDET on the 13th of April 2012. A reference number (12/1/9/2-W26) was issued by LDEDET on the 19th of April 2012. The letter of acknowledgement indicating the above mentioned reference number is attached as **Appendix B1**.

Subsequent to the submission of the Environmental Authorisation Application Form under NEMA, 1998 the Department of Water Affairs (DWA) visited the mine. The DWA requested the mine to apply for additional section 21 (c) & (i) water uses for the haul road crossings, waste rock dump and slimes dam facilities at the Kwaggashoek, Van der Bijl, Bobbejaanwater, Donkerpoort, Buffelshoek and Meyer mine areas. Therefore the application for Environmental Authorisation form was amended to include other activities. The amended application form was submitted to the LDEDET on 27 July 2012. The project reference number 12/1/9/2-W26, and the National Environmental Authorisation System (NEAS) reference number LIM/EIA/0000399/2012, was allocated to the project by LDEDET. The letter of acknowledgement indicating the above mentioned reference numbers is attached as **Appendix B2**.

A letter was received from LEDET requiring submission of the scoping report as some time elapsed from the initial submission of the application. **Appendix B3** - SIOC replied and requested additional extension for the submission of the draft scoping report due to the uncertainty regarding the changes to the new project. This extension request indicated that a draft scoping report would be submitted on the 18th of June 2013.

After the draft scoping report was submitted to LEDET the project was officially named Infinity. The changes to project were presented to LEDET on the 21st of October 2013 attached as **Appenidx D11.** Thereafter a letter was received from LEDET requesting an amended application form and all changes to be highlighted in the final scoping report. The letter is attached as **Appendix B5**.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report (EIR) must be compiled as described in Regulations 26 to 35 of the EIA Regulations, 2010 promulgated in terms of Section 24(5), 24M and 44 of the NEMA, 1998.

It is the intention of this Final Scoping Report (which has been compiled in terms of the NEMA, 1998) to provide the necessary information pertaining to the proposed activities associated with the Project Infinity, as required in terms of the EIA Regulations (EIA Regulations R543: Environmental Impact Assessment Regulations in terms of Chapter 5 of the NEMA, 1998, dated June 2010) under the NEMA, 1998. This Final Scoping Report intends to highlight all information relevant to the proposed additions to the current operation only, since the current operation has been fully described in the updated and revised EIA and EMP under the MPRDA, 2002.

1.2 Process to be followed

1.2.1 Objectives of the Scoping Process and the Scoping Report

Scoping is the procedure, which is undertaken during the initial stages of the Planning Phase of a project, and is used to determine the extent of, and approach to an EIA (i.e. terms of reference). This process is required for the proposed project in terms of the NEMA, 1998 and the EIA Regulations, 2010 there under.

The objectives of the Scoping Process are to:

- Provide an opportunity for the Applicant, relevant Authorities and Interested and Affected Parties (I&APs) to exchange information and express their views and concerns regarding the proposed project before the EIA is undertaken.
- Focus the study on relevant anticipated impacts, issues and concerns, as well as reasonable alternatives, to ensure that the resulting EIA is useful to the Authorities for decision-making, and addresses the impacts, issues and concerns as identified.
- Facilitate an efficient assessment process that saves time, resources and costs.

The objectives of this Scoping Report are to provide:

- An overview of the proposed project and indicate changes from the draft scoping report,
- An overview of the environmental features of the proposed site and immediate surrounding area.
- An indication of the I&AP identified to date.
- An indication of issues of concern/comments received from I&APs to date.
- An indication of potential environmental impacts that could take place as a result of the proposed project.
- Report on the Scoping Process.
- Assess the adequacy and appropriateness of the scoping procedure followed and the Scoping Report submitted.
- Ensure that the Scoping Report reflects the impacts and provides appropriate alternatives.
- Ensure that the Scoping Report is adequate and appropriate, and contains relevant information that will determine the route indication and set appropriate boundaries for the EIA.

1.2.2 Methodology applied to conducting the scoping process

The Scoping Process for the project was carried out in terms of the NEMA, 1998. The Scoping Process therefore consisted of the following:

- Landowners within the mine boundary area were contacted and informed of the project (refer to **Part 4**).
- An Application for Environmental Authorisation Form was compiled and submitted to the Limpopo LEDET (refer to **Appendix B1** and **B2**).

- A Scoping Report describing all project activities as well as the listed activities (in terms of the NEMA, 1998) was compiled in accordance with the requirements of the NEMA, 1998.
- The proposed project was advertised in a local newspaper informing all potential I&APs of the project (refer to **Appendix D1**).
- This Scoping Report was made available to the public for comment for a period of 60 days.
- All comments received from the public during the public consultation period were noted and recorded as part of the Scoping Report (refer to **Appendix D** and **Part 4 & 10**).
- The Scoping Report was finalised taking all public comments into consideration.
- The Scoping Report is submitted to LDEDET and the I&APs for review.
- Provided that the Scoping Report is approved by LDEDET, the EIA process can be carried out.

1.2.3 The Scoping Report in terms of the requirements of the NEMA, 1998

Regulation 28(1) of the EIA Regulations, 2010 under the NEMA, 1998, lists aspects that must be included in Scoping Reports. **Table 2** below indicates where the information has been provided as part of this Scoping Report:

Table 2: The Scoping Report in terms of the EIA Regulations, 2010, under the NEMA, 1998

Regulation No:		Description	Scoping Report Part
R543 Regulation 28(1)(a)		Details of the Environmental Assessment Practitioner (EAP).	Part 2 & **Appendix C**
	(i)	Details of the EAP who prepared the report.	
	(ii)	Details of the expertise of the EAP to carry out scoping procedures.	
R543 Regulation 28(1)(b)	(b)	A description of the proposed activity.	Part 2
	(c)	Any feasible and reasonable alternatives that have been identified.	Part 5
R543 Regulation 28(1)(c)		A description of the property on which the activity is to be undertaken and the location of the activity on the property.	Part 2
R543 Regulation 28(1)(d)		A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity.	Part 3
R543 Regulation 28(1)(f)		An indication of all legislation and guidelines that have been considered in the preparation of the scoping report.	Part 1
R543 Regulation 28(1)(g)		A description of environmental issues and potential impacts, including cumulative impacts	Part 6

Regulation No:		Description	Scoping Report Part
		that have been identified.	
R543 Regulation 28(1)(h)		Details of the public participation process conducted in terms of Regulation 27(a).	Part 4 & **Appendix D**
	(i)	Steps taken to notify potentially interested and affected parties of the application.	
	(ii)	Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given.	
R543 Regulation 28(1)(h)	(iii)	A list of all persons or organisations that were identified and registered in terms of Regulation 55 as interested and affected parties in relation to the application.	
	(iv)	A summary of the issues raised by interested and affected parties, the date of receipt of, and the response of the EAP to those issues.	
R543 Regulation 28(1)(i)		A description of the identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and communities that may be affected by the activity.	Part 5
R543 Regulation 28(1)(j)		A description of the need and desirability of the proposed activity.	Part 2
R543 Regulation 28(1)(k)		Copies of any representations and comments received in connection with the application or the scoping report from interested and affected parties.	Part 4 & **Appendix D**
R543 Regulation 28(1)(l)		Copies of any minutes of any meetings held by the EAP with interested and affected parties and other role players, which record the views of the participants.	Part 4 & **Appendix D**
R543 Regulation 28(1)(m)		Any responses by the EAP to those representations and comments and views.	Part 4 & **Appendix D**
R543 Regulation 28(1)(n)		A plan of study for Environmental Impact Assessment (EIA), which sets out, the proposed approach to the EIA of the application.	Part 7
	(i)	A description of tasks that will be undertaken as part of the EIA process including any specialist reports or specialised processes, and the	

Regulation No:		Description	Scoping Report Part
		manner in which such tasks will be undertaken.	
	(ii)	An indication of the stages at which the competent authority will be consulted.	Part 1 & Part 4
	(iii)	A description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity.	Part 7
	(iv)	Particulars of the public participation process that will be conducted during the EIA process.	Part 4
R543 Regulation 28(1)(o)		Any specific information required by the competent authority.	Not Applicable *
R543 Regulation 28(1)(p)		Any other matters required in terms of Section 24(4) (a) and (b) of the Act.	Noted

* No specific requests have been received from the competent authorities to date.

The EIA process, which will be undertaken subsequent to the Scoping Process, will be conducted in accordance with Regulations 31 of the Environmental Impact Assessment Regulations, 2010 under the NEMA, 1998. The EIA document for the proposed project will include detailed information pertaining to anticipated or potential impacts that may be associated with the proposed project.

1.3 Applicable legislation, policies and / or guidelines

Table 3 below provides an indication of the main legislation, policies and / or guidelines applicable to the project (this list is not all inclusive).

Table 3: Applicable legislation, policies and / or guidelines

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)		To establish a Constitution with a Bill of Rights for the RSA.
Development Facilitation Act, 1995 (Act 67 of 1995)		To provide for planning and development.
National Environmental Management Act, 1998 (Act 107 0f 1998)	Department of Economic Development, Environment and Tourism	To provide for the integrated management of the environment.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)	Department of Economic Development, Environment and Tourism	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)	Department of Economic Development, Environment and Tourism	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bio prospecting involving indigenous biological resources; the establishment and functions of a South African Biodiversity Institute; and for matters connected therewith.

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
National Environmental Management: Waste Act, 2008 (Act 59 of 2008)	Department of Economic Development, Environment and Tourism	To reform the law regulating waste management in order to protect health and the environment by providing for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.
Environmental Impact Assessment Regulations, 2010 (Government Gazette No. 33306 of 18 June 2010)	Department of Economic Development, Environment and Tourism	Regulations pertaining to environmental impact assessments.
National Water Act, 1998 (Act 36 of 1998)	Department of Water Affairs	To control water management aspects.
Natural Heritage Resources Act, 1999 (Act 25 of 1999)	South African Heritage Resources Agency	This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.
Conservation of the Agricultural Resources Act, 1983 (Act 43 of 1989)	Department of Agriculture, Forestry and Fisheries	To provide control over the utilization of the natural resources of the Republic in order to promote the conservation of soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)	Department of Mineral Resources	To make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources; and to provide for matters connected therewith.
Mineral and Petroleum Resources Development Regulations, 2004 (No. R527 of 23 April 2004; GG 26275)	Department of Mineral Resources	
Mine Health and Safety Act, 1996 (Act 26 of 1996)	Department of Mineral Resources	To promote employee health and safety.
Health Act, 1977 (Act 63 of 1977)	Department of Health	To promote public health.

Title of legislation, policy or guideline	Administering authority	Aim of legislation, policy or guideline
Limpopo Conservation Plan	Department of Economic Development, Environment and Tourism	To guide provincial government in implementing its biodiversity mandate, including improvement of the provincial protected area network; and provide biodiversity information in supports of land-use planning and environmental decision-making.
Various by-laws of the Thabazimbi Local Municipality	Thabazimbi Local Municipality	To regulate land use with the Thabazimbi Local Municipal area.
Integrated Development Plan for the Thabazimbi Local Municipality	Thabazimbi Local Municipality	Broad spatial framework guidelines for the Thabazimbi Local Municipality.
Spatial Development Framework for the Thabazimbi Local Municipality	Thabazimbi Local Municipality	Spatially based policy guidelines whereby changes, needs and growth in the region can be managed to benefit the whole community.

2. DESCRIPTION OF THE PROJECT

2.1 Details of the project applicant

The details of the applicant proposing the project are given in **Table 4**.

Table 4: Details of the applicant

Name of Mine	Thabazimbi Iron Ore Mine
Applicant	Sishen Iron Ore Company (Pty) Ltd, Trading as Thabazimbi Iron Ore Mine
Postal Address	Thabazimbi Iron Ore Mine Private Bag X534 Thabazimbi 0380
Responsible Person	Heilet Hattingh
Telephone Number	(014) 777 3137
Facsimile Number	(014) 777 1651
Cell Phone Number	083 703 2318
E-Mail Address	Heilet.hattingh@kioltd.com
Company Registration No.	2000 011 085 07

2.2 Details of the environmental assessment practitioner

Shangoni Management Services (Pty) Ltd was appointed by SIOC to compile this Scoping Report for the proposed project in accordance with the requirements of the NEMA, 1998 and the EIA Regulations, 2010 there under. Shangoni Management Services (Pty) Ltd details are provided in Table 5 below.

Table 5: Details of the Environmental Assessment Practitioner

Name	**Shangoni Management Services (Pty) Ltd**
Postal address:	P.O. Box 74726 Lynwood Ridge 0040
Contact person:	Lee-Anne Fellowes
Tel:	+27 (0)12 807 7036
Fax	+27 (0)12 807 1014
Cell:	+27 (0)82 456 3208
E-mail:	leeanne@shangoni.co.za

Lee-Anne Fellowes has a B-tech degree in Nature Conservation at the Tshwane University of Technology and holds a National Diploma in Nature Conservation. She gained valuable experience in the conservation and the environmental field through her employment at Gauteng's Department of Agriculture, Conservation and Environment. Her areas of expertise include flora monitoring, bio-diversity and conservation plans, Environmental Impact Assessments (EIA), identification of alien invasive species and eradication programmes. Lee-Anne has 7 years' experience at Shangoni Management Services as project lead to EIA's and EMP.

As required by Regulation 28(1) (a) (ii) of the EIA Regulations, 2010 under the NEMA, 1998, summaries of the CV's of the EAP involved in the conducting of the Scoping Process and compiling the Scoping Report, are attached hereto in **Appendix C.**

2.3 Surface Rights, Mineral Rights and Mining Rights Holder

The Surface Rights, Mineral Rights and Mining Rights of the property associated with the proposed site are held by the same owner. **Table 6** below provides the contact details of the owner.

Table 6: Contact Details of the Surface Rights, Mineral Rights and Mining Rights Holder

Properties associated with the proposed site	Remainder of Portion 10 of the farm Donkerpoort 344 KQ; Remaining Extent of the farm Kwaggashoek 345 KQ; Remainder of Portion 1, 2, 3, 5 and 12 of the farm Wachteenbietjesdraai 350 KQ; Portion 4, 9, 13, 40, 46 of the farm Wachteenbietjesdraai 350 KQ; The remainder of the farm Buffelshoek 351 KQ; The remainder of Portion 1 of the farm Buffelshoek 351 KQ; Portion 2 and 2 of the farm Buffelshoek 351 KQ;, The remainder of Portion 1 of the farm Grootfontein 352 KQ; and Portion 12 of the farm Mooivallei 342 KQ.
Owners Name (Applicant)	Sishen Iron Ore Company (Pty) Ltd, Trading as Thabazimbi Iron Ore Mine
Postal address	Thabazimbi Iron Ore Mine Private Bag X534 Thabazimbi 0380
Telephone Number	(014) 777 3137
Facsimile Number	(014) 777 1651
Company registration no.	2000 011 085 07

2.4 Surface owners of immediately adjacent land

The Surface Rights owners of land directly adjacent to the proposed site and mine boundary area are listed in **Table 7** below. Refer also to the plan in **Appendix A**, which indicates the areas owned by each landowner listed in **Table 7**.

Table 7: Surface Rights owners of the land directly adjacent to the proposed site

Farm	Landowner
Klipgat	Bossie Boshoff
	Chris Klopper
	Flip Steenkamp
	Dr. G.H Boshoff
	Trevor van Zyl
	Hans Pelser
Mooivallei	B. Bronkhorst
	Wessel de Clercq
	Fred Few
	Roets Nolte
	Gert Swanepoel
	M.F Reinecke
	Mr. De Wet
	M.S.A. Erasmus
	Hans Human
Wachteenbietjiesdraai	Henk Broeze
	Willie Grimes
	D. Lambrecht
	Kallie Stassen
Haakdoringdrift	Johan Coetzee
	J. du Buys
Spitskop	George Hattingh
	Dave Jooste
	Koos Myburg
	Coert Pelser
Langpan	Piet Human
Hanover	Janse van Rensburg
Grootfontein	Hendrik Jones
	P. Rheeders
Brakvlei	Marius Schrenk
Doornhoek	M. Miller
Varshvly	Harm Schutte
	John Trollope
	Peter Trollope
Roodedam	F. van der Merwe

Farm	Landowner
Rosseauspoort	Pieter van Schalkwyk
	Jan C. Viljoen

Table 8: Surface Rights owners of the land directly adjacent to the proposed site

Farm	Landowner
Klipgat	Bossie Boshoff
	Chris Klopper
	Flip Steenkamp
	Dr. G.H Boshoff
	Trevor van Zyl
	Hans Pelser
Mooivallei	B. Bronkhorst
	Wessel de Clercq
	Fred Few
	Roets Nolte
	Gert Swanepoel
	M.F Reinecke
	Mr. De Wet
	M.S.A. Erasmus
	Hans Human
Wachteenbietjiesdraai	Henk Broeze
	Willie Grimes
	D. Lambrecht
	Kallie Stassen
Haakdoringdrift	Johan Coetzee
	J. du Buys
Spitskop	George Hattingh
	Dave Jooste
	Koos Myburg
	Coert Pelser
Langpan	Piet Human
Hanover	Janse van Rensburg
Grootfontein	Hendrik Jones
	P. Rheeders
Brakvlei	Marius Schrenk
Doornhoek	M. Miller
Varshvly	Harm Schutte
	John Trollope
	Peter Trollope
Roodedam	F. van der Merwe
Rosseauspoort	Pieter van Schalkwyk
	Jan C. Viljoen

2.5 Description of the proposed project

2.5.1 Nature of the activity / development

The proposed Project Infinity – will entail necessary changes and re-fitments to the current Thabazimbi beneficiation plant infrastructure, new infrastructure additions and re-opening of abandoned mining pits, for the production of iron ore product from high grade and low grade run-of-mine material, within the existing Thabazimbi Mine boundary area.

2.5.2 Reason for project

The LOM of the existing Thabazimbi Mine is reaching its end in 2021.

In previously submitted documentation, relevant application forms and license amendments, SIOC indicated its intention to extend the Thabazimbi Life of Mine (LOM) through the exploitation of low grade iron ore resources in the form of banded ironstone formations (BIF). SIOC also considered the construction of a new beneficiation plant and associated infrastructure to treat this said BIF, This intent to extend the Thabazimbi LOM was called the Phoenix Project.

As part of the natural optimisation and improvement processes followed when considering project scenarios, the project team responsible for the study of the Phoenix Project identified an improved project scenario. This improved scenario identified two major considerations, (i) in addition to the potentially available low grade BIF material tonnages investigated by the Phoenix project, adding the BIF material available in current Thabazimbi mine plans which at present is being discarded as mining waste, and (ii) updating the current Thabazimbi beneficiation plant through equipment changes, re-fitments and additions to treat the BIF material, as opposed to the construction of a brand new beneficiation plant facility.

This project scope change was tabled to SIOC and has subsequently been accepted as an improved project scope as opposed to the original Phoenix Project scope. Phoenix Project was placed on ice on the 31st of May 2013 due to different reasons (opportunity for improved business case and timing of the project development).

Project Phoenix entailed the development of a new project which included a new plant, slimes dam, open pit development, bridge etc. During negotiations with AMSA an opportunity to better utilise the existing asset was identified. The project was therefore redefined.

Thabazimbi Low Grade Retrofit (TLGR) project was defined as the retrofitting of the existing Thabazimbi Plant and associated infrastructure to optimise the processing of the low grade resource. One component of the project entails removal of the discard dump adjacent of the Rooikuilspruit to facilitate additional infrastructure placement close to the existing plant.

The implementation of the Project Infinity will potentially increase the current annual production volumes of the existing Thabazimbi mine to 2 Mt per annum within its current mine plan to 2021, and could potentially increase the LOM for the Thabazimbi Mine by 20 years; this would continue creating employment and supplying ore to the domestic steel market.

SIOC requires the necessary environmental authorisations for the execution of the proposed Project Infinity, which will take place within the current mine boundaries

In order to obtain environmental authorisation, a Scoping Report and an EIR must be compiled as described in Regulations 26 to 35 of the Environmental Impact Assessment Regulations, 2010 promulgated in terms of Section 24(5), 24M and 44 of the NEMA, 1998.

2.5.3 Detailed description of the development and all relevant components

2.5.3.1 Existing operations at the Thabazimbi Mine

Thabazimbi Mine is an established open pit operation, with ore processed through a single processing facility. Thabazimbi Mine is situated in the Thabazimbi Local Municipality (TLM), which falls within the Waterberg District Municipality (WDM) of the Limpopo Province. Thabazimbi is located 130 km north of Rustenburg, 140 km south of Lephalale (Ellisras), 140 km north-west of Brits, 130 km west of Bela-Bela (Warmbaths), and 220 km north-west of Tshwane (Pretoria).

The Thabazimbi area is characterised by three prominent east-west trending mountain ranges and the majority of the mining operations take place in these mountains where the deposits occur. The altitude varies from 95 m (valley floor) to 1 280 m above mean sea level (hereafter referred to as mamsl).

The mine beneficiates its ore in a plant situated close to the mining areas. Where the pits are far removed from the plant, ore is trucked to crushers located close to Donkerpoort pit or the Van der Bijl pit. The crushed material is transported by conveyor belt to a stockpile that feeds the plant. Eskom supplies electricity and water is obtained from boreholes on the mine's properties as well as from the local municipal supply if required.

Currently only opencast mining takes place at Thabazimbi Mine. Nine open pits (East pit Buffelshoek East, Buffelshoek West, Bobbejaanwater, Donkerpoort West, Donkerpoort, Kumba, Kwaggashoek East and Van der Bijl) are present on site. Only three pits (Buffelshoek West, Kumba, and Bobbejaan water) are currently actively mined. According to the LOM plan the inactive pits may be mined in the future. The proposed Project Infinity target areas are the existing, Kumba pits, and potentially Vanderbijl pit. With the implementation of the Project Infinity, a production level of 2 Mt per annum is targeted.

A summary of the **current** infrastructure of the mine is as follows:

- Non-mineral waste handling facilities;
- Mine Residue Deposits;
- Slimes Dams (1 to 4);
- Open Cast Pits;
- Plant;
- Crushers;
- Thickeners;
- Conveyor belts;
- Ore passes; and
- Stockpiles.
- Water Reticulation System;
- Storm water control structures;
- Reservoirs and Storage Tanks;
- Workshops ;
- Warehouses;
- Offices, houses, buildings;
- Clinic;
- Training Centre;
- Ablutions (Toilets) / Change Houses;
- Service Station;
- Fuel Supply, Storage and Dispensing;
- Oil and/ or Gas Storage;
- Electricity Supply Network;
- Explosive Magazines;
- Haul Roads and Service Roads;
- Parking for visitor;
- Bridges;
- Railway Facilities / Siding;
- Dust-A-Side and road maintenance; and
- Ben Albert's Game Farm and Lodge.

The existing operation has been approved in terms of the MPRDA, 2002 and the Thabazimbi Mine has recently submitted an updated and revised EMPr amendment (incl. EIA) under the MPRDA, 2002 with reference number LP30/5/1/3/2/1(45) and (47) EM, compiled by Shangoni Management Services (Pty) Ltd and submitted to the DMR on 29 July 2012.

Note that since the current operation is already authorised in terms of the MPRDA, 2002 this Scoping Report will only cover the new proposed activities associated with the proposed Project Infinity in terms of NEMA, 1998. The updated and revised EIA and EMP under the MPRDA, 2002 submitted includes details of all existing and new activities.

2.5.3.2 Proposed new developments associated with Project Infinity

New developments **(all within the existing mining area)** associated with the project include the following:

The following activities are related to Mining:

- Exploration within existing pit boundaries,
- Mining of Low Grade Material within the existing Kumba North and South Pits and re-entry to Vanderbijl pit);
- New access and haul roads (Vanderbijl pit),
- Stockpiling of low grade ore at various localities on the mining area (Buffelshoek west B1 & B2). Refer to figure 2.
- Primary stockpile areas located Donkerpoort and Van der Bijl primary crushers. Refer to figure 3.

The project consists of two main components namely the Retrofit Stand-alone Plant.
The Retrofit Plant:

3) The following activities are associated with the Processing Plant:
   (a) Removing old and fitting new 3-way chute between 1° & 2° crushing and washing & screening,
   (b) Changing current 32mm top decks to 25mm top decks at 1°Screening,
   (c) Removing old and fitting new 1mm classification circuit to existing washing and screening building,
   (d) Changing current 8mm decks to 5mm decks at 3° screening,
   (e) Upgrading of existing DMS Plant equipment for same throughput & media recovery from 2.8 t/m³ to 4.1 t/m³ circuit medium density,
   (f) Installing new 1mm beneficiation circuit into existing refurbished structural steel above existing plant civils,
   (g) Increasing existing fines product stockpiling capacity for increased fines: lump ratio from low grade run of mine.

The following infrastructure is associated with the Retrofit Plant:

4) (a) Upgrading existing plant discard system for increase Solid waste output from maximum future high & low grade beneficiation circuits,
   (b) Construction of a new slimes dam 5 before existing run out of capacity,

(c) Upgraded slimes handling system.

Stand-alone Plant:

(2) The following activities are associated with the Stand-alone plant:

(a) Stockpiling of 2014 unbeneficiated Low grade lump material,

(b) Constructing new stand Alone liberation, classification & beneficiation circuit for future Low grade lump material,

(c) Installing fines product blending ability to increased fines product stockpiling.

The following infrastructure is associated with the Stand-alone plant;

(a) Existing Thabazimbi rail yard to ensure a less than 12 hours turnaround time.

Possible construction of new 2° crushing circuit for partial feed to low grade circuit.

Most of the listed activities are associated with the slimes dam, pipeline and increase of the discard dump footprint. Retrofitting of the existing plant and construction of the stand alone plant are within a brown field area and no listed activities are triggered for those two activities.

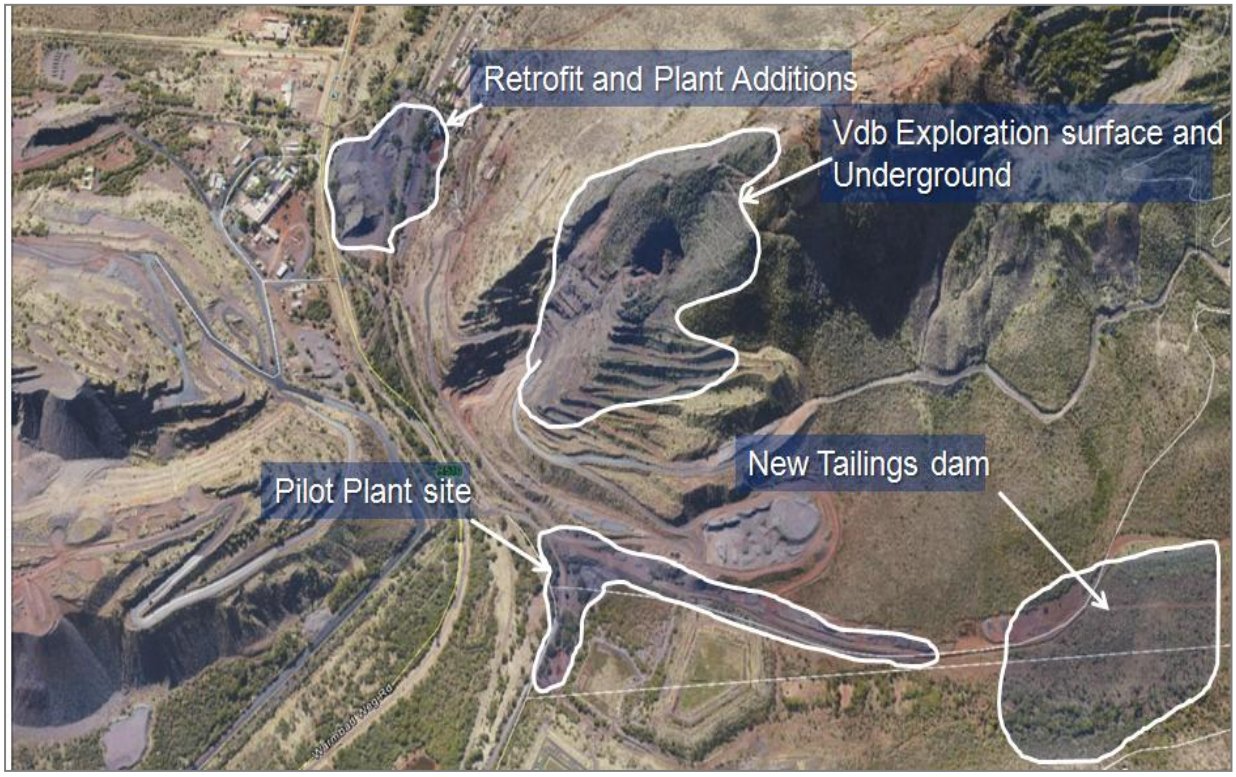

Figure 1: Project Infinity infrastructure

Figure 2: Low Grade ore stockpiles areas

Figure 3: Primary crushers

2.5.4 Regional Setting

2.5.4.1 Location of site

The mining area is located within 16 km from the town of Thabazimbi, in a mountainous terrain. Thabazimbi Mine is situated in the Thabazimbi Local Municipality, which falls within the Waterberg District Municipality of the Limpopo Province. Thabazimbi is located 130 km north of Rustenburg, 140 km south of Lephalale (Ellisras), 140 km north-west of Brits, 130 km west of Bela-Bela (Warmbaths), and 220 km north-west of Tshwane (Pretoria). Refer to the plan in **Appendix A** that indicates the regional location of the site.

The centre co-ordinates of the mine are as follows:

- 24º 36' 34.95'' S;
- 27º 23' 04.81" E.

2.5.4.2 Site description

The Thabazimbi area is characterised by three prominent east-west trending mountain ranges and the majority of the mining operations take place in these mountains where the deposits occur. The altitude varies from 95 m (valley floor) to 1 280 m above mean sea level (hereafter referred to as mamsl).

The mine beneficiates its ore in a plant situated close to the mining areas. Where the pits are far removed from the plant, ore is trucked to crushers located close to Donkerpoort pit or the Vanderbijl pit. The crushed material is transported by conveyor belt to a stockpile that feeds the plant. Eskom supplies electricity and water is obtained from boreholes on the mine's properties as well as from the local municipal supply if required.

Project Infinity will focus on retrofitting the existing plant area, construction of a stand-alone plant in an already disturbed area, construction of a new slimes dam with associated infrastructure and mining activities within the existing pit areas i.e. Van der Bijl, Kumba.

2.5.4.3 Servitudes

Servitudes associated with the Thabazimbi Mine include roads, railway lines, pipelines, Telkom phone lines, graveyards and power lines.

Table 9 below provides a list of all the servitudes, which exist inside the area.

Table 9: List of Servitudes in the Area

SERVITUDES		
FARM NAME	**PORTION**	**TYPE**
Wachteenbietjesdraai 350KQ	National road	R511 to Northam
Wachteenbietjesdraai 350KQ	National road	R510 to Brits
Wachteenbietjesdraai 350KQ	Portion 34	Powerline
Wachteenbietjesdraai 350KQ	Portion 35	Powerline
Wachteenbietjesdraai 350KQ	Portion 35	Powerline
Wachteenbietjesdraai 350KQ	Portion 35	Pipeline
Wachteenbietjesdraai 350KQ	Portion 36	Powerline
Wachteenbietjesdraai 350KQ	Portion 37	Cemetery
Wachteenbietjesdraai 350KQ	Portion 37	Pipeline
Wachteenbietjesdraai 350KQ	Portion 38	Road
Wachteenbietjesdraai 350KQ	Portion 38	Powerline
Wachteenbietjesdraai 350KQ	Portion 38	Powerline
Wachteenbietjesdraai 350KQ	Portion 40	Powerline
Wachteenbietjesdraai 350KQ	Portion 6	Powerline
Wachteenbietjesdraai 350KQ	Portion A	Powerline
Wachteenbietjesdraai 350KQ	Portion 2B	Powerline
Wachteenbietjesdraai 350KQ	Portion 2B	Pipeline
Wachteenbietjesdraai 350KQ	Portion 3	Powerline
Donkerpoort 344KQ	Portion 10	Powerline
Buffelshoek 351KQ	Remainder of Portion 1	Powerline
Buffelshoek 351KQ	Remainder of Portion 1	Pipeline
Grootfontein 352KQ	Portion 1	Powerline
Grootfontein 352KQ	Portion 1	Pipeline

2.5.4.4 Adjacent Land Uses

The adjacent land belongs mainly to farmers and is used for cattle, game farming and town development. Land along the Crocodile River is used to grow wheat, lucerne, maize, sunflowers and soya beans. On the remaining extent of the farm Grootfontein 352 KQ, andalusite is mined by the company Rhino Minerals (Pty) Ltd. Rhino Minerals (Pty) Ltd are currently applying for a Mining Right for the andalusite deposit on the Farms Grootfontein 352 KQ and Buffelshoek 351 KQ, these farms are owned by SIOC and within the mining right area of SIOC.

2.5.5 Mineral, mining method and target of mine

2.5.5.1 Target mineral

The target mineral for the proposed Thabazimbi Project Infinity is high grade as well as low grade

Haematite ore resources.

2.5.5.2 Mine product(s)

The iron ore mined at the Thabazimbi Mine is processed (washed and screened). Several different qualities and sizes of iron ore product of banded ironstone, enriched banded ironstone, low-grade haematite ore and high-grade haematite ore are therefore produced. This iron ore product is sold exclusively to the domestic market.

2.5.5.3 Extent of target area

The iron ore deposits at Thabazimbi mainly occur as basal units in the Penge Formation. This unit comprises orto-chemical Banded Iron Formations (hereafter referred to as BIFs) (350 m thick) at the top, with a chert-rich shale unit (10 m) towards the bottom. The lower part of the BIF (towards the shale unit) is highly ferruginised and represents the major hematite ore zone. The shale unit is underlain by dolomites from the Frisco formation of the Malmani subgroup (Pretoria Group, Transvaal Sequence).

The ore body dips south at an angle of approximately 45°. At depth, the hematite grades into calcite-hematite and talc-hematite rocks. The mineralization covers 12 km along strike with sterile gaps of BIF in between. The occurrence of sterile zones in between ore bodies is associated with faulting. The ore zones wedge out laterally and vary in thickness from 10 to 25 m. The intensity of ferrugenisation is usually associated with brecciation of the BIF due to the underlying karst topography (surface characterised by numerous sink holes) of the dolomites.

Diabase dykes and sills serve as local barriers to regulate the flow of iron rich fluids. The ore zones are therefore usually located below or next to these features. The genesis of the deposits reflects primary chemical sedimentation, followed by secondary metamorphic and supergene iron enrichment processes. The intrusion of the Bushveld Igneous Complex led to contact metamorphism in the country rock. It is responsible for the southward dipping character of the dolomite and BIFs.

Tectonism of Waterberg Age caused thermodynamic metamorphism of the iron-rich formation, resulting in the creation of talc-hematite and calcite-hematite deposits. This resulted in the triplication of the Penge Formation as well. Later differential erosion resulted in three prominent mountain ranges namely, the Rosseauspoort-, the Northern- and the Southern Ranges. A small reef, the so-called Middle Range is encountered locally between the Northern- and the Southern Ranges. Post-Karoo stress deformation led to the development of local north-south and east-west striking faults.

The Thabazimbi area is characterised by sedimentary and volcanic rocks of the Transvaal Supergroup, which overlie the granite gneisses of the Kaapvaal Craton. The iron ore deposits occur in the chemical sediments of the Chuniespoort Group, which consists of the basal part of the upper Penge Formation. The latter in turn overlies the dolomites of the Malmani Subgroup. The iron ore –

which, by definition, consists of > 60 % Fe (by mass) and < 15 % Si - occurs in 80 m thick iron rhythmites of the Penge Formation.

Deformation of the Thabazimbi area caused the sediments to dip to the south, and also caused the stratigraphy to be triplicated. Differential erosion produced the three prominent mountain ranges, namely the Rousseauspoort- and the Northern- and Southern Range.

The main iron deposits occur in the Northern Range and are known as the Eastern Mine, Kwaggashoek East, Donkerpoort, Donkerpoort Nek, Vanderbijl and Kumba North, South and East deposits. The middle range consists of Bobbejaanwater and the Southern Range includes Buffelshoek East and Buffelshoek West.

2.5.5.4 Mining method

Above ground, conventional opencast mining methods are currently applied. The existing pits are excavated with benches of 10-15 m and double benches at the final boundaries. The current mining operations are general drilling, blasting, loading and hauling operations. These mining methods can be summarised as follows and remains unchanged to Project Infinity:

2.5.5.4.1 Drilling

Drilling is done on a level surface with 60R and GD 120 drills. Drill holes are 251 mm in diameter and are drilled 12.5 m deep to secure 10 m benches in the pit. Water is added in the drill process to suppress dust generated.

2.5.5.4.2 Blasting

Drill holes are charged with ANFO or HEF emulsion in the areas where the holes are water logged. Each hole contains ANFO and a Pentolite booster and detonator in the booster. The Pentolite booster is connected to the surface via a shock tube. The booster is approximately 3 m from the bottom of the hole and the last 5 m of the hole is tamped with drill chips. The blast is set off with a 1.2 m long safety fuse, which burns for 4 minutes. On average blasting takes place once a week in each pit.

2.5.5.4.3 Loading

Blasted material is loaded onto haul trucks with P&H shovels. Rubber wheel loaders or a Mechanical shovel are used to select ore in confined areas or where mixing has occurred or where the larger shovels cannot separate the ore and the mineral waste (selective mining).

2.5.5.4.4 Hauling

Ore is transported to the ore passes at Donkerpoort and Vanderbijl crusher with haul trucks. The low grade ore to be mined as part of Project Infinity will follow the same processes. The mineral waste is transported to the waste tips on the side of the mountains.

2.5.5.4.5 Roads

Graders are used to grade the roads in the pit to secure an even surface for the haul trucks. Dust suppression is done on all haul roads to ensure an even surface for transport of Iron ore as well as preventing dust generation during hauling.

2.5.5.4.6 Pit Layout

Figure 2 below depicts the layout of a typical pit at Thabazimbi Mine. The figure provide for a side view of the pit. The figure indicates the various sections of a typical pit as well as the cut-out view of the benches in the pit.

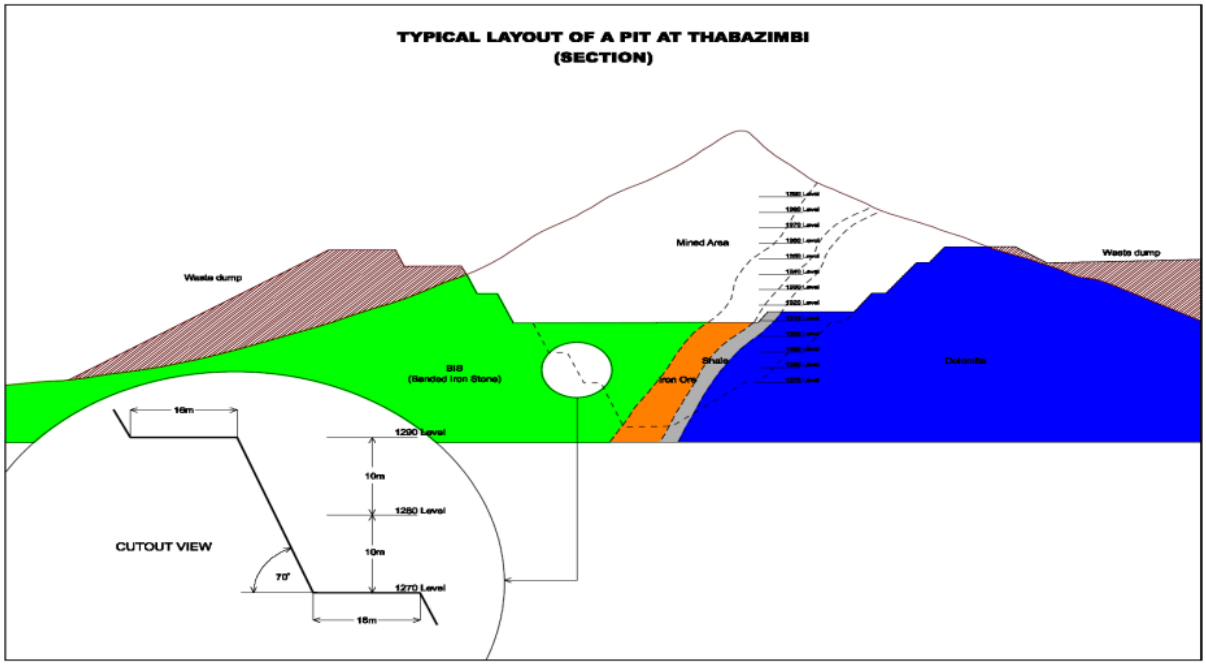

Figure 4: Typical pit layout at Thabazimbi Mine

2.5.5.5 Planned production rates

Project Infinity will target a total production tonnage of 2 Mt per annum from the overall Thabazimbi operations, consisting of lump and fine ore

2.5.5.6 Planned life of mine

The LOM of the existing Thabazimbi Mine is reaching its end in 2021. The implementation of the project could potentially increase the LOM for the Thabazimbi Mine by 20 years by exploiting the low grade iron ore resources in the form of banded ironstone formations (BIF) available in the current Thabazimbi mining pits as well as potential future pits currently not being mined.

2.5.6 Mining process and associated infrastructure

2.5.6.1 Ore Processing

2.5.6.1.1 Crushing and Screening

Crushing of material shall be done by means of a primary, secondary and new tertiary crusher. Crushed ore shall be screened in the exiting screening building.

2.5.6.1.2 Stand-Alone plant

The construction of a stand-alone plant which includes the following:

- Construction of new stand alone thickener for future low grade lump material to tie into upgraded slimes handling system.
- Construction of new stand alone liberation, classification and benefiation circuit for future low grade lump material.

2.5.6.1.3 Retrofitting of existing plant

Retrofitting of the existing Thabazimbi Plant which includes the following:

- Removing old and fitting new 3-way chute between 1° and 2° crushing, washing and screening,
- Changing current 32mm top decks to 25mm top decks at 1° screening,
- Removing old and fitting new 1mm classification circuit to existing washing and screening building,
- Changing current 8mm decks to 5mm decks at 3° screening.

Figure 5: Retrofit and Stand-alone Plant localities

2.5.6.1.4 Beneficiation Plant

Screened crushed ore shall be beneficiated with upgraded DMS technology and new spiral technology. This beneficiated material shall follow same product handling process to the domestic customer.

2.5.6.2 Associated infrastructure

The following additional (new) infrastructure will be required at Thabazimbi Mine to facilitate the proposed Project Infinity:

- Two slimes and one return water pipelines of 150mm (each) and length of 6km delivering slimes from the plant to the slimes dam and return water from the slimes dam Construction of slimes dam number 5. Two 150mm diameter (each) slimes pipelines delivering slimes from plant to the slimes dam with a combined throughput of more than 120ℓ per second.
- Lengthening of the existing siding to ensure less than 12 hours turnaround time.
- Construction of new haul roads within the mining area with a width of 30 m.
- Stormwater management infrastructure at haul roads, waste rock dumps and slimes dam facilities that alter surface water run-off originating in the Kwaggashoek, Van der Bijl, Bobbejaanwater, Donkerpoort, Buffelshoek and Meyer mine areas will require a Water Use Licence (WUL).
- Construction of the Project Infinity plant including amongst others;
    - Increasing of waste rock dumps and plant discard dump(s) footprints;
    - Maintenance workshop;

2.5.6.2.1 Pipelines

The construction of pipelines is proposed as part of the Project Infinity. The pipelines consisting of two slimes and one return water pipelines with diameter of 150mm (each) and length of ±6 kilometres, with a combined throughout put of more than 120ℓ per second, for the purpose of delivering slimes from the new plant to the slimes dam and return water from the slimes dam.

2.5.6.2.2 Slimes dam number 5

Figure 4 indicates the location alternatives for the proposed Slimes Dam, which forms part of the Project Infinity. A new slimes dam will be constructed to handle fines generated from the Plant.

The slimes dam is to be developed as an impoundment with waste rock obtained from the mining operations forming the outer wall. Only the fine slimes fraction will be deposited on the dam.

The west wall of the slimes dam has been located so that the base of the wall is founded on the flattest portion of the valley floor to maximize the storage capacity behind the wall on commissioning as well as for the ease of construction. The wall is also located as far to the west as possible to maximize use of the natural ridge to the south as a retaining wall.

An access road to the slimes dam will be provided along the pipe- and power line route.

Supernatant and storm water shall be pumped off the dam by means of a pump on a barge. The storm water capacity for the proposed slimes dam was determined, with assumption that the minimum practical vertical free board would be 3 m.

Dirty water from the slimes dam shall be pumped back to the plant in a closed reticulation system. The minimum pumping rate shall be calculated to return storm and process water back to the plant to prevent an accumulation of water in the dam.

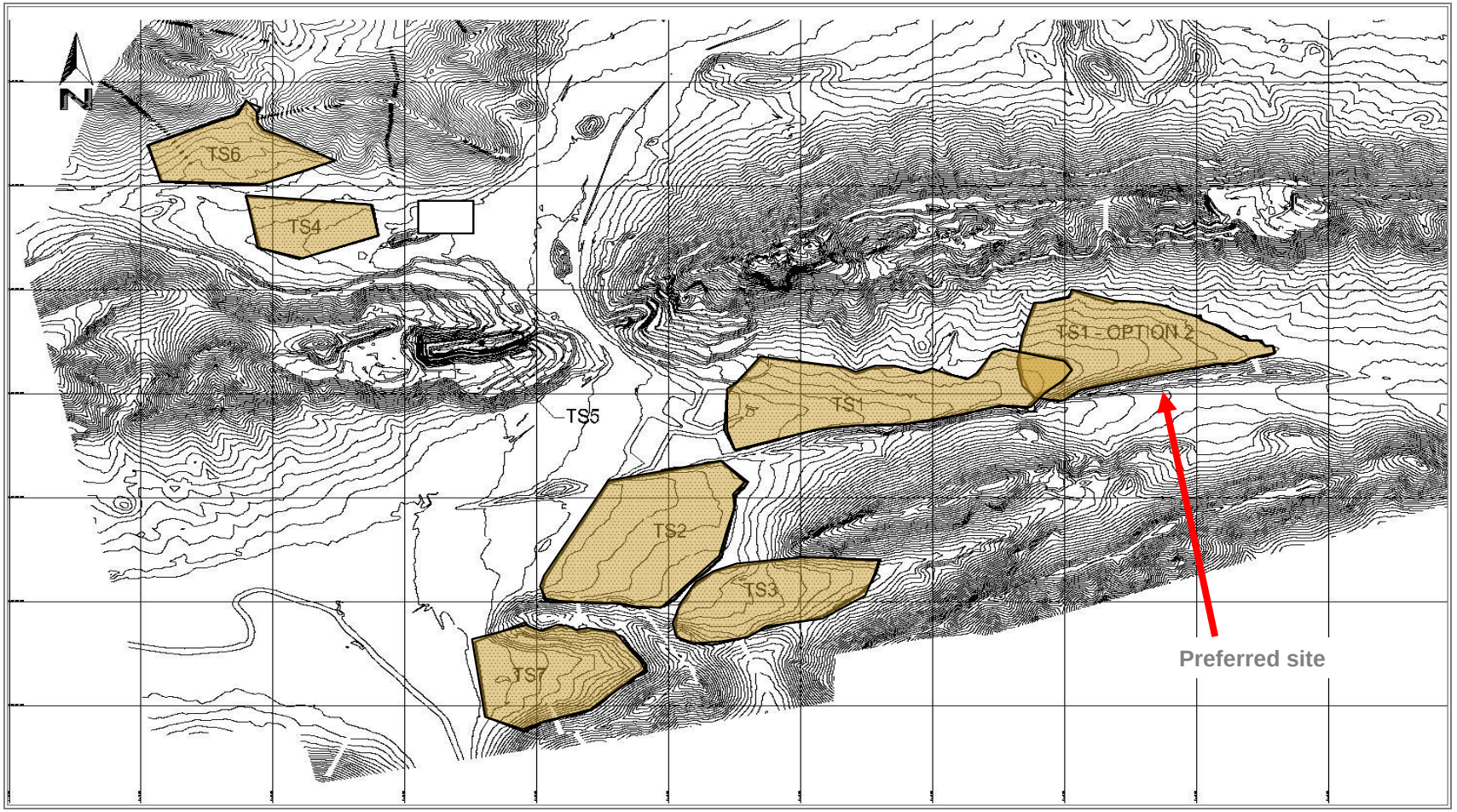

Figure 6: Location of the proposed Tailings Dam

2.5.6.2.3 Railway Siding

Construction of longer railway lines within the existing siding to accommodate 2 MTPA of product within Transnet requirements.

2.5.6.2.4 New Haul Roads

As part of the proposed Project Infinity additional haul roads of between 10-20km with a width of 30 metres will be constructed within the mining area.

2.5.6.2.5 The Project Infinity Plant

The Thabazimbi retrofit process plant shall be fed with more run of mine produce same 2 MTPA. This increase shall result in an approximate 50% increase in plant discard causing an increase in the capacity of the plant discard dump.

2.5.6.3 Water Management Systems

2.5.6.3.1 Dewatering

It will be necessary to remove the collected rain water and possible groundwater from within the Project Infinity Pits 1 and / or 2 for the purpose of continuing mining efficiently and for the safety of people and equipment. The rainwater will be incorporated into the process water circuit at Thabazimbi Mine for re-use.

According to the report compiled by WSM Leshika (Pty) Ltd, titled "Project Phoenix: Thabazimbi, dewatering will become necessary in order for mining to continue safely and efficiently. It is proposed that the groundwater table be lowered to below the Project Infinity Pit 1 floor by pumping groundwater out of boreholes surrounding the pit. The water that is abstracted will not be discharged, but will be incorporated into the process water system at Thabazimbi within the proposed Project Infinity.

2.5.6.3.2 Boreholes

As part of the proposed Project Infinity, it is anticipated that some of the existing production boreholes at Thabazimbi Mine may become dry due to the dewatering of the proposed Project Infinity Pits 1 and / or 2. This will be verified during the EIA phase of the project. In order to ensure that Thabazimbi Mine will have a sufficient supply of water, three new boreholes have been drilled, which will remain unequipped until such time as the use of the boreholes becomes necessary. The new boreholes are as follow:

- Borehole DON1177A (DP Groef), with a yield of 90 m^3/h;
- Borehole DON1180 (Draai Donkerpoort West ertsvervoerpad), with a yield of108 m^3/h; and
- Borehole DON1181 (Begraafplaas), with a yield of 25 m^3/h.

2.5.6.3.3 Process Water

The proposed retrofit of the Thabazimbi process plant shall possibly require slightly more process water, but this needs to be calculated as design develops. The process plant shall continue to make use of treated sewage water and ground water abstracted from boreholes for process purposes. No water shall be abstracted from any of the non perennial rivers and streams in the area for process purposes.

2.5.6.4 Water Source and Usage

2.5.6.4.1 Potable and Process Water

Groundwater shall be abstracted through boreholes, which includes the Donkerpoort basin boreholes, golf course boreholes, and Group 5 boreholes. These groundwater supply boreholes are used for supply of process and potable / drinking water to the mine and town as well as at the golf course.

Additional treated sewage water is purchased from the Waste Water Treatment Works (WWTW) plant for process use.

2.5.6.4.2 Domestic Wastewater

The Thabazimbi Waste Water Treatment Works treats domestic sewage before discharging it to the Ore Processing Plant for use in the process for the Thabazimbi Mine or alternatively to the Rooikuilspruit.

2.5.7 Waste generation and disposal

2.5.7.1 Mine residue disposal

Part of the mining process produces large volumes of waste rock, which is disposed on the slopes of the mountains. Mine waste rock will be used for the construction of the starter wall of the slimes disposal facility. Mine residue is also produced in the plant. The fines go to the slimes dams and the coarse material goes to the plant discard dump.

Waste rock volumes are envisaged to decrease as a result of the processing of low grade ore previously seen as waste material. Coarse residue post the retrofit project shall continue to be placed on the second discard dump, which was commissioned in the 1960's.

Fine residue originating from the process is pumped from the thickener in the plant and disposed of at the slimes dam facility. Slimes generated post the retrofit project shall be transported via a pipeline from the plant to the new slimes dam.

The prospecting for The Project Infinity has already commenced and is still in process. The Van der Bijl pit has been extensively explored from old underground tunnels into the ore body. Surface prospecting was and is still conducted and surface prospecting is conducted in Kumba pit as well. As part of this process, a bulk sample was mined in the Van der Bijl open pit. The material was moved and treated in a pilot plant (see later description of plant).

2.5.7.2 Other waste disposal

The main non-mineral waste types identified on the mine are the following:

1. General waste is the generic term for waste that, because of its composition and characteristics, does not pose a significant threat to public health or the environment if properly managed and which is not inherently hazardous. General waste comprises for example of the following:
   - Rubble (e.g. Building rubble);
   - Garden waste (e.g. Grass and leave cuttings); and
   - Domestic waste (e.g. plastics, food rests, wood related items, glass etc.).

2. Hazardous waste is that waste which can, even in low concentrations, have a significant adverse effect on public health and/or the environment. Hazardous waste can be divided into the following categories:
   - Oil related waste or oily waste (Used oil, grease, oil contaminated rags, diesel, petrol etc.);
   - Organic waste (e.g. Pesticides); and
   - Other waste (e.g. medical waste, explosive containers redundant chemicals - battery acid etc.).

Currently all waste is disposed of site. General waste is disposed at the municipal general waste site.

2.5.8 Need and desirability of the project

Thabazimbi mine produces iron ore to the domestic steel market. At present iron ore from Thabazimbi Mine is used together with Sishen Mine iron ore to provide feedstock to the domestic market.

Domestic supply is crucial in maintaining the viability of the local steelmakers, as the import of Iron ore carries a high cost premium to locally produced iron ore.

Thabazimbi Mine currently has a LOM until 2021, after which local markets will be fully dependent on Sishen and other smaller deposits of iron ore. This may create an imbalance in iron ore distribution from different suppliers, and will create issues around blended iron ore chemical qualities, as the different iron ore mines complement each other in the impurity levels at which iron ore can be produced from each mine, in order to maintain acceptable qualities at the steelworks. Correcting

quality issues at the steelworks require expensive equipment investments and higher production costs, which could render the steelmaking processes unviable.

It is therefore necessary to ensure sustained mine lives from different geographical areas in South Africa, through projects e.g. Project Infinity at Thabazimbi.

3. DESCRIPTION OF THE EXISTING ENVIRONMENT

This chapter provides for a description of the natural environment in which the mining activities take place. Since the initial development of the EMP and EIA under the MPRDA, 2002 numerous specialist studies have been done to improve the understanding of the environment and mitigation measures applied to minimise the impacts of the mining operations.

As part of The Project Infinity additional specialist studies and the revision of some of the old specialist studies are underway. The following table provides a list of all the specialist studies completed and/or underway:

Table 10: List of specialist studies completed or underway

SPECIALIST STUDY	DATE COMPILED	
	Old	New (to be included in EIR)
Climate Assessment	October 2010 Expansion	Expansion of existing study to include micro climate of the region (Mooivallei)
Fauna and Flora Survey	June 2005	December 2011 & February 2012
Fauna and Flora Survey Addendum	July 2010	April 2010
Air Quality Management Plan (hereafter referred to as AQMP)	September 2009	New study
Noise Impact Assessment	September 2006	New study
First Phase Heritage Impact Assessment	July 2010	-
Socio-Economic Impact Assessment and a Plan to Address the Socio-Economic Aspects of Mine Closure at Thabazimbi Mine	July 2009	Review of Juy 2009 study
Biodiversity Action Plan – hereafter referred to as BAP	August 2009	November 2012
Traffic Impact Assessment Report	May 2007	Revision is underway
Revised Draft Report Comparative Social Impact Assessment	February	Revision is

SPECIALIST STUDY	DATE COMPILED	
	Old	New (to be included in EIR)
	2007	underway
Stormwater Management Plan	March 2006	December 2012
Groundwater Model for the Dewatering of the Thabazimbi Mine Area	April 2007	Revision is underway
Baseline Aquatic Biomonitoring Survey and Toxicity Testing of Selected Sites Associated with Mining Activities in Thabazimbi, Limpopo South Africa	September 2010	-
Regional Geohydrological Model	March 2011	Revision is underway
Paleontological study	-	February 2012
Visual Study	-	New study
Hydrology Study	-	New study
Geohydrology Study	-	New study
Blasting and vibration study	-	New study
Air Quality Study	-	Expansion of existing study to include Thabazimbi Project Infinity activities in air dispersion model
Economic study	-	New study

Since the commencement of mining operations at Thabazimbi Mine, the environment has already been impacted upon. This part of the document describes the current biophysical environment relevant to the proposed project, so that the potential impacts of the project can be assessed and the best practical environmental options can be identified.

3.1 Climate

3.1.1 Regional Climate

The Thabazimbi area lies in the summer rainfall region of the Bushveld. The Thabazimbi Mine area lies at an altitude of 995 to 1 445 mamsl. The Thabazimbi area is known for its relatively high temperatures, with day temperatures that may rise above 40°C in summer. The mean maximum summer temperature is about 30°C.

Table 11: Rainfall Data from 1935-2010

THABAZIMBI RAINFALL REPORT													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1935							0.00	0.00	0.00	0.00	5.10	102.10	107.20
1936	65.50	169.20	135.90	0.00	68.80	0.00	0.00	0.00	0.00	74.40	111.80	0.00	625.60
1937	245.10	159.80	68.60	29.70	0.00	0.00	0.00	0.00	17.80	72.60	20.60	175.80	790.00
1938	147.10	70.40	22.60	98.60	0.00	6.40	0.00	0.00	0.00	22.60	21.10	138.20	527.00
1939	45.50	269.20	158.00	0.00	44.50	0.00	30.00	4.80	11.70	58.70	185.40	74.20	882.00
1940	123.70	70.90	132.10	38.60	29.00	88.90	0.00	3.60	76.20	32.00	54.40	231.90	881.30
1941	83.10	48.80	14.70	78.50	0.00	0.00	0.00	0.00	9.10	13.00	16.50	139.70	403.40
1942	81.00	108.50	143.30	0.00	8.90	0.00	0.00	10.90	37.80	109.50	52.80	97.80	650.50
1943	102.10	49.00	104.60	140.20	40.10	1.00	3.30	13.20	29.50	125.70	29.50	38.10	676.30
1944	170.20	220.50	58.40	2.30	14.70	55.60	0.00	0.00	4.10	114.80	125.50	18.80	784.90
1945	74.70	78.50	116.80	34.80	3.30	0.00	3.30	0.00	0.00	55.40	63.20	34.80	464.80
1946	287.00	158.80	76.50	19.80	0.00	0.00	0.00	0.00	0.00	13.20	39.10	37.80	632.20
1947	106.20	109.00	159.00	30.20	0.00	0.00	2.30	0.00	6.90	39.90	203.50	108.00	765.00
1948	75.40	37.30	152.10	44.50	15.50	0.00	0.00	0.00	10.20	67.80	151.60	2.50	556.90
1949	179.80	49.50	53.30	13.70	8.40	25.90	1.80	0.00	0.00	30.70	69.60	237.20	669.90
1950	68.10	40.40	53.60	61.00	37.10	0.00	0.00	0.00	4.80	6.10	59.40	247.90	578.40
1951	69.10	82.30	61.70	50.30	37.10	5.10	16.00	16.30	3.30	105.90	24.10	56.40	527.60
1952	120.90	141.70	32.30	29.70	33.50	1.00	0.00	0.00	0.30	23.10	142.20	178.10	702.80
1953	70.60	179.60	153.70	112.00	6.60	0.00	0.00	0.00	0.00	23.60	125.50	89.90	761.50
1954	213.40	82.00	27.90	67.10	4.80	0.00	0.00	0.00	3.00	20.80	96.50	119.40	634.90
1955	165.10	358.10	50.80	27.40	10.20	13.00	0.00	0.00	0.00	47.80	71.60	344.40	1088.40
1956	43.70	189.50	153.40	15.20	38.10	0.00	0.00	0.00	30.50	20.60	71.10	96.00	658.10
1957	88.40	93.00	44.70	32.50	17.50	64.30	63.00	41.90	38.90	48.00	36.60	32.80	601.60
1958	133.60	65.00	33.00	57.20	1.80	0.00	0.00	0.00	30.00	55.10	106.20	175.00	656.90
1959	179.60	123.20	92.50	40.60	25.70	0.00	2.00	8.10	0.00	15.00	117.60	165.90	770.20

THABAZIMBI RAINFALL REPORT													
1960	35.80	98.30	79.50	74.40	14.00	0.00	1.00	18.00	1.50	37.60	199.10	127.50	686.70
1961	50.60	79.80	47.50	76.00	32.50	10.50	0.00	0.00	0.00	19.80	124.00	102.00	542.70
1962	86.50	30.50	23.00	77.50	0.00	3.60	0.00	2.50	0.00	21.00	97.50	76.20	418.30
1963	75.50	35.60	0.50	56.40	9.00	51.00	0.00	0.00	0.00	57.50	87.00	67.60	440.10
1964	143.00	39.60	4.00	42.00	0.00	1.00	0.00	0.00	5.60	151.00	68.00	103.60	557.80
1965	60.00	46.60	11.00	64.00	0.00	0.00	0.00	0.00	0.00	0.00	91.00	35.50	308.10
1966	90.50	67.00	9.00	24.00	2.50	32.00	0.00	0.00	63.50	53.50	41.00	111.00	494.00
1967	326.70	198.60	100.50	158.00	16.00	0.00	0.00	16.50	0.00	20.00	89.50	35.30	961.10
1968	147.60	50.50	88.00	78.50	38.00	0.00	0.00	0.00	0.00	9.00	103.00	84.60	599.20
1969	38.00	83.60	138.20	21.60	27.00	0.00	0.00	1.50	1.00	52.60	57.00	233.60	654.10
1970	144.00	36.00	35.60	10.50	11.00	8.00	7.60	0.00	13.50	55.00	89.50	109.00	519.70
1971	202.20	120.20	47.00	38.60	20.00	0.00	0.00	0.00	20.00	46.00	152.20	68.10	714.30
1972	227.00	50.60	143.00	16.00	6.10	0.00	0.00	0.00	4.00	12.50	92.00	66.00	617.20
1973	62.50	166.60	57.40	40.00	0.00	0.00	0.00	0.00	15.00	94.50	83.00	169.00	688.00
1974	98.50	54.50	120.50	32.00	0.00	0.00	0.00	6.50	18.00	20.50	92.00	165.50	608.00
1975	205.00	144.00	30.00	131.50	41.50	5.00	0.00	0.00	0.00	10.00	46.50	189.50	803.00
1976	127.00	122.50	108.50	30.00	32.50	0.00	0.00	0.00	14.50	60.00	107.00	148.50	750.50
1977	192.00	55.00	100.50	79.00	0.00	0.00	0.00	18.50	98.00	48.00	45.50	204.00	840.50
1978	325.00	108.00	98.00	41.00	0.00	0.00	0.00	0.00	20.00	54.00	58.50	57.50	762.00
1979	59.50	95.50	108.00	22.00	40.00	0.00	2.00	23.00	11.00	76.00	174.00	55.00	666.00
1980	151.50	103.50	53.00	23.50	0.00	0.00	0.00	0.00	29.50	30.50	113.50	157.50	662.50
1981	141.00	46.00	85.00	18.00	0.00	9.00	0.00	22.00	16.50	8.00	124.50	58.50	528.50
1982	152.00	54.50	120.50	13.00	0.00	0.00	10.00	0.00	0.00	77.00	53.50	158.90	639.40
1983	65.00	16.00	90.00	44.00	2.00	9.00	0.00	20.00	15.00	27.50	130.00	135.20	553.70
1984	14.50	24.00	126.00	0.00	0.00	41.00	29.00	0.00	5.00	92.00	96.00	172.40	599.90
1985	133.60	63.00	53.00	0.00	2.00	0.00	0.00	10.00	6.00	58.50	26.50	152.60	505.20
1986	68.50	78.50	80.50	56.00	0.00	0.00	0.00	4.00	29.50	88.00	130.00	102.50	637.50

THABAZIMBI RAINFALL REPORT													
1987	68.50	87.50	104.50	14.00	0.00	0.00	0.00	18.00	8.50	27.00	151.00	98.50	577.50
1988	103.00	163.50	140.50	54.50	0.00	1.00	0.00	2.00	27.00	92.50	32.00	144.00	760.00
1989	54.50	240.50	43.50	42.50	0.00	7.80	0.00	6.50	0.00	36.20	93.20	134.80	659.50
1990	86.90	111.20	94.00	57.00	31.70	0.00	0.00	0.00	10.30	22.10	18.00	69.20	500.40
1991	268.30	141.30	206.90	0.00	0.00	0.00	0.00	0.00	4.00	34.00	115.00	148.00	917.50
1992	34.50	46.70	82.60	34.60	0.00	0.00	0.00	0.00	0.00	38.00	131.70	80.50	448.60
1993	53.90	143.20	159.70	43.40	0.00	0.00	0.50	0.00	18.00	74.40	76.30	137.70	707.10
1994	115.90	107.50	12.70	3.80	0.00	0.00	0.00	0.00	0.80	50.30	30.10	119.10	440.20
1995	76.80	46.80	110.50	19.10	19.00	0.00	0.00	5.50	1.00	52.00	123.40	144.60	598.70
1996	127.80	324.40	52.50	42.00	7.30	0.00	1.90	0.00	0.40	47.80	77.40	148.70	830.20
1997	261.10	20.60	133.40	11.00	49.30	1.00	1.10	0.30	42.70	22.00	76.60	96.80	715.90
1998	115.10	55.20	17.70	8.50	0.00	0.00	0.00	2.00	2.90	29.70	99.60	251.20	581.90
1999	95.10	18.90	24.70	26.80	71.50	0.50	0.00	0.00	2.70	42.40	24.00	265.30	571.90
2000	308.00	230.80	119.90	27.00	23.00	15.90	1.30	0.00	0.00	74.80	48.30	81.50	930.50
2001	11.10	151.20	49.30	72.30	35.80	2.30	0.00	0.00	19.10	129.30	176.10	66.00	712.50
2002	26.10	0.00	35.60	36.40	0.50	44.30	0.00	2.00	11.00	60.70	0.70	207.80	425.10
2003	111.30	75.10	6.00	0.00	0.00	17.30	0.00	0.00	0.00	42.20	134.30	122.50	508.70
2004	130.20	159.80	203.10	63.90	0.00	0.70	13.70	0.00	0.00	2.10	67.30	176.30	817.10
2005	84.30	18.70	77.00	35.30	0.00	0.00	0.00	0.00	0.00	0.00	156.90	110.50	491.70
2006	256.20	326.80	138.90	0.00	4.00	0.00	0.00	6.90	0.00	76.50	56.70	116.80	982.80
2007	73.90	10.80	0.50	33.80	0.00	19.60	4.30	0.00	52.00	92.50	21.80	203.00	512.20
2008	259.02	37.60	101.40	0.00	14.00	3.00	3.40	0.00	0.00	1.20	122.70	67.30	609.62
2009	169.80	100.40	62.40	0.00	11.70	64.20	0.10	0.60	35.00	87.40	47.60	49.60	628.70
2010	146.10	57.10	106.50	159.70	73.00	0.00	0.00	0.00	0.00				542.40
Average per month	125.32	102.64	81.88	41.03	14.41	8.12	2.60	3.75	12.32	48.15	86.15	121.72	48626.12

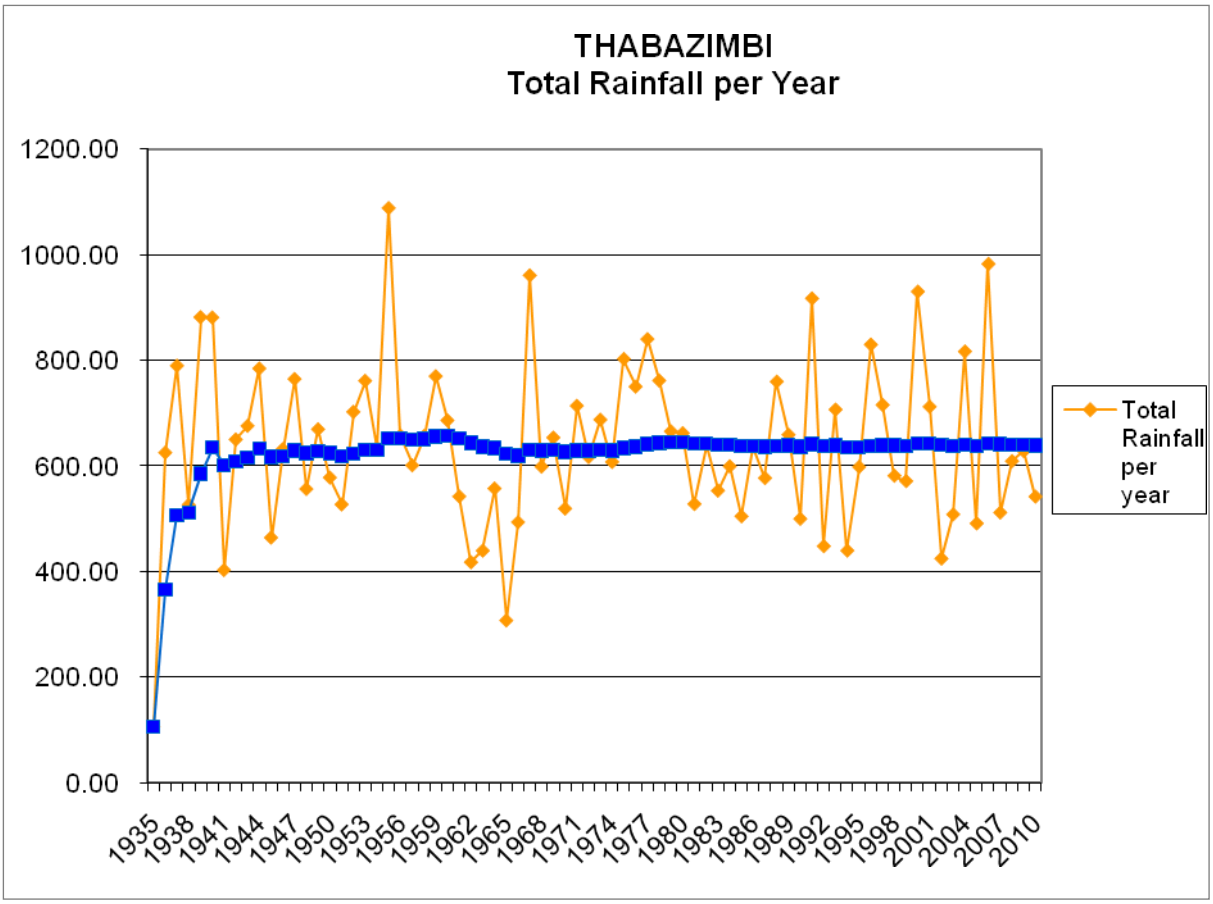

Figure 7: Average Rainfall from 1935 - 2010

3.1.2 Mean Monthly and Annual Precipitation

The Thabazimbi area has a mean annual precipitation (hereafter referred to as MAP) of 645 mm, of which 90% falls in the period October to April. The highest rainfall in a single day measures since 1981 was 122 mm on the 15th of March 1991. The MAP at Thabazimbi Mine (1935 – 2010) is reflected in **Figure 4**. Table 12 presents the information used to develop the graphs to indicate the average rainfall as well as the monthly rainfall for the past 69 years.

3.1.3 Minimum, Maximum and Maximum Rainfall Intensity per Month

Table 12 below shows the maximum rainfall per 24 hours recorded for each month in the past year.

Table 12: Maximum Rainfall in 24 Hour Period in 2010

MONTH	MIN RAINFALL (mm)	MAX RAINFALL (mm)	AVG RAINFALL (mm)
January	2.8	222.5	115.0
February	4.3	223.5	71.2
March	6.3	198.4	71.1
April	0.8	95.5	23.4

MONTH	MIN RAINFALL (mm)	MAX RAINFALL (mm)	AVG RAINFALL (mm)
May	0.0	31.8	7.8
June	0.0	55.1	12.0
July	0.0	10.2	2.6
August	0.0	7.1	1.2
September	0.0	68.3	12.5
October	0.0	81.3	32.9
November	1.8	129.0	71.0
December	1.0	164.8	87.3
Total	**431.8**	**770.6**	**541.8**

3.1.4 Mean Monthly Minimum and Maximum Temperatures

Temperatures may range from a maximum day temperature of 40°C in summer to a few degrees below zero in winter.

In summer, the mean temperature at 14h00 is 30°C, and in winter 21°C. At 08h00, the mean temperature is 23°C in summer and 8°C in winter.

The mean monthly maximum and minimum temperatures are shown in the **Table 13** below.

Table 13: Mean Monthly Maximum and Minimum Temperatures

MONTH	MAX. TEMP. (° C)	MIN. TEMP. (°C)
January	33,4	20,7
February	32,3	21,1
March	31,9	19,0
April	29,3	16,6
May	27,3	12,8
June	25,1	10,1
July	25,1	11,1
August	27,9	14,4
September	29,8	17,6
October	31,9	19,9
November	32,0	20,4
December	31,6	20,7

3.1.5 Mean Monthly Wind Direction and Speed

From the wind roses it is evident that the mean wind direction is North to North-east, refer to **Figure 5**.

During the winter months April, May, June and July the wind roses indicate that the wind direction sometimes changes slightly from South to South-east.

The mean monthly wind direction and speed are shown in the table below (period: 1986 – 1991). The prevailing wind direction is north-east, at a speed averaging 2.5 m/s. Gale force winds occur very rarely.

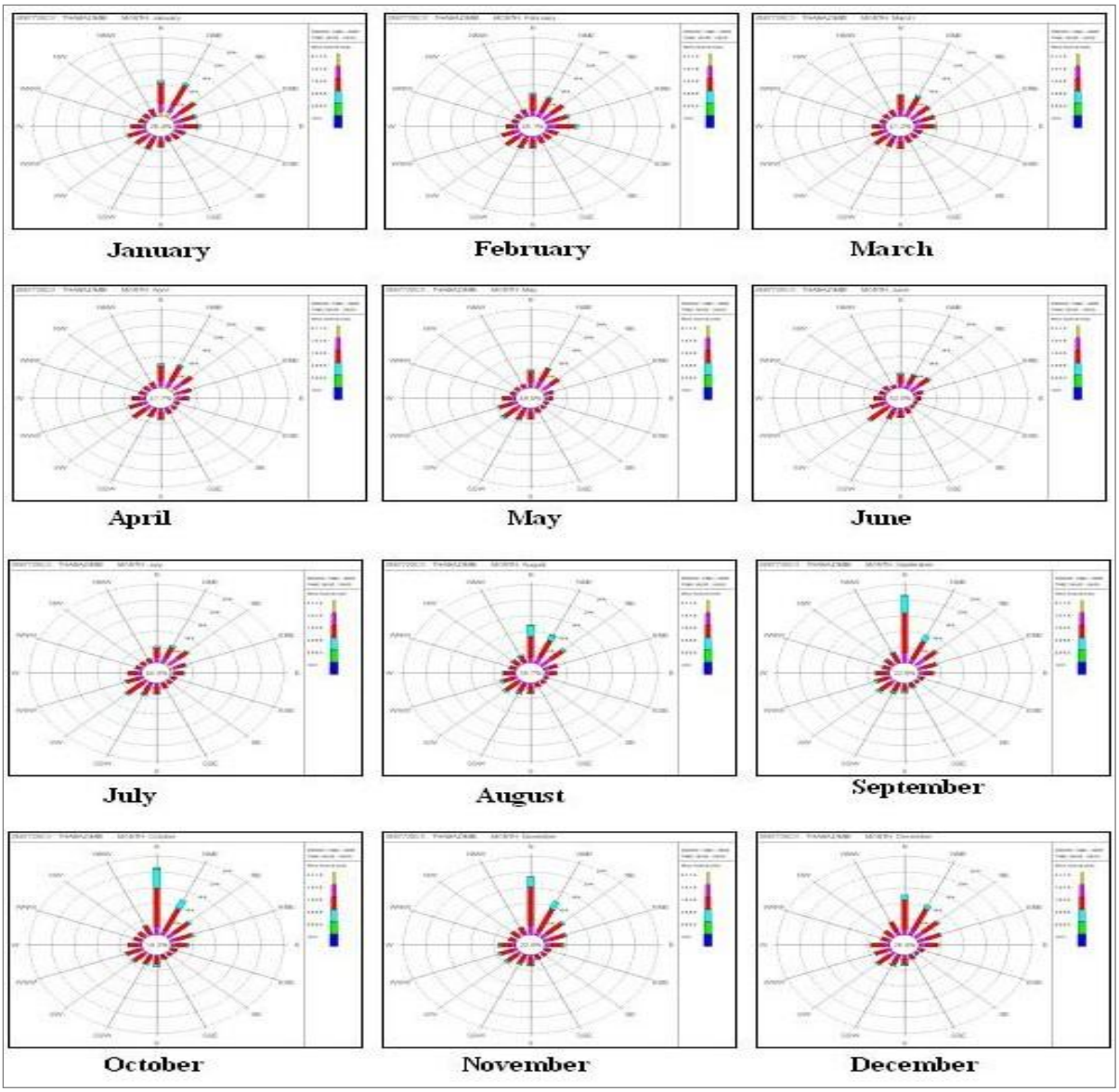

Figure 8: Annual Wind Direction

3.1.6 Mean Monthly Evaporation

The monthly evaporation for Thabazimbi is not available. The monthly evaporation for Swartklip Rustenburg Platinum Mine, about 80 km from Thabazimbi, is given in **Table 14** below.

Table 14: Mean Monthly Evaporation

MONTH	SYMONS PAN (mm)	"A" PAN (mm)
January	183	219
February	156	186
March	145	173
April	118	141
May	98	117
June	77	98
July	83	115
August	114	167
September	156	208
October	192	256
November	191	248
December	200	247

3.1.7 Incidence of Extreme Climatic Conditions

The incidence of hail varies from light to severe hailstorms, although the latter are very rare. Frost occurs in the low-lying areas of Thabazimbi. Strong winds occur sporadically, mainly from the south, and blow at a mean speed of 4.7 to 6.4 m/s.

3.2 Geology

3.2.1 General Geology

The Thabazimbi mining area consists of rocks of the Transvaal Supergroup, an early to mid-Precambrian volcano-sedimentary sequence overlying the granite gneisses of the Kaapvaal Craton.

The Transvaal Supergroup was formed approximately 2 100 to 2 300 million years ago; the Hekpoort andesite is some 2 224 million years of age. This age was determined with a fair degree of certainty because of intrusions by the Bushveld Igneous Complex, which dates back ± 2 095 million years.

The iron ore deposits at Thabazimbi occur mainly as basal units in the Penge Formation. The Penge Formation consists largely of alternate thick units of the autochthonous iron formation and thin units of autochemical iron formation. The upper part consists of allochemical-orthochemical iron formation cycles.

This formation comprises a 350 m thick succession of orto-chemical BIF's at the top and a 10 m thick chert-rich shale unit towards the bottom. The lower part of the BIF (towards the shale unit) is highly ferruginised and represents the major hematite ore zone. The shale unit is underlain by dolomites from the Frisco Formation of the Malmani Subgroup (Pretoria Group, Transvaal Super Group). Refer to **Table 15** for the litho-stratigraphy of the Transvaal Super Group in the Limpopo Province.

Ore genesis is of a chemical nature, where secondary hematite replaced chert within the BIF. Later stages of ferruginisation followed to produce high-grade laminated to brecciated iron ore. The occurrence of iron ore is structurally controlled, with faults serving either as conduits for iron-rich fluids or later displacing ore zones.

Table 15: Litho-Stratigraphy of the Transvaal Super Group in the Limpopo Province

GROUP	SUB GROUP	FORMATION	LITHOLOGY	THICKNESS (m)
Pretoria		Magaliesberg	Quartzite	0-15
		Silverton	Hornfels, shale	>=300
		Daspoort	Quartzite, shale, siltstone	190
		Strubenkop	Ferruginous shale, siltstone, basal conglomerate	130
		Hekpoort	Andesitic lava	280
		Timeball Hill	Shale, quartzite, siltstone Andalusite	570
		Rooihoogte	Conglomerate, quartzite, shale Bevets conglomerate	50
Chunies-Poort	Malmani	Penge	Iron – Formation Footwall shale, Iron Ore 60% Fe, Calcite-hematite, Talc-hematite, Banded ironstone, Diabase sill	320
		Frisco	Chert-poor dolomite	30
			Carbonaceous shale band, discoidal dolomite and possible collapse structure	
		Eccles	Chert-rich dolomite	490
		Lyttelton	Chert-poor dolomite	290
		Monte Christo	Chert-rich dolomite	740
		Oaktree	Dark-coloured dolomite	330
		Black Reef	Quartzite, shale, conglomerate	25

Local collapse structures within the dolomites produced brecciated zones within the BIF which were then filled by iron-rich fluids. A regional network of diabase sills and dykes served as barriers and trapped mineralising fluids in the lower section of the BIF, resulting in an enriched lower section and a less enriched upper section of the Penge Formation.

The Project Infinity is located on portions of the farms Wachteenbietjesdraai and Kwaggashoek East. These farms are located within the Thabazimbi ore deposits where high-grade hematite ore has been mined extensively for the past 76 years.

The deposits dip southwards at an angle of approximately 55°. At depth the hematite-rich rocks grade into calcite-hematite and talc-hematite rocks. The mineralization extends for 12 km along strike; however, sterile gaps of BIF occur in between the deposits. The occurrence of sterile zones in between deposits is associated with faulting, where the ore zones wedge out laterally and vary in thickness from 10 m to 25 m. The intensity of ferruginisation is usually associated with brecciation of the BIF due to the underlying karst topography of the dolomites.

Diabase dykes and sills acted as local barriers to regulate the flow of iron-rich fluids. The ore zones are therefore usually located below or next to these features.

The genesis of the deposits reflects primary chemical sedimentation, followed by secondary metamorphic and supergene iron enrichment processes. The intrusion of the Bushveld Igneous Complex led to contact metamorphism in the country rock. It also resulted in the southward dipping character of the dolomite and BIF's in the Thabazimbi area. Tectonism of Waterberg-age (1.9 Ma) caused thermodynamic metamorphism of the iron-rich formation, which resulted in the creation of talc-hematite and calcite-hematite deposits and the overall triplication of the Penge Formation. Later differential erosion resulted in the development of three prominent mountain ranges, the Rosseauspoort, Northern and the Southern Ranges. A small reef, the so-called Middle Range, is encountered locally between the Northern- and the Southern Ranges. Post-Karoo stress deformation led to the development of local north-south and east-west striking faults.

3.2.2 Local Geology within Production Areas

3.2.2.1 General Stratigraphy

The Thabazimbi area was exposed to intense deformation and alteration due to the continuous regional tectonic and magmatic activities. Apart from this, weathering processes and events such as folding and faulting gave rise to slumping structures, resulting in brecciation of the overlying strata. Layers of impermeable rock enclosed this highly porous zone of broken material at the top (diabase sill), bottom (shale) and sides (diabase dykes). These acted as barriers to trap the circulating iron rich fluids within the porous zone, resulting in the present day high-grade hematite ore and secondary iron enriched BIF in the Vanderbijl pit area.

Stratigraphically, the BIF can be subdivided into four zones, refer to Figure 6. The first zone (zone 1) overlies the basal shale and dolomite units. Its thickness on average is 80 m. In the project area this zone is generally fractured and brecciated due to tectonism and slumping of the underlying dolomite. This zone can be subdivided into different rock types based on Fe content, thickness of chert layers and ferruginisation

The three zones (zones 2 to 4) above the first zone consist of cyclic occurrences of layered chert and iron minerals. The iron minerals range in composition from hematite to iron silicates. Dominant shale bands of a cyclic nature are common to the last three zones.

Zone 1 was selected as a potential target for beneficiation. This was based on the higher than usual enrichment in iron. Rock types in this zone can be classified in a high-grade ore zone and a ferruginised (secondary enriched) BIF.

Different types of BIF can be distinguished within the ferruginised zone and the classification is based on the thickness of chert and hematite banding within the BIF. Each of the different types has unique characteristics that have a distinct influence on the liberation of the hematite component from the host rock.

Chert is dominant within micro-banded ironstone, with bands ranging from fine to ±30 mm thick (broad massive bands are occasionally observed). The blue hematite layers are on average very fine to ±5 mm in thickness. The contacts between chert and hematite bands are vague to well-defined. Very fine crushing will be needed for significant hematite liberation. In situ Fe values range from 27% to 34%.

The meso-banded ironstone is characterized by alternating well-defined greyish chert and blue hematite layers. The chert is dominant, varying from ±10 mm to ±30 mm in thickness while the hematite bands average between ±5 mm and ±20 mm. In some intersections cyclical broad chert bands (up to ±80 mm) are sporadically evident. The average volumetric hematite content in this rock type is estimated at ±30% to 37%.

Extraction of the hematite is expected to be viable, with in situ Fe values ranging from 32% to 43%.
The chert in ferruginised Banded Iron Stone (hereafter referred to as BIS) (FeLY) is leached and / or replaced to some extent by hematite. The degree of ferruginisation can vary significantly, resulting in situ Fe values ranging from ± 45% to 54.9%. It is generally weathered, sometimes brecciated with primary chert bands and fragments still present. In some minor cases the rock is intensely weathered and friable. Beneficiation may be problematic in some intersections due to the incomplete ferruginisation of the chert.

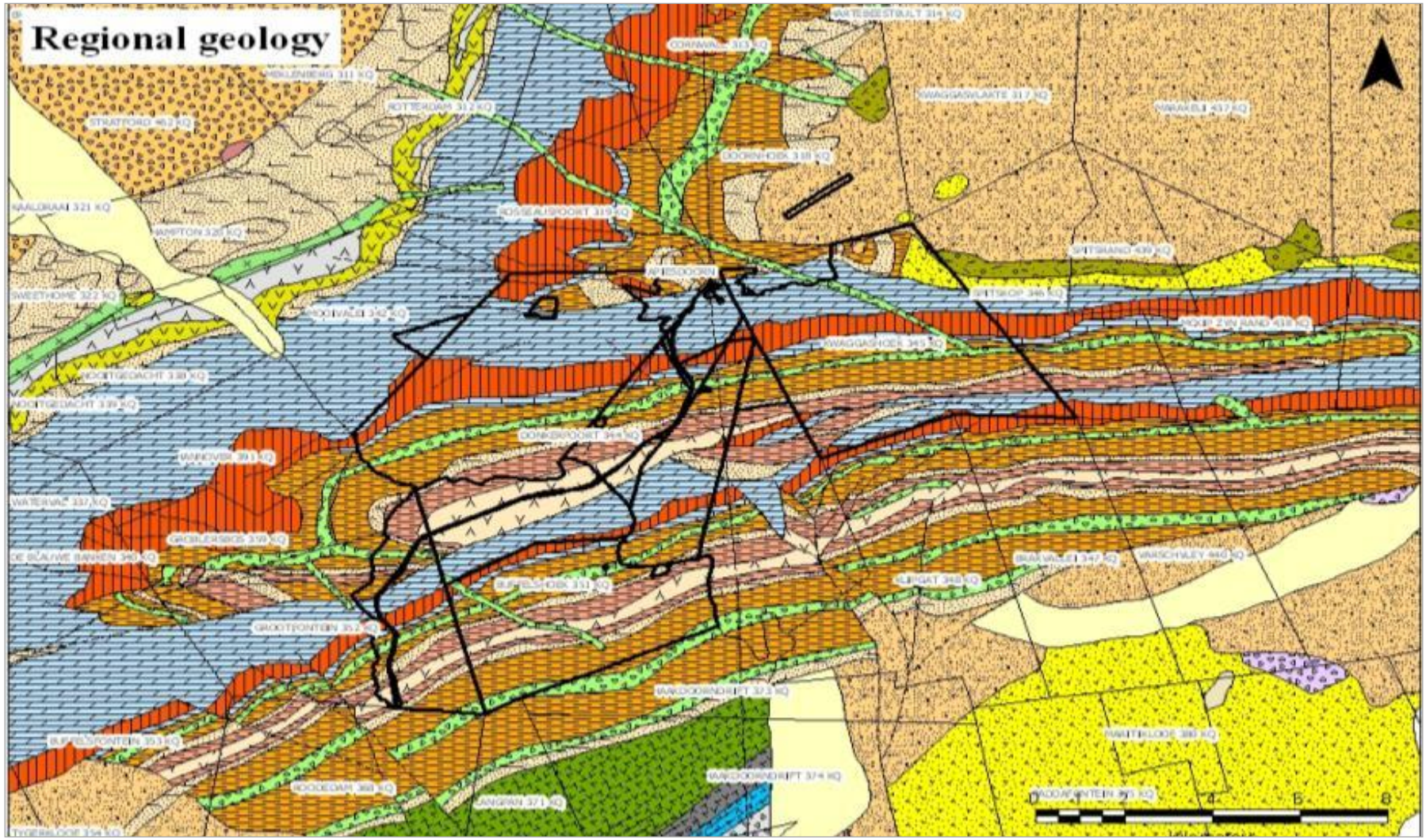

Figure 9: Geology Specific to the Mining Area

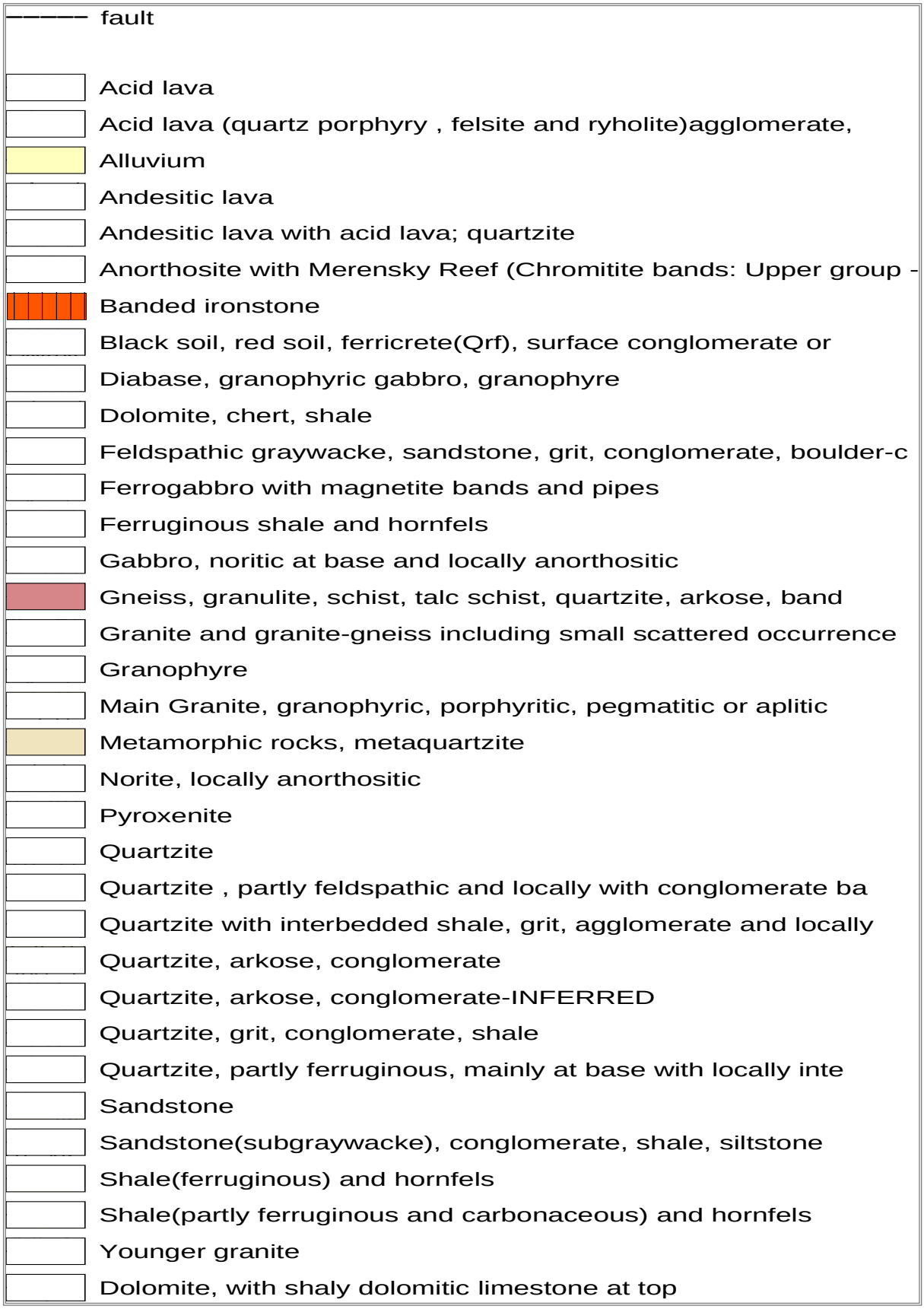

Figure 10: Legend to geology specific to the mining area

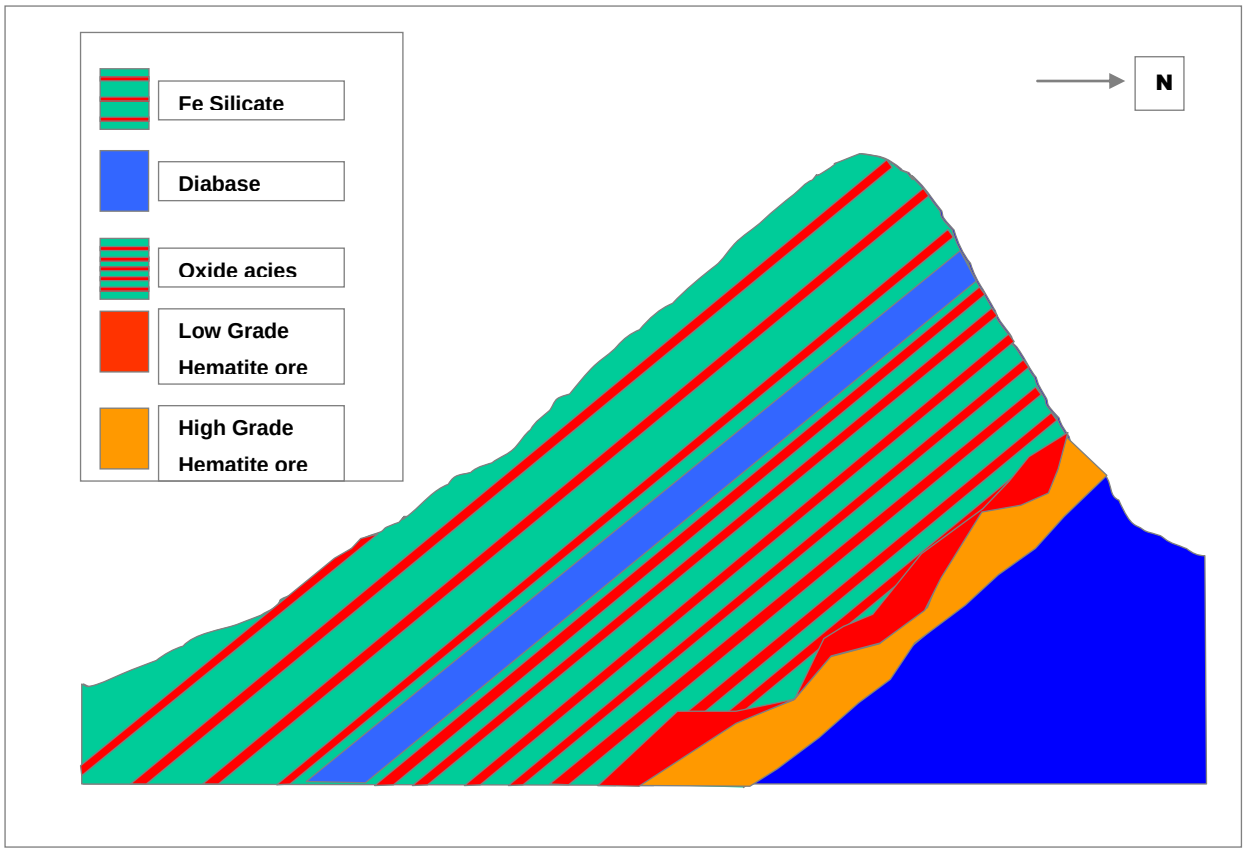

Figure 11: General Geological Profile to Illustrate Geology at Thabazimbi Mine

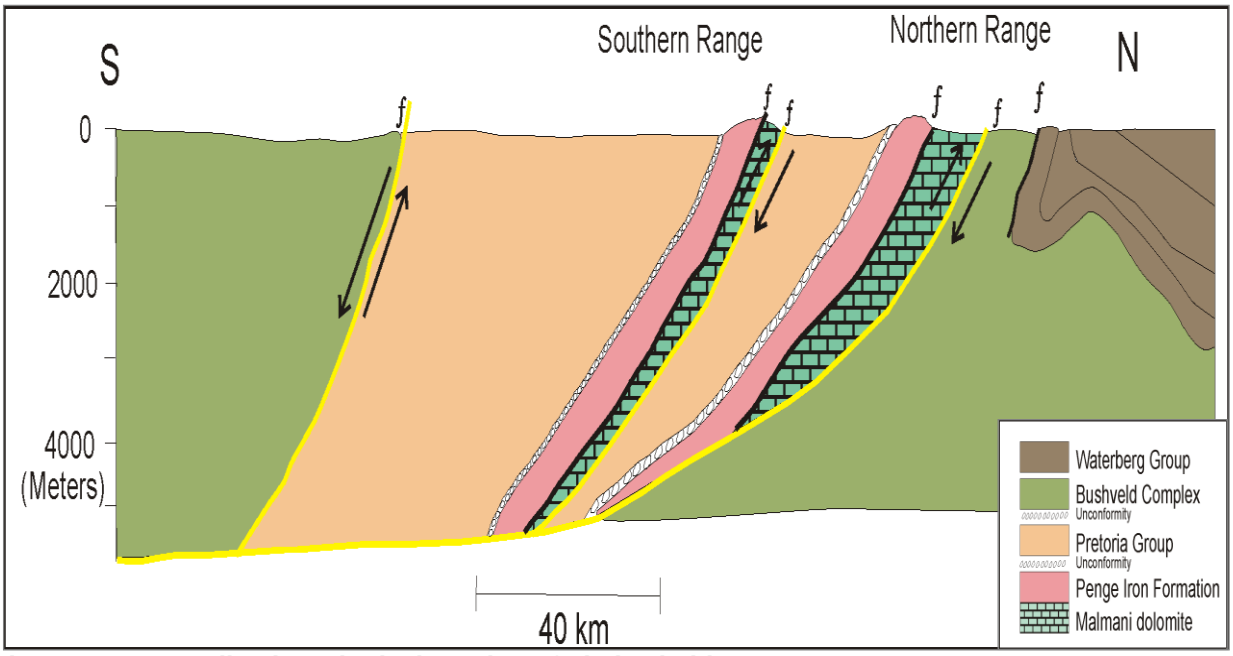

Figure 12: Generalised Geological Section of Thabazimbi Area

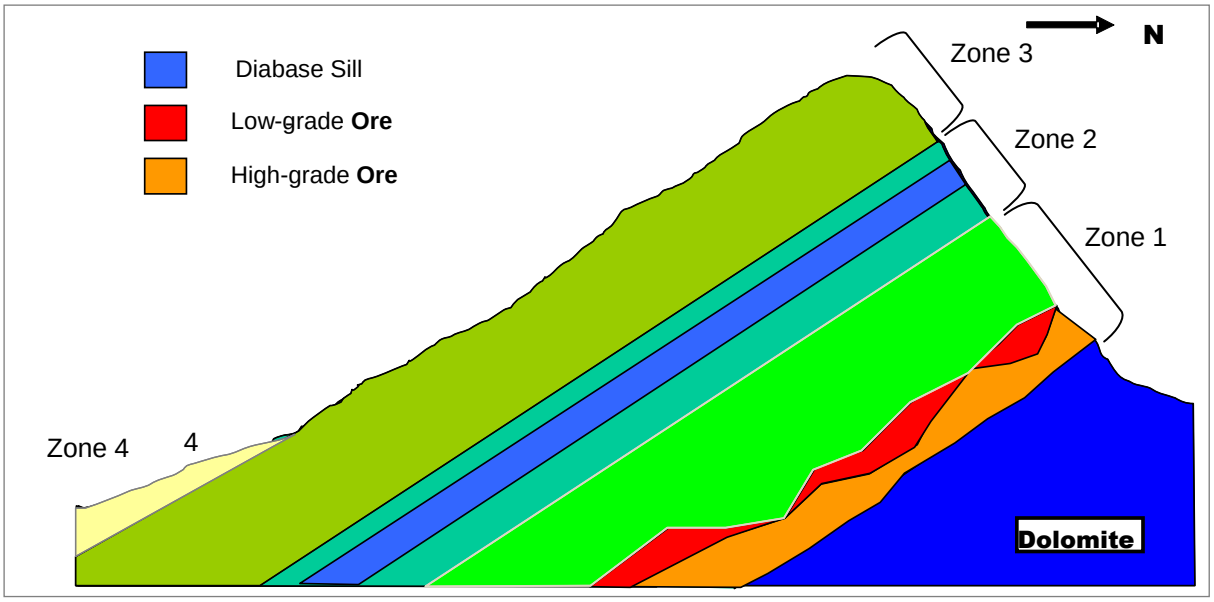

Figure 13: Stratigraphic Zones within the BIF of the N. Mountain Range

Intersections with varying or alternating rock types (small alternating bands BIF, shale, ferruginous BIF) occur at random. This type doesn't fit into any of the other mentioned types due to physical and lithological diversity. The in situ Fe values vary from 26% to 52%. Low-grade iron ore includes any material type with an in situ Fe-value of 55% to 59% Fe. Lenses of high-grade ore occur as lenses throughout the jig zone and are treated as part of the jig material. Refer to Figure 10, which depicts the stratigraphic zones within the BIF of the Northern Mountain Range.

The high-grade hematite ore occurs in two distinct phases. The first type occurs as a brownish, weathered to intensely weathered friable rock (referred to as E Lae). Small shale bands are often sporadically present. Specularite and chert remnants can occasionally be observed. In some solid core intersections, alternating hard, blue hematite as well as brown secondary ferruginous bands can be identified. The in situ Fe values range between 55% and 59.9% but may be >60% Fe in some intersections. Due to its friable nature, a major portion of this rock type will report in the finer fraction of the crushed product and is therefore included in the jig zone material.

The second is a bluish, competent rock and is mostly associated with the basal ore body. This unit is situated at the bottom of the jig zone on top of the shale / dolomite contact. Small shale bands are occasionally present. The ore is often brecciated with sporadic talc mineralization on cleavage planes. It occurs as smaller zones or stringers within the jig zone. The in situ Fe content ranges from 60% up to 67%.

Other potential hematite ores include calcite-hematite and talc-hematite. Calcite-hematite is primarily a layered rock consisting of hard, blue hematite within layers of brittle white calcite. The rock is often brecciated but with contacts between hematite and calcite fragments still well defined. The average in situ chemical values are: Fe (45%), SiO_2 (3.7%), CaO (18%) and P (0.04%).

Talc-hematite is a greenish–grey, brecciated, medium hard rock. The discoloration is related to the magnesium bearing greenish talc mineral. It is observable as fragments, bands and / or finely disseminated in a ferruginous (hematite) mass. Calcite is occasionally present as minor fragments or veins. Due to the disseminated nature of the talc minerals, liberation of hematite may be problematic in any upgrading process. The exceptionally high phosphorus values are most probably directly related to the presence of the talc minerals. The in situ Fe values range from 42% to 60%.

It is important to note that the last two rock types occur only at depth, at the lower limit of the jig zone in the project area. These rock types were not included in the resource model as the lower level cut-off level of the geological model does not include the material types.

3.3 Topography

The topography of the region is characterized by a valley rising from west to east and bound on the northern and southern sides by two prominent mountain ranges. See Figure 11 and Figure 12 for illustrations of the topography of Thabazimbi Mine area. The non-perennial Crocodile River crosses a flood plain that forms the western part of the valley. An intermittent creek (which flows only after a heavy shower), the Rooikuilspruit, separates the mining areas of the northern range into two separate mountain sections. The Rooikuilspruit flows into the Crocodile River.

To the south of Thabazimbi, on the underlying Bush Veldt Layered complex, the topography is flat to slightly undulating. The surface undulates between 850 and 950 mamsl.

In the immediate mining area, thrusting, faulting and weathering have caused the BIF, Shales, quartzite's and dolomites of the Transvaals sequence to form prominent ranges of relative steep hills (30-45° from horizontal). These hills rise up to 500 m from the valleys below, to a maximum of about 1650 mamsl in the Rossouw’s kop area to the west of Thabazimbi. The hills usually comprise the BIS formations or quartzites while the valleys are the remembrance of the less erosion-resistant dolomite, shale and lava.

To the north of the area, the hills taps out to flat bushveld topography, until the rise of the escarpment of the Kransberg formed by the sandstones, shales and conglomerates of the Water berg succession is reached.

Figure 14: Google image of the mining pits

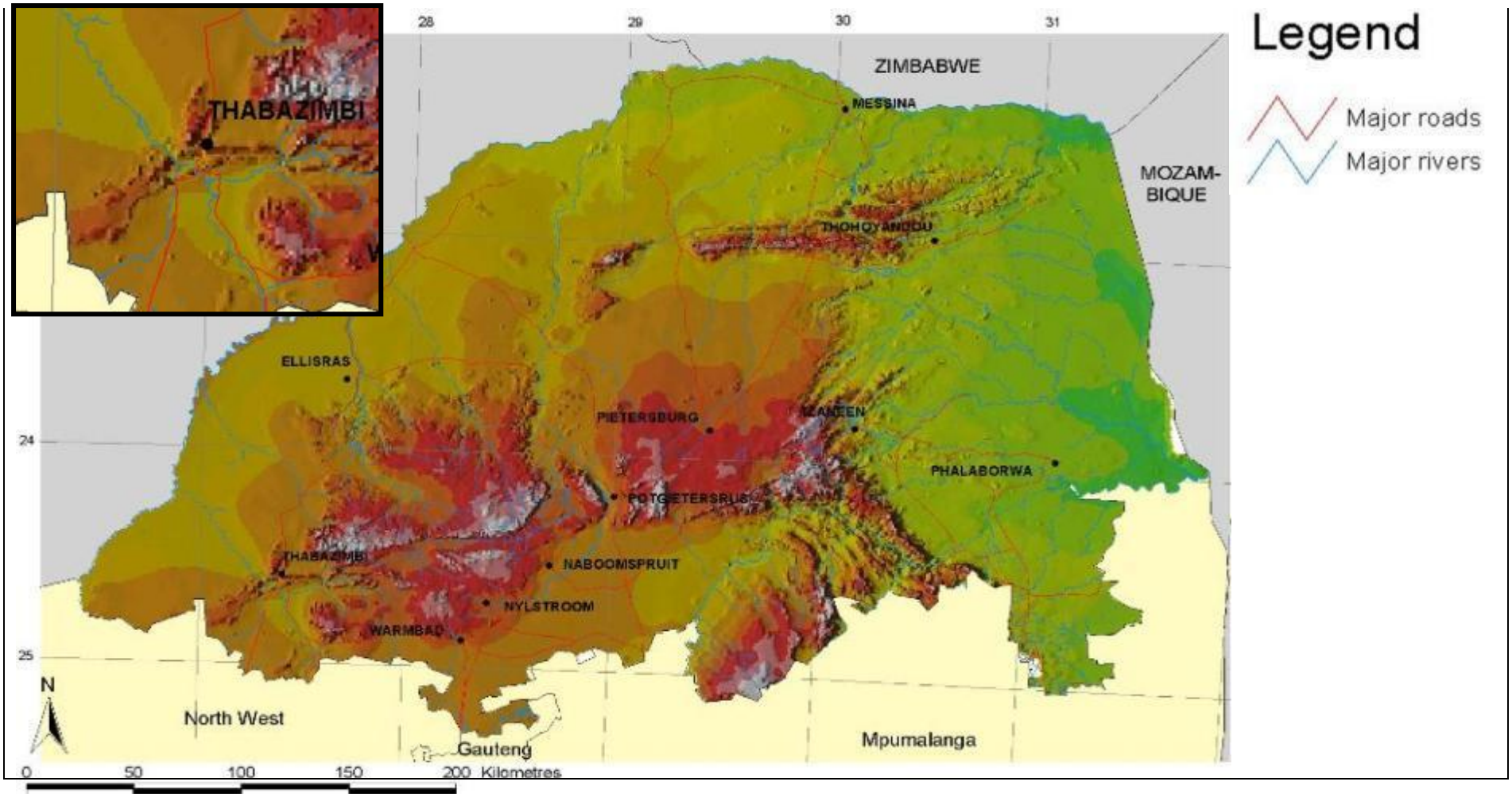

Figure 15: Topography of the area

3.4 Soil

From the specialist soil survey that was conducted for the purpose of the approved EMPR dated October 2005, it is conclusive the dominant soils on the 10 807 ha, according to the Taxonomical Soil Classification System of South Africa, are Hutton, Mispah, Dundee and Coega soils. The effective depths of the Hutton and Dundee soils are 1 800 mm, 150 mm for the Mispah and 175 mm for the Coega soils respectively. Theoretically the agricultural potential of the Hutton and Dundee soils is considered high under dryland (>650 mm / a rainfall) and irrigation conditions (>10 – 15 mm / week 33 – 1 500 kPa plant available water).

The theoretical agriculture potential of the Mispah and Coega soils is considered low. Considering the general climate of the Thabazimbi region taking cognizance of the various water balance contributors it is reasonable to estimate an average negative water balance for 95% of the year, i.e. dry soil moisture conditions. Taking this into account and the scarcity of available groundwater for irrigation purposes the agricultural potential (dryland and irrigation) for crop and pasture production is considered low for the Hutton, Mispah, Dundee and Coega soils.

No evidence of soil erosion or misuse was observed on any of the soils during the investigation. An estimated area of 5 633 ha could potentially be covered 300 mm thick @ Bulk Density 1.275 kg / m^3 during rehabilitation taking into consideration a 10% loss of topsoil from the 18 773 300 m^3 due to handling, compaction etc. Since only limited areas are considered for establishment of mining infrastructure, i.e. plant, tailings dam etc., it would not be recommended from a cost benefit perspective to strip any topsoil.

The specified horizons of the Hutton, Mispah, Dundee and Coega soils are suitable for rehabilitation purposes. However, considering only limited areas with low impact on the environment are considered for establishment of mining infrastructure, i.e. tailings dam, plant, etc., which are shallow Mispah soils no topsoil stripping from an economical perspective was recommended.

3.5 Pre-Mining Land Capability and Land Use

In the TLM, approximately 40% of the land situated within the municipal area is utilised for game farming (western and eastern part), ± 2% for irrigation, ± 3% for dry-land farming e.g. cotton and sunflower, mining 0.4% and approximately 5% for towns, roads and other infrastructure. The remainder of the area is utilised for extensive cattle farming. The geographical area of the TLM comprises approximately 9 862 km^2.

The areas to the northern, northwest and southeast of Thabazimbi Town are mainly environmentally sensitive areas due to the location of the Waterberg Biosphere, the Nature Reserves and the game farms.

Prior to the mining operations commencing in 1931 the land capability was mainly focused on cattle farming and the areas next to the Crocodile River had the potential for planting crops. The mountainous areas and the valley enclosed by the Northern and Southern mountain ranges were used for cattle farming. These areas were also frequented by various game species. Although the areas adjacent to the Crocodile River had the potential for planting crops this was however never done.

The main structures on the mining area prior to mining were farming related structures. These structures could however not be used as part of the mining activities and most became derelict ruins during the early years of the mines operation.

3.6 Natural Vegetation/Plant Life

Thabazimbi Mine falls within three different vegetation units. Refer to Figure 13 for the vegetation in terms of Thabazimbi Mine. The Project Infinity activities will take place in different areas on site and may affect all three the different vegetation units. It is with this in midn that the description is broad. These vegetation unites are described below.

SVcb 1 - Dwaalboom Thornveld:

On Thabazimbi Mine this vegetation unit is evident on Kwaggahoek 345 KQ, Wactenbietjiesdraai 350 KQ, Buffelshoek 351 KQ, Grootfontein 352 KQ, and Donkerpoort 344 KQ. The total area covered on Thabazimbi Mine by this unit is 7 420 ha.

Other references: According to Acocks (1953) the vegetation is described as "Other Turf Thornveld (58%)"; and according to Low & Rebelo (1996) the vegetation is described as "Clay Thorn Bushveld (48%) and Mixed Bushveld (43%).

This vegetation type occurs in the Limpopo and North West Provinces on the flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area but including a patch around Centrum. South of the ridges it extends eastwards from the Nietverdiend area, north of the Pilanesberg to the Northam area. Altitude is between 900 - 1200 mamsl (Mucina *et al.* 1996).

The vegetation and landscape features can be described as: Plains with a layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species, and an almost continuous herbaceous layer dominated by grass species.

Acacia tortilis and *A. Nilotica* dominate on the medium clays (at least 21% clay in the upper soil horizon but high in the lower horizons. On particularly heavy clays (>55% clay in all horizons) most other woody plants are excluded and the diminutive *A. tenuispina* dominates at a height of less than 1 m above ground on the sandy clay loam soils (with not more than 35% in the upper horizon but high

in the lower horizons). *A. erubescens* is the most prominent tree. The alteration of these substrates types creates a mosaic of patches typically 1 – 5 km across, the unit west of Thabazimbi.

The following are important taxa of this vegetation type:

- Tall trees: *Acacia erioloba;*
- Small trees: *Acacia erubescens, A. nilotica, A. tortilis* subsp. h*eteracantha, A. fleckii, A. mellifera* subsp *detinens, Combretum imberbe, Rhus lancea, Ziziphus mucronata;*
- Tall shrubs: *Acacia hebeclada* subsp. *hebeclada, Combretum hereroense, Diospyros lycoides* subsp*. lycoides, Euclea undulate, Grewia flava, Tarchonanthus camphorates;*
- Low shrubs: *Acacia tenuispana, Abutilon* austro-africanum, *Aptosimum elongatum*, *Hirpicium bechuanense, Pavonia burchelli, Solanum delagoense;*
- Succulent shrubs: *Kalanchoe rotundifolia, Talinum caffrum;*
- Herbaceous climber: *Rhynchosia minima;*
- Graminoids: *Aristida bipartite, Bothriochloa insculpta, Digitaria eriantha* subsp *eriantha, Ischaemum afrum, Panicum maximum, Cymbopogon pospischilii, Eragrostis curvula, Sehima galpinii, Setaria incrassata; and*
- Herbs: *Heliotropium ciliatum, Kohautia caespitose* subsp*. brachyloba, Nidorolla hottentotica.*

In terms of Conservation status this vegetation type is the least threatened. The target is set at 19% but only 6% is statutorily conserved, mostly within the Madikwe National Park in the west. Approximately 14% is transformed mainly due to cultivation. The erosion is low to very low. This vegetation type is mostly used for extensive cattle grazing.

SVcb 17 - Waterberg Mountain Bushveld:

On Thabazimbi Mine this vegetation unit is evident on Kwaggahoek 345 KQ, Wactenbietjiesdraai 350 KQ, Buffelshoek 351 KQ, Grootfontein 352 KQ, and Donkerpoort 344 KQ. The total area covered on Thabazimbi Mine by this unit is 3 180 ha

Other references: According to Acocks (1953) the vegetation is described as "Sour Bushveld (73%)"; and according to Low & Rebelo (1996) the vegetation is described as "Waterberg Moist Mountain Bushveld (83%).

This vegetation types occur in the Limpopo Province, in the Waterberg Mountains, including the foothills, escarpment and tablelands south of the line between Lephalale and Marken and north of Bela-Bela and west of Mokopane and with outliers in the southwest such as the Boshofsberge and Vlieepoortberge near Thabazimbi. The altitude is about 1 000 – 1 600 m and generally at a lower altitude than the Gm 29 Waterberg-Magaliesberg summit Sourveld.

Vegetation and Landscape features include rugged mountains with vegetation grading from *Faurea saligna-Protea caffra* bushveld on higher slopes (in turn grading into the Gm 29 Waterberg-Magaliesburg Summit Sourveld) through broad-leaved deciduous bushveld (dominated by *Diplorhynchus cana-Terminalia sericea* savanna in the lower-lying valleys as well as on deeper sands on the plateaus. The grass layer is moderately developed or well developed.

Important taxa for this vegetation type are as follows:

- Tall trees: *Acacia robusta;*
- Small trees: *Acacia caffra, Burkea africana, Combretum apiculatum, Croton gratissimus, Cusonia transvaalensis, Faurea saligna, Heteropyxis natalensis, Ochna pulcra, Protea caffra, Albizia tanganyicensis, Combretum molle, Englerophytum magalismontanum, Ficus burkei, F. Glumosa, Ochna pretoriensis, Pseudolachnostylis mapronefolia, Rhus lances, Terminalia sericea, Vangueria infausta, V. Parvifolia;*
- Tall shrubs: *Diplorhynchus condylocaron, Elephantorhiza burkei, Combretum moggii, C. Nelsonii, Dichrostachys cinerea, Euclea crispa* subsp*. crispa, Gnidia kraussiana, Olea capensis* subsp *enervis,O. Europaea* subsp. *africana, Rhus pyroides* var. *pyroides, Strychnos pungens, Vitex rehmannii;*
- Low shrubs: *Anthospermum rigidum* subsp*. rigidum, Barleria affinis, Felicia muricata, Helichrysum krausii, Protea welwitschii* subsp*. welwitschii, Rhus rigida* var. *Dentate;*
- Geoxylic Suffrutices: *Dichapetalum cynosum, Parinari capensis* subsp. *Capensis;*
- Succulent shrubs: *Aloe chabaudii. Lopholaena coriifolia;*
- Woody climbers: *Ancylobotrys capensis, Rhoicissus revoilii;*
- Graminoids: *Loudetia simplex, Schizachyrium sanguineum, Trachypogon spicatus, Brachiaria serrata, Digitaria eriantha* subsp*. eriantha, Elionurus muticus, Enneapogon scoparius, Setaria sphacelata, Themeda triandra, Tristachya leucothrix;*
- Herbs: *Berkheya insignis, Chamaecrista mimosoides, Geigeria elongate, Hibiscus meyeri* subsp*. transvaalensis, Xerophyta retinervis; and*
- Geophytic Herbs: *Haemanthus humilis* subsp*. humilis, Hypoxis rigidula.*

Biogeographically important taxa are as follows: (Central Bushveld endemic, Northern Sourveld endemic) Small tree: *Encephalartos Eugene-maraisii,* Tall Shrub: *Enythrophysa transvaalensis* (protected species), Soft Shrub: *Chorisochora transvaalensis,* Graminoid: *Mosdenia leptostachys.*

Endemic taxa are as follows: Tall Shrubs*: Grewia rogersii, Pachystigma triflorum,* Herb*: Oxygonum dregeanum* subsp*. canescens var. Pilosum.*

In terms of conservation status this vegetation type is the least threatened. The set target is 24% but only 9% is statutorily conserved mainly in the Marakele National Park and Moepel Nature Reserve. More than 3% is transformed, mainly by cultivation. The human population is considered low and erosion is low to very low.

SVcb 16 – Western Sandy Bushveld:

At Thabazimbi Mine on the northern slopes of the "Berg in die winde" a small population of *Enythrophysa transvaalensis* occurs on ±15 ha. At this stage they are not threatened but could be destroyed by Future WRDs.

The Vegetation type of the area falls within the savannah biome of South Africa. According to Acocks, the vegetation of Thabazimbi may be described as Sour Bushveld (Thabazimbi) (Acocks no. 20)

This veld type can be described as follows:

This veld type falls in the Bushveld Mountains and is the largest occurring area is found in the Waterberg Mountains. It is an open savannah area filled with tall *Faurea saligna* trees surrounded by a tall, tufted, wiry, sour grassveld in the less rocky parts and a dense mixed bushveld in the rugged parts. It is a beautiful country, but hot in spite of its altitude of 1200 to 1 500 mamsl. On the quartzite, sandstone and shale of most of the mountains, the soil is of sandy, rubbly nature, very poor and sour. Rainfall ranges from 650 to 900 mm per annum and mainly occurs in the summer.

In patches on the slopes, on *Terminalia,* and in sheltered kloofs (especially of the Magaliesburg), patches of near-forest develop.

Along the rocky valleys, a thornveld composed of *Acacia caffra* is typical.

The grassveld constituent is a rich one floristically even if peculiarly useless for grazing, at least in its present condition. It is probable however, that a wasteful combination of burning of selective grazing is largely responsible for this uselessness, through reducing the proportion of such useful grasses as *Themeda.*

A great wealth of forbs and bushy plants, including a few stragglers of southern flora, e.g. Cliffortia linearifolia, *Pegollettia tenuifolia, Helicrysum kraussii* and *Erica drakenbergensis*, besides the important *Faurea saligna* and *Protea caffra* occur on a frequent basis.

Refer to Table 16 for a list of all the protected trees found in the area, Table 17 for a list of specially protected trees found in the area, Table 18 for a list of vulnerable trees found in the area and Table 19 for the detailed lists of plant species found during the survey.

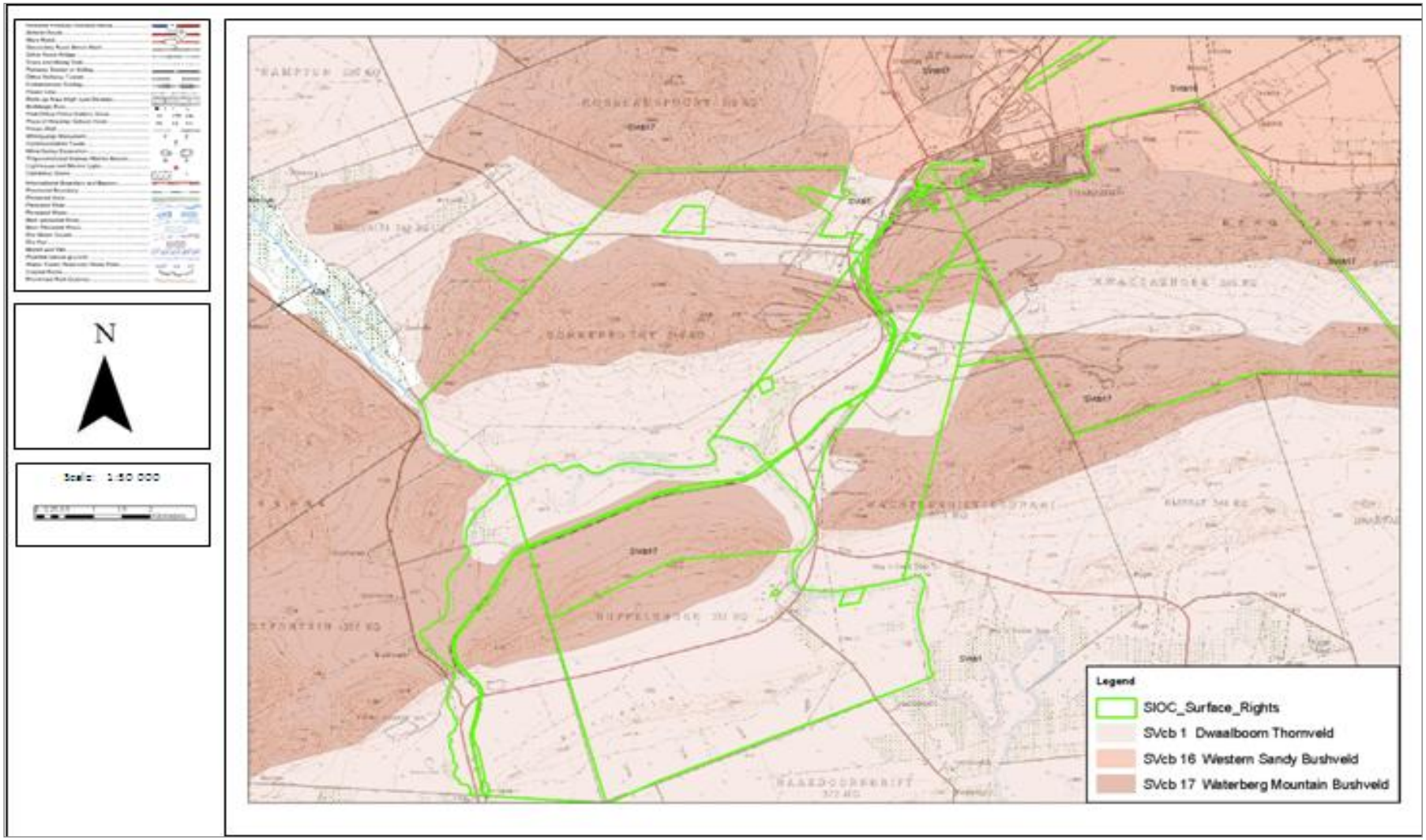

Figure 16: Vegetation map of the mine

Table 16: Protected Trees Found in the Area

SCIENTIFIC NAME	COMMON NAME
Acacia erioloba	Camel thorn
Sclerocarya birrea subsp *caffra*	Marula
Combretum imberbe	Leadwood
Securidaca longepunculata	Violet tree
Elaeodendron transvaalensis	Bushveld Saffron

Table 17: Specially Protected Trees Found in the Area

SCIENTIFIC NAME	COMMON NAME
Erythrophysa transvaalensis	Transvaal red balloon

Table 18: Vulnerable Trees Found in the Area

SCIENTIFIC NAME	COMMON NAME
Spirostachys Africana	Tamboti

The following table lists all the plant species found during the survey done in 2005, which was updated for specific sections in April 2010.

Table 19: List of Plant Species Found During the Survey

COMMON NAME	SCIENTIFIC NAME	STATUS
Trees		
Black monkey thorn / Swartapiesdoring	*Acacia burkei*	
Common Hook-thorn / Gewone haakdoring	*Acacia caffra*	
Sweet thorn / Soetdoring	*Acacia karroo*	Known endemic invader if not managed e.g. with overgrazing etc.
Knob Thorn / Knoppiesdoring	*Acacia nigrescens*	
Scented thorn / Lekkerruikpeul	*Acacia nilotica* subsp. *kraussiana*	
Ankle thorn / Enkeldoring	*Acacia robusta* subspecies *robusta*	
Umbrella thorn / Haak-en-steek	*Acacia tortilis*	
Worm-bark, False-thorn / Wurmbasvalsdoring	*Albizia anthelmintica*	
Red Ivory / Rooi-ivoor	*Berchemia zeyheri*	
Shepherd's tree / Witgat	*Boscia albitrunca*	
Lowveld Silver Oak / Laeveldvaalbos	*Brachylaena huillensis*	
Wild Seringa / Wildesering	*Burkea africana*	

COMMON NAME	SCIENTIFIC NAME	STATUS
White stinkwood / Witstinkhout	*Celtis africana*	
Leadwood / Hardekool	*Combretum imberbe*	
Velvet bushwillow / Fluweelboswilg	*Combretum molle*	
Large-fruited bushwillow / Raasblaar	*Combretum zeyheri*	*Deudorix dinochares* feeds on the tree.
Tall Common Corkwood / Groot Gewone Kanniedood	*Commiphora glandulosa*	
Common Corkwood / Gewone kanniedood	*Commiphora pyracanthoides*	
Highveld cabbage tree / Hoëveldse kiepersol	*Cussonia paniculata*	
Sickle bush / Sekelbos	*Dichrostachys cinerea*	In areas the bush encroachment of this species were clearly visible
Horn-pod tree / Horingpeultjieboom	*Diplorhynchus condylocarpon*	
Common wild pear / Gewone drolpeer	*Dombeya rotundifolia*	
Puzzle bush / Deurmekaarbos	*Ehretia rigida*	
Sumach bean / Basboontjie	*Elephantorrhiza burkei*	
Transvaal Milk plum / Stamvrug	*Englerophytum magalismontanum*	
Transvaal Red Balloon / Transvaalse Rooiklapperbos	*Erythrophysa transvaalensis*	Not only endemic to South Africa exclusively but on Red data list. Species is not threatened.
Red River Gum / Rooibloekom	*Eucalyptus camaldulensis*	Invader (Category 2)
Blue guarri / Bloughwarrie	*Euclea crispa*	
Transvaal Beech / Transvaalboekenhout	*Faurea saligna*	
Red-leaved Fig / Rooiblaarvy	*Ficus ingens*	
Common Wild Fig / Gewone Wildevy	*Ficus thonningii*	
Common spike-thorn / Gewone pendoring	*Gymnosporia buxifolia*	
Lavender Tree / Laventelboom	*Heteropyxis natalensis*	
Jacaranda / Jakaranda	*Jacaranda mimosifolia*	Invader (Category 3)
Koko Tree / Kokoboom	*Maytenus undata*	
Seringa / Sering	*Melia azedarach*	Invader (Category 3)
Cork Bush / Kurkbos	*Mundulea sericea*	
Lance-leaved Waxberry / Smalblaarwasbessie	*Myrica serrata*	
Peeling Plane / Lekkerbreek	*Ochna pulchra*	
Jacket-plum / Doppruim	*Pappea capensis*	

COMMON NAME	SCIENTIFIC NAME	STATUS
Weeping Wattle / Huilboom	*Peltophorum africanum*	
Kudu-berry / Koedoebessie	*Pseudolachnostylis maprouneifolia*	
Castor-oil Plant / Kasterolieboom	*Ricinus communis*	Invader (Category 2)
Common Karee / Gewone Karee	*Rhus lancea*	
Mountain Karree / Bergkaree	*Rhus leptodictya*	
Common Wild Currant / Gewone taaibos	*Rhus pyroides*	
Marula / Maroela	*Sclerocarya birrea* subsp. *Caffra*	
Violet Tree / Krinkhout	*Securidaca longipedumculata*	
Tamboti / Tambotie	*Spirostachys Africana*	
Spine-leaved monkey orange / Stekelblaarklappper	*Strychnos pungens*	
Blue bitterberry / Bloubitterbessie	*Strychnos usambarensis*	
Blue sourplum / Blousuurpruim	*Ximenia americana*	
Sourplum / Suurpruim	*Ximenia caffra*	
Knobwood / Perdepram	*Zanthoxylum davyi*	
Buffalo-thorn / Blinkblaarwag-'n-bietjie	*Ziziphus mucronata*	
Shrubs and herbs		
	Abutilon angulatum var. *angulatum*	
Wild Apricot / Wilde-appelkoos	*Ancylobotrys capensis*	Northern side
Mexican poppy / Bloudissel	*Argemone ochroleuca*	Declared Weed (Category 1)
Milkbush / Melkbos	*Asclepias fruticosa*	
Blackjack / Knapsekêrels	*Bidens formosa*	
Velvet sweetberry / Fluweelsoetbessie	*Bridelia mollis*	
Mauritius Thorn / Kraaldoring	*Caesalpinia decapetala*	Declared weed. (Category 1)
Fish-bone Cassia / Boesmanstee	*Chamaecrista mimosoides*	Weed – eradication is needed
Flax-leaf fleabane / Kleinskraalhans	*Conyza bonariensis*	Weed in disturbed places
Large thorn apple / Groot stinkblaar	*Datura ferox*	Declared Weed (Category 1)
Smelter's bush / Smelterbossie	*Flaveria bidentis*	
Velvet raisin / Fluweelrosyntjie	*Grewia flava*	
Sandpaper raisin / Skruwe rosyntjie	*Grewia flavescens*	
Cross-berry / Kruisbessie	*Grewia occidentalis*	
Bladderweed / Terblansbossie	*Hibiscus trionum*	

COMMON NAME	SCIENTIFIC NAME	STATUS
Morning Glories / Purperwinde	*Ipomoea indica*	Declared Weed (Category 1)
Lantana	*Lantana camara*	Declared Weed (Category 1)
Wild Dagga / Wilde Dagga	*Leonotis ocymifolia* var. *schinzii*	
Soap-nettle / Seepnetel	*Pouzolzia mixta*	
Wild Asparagus / Katbos	*Protasparagus laricinus*	
Asparagus fern	*Protasparagus setaceus*	
	Siphonoglossa linifolia	
Khaki weed / Kakiebos	*Tagetes minuta*	
Monkey's tail / Bobbejaanstert	*Xerophyta retinervis*	
Blue sourplum / Blousuurpruim	*Ximenia americana*	
Sourplum / Suurpruim	*Ximenia caffra*	
Redstar Zinnia / Wilde Jakobregop	*Zinnia peruviana*	Is an exotic plant and a weed but not invasive at all.
Grass		
Rolling Grass / Groot tolgras	*Aristida bipartita*	
Tassel Three-awn / Katstertsteekgras	*Aristida congesta* subsp. *congesta*	
Iron Grass / Ystergras	*Aristida diffusa*	
Spanish Reed / Spaanse riet	*Arundo donax*	Declared weed (Category 1)
False Love Grass / Vals-eragrostis	*Bewsia biflora*	
Pinhole Grass / Stippelgras	*Bothriochloa insculpta*	
Foxtail Buffalo Grass / Bloubuffelgras	*Cenchrus cilliaris*	
Narrow-leaved Turpentine Grass / Smalbaarterpentyngras	*Cymbopogon plurinodis*	
Couch Grass / Kweekgras	*Cynodon dactylon*	
Common Finger Grass / Gewone-vingergras	*Digitaria eriantha*	
Goose Grass / Afrikaanse osgras	*Eleusine coracana*	
Nine-awned Grass / Negenaaldgras	*Enneapogon cenchroides*	
Bottlebrush grass / Kalkgras	*Enneapogon scoparius*	
Weeping Love Grass / Oulandsgras	*Eragrostis curvula*	
Gum Grass / Gomgras	*Eragrostis gummiflua*	
Lehmann's love grass / Knietjiesgras	*Eragrostis lehmaniana*	
(Broad) Curly Leaf / (Breë-) Kruilblaar	*Eragrostis rigidior*	
Hairy Love Grass / Harige-pluimgras	*Eragrostis trichophora*	

COMMON NAME	SCIENTIFIC NAME	STATUS
Brown Rhodes Grass / Bruinhoenerspoor	*Eustachys paspaloides*	
Spear Grass / Assegaaigras	*Heteropogon contortus*	
Natal Red Top / Natal-rooipluim	*Melinis repens*	
Small Buffalo Grass / Kleinbuffelsgras	*Panicum coloratum*	
Gunea grass / Buffelgras	*Panicum maximum*	
Fountain grass / Pronkgras	*Pennisetum setaceum*	Declared Weed (Category 1)
Herringbone Grass / Sekelgras	*Pogonarthria squarrosa*	
Red Autumn Grass / Rooiherfsgras	*Schizachyrium sanguineum*	
Sand Quick / Sandkweek	*Schmidtia pappophoroides*	
Mountain Bristle Grass / Berg-setaria	*Setaria lindenbergiana*	
Golden Bristle Grass / Goue-mannagras	*Setaria sphacelata* var. *Sericea*	
Bur Bristle Grass / Klitsgras	*Setaria verticillata*	
Johnson grass	*Sorghum halepense*	Invader (Category 2)
Ratstail Dropseed / Taaipol	*Sporobolus africanus*	
Dropseed Grass / Fynsaadgras	*Sporobolus fimbriatus*	
Red grass / Rooigras	*Themeda triandra*	
Giant Spear Grass / Bokbaardgras	*Trachypogon spicatus*	
Blue-seed Grass / Blousaadgras	*Tricholaena monachne*	
Quinine Grass / Varkstertgras	*Urelytrum agropyroides*	
Other		
Hard fern	*Pellaea calomelanos*	
Giant carrion flower / Reuse-aasblom	*Stapelia gigantea*	
Mistletoe / Voëlent	*Viscum rotundifollum*	

3.7 Animal Life

The greater Ben Alberts game reserve, about 7 km south-west of Thabazimbi, was created by Iscor.

The purpose of this reserve was to re-introduce the animal species that occurred in the area years ago and were displaced by human settlement. The reserve occupies 5 000 ha, and with its topography consisting of mountains, plateaux and plains and the Crocodile River flowing through it, it is eminently suitable for accommodating all sorts of game.

The following animals can be found in the reserve, see Table 20.

Table 20: Animals occurring in the Ben Albert's Nature Reserve

COMMON NAME	SCIENTIFIC NAME
Impala	*Aepyceros melampus*
Mountain reedbuck	*Redunca fulvorufula*
Oryx	*Oryx gazelle*
Waterbuck	*Kobus ellipsiprymnus*
Blue Wildebeest	*Connochaetes taurinus*
Civet cat	*Felis silvestris libyca*
Shrub hare	*Lepus saxatilis*
Aardwolf	*Proteles cristatus*
Klipspringer	*Oreotragus oreotragus*
Zebra	*Equus zebra*
Giraffe	*Giraffa camelopardalis*
Cape hartebeest	*Alcelaphus caama*
Baboon	*Papio ursinus*
Vervet monkey	*Cercopithecus aethiops*
Dwarf mongoose	*Helogale parvula*
White tail mongoose	*Ichneumia albicauda*
Brown Hyena	*Parahyaena brunnea*, formerly *Hyaena brunnea*
Tsessebe	*Damaliscus lunatus*
Bushbuck	*Tragelaphus scriptus*
Nyala	*Tragelaphus angasii*
Warthog	*Phacochoerus africanus*
Bush pig	*Potamochoerusl arvatus*
Porcupine	*Hystrix cristata*
Genet cat	*Genetta tigrina*
Cape Honey Badger	*Mabuya capensis*
Rock Dassie	*Procavia capensis*
Jackal	*Canis mesomelas*
Steenbuck	*Raphicerus campestris*
Kudu	*Tragelaphus strepsiceros*
Duiker	*Sylvicapra grimmia*
Mountain Reedbuck	*Redunca fulvorufula*
Leopard	*Panthera pardis*
Caracal	*Caracal caracal*
Aardvark	*Orycteropus afer*

It is found that game and birds move away only temporarily because of the mining activities. Of those listed below, some are found within only one or two Km from the sites of current mining activities, namely:

- Klipspringers (*Oreotragus oreotragus*);
- Mountain reedbuck (*Redunca fulvorufula*);
- Hyrax (*Procavia capensis*); and

- Black eagles (*Aquila verreauxii*).

A “Vulture Restaurant” was initially established at Bobbejaanwater from where it was later moved to a new location east of the explosives magazine. The main purpose of this site is to provide food for the endangered vulture species of the area. The following species gave been observed at the feeding site:

- Cape vulture (*Gyps coprotheres*);
- Whitebacked vulture (*Gyps africanus*);
- Lappet-faced vulture (*Torgos tracheliotus*);
- White-headed vulture (*Trigonoceps occipitalis*);
- Marabou stork (*Leptoptilos crumeniferus*);
- Black eagle (*Aquila verreauxii*);
- Martial eagle (*Polemaetus bellicosus*);
- Brown hyena (*Parahyaena brunnea*);
- Warthog (*Phacochoerus africanus*); and
- Jackal (*Canis mesomelas*).

Experience has shown that traps and poaching are the greatest threats. Regular investigations and checks by Kumba officers charged with nature conservation curtail this evil to some extent.

The following protected bird species, the following are found:

- Ostrich (*Struthio camelus molybdophanes*);
- Marabou stork (*Leptoptilos crumeniferus*);
- Hamerkop (*Scopus umbretta*);
- Martial eagle (*Polemaetus bellicosus*);
- African fish eagle (*Haliaeetus vocifer*);
- Grey heron (*Ardea cinerea*);
- Black eagle (*Aquila verreauxii*);
- Buzzard (*Buteo buteo*); and
- Great white egret (*Coqui Francolin*).

See Table 21 for the protected bird species found.

Table 21: Protected Bird Species Found

SCIENTIFIC NAME	COMMON NAME
Endangered species found in the area	
Gyps africanus	White-backed vulture
Gyps coprotheres	Cape vulture
Torgos tracheliotus	Lappet-faced vulture
Vulnerable species	
Polemaetus bellicosus	Martial eagle

The following areas on the mine are considered to have high occurrence of game:

- Lower slopes of Donkerpoort Mountain; and
- Crocodile River Floodplain.

3.8 Surface Water

3.8.1 General Description

The mine is located in the Crocodile River Catchment, referred to as the A24 drainage region by the Department of Water Affairs (hereafter referred to as the DWA) and is mainly located in the A24H quaternary catchment with small portions situated in the A24F and A24J quaternary catchment. The Rooikuilspruit and Bierspruit form part of the receiving water resources.

3.8.2 Surface Water Quantity

3.8.2.1 Streams and Catchment Boundaries

The catchment boundaries and relevant streams at Thabazimbi Mine are shown on Figure 14. Unpolluted storm water is diverted by cut-off drains into the Crocodile River, Rooikuilspruit and Bierspruit. The total catchment area is estimated at 29 400 km^2. The upper catchment of the Crocodile River is located in the Gauteng Province, near Hartbeespoort Dam. The north or northeast catchment areas are located in the Limpopo Province and the central and western areas drain the North West Province (Limpopo DFED, 2004).

3.8.2.2 Mean Annual Runoff

The mean annual runoff (hereafter referred to as MAR) from the larger catchment upstream of the point of discharge into the Crocodile River and Rooikuilspruit is 1 287 097 500 m^3. The MAR of the Rooikuilspruit (28 195 ha) is 11 820 075 m^3.

3.8.2.3 Mean Annual Precipitation

The MAP is 641 mm / a, as recorded at Thabazimbi Weather Station Number 587/697.

3.8.2.4 Normal Flow during Dry Weather

The relevant watercourses, namely the Rooikuilspruit, Bierspruit and part of the Crocodile River are non-perennial streams that carry no water during normal dry weather.

3.8.2.5 Flood Peaks and Volumes

Table 22 indicates the flood peaks and volumes of the sub-catchment.

Table 22: Flood Peaks and Volumes

POSITION	1:20 YEARS	1:50 YEARS	1:100 YEARS	RMF
Crocodile River	358 m³/s	584 m³/s	895 m³/s	2 790 m³/s
Rooikuilspruit	225 m³/s	357 m³/s	539 m³/s	1 628 m³/s

The flood peaks were calculated at two points in the mining area of Thabazimbi Mine namely:

Point 1 where the Crocodile River leaves the sub-catchment on the western side and reflects the contribution of the entire sub-catchment; and

- Point 2 peak flows in the Rooikuilspruit through the poort.

Refer to Table 23 for the flood peaks and volumes as calculated at points 1 and 2 of the sub-catchment.

Table 23: Flood Peaks and Volumes

POSITION	1:20 YEARS	1:50 YEARS	1:100 YEARS	RMF
Point 1	358 m3/s	584 m3/s	895 m3/s	2 790 m3/s
Point 2	225 m3/s	357 m3/s	539 m3/s	1 628 m3/s

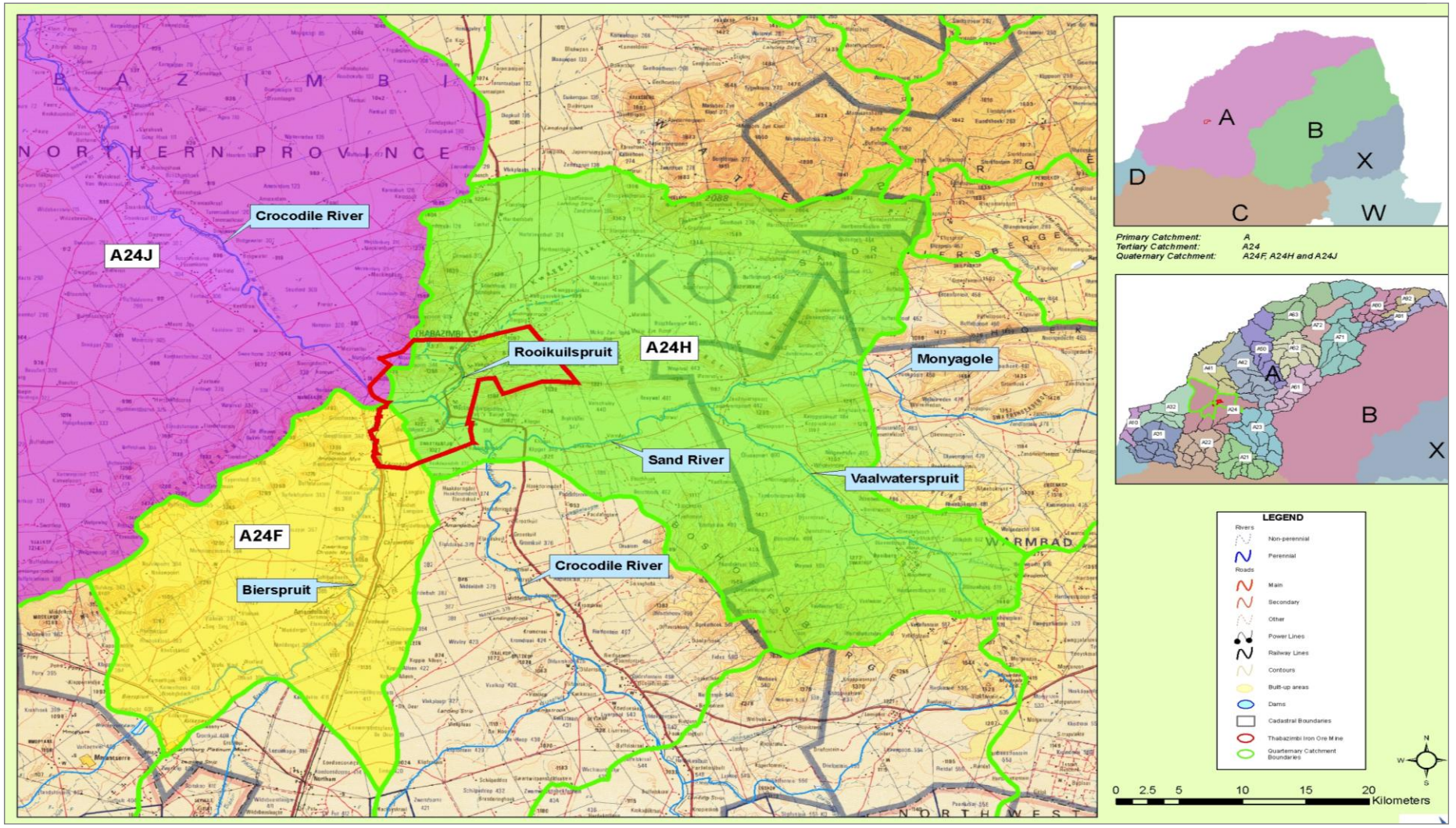

Figure 17: Catchment Boundaries and relevant streams

3.8.3 Drainage Density

The sub-catchment drainage density of the area is 1.56 km / m².

3.8.4 Storm Water Runoff

Historical permit conditions for Thabazimbi Mine stipulated the measurement of the quality of storm water run-off after significant storm events. Since 2004 / 2005 season measurements have been taken at four designated storm water run-off monitoring points as and when water was present at these points.

3.8.5 Watercourse Alterations

Portions of the Rooikuilspruit were diverted as part of the mining and related activities in the past (including concrete culverts to cross the Spruit). In 1982, the Rooikuilspruit immediately south of the poort giving access to Thabazimbi Mine was diverted. The toe of the WRD at Donkerpoort Pit would grow to within the distance of 45 m stipulated in regulation 16.1 of section 26(c) and (d) of the Water Act, 1956 (No.54 of 1956) – hereafter referred to as WA, and therefore permission to divert the creek was applied for. The diversion is about 1 050 m long and very stable. Dumping has been discontinued since then, and the toe is outside the 45 m limit. These are permanent features that will remain unchanged after decommissioning.

In 1997, a temporary diversion of the flow of the Crocodile River was implemented to construct the Kwai Bridge over the river to enable the mine to extend its mining operations to Buffelshoek Pit. The bridge was constructed over a period of six months and was completed in 1997. The river diversion was approximately 150 m long with a bottom width flow of 5 m. The river was diverted back into the original channel after construction was completed. The rehabilitation of the river diversion has been included in the rehabilitation plan. This water use is a permanent feature which will remain in place post-closure. The long-term sustainability of the structure formed part of the design parameters,

Several existing crossings provide access over the Rooikuilspruit. These have been discussed in detail in Part 4 of this revised Thabazimbi Mine Integrated Water Use License Application (hereafter referred to as IWULA) Technical Supporting Document.

3.8.6 Water Authority

Thabazimbi resorts under the Vaalkop Water Council and the DWA: North West Regional Office.

3.8.7 Wetlands

There are no natural wetlands located within the mine boundary area.

3.8.8 Surface Water Quality

Econ@uj, a consortium of environmental specialists based in the Zoology Department of the University of Johannesburg, was requested to trend current and historical water quality data. The data has been obtained from various sources including, river sites, waste water, drinking water and groundwater monitoring points. Many of the sampling points are associated with mining activities in the form of iron ore. Mining activities in the area are currently operated by Thabazimbi Mine.

3.8.8.1 Surface and Groundwater Quality Results

The results of the surface water quality analyses indicated that there are no significant increases in water quality parameters over the recent years (2005 – 2010). The majority of variables measured were fairly stable and did not increase specifically. However, peaks in certain variables were seen in some of the effluent samples analysed. It must be noted that the water quality data were not complete for all the sites for all the different years and that could have an effect on the confidence of the analysis. The variables analysed in this report were the only variables that had a somewhat complete dataset. It is recommended that a set number of variables are selected for analysis at all the effluent and river sites so that analysis in the future can be more accurate and complete.

Analysis of the physic-chemical variables for the groundwater samples (points 16, 17, 19 – 25, 33, 38, 56 and 57) indicated that there was very little temporal variation. Some spatial trends became evident with sites 16, 17 and 19 separating from the other monitoring points that have been studied. Two of these points (point 16 and 17) are important as they are used for monitoring of a possible direct impact by mining activities. It should be noted that apart from Iron concentrations at point 17, most of the variables at these sites were lower when compared to the other sampling points. Sulphate concentrations have consistently increased at point 17 since 2005. There is no evidence of pollution at these points or any monitoring points. The lower salt concentration and little variability observed at monitoring points 16, 17 and 19 could be due to constant (unnatural) recharge. Nitrate levels are still relatively high at monitoring points 20 - 25, but this appears to be a natural occurrence.

3.8.9 Biomonitoring

Econ@uj was also requested to carry out a baseline biomonitoring survey of the Rooikuil River and the Bierspruit to determine the ecological integrity of both systems. Both of these rivers are tributaries of the Crocodile River and may have potential impacts on the Crocodile River. Both tributaries and the Crocodile River are associated with mining activities in the form of iron ore. Mining activities in the area are currently operated by Thabazimbi Mine.

3.8.9.1 Site Selection

The procedure of selecting sites for purposes of assessing impacts was based on the standard approach of “Before-After-Control-Impact”. The sites selected for the study is summarized in Table 23, as well as in Figure 15.

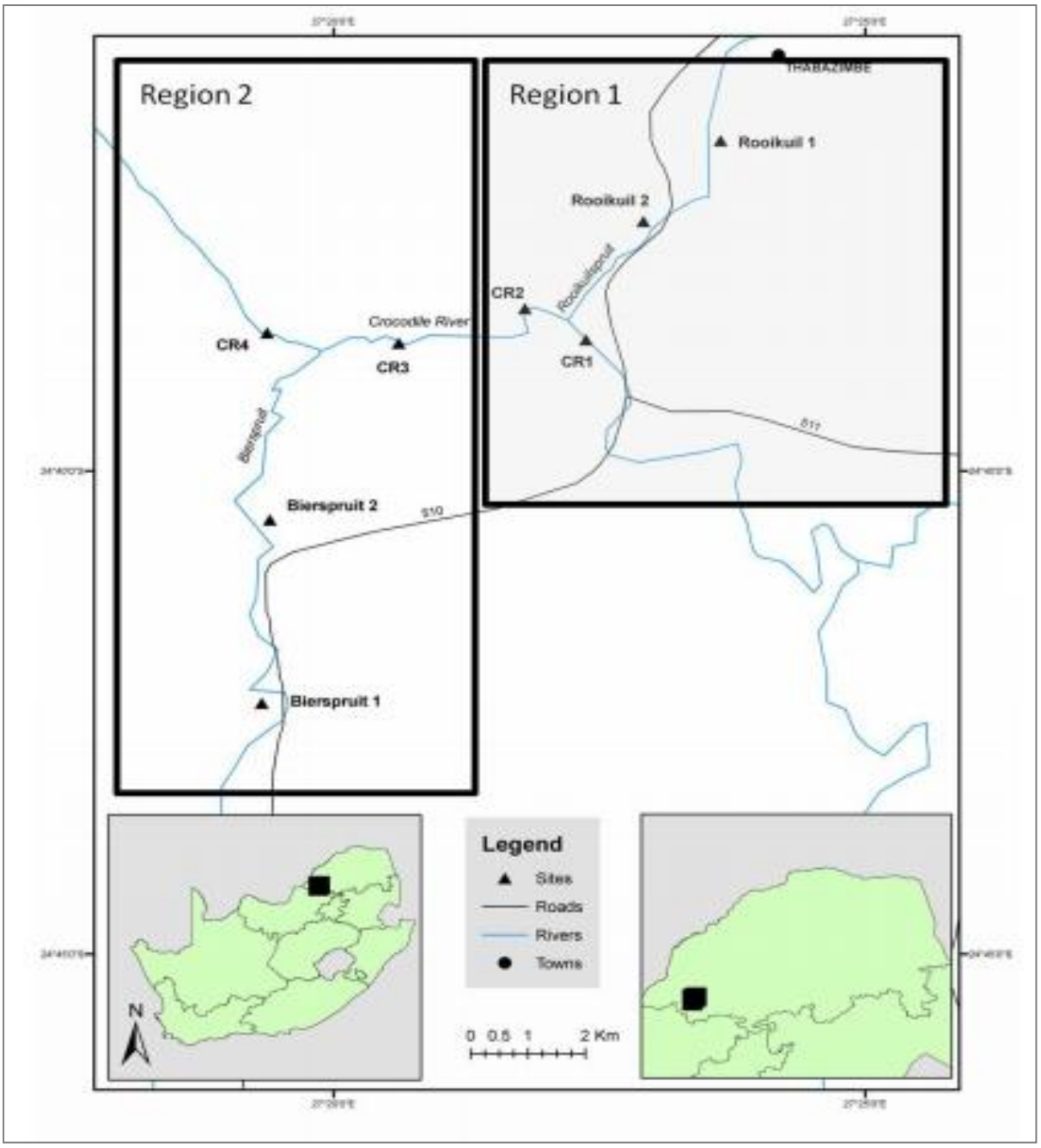

Figure 18: Regions used in PCA Analysis of Effluent and River Samples

Table 23: Position and Coordinates of the Sites Selected for the Study

SITE	POSITION	CO-ORDINATES
Rooikuil 1	Below WWTW and above most mining activities	S 24° 41"999' E 27º 19"513'
Rooikuil 2	Below mining activities	S 24° 40"793' E 27º 19"399'
Bierspruit 1	Above andalusite mining activities	S 24° 36"797' E 27º 23"206'
Bierspruit 2	Below andalusite mining activities	S 24° 37"801' E 27º 22"706'

3.8.9.2 Site Descriptions

3.8.9.1.1 Rooikuil 1

This site is positioned on the Rooikuil River below the discharge point for the Waste Water Treatment Works (hereafter referred to as WWTW) for the town of Thabazimbi. In stream habitat consisted largely of sand and mud as substrate with small areas of cobble beds. The water at the site was greyish in colour and the water level was very low, with minimal flow at the time of sampling. The vegetation at the site was dominated by exotics and was highly disturbed overall due to mining activities and associated mining infrastructure. The marginal zone was approximately 3 m wide and dominated by exotic grasses. The non-marginal component was characterised by alien woody and non-woody species, with a lower than expected ground cover due to rubbish dumping and general disturbance and extended approximately 45 m on either side of the river.

3.8.9.1.2 Rooikuil 2

This site is positioned below mining activities (including a washing plant). Although the flow in the river was quite strong during sampling the water level was quite low and the river is quite narrow. The water at the site was reddish in colour. The substrate consists of a mixture of sand and mud with extensive coble beds also present at the site. This leads to the availability of a variety of different flow classes. A road cuts through the river, leading to the formation of pooled areas above a low level bridge. The vegetation was generally in good condition, with the exception of the roads that infringe on the riparian zone. Marginal vegetation consisted mainly of sedges with some hydrophytic grasses in a 2.5 m wide band. Non-marginal vegetation showed a high cover of the woody element and excellent ground cover. The non-marginal zone extended approximately 90 m on either side of the river.

3.8.9.1.3 Bierspruit 1

This site is situated above the nearby andalusite mining activities on the Bierspruit. The in stream habitat has been severely modified to the presence of bridges and weirs at the site. The flow alterations caused by these structures have caused the dominance of pooled habitat at the site, leading to the substrate consisting largely of sand and mud with little variation in flow. The marginal zone was approximately 8 m wide on either side, with vegetation composition made up of reeds, hydrophytic grasses and herbs with a higher than expected woody component. The non-marginal zone was approximately 80 m wide on both the eastern and western sides, with a dominance of tall trees and shrubs making up the woody component. Ground cover in the no marginal zone at Bierspruit 1 was high.

3.8.9.2.4 Bierspruit 2

The Bierspruit 2 site is positioned below the andalusite mining activities in the area. The substrate at the site consisted largely of sand and mud with very little cobble beds available. There was, however, a variety of flow classes present at the site. The alteration in flow is caused by two bridges at the site.

The water at the site was clear. The marginal zone was approximately 3 m wide and dominated by hydrophytic grasses with a low to moderate woody cover. The no marginal zone was approximately 60 m wide on the south-eastern and north-western sides. The cover of trees and shrubs were high and ground cover in the non-marginal zone was excellent. Signs of hippo tracks and paths were noted at this site.

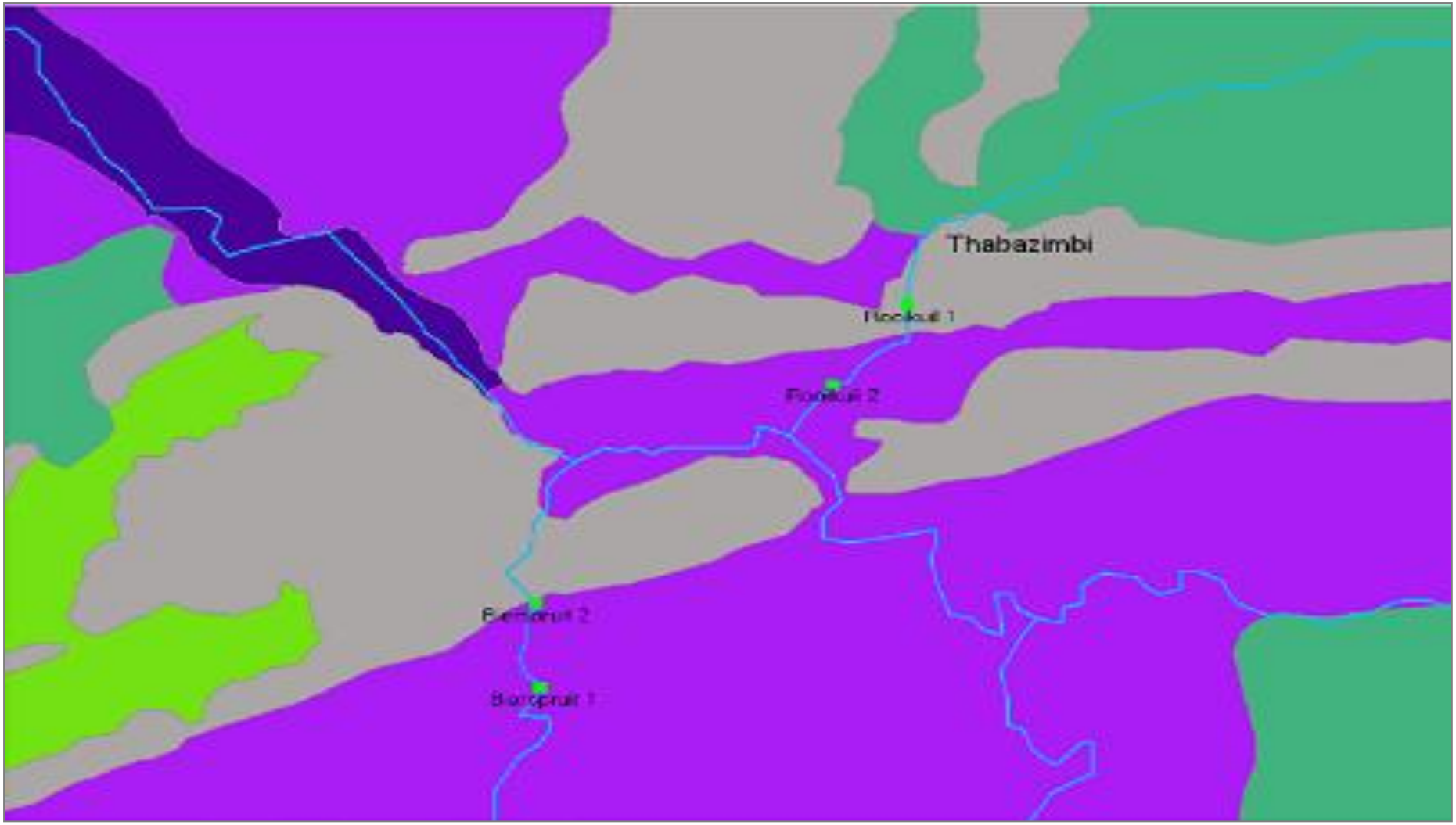

Figure 19: Locations of biomonitoring points

3.8.9.2 Water Quality Assessment

The results of the water quality analysis for the sites on the Bierspruit and Rooikuilspruit are presented in Tables 24 and Table 24. The water quality data was compared to the Target Water Quality Guidelines for Aquatic Ecosystems (DWA, 1996a) while the bacterial counts was compared to the Target Water Quality Requirements (hereafter referred to as TWQR) for Domestic Use (DWA, 1996b). The physico-chemical parameters in Table 25 are mostly within the TWQR with the exception of oxygen saturation, inorganic nitrogen parameters and the bacteriological parameters. However it must be noted that electrical conductivity and chemical oxygen demand (hereafter referred to as COD) are also elevated.

The oxygen saturation was extremely low at the Rooikuil1 site due to the extremely high levels of discharges from the Thabazimbi WWTW. The bacteriological counts (HPC, TC, FC) confirmed significantly higher values were presented than other sites as well as the counts being significantly higher than the TWQR for Domestic Use. Furthermore, no fish and only extremely hardy macro invertebrates were sampled at this site due to the poor quality of water. However, the Rooikuil did show some improvement at the lower site (Rooikuil 2) for the bacteriological counts as well as in the biotic communities. It must also be noted that this high.

The water quality data was compared to the Target Water Quality Guidelines for Aquatic Ecosystems (DWA, 1996a) while the bacterial counts was compared to the TWQR for Domestic Use (DWA, 1996b). The physico-chemical parameters in Table 24 are mostly within the TWQR with the exception of oxygen saturation, inorganic nitrogen parameters and the bacteriological parameters. However it must be noted that electrical conductivity and COD are also elevated.

Table 24: Physico-Chemical Water Quality Results for the Sites on the Bierspruit and Rooikuil River during the May 2010 Survey

	UNIT	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
Temperature	°C	19.2	18.2	20.4	21.1	10 – 15%
pH	-	7.22	7.38	7.45	7.55	5%
Oxygen saturation	%	53	53	8.6	50.3	80 – 120% saturation
Dissolved Oxygen	mg/l	4.41	4.47	0.68	4.03	
EC	µs/cm	877	1216	874	957	10 – 15%
Calcium, Ca	mg/l	45	46	45	72	NA
Magnesium, Mg	mg/l	20	28	17.7	34	NA
Sodium, Na	mg/l	51	95	61	41	NA
Potassium, K	mg/l	7	6.4	11.6	3.4	NA
COD	mg/l	74	83	83	91	NA

	UNIT	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
Sulphate, SO4	mg/l	68	78	34	73	NA
Nitrate, NO3	mg/l	11.1	4	18	64	15% (<0.5 or 0.5 – 2.5)
Nitrate as N	mg/l	2.5	0.9	4.1	14.5	
Nitrite as N	mg/l	<0.1	<0.1	<0.1	<0.1	
Ammonia as N	mg/l	<0.1	<0.1	18.5	<0.1	
Heterotrophic plate count (HPC)	cfu/ml	2000	3400	38000	4300	NA
Total Coliforms (TC)	cfu/100ml	1700	1200	2500000	19000	NA
Faecal Coliforms (FC)	cfu/100ml	700	500	100000	10000	NA
E coli	Per 100ml	detected	detected	detected	detected	NA

NA = Not available

TWQR for Aquatic Ecosystems are provided for reference. The shaded blocks in the above table reflect an exceedance in accordance to the TWQR. The results of the metal analysis in the water samples are presented in Table 25 together with the TWQR for Aquatic Ecosystems. Only copper, selenium and aluminium were higher than the TWQR. Selenium was found to be higher than the TWQR and at the levels measured it can possibly pose a threat to aquatic ecosystems. Selenium is a necessary trace element in animals for some enzyme processes. However, elevated levels can interfere in biological substances containing sulphur due to selenium's similarity to sulphur. This can cause toxic effects in fish as well as invertebrates. Naturally selenium occurs in low levels. The levels measured in the Rooikuil and Bierspruit could possibly be elevated above natural levels or this area could contain higher natural levels. Therefore, as these results are based on a once off survey and it is recommended to do a follow up study during the low flow season to confirm the selenium levels.

Table 25: Metal Concentration Results of the Water Samples from Sites on the Bierspruit and Rooikuilspruit during the May 2010 Survey

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
Arsenic, As	<0.02	<0.02	<0.02	<0.02	0.01
Selenium, Se	0.13	0.09	0.07	0.11	0.002
Titanium, Ti	0.004	0.005	0.005	0.004	NA
Aluminium, Al	0.014	0.027	0.043	0.011	0.005
Nickel, Ni	0.032	<0.003	0.022	0.08	NA
Manganese, Mn	0.002	0.003	0.92	0.008	0.18
Iron, Fe	0.079	0.2	0.7	0.093	NA
Vanadium, V	0.029	0.033	0.028	0.041	NA

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
Zinc, Zn	<0.005	<0.005	<0.005	<0.005	0.002
Lead, Pb	<0.01	<0.01	<0.01	<0.01	0.0002
Cobalt, Co	0.004	0.009	0.004	0.009	NA
Copper, Cu	0.019	0.024	0.03	0.019	0.0003
Total Chromium, Cr	0.024	0.017	0.011	0.016	0.007 / 0.012
Silicon, Si	1.6	1.5	2.8	5.6	NA
Cadmium, Cd	0.003	0.002	0.001	0.003	0.15
Strontium, Sr	0.26	0.28	0.12	0.082	NA
Boron, B	0.027	0.034	0.037	0.016	NA
Phosphorus, P	0.13	0.15	2.7	0.47	<5
Molybdenum, Mo	0.01	0.009	0.011	0.01	NA
Barium, Ba	0.065	0.14	0.031	0.025	NA

TWQR for Aquatic Ecosystems are provided for reference. Shaded blocks exceed the TWQR.

Follow-up work during the low flow season will confirm the values of these metals in their dissolved form. It might also be of some worth to determine the metal values associated with the sediment in these streams to determine if any metals are accumulating within the sediment. Any change in basic water constituents (pH, hardness, temperature) can cause metals contained in the sediment to become available to aquatic organisms.

Overall, the water quality in the Bierspruit and Rooikuil is poor due to the increased nitrogen and bacterial counts. However, this is not due to any activity related to the Thabazimbi Mine as the sources are the WWTW and upstream land use activities. The selenium levels could possibly be attributed to the mining activities. Even though copper, aluminium and selenium were higher than the TWQR, follow-up monitoring should be carried out before any management actions are taken.

3.8.9.3 Habitat Assessment

The habitat availability at Rooikuil 1 is currently still good. A variety of habitats including, small cobble beds and different vegetation types are still present at the site. In addition there was different flow classes (fast and slow flowing water) observed at the site. Currently the biggest threat to the in stream habitat at this site is the encroachment of road works and mining infrastructure into the riparian zone. Of particular concern is a WRD that has been placed in the macro channel, part of which is extending into the river. This can lead to erosion and the resultant siltation of in stream habitat as well as water quality deterioration.

Compared to Rooikuil 1, the downstream site (Rooikuil 2) is currently still in a largely natural state. There are certain impacts including a road and low water bridge that cuts through the site. The bridge

has caused the formation of pooled areas and is considered to be a flow alteration. Although this contributes to the availability of habitat, this is not a natural occurrence. In addition there are extensive cobble beds and riffles at the site and as a result a range of flow velocities are present. This provides excellent habitat for a range of biota. In addition, both banks are completely covered with vegetation and as a result erosion is minimal.

Integrated Habitat Assessment System (hereafter referred to as IHAS) and Habitat Quality Index (hereafter referred to as HQI) results indicate that the only changes to habitat are brought about by the flow alterations and the discoloured water. In comparison to the Rooikuil sites, the in stream habitat at both the sites on Bierspruit were in a modified state. At Bierspruit 1 there were numerous changes to the in stream habitat integrity. The largest impact is in the form of flow modifications where numerous weirs and bridges have caused pooled areas to be the dominant habitat type. There is almost no flowing water present at the site. These flow alterations are also reflected in the community structure of the macro invertebrates and fish observed at the site. There are no riffles or cobble beds present at the site, but both banks are still completely covered with a variety of vegetation types. This leads to minimal erosion or siltation at the site. The lack of stones as a habitat and lack in flow variation was largely responsible for the low IHAS scores obtained for this site. Aquatic macrophytes are present in the pooled areas and this contributes to habitat potential. Flow alteration was also responsible for the low HQI and IHAS scores obtained at Bierspruit 2. These flow alterations are caused by bridges and the related supporting structure in the river and are not directly related to the andalusite mining activities upstream of the site. Although a variety of flow velocities were present at the site, a lack of stones as a habitat was observed at the site. Both banks are also covered by vegetation, but the flow alterations at the site have caused erosion of both banks. Different types of vegetation were also present at this site and this contributes to habitat availability at the site.

The results indicated that the aquatic invertebrate community at Rooikuil 1 was in a seriously modified state. Only two taxa were sampled at the site and both taxa were present in large numbers. The two taxa sampled were from the family Culicidae and Syrphidae. Both these taxa are extremely tolerant to pollution (according to South Africa Scoring System Version 5 (hereafter referred to as SASS5) sensitivity ratings) and both taxa are air breathers. The presence of these taxa could thus be expected as the oxygen concentrations at this site were extremely low. The low diversity observed at this site is of serious concern and is directly related to poor water quality caused by the effluent from the WWTW. Within stream habitat integrity still being largely natural, an improvement in water quality at this site could lead to recolonisation of aquatic invertebrates and the improvement in the ecological integrity of the aquatic invertebrate communities. The poor water quality at this has also influenced the invertebrate communities further downstream at Rooikuil 2. From the results it is evident that despite good habitat availability the invertebrate community at Rooikuil 2 are also in a seriously modified state. Only six taxa were sampled at this site and the average sensitivity of the taxa was only 2.6. The taxa sampled at this site prefer a range of habitats and an improvement in the water quality will also lead to an increase in the ecological integrity of the aquatic invertebrate communities at this

site. The poor state of the invertebrate communities in the Rooikuil is of serious concern as the Rooikuil flow directly into the Crocodile River a few Km downstream of the Rooikuil 2.

The ecological integrity of the invertebrate communities in the Biersspruit was better in comparison to the Rooikuil. The invertebrate community at Bierspruit 1 was, however, still in a poor state. The changes in the community structure at this site are largely brought about by the flow alterations and the resultant lack of flowing water and not due to serious water quality changes. The presence of many taxa from the order Hemiptera (including the families Belostomatidae, Corrixidae, Nepidae and Gerridae) reflect these changes. Taxa from these families are all free swimming air breathers that prefer pooled areas and back water as habitat. The presence of vary few taxa preferring stones and flowing water as habitat further reflects these flow alterations. The higher ASPT of 4 observed at the site (compared to 1 and 2.6 at the Rooikuil sites) also reflect the habitat alterations. Changes to the ASPT are often a reflection of changes to water quality, whereas changes to the SASS score is often a reflection of habitat alteration. The aquatic invertebrate community at Bierspruit 2 was in a fair state. This is despite the lack of stones as a habitat. The lack of habitat is again reflected in the community structure with the community being dominated by taxa preferring GSM, backwaters or pooled areas as habitat. The strong flows observed during the survey did not appear to influence the community structure of the invertebrates.

According to River Health Program (hereafter referred to as RHP) of 2005 the ecological integrity of the lower Crocodile River is in a poor state. The changes in the community structure are largely related to poor habitat caused by major abstraction from the system and other flow regulation. Refer to Table 26, for the results of the diversity of the invertebrate samples.

Table 26: Results of the Diversity of the Invertebrates Samples at the Various Sites along with SASS 5 Results

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2
Atyidae			X	X
Baetidae			X	X
Balostomatidae			X	
Caenidae				X
Caratopogonidae			X	X
Chironomidae		X	X	X
Coanagrionidae		X		X
Corixidae			X	
Culicidae	X	X	X	
Garridae			X	X
Gyrinidae				X
Hydracarina			X	
Libellulidae			X	X

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2
Naucoridae				X
Napidae			X	
Oligochaeta		X	X	X
Physidae				X
Potamonautidae		X		X
Simuliidae		X		X
Syrphidae	X			
SASS Score	2	16	48	62
No of taxa	2	6	12	13
ASPT	1	2.6	4	4.8
Ecological class	F	D/E	C/D	C

3.8.9.4 Fish Community Assessment

The results of the fish assessment are tabulated from Table 27 to Table 28. The FFROC 2007 database was used to determine the expected fish species list as well as the frequency of occurrence of these species. Table 27 is the expected fish species list based on a site upstream of the Bierspruit sites 1 and 2. The list of species was used for the Rooikuil River as well as the Bierspruit fish assessment. The expected fish species are mostly tolerant to water quality and flow disturbances while their habitat preferences are mostly for slower flowing water together with overhanging vegetation. None of these species are endangered but it must be noted that *Oreochromis mossambicus* are near threatened (IUCN, 2010) due to hybridization with *Oreochromis niloticus*.

Table 27: The Expected List of Fish Species in the Bierspruit River According to FFROC 2007 (Kleynhans et al. 2007)

SPECIES NAME	ABBREVIATION	FFROC	CONFIDENCE	RELATIVE ABUNDANCE
Berbus trimeculatus	BTRI	4	3	2
Chetli fleviventris	CFLA	3	3	2
Cleries gariepinus	CGAR	1	3	1
Mesobole brevieneiis	MBRE	3	3	2
Oreochromis mossemblous	OMOS	3	3	2
Tiipie spernnenii	TSPA	3	3	2
Berbus peludinosus	BPAU	4	3	2
Berbus unlteenletus	BUNI	4	3	2
Pseudocreniiebrus phiiender	PPHI	3	3	3

Table 29 is the list of species caught during the May 2010 survey on the Rooikuil and the Bierspruit. The flow in the Rooikuil was high due to rain in the preceding week and night. Even with the higher

than normal flow experienced no fish were caught in the Rooikuil 1 site. This is due to the severely degraded water quality found at the site due to the WWTW effluent entering upstream of the site. The available fish habitat was fair with different flow conditions and various forms of in stream and overhanging vegetation present. If the water quality improved it is probable that some of the expected fish species will return to this section of the river.

The fish sampling downstream at Rooikuil 2 was found to be fair which indicated that some form of recovery takes place between Rooikuil 1 and Rooikuil 2. A total of four out of the expected nine fish species were sampled here. Notable absent species included the *Pseudocrenilabrus philander* and *Tilapia sparrmanii* which have similar tolerances and habitat preferences than *O. mossambicus*. However, possibly due to the increased flow the Large Scale yellow fish *Labeobarbus marequensis* were sampled in this section of the Rooikuil. This species is moderately tolerant to decreased water quality but it shows a higher preference for faster flowing water. Therefore due to the increased flow in the Rooikuil it probably moved from the Crocodile

Further sampling in the low flow period needs to be undertaken to establish the frequency of occurrence of *Lb. marequensis* in the Rooikuil.

Table 28: Fish Species and Abundance Caught at the Sites on the Rooikuilspruit and Bierspruit during the Biomonitoring Survey in May 2008

SPECIES NAME	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2
Berbus peludinosus	-	1	6	11
Berbus trimeculatus	-	4	-	2
Berbus unlteenletus	-	4	1	-
Gembusie affinis*	-	-	1	2
Lebeoberbus marequensis	-	2	-	-
Oreochromis mossemblous	-	6	1	-
Pseudocreniiebrus phiiender	-	-	-	23
Tiipie spernnenii	-	-	-	2

The Fish Response Assessment Index (hereafter referred to as FRAI) index was implemented on the Rooikuil to determine the current ecological category of the fish community. The results of the fish sampling for both sites were combined to determine the frequency of occurrence of the sampled fish species. The results for the FRAI index are tabulated in Table 29. The results indicated that the Rooikuil is in a Category D which is defined as largely modified with a large loss of biota as compared to the reference conditions. This was seen in the Rooikuil as only 50% of the species expected to occur was sampled at Rooikuil 2 while no fish species were sampled at Rooikuil 1. The ecological category of the fish should improve if the severely degraded water quality at Rooikuil 1 is remediated. This result is similar to that found by the (RHP; 2005) during surveys conducted for a State of the Rivers report of the Crocodile River (West). The RHP only sampled in the Crocodile River (West) but their results indicated that the fish communities in the Lower Crocodile River (West) are poor with only

hardy species present while there is a loss of habitat and connectivity in the system that results in stress for most fish species (RHP, 2005).

Table 29: FRAI Results for the Bierspruit and Rooikuilspruit for the May 2010 Survey

	BIERSPRUIT	ROOIKUILSPRUIT
FRAI score (%)	**69.9**	**53.7**
Ecological Categorie	**C**	**D**

The fish species caught at Bierspruit 1 numbered four while at Bierspruit 2 five species were sampled. Overall, six out the expected nine species were sampled during the May 2010 survey (**Table 27**). The lowered number of species at Bierspruit 1 as well as the lowered abundances is due to the large pools present at the site with very little flow present. This resulted in sampling difficulty as all the pools were extremely deep. The presence of the exotic Mosquito fish, *Gambusia affinis* at both sites in the Bierspruit must also be noted. The absence of *Tilapia sparrmanii* and *Pseudocrenilabrus philander* at Bierspruit 1 is not of a concern as they were sampled downstream. There absence can possibly be explained due to it not being sampled on the day rather than being absent due to some impact occurring at the site. Further studies during the low flow will be needed to confirm whether they are present or absent. The available habitat at the site would suggest that *T. sparrmanii* and *P. philander* should be present.

The abundances of the fish species at Bierspruit 2 were higher due to a variety in flow conditions as well as a variety in overhanging vegetation. The fish habitat conditions at this site are more suited for a variety of fish to occur than at Bierspruit 1 and that was reflected in the fish species sampled. Looking at the habitat preferences and tolerances of the species that were not sampled during this survey the possibility of them occurring at this site is significant. Further studies during the low flow period is recommended to determine whether there absence is due to an impact on the system or natural variability in fish community structure.

The fish results for the Bierspruit were, as with the Rooikuil, combined for the FRAI index to determine the frequency of occurrences. The ecological category for the Bierspruit was calculated at a Category C with the FRAI index (Table 28). This indicated that the fish community is moderately modified with some loss in biota but that ecosystem functioning is still present. This is a slightly higher category than found in the RHP (2005) State of the Rivers report. However, it must be noted that the abundances of fish in the Bierspruit was lower than expected. This can indicate that the fish community is declining and the loss of species from the system is possible.

3.8.9.5 Summary of the Assessments

The assessment of water samples from sites on the Rooikuil and Bierspruit indicated that the majority of parameters are within the TWQR's. Parameters that exceeded these TWQR were total inorganic nitrogen, selenium, copper, aluminium and the bacterial counts. These values indicated that the

majority of pollution is organic in nature from agriculture and WWTW runoff (Rooikuil). The slight increase in selenium is possibly of concern but follow up studies should be carried out to determine if the elevated values are from contamination or background geology. Overall, no significant impact from the Thabzimbi Mine was seen on the water quality of the Rooikuil and Bierspruit based on the May 2010 sampling survey. The in stream habitat integrity appeared to be in a modified to largely natural state. The only major changes in habitat are caused by flow alteration from a variety of bridges and roads that cut through the rivers. These changes are, however not related to the mining activities alone.

The fish community assessment on the Rooikuil and Bierspruit indicated that these communities are in a largely to moderately modified condition respectively. This is due to the absence of tolerant species as well as changes in the habitat conditions and water quality. These results were found to be similar than a RHP (2005) study carried out on the Lower Crocodile River (West) which indicated the fish community is in a poor condition. The decreased fish community in the Rooikuil is largely due to the poor water quality but impacts on the riparian zone from Thabazimbi Mine could possibly affect flow conditions in the Rooikuil. The poor water quality in the Rooikuil has also caused major alterations to the aquatic invertebrate community structure at both sites on this river.

3.8.10 Surface Water Use

The dilution ratio of the sporadic inflows from the non-perennial creeks into the Crocodile River is very high. The watercourses in the study areas run only sporadically in the rainy season. Most of them run into the Crocodile River.

Water from the Crocodile River is used for irrigation by farmers. Table 30 lists the farms situated adjacent to the Crocodile River downstream of the affected watercourse.

Table 30: Farms Situated on the Crocodile River Downstream of the Affected Watercourse

FARM	OWNER
Hanover 341 KQ	Dr. J Grobler
Mooivallei 342 KQ (± 15 portions)	Several owners

The dilution ratio of the sporadic inflows from the non-perennial creeks into the Crocodile River is very high. Water samples are taken at the Crocodile River when the creek and river are flowing.

3.9 Ground Water

The information in this part of the IWULA was extracted from the following sources:

- The report titled, “Geo-hydrological report. The water supply potential of the Donkerpoort Basin for sustained groundwater yield and preliminary investigation of the pollution risks in the Donkerpoort Basin and other selected areas”, dated June 1998, compiled by Gerhard

Steenekamp and Ina Fourie, Geo-hydrological Services, Iscor Mining Consulting Services; and

- The report titled, “Project Phoenix: Thabazimbi. Groundwater Model for the Dewatering of the Thabazimbi Mine Area. Final Report (Amended)”, dated April 2007, compiled by WSM Leshika Consulting (Pty) Ltd.

3.9.1 Depth of Water Tables and Qualities

According to the geohydrological report, dated June 1998, four main aquifer types were distinguished in the Thabazimbi area. The groundwater quality will be discussed briefly for each main aquifer type in the area to provide a general overview of the water quality in the Thabazimbi area.

The Groundwater Model report for the proposed Project Thabazimbi Project Infinityindicated that the main aquifers in the area are:

- The dolomites and banded ironstone, with the contact between the dolomites and banded ironstone being the most permeable; and
- The Donkerpoort Breccia basin, formed at the intersection of the two major fault systems. The high sustained yields of this basin are believed to be supplied by the numerous faults that intersect the basin.

The shales, quartzites and granite are generally of low permeability. The diabase sills and dykes generally form barriers to flow.

The breccia basin is of great significance for the large volume of groundwater it stores and transmits. It is the aquifer presently being pumped to meet the bulk of the mine and town’s water requirements. It is also located in proximity of the proposed Thabazimbi Project Infinity Pit 1. It is also in hydraulic connection and interacts with the Rooikuilspruit, hence may receive or gain water from the spruit depending on flow in the spruit and the piezometric head in the aquifer.

3.9.2 Depth of Water Tables and Qualities

Four main aquifer types can be distinguished in the Thabazimbi area. The groundwater quality will be discussed briefly for each main aquifer type in the area to provide a general overview of the water quality in the Thabazimbi area. Information from: “Geohydrological report. The water supply potential of the Donkerpoort Basin for sustained groundwater yield and preliminary investigation of the pollution risks in the Donkerpoort Basin and other selected areas”, dated June 1998 compiled by Gerhard Steenekamp and Ina Fourie, Geohydrological Services, Iscor Mining Consulting Services.

3.9.2.1 Crocodile River Primary Aquifer

The only primary aquifer that has been pumped intensively in the past, especially by the Town Council, is the quaternary alluvial aquifer that exists in places along the banks of the Crocodile River.

This aquifer is a very reliable source of good quality groundwater when the river is flowing and has yielded large volumes even in times of severe drought.

Water from this aquifer is only used for the wetting of roads and other industrial purposes at present. A large number of boreholes and large diameter wells exist in the aquifer which is unsuccessful (low yields) due to the high clay content of the alluvium in some locations. Transmissivities of more than 700 m^2 / d have been measured in pumping tests. The effective recharge to the aquifer is estimated at between 5 and 10% of precipitation while the specific yield is in the order of 0.05.

The water quality in this aquifer strongly reflects the quality of the river water which continuously recharges the aquifer, as well as the mixing with recharging rainwater of very good quality. The water is dominated by bicarbonate (HCO_3), Ca and Mg with slightly elevated Na values, indicating recently recharged water with some degree of mixing with other water types. The slight elevation of the Na and Cl values separates this water from the typically dolomitic water of the dolomite aquifers.

It is clear that there is an overall deterioration in water quality which is especially evident from 1996 to 2004. The EC in the river is rising progressively with the countrywide salt-load in the rivers increasing every year. The one water quality measurement of the borehole plots exactly on the graph of the pure river water, showing that it is definitely river water that is being pumped from the quaternary alluvium and not water from other aquifers or recharge from rainfall.

3.9.2.2 Malmani Subgroup Dolomite Aquifer

Groundwater is abstracted mainly from the Donkerpoort Basin at present. This area extends from the Donkerpoort and Vanderbijl pits in the south to the horse riding club in the north-west and the Spoornet workshop in the north-east. The name refers to the topographical setting of the area and to support the fact that the aquifer forms part of an intensely weathered basin structure in the Malmani Subgroup dolomites underlying the area. The dolomites are intensely weathered to an average depth of about 60 m below surface and a maximum depth of about a 100 m over a total area of about 1.25 km^2.

Although the groundwater yield in the general dolomitic rocks can be very high, the yield depends absolutely on weathered zones, brecciation, fault zones, dyke intrusions or other types of fracturing. Dolomite is usually a good medium for holding water, but not necessarily for conducting or transmitting water to a borehole if it has not been significantly fractured.

The Malmani dolomites are about 1 500 m thick on average and underlie large parts of the mining area, especially in the northern parts. The storativity (storage coefficient) of the dolomites is estimated at around 0.05% and the effective recharge to the aquifer can be as high as 10%, or even more, of the annual precipitation. The transmissivity is dependent on the presence of fractures or dissolution cavities and varies from < 0.5 to 1 200 m^2 / d.

More than 85% of groundwater that is currently used by the mine / town council is abstracted from this aquifer at an average pumping rate of about 40 l / s.

The analysis of the water in this aquifer is typical of water generally found in dolomitic aquifers, namely with Ca and Mg the dominant cations and bicarbonate (HCO_3) the dominant anions. Like other dolomitic water, the hardness is relatively high, as is the alkalinity of the water. Na, Cl and SO_4 concentrations are generally low. The NO_3 concentrations in water near the open pits are sometimes elevated, mainly because of the use of nitrate-type explosives in the open pits and underground workings.
It is clear that a general deterioration is evident in water quality in all the boreholes for which time-series data exists. Whether the 'pollution' is a natural phenomena caused by leaching of certain elements from the aquifer of whether one or more man-made pollution sources are causing it, it needs to be verified.

Specific analyses later in the report will show that it is very difficult to delineate single pollution sources as a cause of the pollution. The deterioration in quality of Borehole 5 is the largest, mainly because this borehole is constantly pumped at the highest rate.

All the boreholes show a strong dolomitic composition with Ca, Mg and CO_3 the dominating ions.

3.9.2.3 Penge Banded Iron Formation Aquifer

BIF is the base rock for the hematite ore that is mined in the area. Although BIF is not usually considered a significant aquifer, the BIF in the Thabazimbi area was often found to be highly transmissive and a good conductor of groundwater flow.

Due to the hardness and consistency of the rock, widespread fracturing occurred during tectonic disturbances, especially in fault zones, tightly folded areas, and dyke intrusions and in contact zones with other rock types. Boreholes in the BIF rocks can thus have very high transmissivities, although the storativity is usually lower than that of the dolomites.

The BIF varies from about 100 m to 250 m thick in the area and is also triplicated due to thrusting like the rest of the stratigraphic sequence. The effective recharge is estimated at 3% to 5% of annual rainfall with storativity of about 0.008 and lower. Transmissivity varies between 0.1 and about 800 m^2 / d.

This aquifer was utilised significantly only since 1997, mainly because pumping in the BIF became necessary for pit dewatering purposes and safer mining activities. The water was used mainly for the wetting of roads for dust prevention, although it is usually good quality potable water. The quality of

water is exactly the same as the dolomitic water, which confirms that the dolomite is the water holder while the BIF usually serves as the water transmitter.

The water content of this aquifer is very much the same as that of the dolomitic aquifer itself. This phenomenon strongly supports the assumption that the dolomite holds the water and the BIF serves mainly as a conductor. The ratio of the macro-elements in the BIF is exactly the same as the dolomite, but the concentrations are generally lower. The reason is that the water is derived from the dolomite, but dilution through rainwater recharge and ion exchange has increased the water quality in the BIF aquifer. The water in the BIF will thus plot in the same field in a Piper or Durov diagram, although the concentrations may differ largely.

No time-series data is unfortunately available. Two analyses are available for boreholes in the Donkerpoort West area. Both water qualities are excellent. The water type is recently recharged with no specifically dominating ion, but the compositions trend strongly to dolomitic water due to the interaction of the two aquifers.

3.9.2.4 Quartzite, Shale and Lava Aquifer

The rest of the mining area and probably covering most of the surface area consists of the quartzites, shales and sometimes lava of the Pretoria Group. The potential of this aquifer in terms of borehole yields is significantly lower than that of the first three aquifer types. Borehole yields are once again dependent on the presence of open / conductive fractures of any origin.

The most important uses of groundwater from this aquifer in the mining area are water supply to the golf course and nature reserve as well as supply to livestock and game in the region. Effective recharge depends on various factors and is estimated at between 2 and 5 % of annual precipitation, with a storativity of about 0.005 %. Transmissivities vary from 0 to about 150 m^2 / d.

The groundwater quality in these aquifers is generally very good, and indicates that this water has recently been recharged with rainwater and that little ion exchange has taken place. Although the transmissivities in this aquifer are generally lower than in the other aquifers, there is still significant movement of water through the aquifer and no stagnant water conditions occur. No time-series data is available.

Borehole BA2 is situated at the new domestic non-mineral waste disposal site and has excellent quality, representing unpolluted recently recharged water. The quality of Borehole BA6 did not comply with objectives but this may be explained by the fact that a grab sample was taken in very turbid water which was probably also very stagnant for a long time. Future samples during pumping of Borehole BA9 will have to ascertain the quality in this area. The water type is close to dolomitic with higher contents of Na and K than dolomitic water, showing the influence of the shale and clay in the aquifer.

3.9.3 Groundwater Boreholes and Springs

There are no springs in the mining area. Various boreholes are situated on site. A number of boreholes are pumped for use on the mine; see Table 31 for estimated delivery of some of the Boreholes at Thabazimbi Mine.

Table 31: Estimated Delivery of some of the Boreholes at Thabazimbi Mine

BOREHOLE NUMBER	ESTIMATED DELIVERY M3/H
M423/05	65
M423/06	20
M423/09	44
M423/07	15
M423/16	15

3.9.4 Groundwater Zone

No mining activities occur in the vicinity of the primary aquifer. However, in accordance with the Business Plan of Thabazimbi Mine mining activities will take place in places where the secondary water table will be affected.

3.9.5 Ground Water Quality

The water quality monitoring programme with monitoring point names, monitoring frequency and parameters to be analysed for was described in detail in Part 3.5 of the revised THABAZIMBI MINE Integrated Water and Waste Management Plan (hereafter referred to as IWWMP), dated July 2007.

The groundwater quality described here is taken from the document: *"Thabazimbi Mine: Water quality report for the period September 2005 to October 2006",* dated May 2007, Reference number: TIOM/WQR/CSGW05/2007 compiled by Clean Stream Groundwater Services.

Groundwater levels were measured on a weekly basis at fourteen boreholes and five wells during the mentioned monitoring period. Water levels were measured on a two-weekly basis in two boreholes near the VDB350 (H1 tunnel). These boreholes cover most of the mining area where impacts on the groundwater level may occur because of mine dewatering or groundwater abstraction. Ambient water levels were also measured where no impacts from mining are likely to occur but only natural seasonal fluctuations should play a role.

Boreholes where water levels are monitored can also be divided logically into three different categories, namely groundwater supply (production) boreholes, mine dewatering observation boreholes and general water level fluctuation monitoring boreholes.

3.9.5.1 Groundwater Supply (Production) Boreholes

Groundwater supply boreholes are used for supply of mine process and drinking water to the mine and town as well as three boreholes at the golf course. The boreholes supplying groundwater to the mine occur in the Donkerpoort Basin area as well as five wells in the alluvium next to the Crocodile River used for water supply to the pit and roads at Buffelshoek. Three boreholes are used for supplying irrigation water to the golf course and rest camp in the Ben Albert's Nature Reserve. These three boreholes are not the responsibility of the mine and abstraction rates are therefore not included in IWULA of the mine.

Despite of some fluctuations due to variable pump cycles (especially Points 37 and 39) a definite increasing/rising water level trend occurred during the year. The average increase in water levels measured over the Donkerpoort Basin aquifer, the Golf Course and the Crocodile River was more than 40%. The very positive water level increases in spite of groundwater abstraction from the boreholes is a result from the good and regular rainfall events during the 2005 / 2006 season. The water level increases confirm the occurrence of significant effective recharge to the aquifers as also derived from water quality characteristics during the previous section.

The conclusion is that despite regular or continuous abstraction and slight decreases during previous seasons it takes one good season like 2005 / 2006 to obtain a complete water level recovery. It shows that the production boreholes are fully capable of sustaining the current pumping rates from the different aquifers over prolonged periods of time.

3.9.5.2 Water Level Fluctuation Monitoring Boreholes

These boreholes are used to monitor the affects of mining, natural recharge and pumping on the aquifer on a regional scale. Some of the boreholes are situated relatively close to (within 50 m) of production boreholes discussed in the previous sub-section while others are situated far away to measure regional water levels. Water levels are also measured to correlate natural and artificial recharge effects (such as at the slimes dam) with water quality changes.

The water levels of the boreholes away from the direct groundwater abstraction areas displayed the same water level trends as the production boreholes. Water levels showed a very positive increase as a result of good rainfall and recharge from November 2005 to April 2006.

Good water level recovery occurred without exception in the regional monitoring boreholes and the levels also confirm that no regional dewatering effect occurs because of the groundwater abstraction in the Donkerpoort basin, Golf Course and Crocodile River.

A number of boreholes in especially the Donkerpoort and Vanderbijl areas were added to the monitoring program from May 2006 and seasonal fluctuations should be available from the next evaluation onwards.

3.10 Air Quality

The air quality assessment comprised of a baseline and impact assessment study. The baseline study included the review of the site-specific atmospheric dispersion potential, relevant air quality guidelines/limits and existing ambient air quality in the region. The predicted air quality impact assessment comprised the establishment of an emissions inventory for the current, proposed future Operational Phases and the closure phase. Subsequent dispersion simulations whereby ambient air pollutant concentrations and dust fallout rates were predicted followed by a comparison to health risk and compliance requirements. An AQMP including possible mitigation and management measures for significant sources was developed.

3.10.1 Baseline Assessment

Other than the current mining operations at Thabazimbi, the other anthropogenic sources of emissions are industrial activities in or closer to the town of Thabazimbi. Existing mining operations in the area include Amandelbult Platinum Mine located 24 km south-west of Thabazimbi Mine and a proposed mine, Cronimet Chrome Mine located 28 km to the south-west. The residential areas located close to the mine are the town of Thabazimbi (located 1.8 km north-east) and the informal settlement (located 2.8 km north).

3.10.2 Existing Air Quality of the Region

A dust fallout monitoring network existed at Thabazimbi Mine and was decommissioned with data available for the period November 2005 to October 2006. The dust fallout during the month of November 2005 and October 2006 were significantly higher than that of the other months. On average, the recorded dust fallout was high, exceeding the SANS residential limit only at Thabazimbi Nursery (620 mg / m² / day). No other dust fallout measurements for the period exceeded the industrial limit.

Due to the limited monitored data, current operations at Thabazimbi Mine were assessed through dispersion simulations. This provided a baseline for the mine but excluded background pollution (i.e. other sources in the region). All pollution generating sources at the mine were identified and emissions quantified. The establishment of an emissions inventory is necessary to provide the source and emissions data required as input to the dispersion simulations. Current sources of emissions included vehicle activity on the unpaved haul roads, wind erosion from WRDs, storage piles, materials transfer points, crushing and screening. In-pit operations accounted for included excavation of ore and waste rock, drilling and blasting and equipment movement within the pits (Kwaggashoek East, Buffelshoek West and Donkerpoortnek). Gaseous emissions from vehicles and equipment were regarded as insignificant and omitted from the study. The main sources of particulate emissions from the current operations were quantified to be as follows for the unmitigated scenario:

- Unpaved roads (49% (PM10) and 40.8% (Total Suspended Particles – hereafter referred to as TSP);
- The second most significant source of PM10 was materials handling (11.4%) and this source was the third most significant source of TSP (11.4%); and
- Crushing and screening was predicted to be the third most significant source of PM10 (9.7%) and second most significant source of TSP (28.6%).

The predicted daily unmitigated PM10 concentrations exceeded the SANS and proposed SA standard at the town of Thabazimbi. PM10 daily concentrations at the informal settlement were however within the proposed SA standard. The number of days when the PM10 concentrations exceeded the SA standard of 75 µg / m³ at Thabazimbi was 7 days over the one year period and 22 days for the EC standard, while no exceedance were predicted at the informal settlement. No exceedance of the screening criteria was predicted at the sensitive receptor sites over an annual average. There was no exceedance of the screening criteria for the mitigated daily and annual PM10 concentrations at both sensitive receptor sites.

Maximum daily dust fallout levels were predicted to be well below the SANS residential dust fallout limit of 600 mg / m² / day at all the sensitive receptor sites.

3.10.3 Conclusion from Establishment of Baseline Conditions and Predicted Air Quality Impact Assessment

The main conclusion from the establishment of baseline conditions and a predicted air quality impact assessment is that the proposed operations will result in an increase in ground level PM10 concentrations and dust fallout levels at the various sensitive receptors. The modelling did however follow a conservative approach to ensure that the worst-case scenarios were reflected in the assessment, especially for the proposed Thabazimbi Project Infinity.

3.11 Noise

Stationery noise levels were measured at pre-selected positions around the proposed mining area on top of the mountain and some measurements were also taken at the bottom around the pilot plant.

Measurements could only be taken during daytime due to the fact that it is too dangerous to enter the mountain at night and no activities are taking place at night on the mountain.

Noise is defined as an unwanted, disturbing and/or physiologically damaging sound. Personal exposures to noise levels equal to, or above 85 dBA for eight hours can cause hearing loss.

In terms of sound pressure levels measured in the environment around the perimeter of any operation the definition and understanding of noise levels can be best described in terms of annoyance amongst the workers and community and not in particular the cause of hearing damage.

Many characteristics are important in the generation of annoyance. As the intensity of the noise increases, the more annoying it becomes.

High frequencies, above 1000Hz, are more annoying than lower frequencies. In addition, if the noise is intermittent, irregular or rhythmic or contains impulses or recognizable pure tones, it may be considerably more annoying than a steady noise of the same intensity or even the same perceived loudness.

The measurement positions were selected around the proposed mining area and at specific locations down the mountain side. The current and future proposed activities on the mountain are adjacent to the main business centre of Thabazimbi with formal or informal communities that could possibly be affected by the prospecting and mining activities.

The noise levels all were measured within the recommended levels that could cause disturbance to any community that could be affected.

Currently the noise levels around the proposed mining site are mainly generated by the exploration drills on site and some of the light vehicles travelling up and down the mountain as well limited activities by the existing pilot plant.

The reflected values in the table 32 represent the noise levels of the relevant sampling positions as described. All substandard readings are presented in **Bold and *Italic*.**

Activities on the mountain at the various sampling positions were very limited and the main noise sources were road traffic on the main roads, one exploration drill on the side of the mountain and a washing and screening plant adjacent to the Jig Plant. Refer to Figure 17 for the monitoring locations.

Table 32: Noise levels at various sampling locations around the proposed mining site and pilot plant

Measuring Positions	AMBIENT NOISE (dB(A))					Remarks
	Day Time Levels					
	Average Results (dBA)		Typical Rating (SABS 0103) (Category C)	Excess $_{\Delta}L_{Req,T}$ (dBA)		
	November 2012			November 2012		
Position 1: Close to H1 Mine Tunnel entrance on main gravel road.	33.1		55,00	-21.9		Day Time: - No mining activities. Mainly background noise from birds and main road traffic
Position 2: Solar panels on the side of the mountain.	51.5		55,00	-3.5		Day Time: - Close to the main road between Thabazimbi and Rustenburg. Road traffic the main noise source. No contribution from any mining activities.
Position 3: Entrance to "Zig-Zag" Road	51.8		55,00	-3.2		Day Time: - Exploration drill machine active ±500m below the measuring point on the side of the mountain.
Position 4: Kwaggashoek at the communication towers on top of the mountain	31.4		55,00	-23.6		Day Time: - General background and bushveld noise. No contribution from any mining or drilling activities.

Measuring Positions	AMBIENT NOISE (dB(A)) Day Time Levels					Remarks
	Average Results (dBA)		Typical Rating (SABS 0103) (Category C)	Excess $_{\Delta}L_{Req,T}$ (dBA)		
	November 2012			November 2012		
Position 5: Close to the entrance of the "Mostert" Mine Tunnel. Active production site.	45.3		55,00	-9.7		Day Time: - Human and vehicle traffic and noises represented the main noise sources at this point.
Position 6: Western side of the Jig Plant. Measuring point ± 300m from washing plant.	48.5		55,00	-6.5		Day Time: - Polycius washing plant was working representing the main noise source together with a front end loader. Jig plant was not operational. Trees in-between measuring point and the wash plant created some attenuation effect.
Position 7: Eastern side of the Jig Plant. Measuring point ± 500m from washing plant.	49.9		55,00	-6.5		Day Time: - Polycius washing plant was working representing the main noise source together with a front end loader. Jig plant was not operational

These measurements were conducted as an initial baseline to compare disturbance levels of any future mining or any other activities on this site. All noise levels measured below the prescribed

requirements. Apart from the one exploration drill machine that was drilling on the side of the mountain, there were no other mining activities that could contribute to any noise disturbances. Once the proposed mining activities commence, the Environmental Noise Levels should be measured on a regular basis to determine the effect on the surrounding communities.

All Noise Levels were determined in accordance with the standards as set in SABS 0103 of 2008 under the guidance of SABS 0238:2003 and the typical ratings provided that would best fit the conditions and situation (Sishen Environmental Noise Survey report, Varicon cc, November 2012).

Figure 20: Google image of the mine showing all noise monitoring positions

3.12 Sites of Archaeological and Cultural Interest

A detailed heritage assessment was done on the entire site. The assessment identified three applicable eras namely:

- Stone age;
- Iron age; and
- Current age.

3.12.1 Stone Age

Stone tools were only encountered to the direct east of the area known as BA 3 in an area affected by sheet erosion. The tools appear to be mainly from the period know as the “Middle Stone Age” and because no dating was done can only approximately be assigned to a period of between 30 000 and 120 000 years ago. The fact that these were the only tools observed does not necessary mean that there are not more tools present in lower levels.

With the knowledge of the general richness in remnants of artefacts from the stone tool people at the Limpopo valley to the west, the Magalies Mountain to the south and the Waterberg to the east one would have expected more Stone Age material from the riverbanks of the Crocodile River that runs through the Kumba property. On the other hand it is known that owing to regional pluvial and inter-pluvial periods Stone Age people were forced to move away from places that were either to wet or to dry.

There does not appear to be any sites on the property that indicate long periods of use of the landscape.

There are no rock-art sites, either of paintings or engravings on the property. On such a large area it is often indicative of low use of the region during the Stone Age.

3.12.2 Iron Age

The Iron Age on the Thabazimbi Mine property is represented by a number of stone walled structures as well as a number of smelting ovens. The period that this occupation reflects is between 1400 and 1600. Although there is circumstantial evidence that peoples from both earlier and later periods have had access to utilize the iron ore source no direct evidence is forthcoming at present.

Previous excavations and reconstruction work has sensitised the mine authorities to its responsibility and a number of positive steps have been taken to ensure the protection of the sites involved. Even though this work was done in the past, some questions still need to be addressed, and further academic research on the site should be supported by the mining authorities.

3.12.3 Current

3.12.3.1 Du Randt Homestead

The site could only be visited on a Saturday afternoon after 14h00 after active dumping had ceased on the spoil site above the homestead and the approach road to it. This is owing to mine safety regulations preventing people to enter dangerous areas that can be affected by the spoiling process. Even this precaution may not be sufficient, as the spoil-tail stays “alive” for several hours after actual dumping and even during our visit to the site, settlement of the dump could be noticed.

Of the building itself only three walls (east, west and north) are still standing in its original position while the rest have all collapsed owing to natural decay. The site is also rather overgrown with pioneer trees such as sickle bush (*Dichrostachys cinerea*) and black thorn (*Acacia mellifera*) that impedes movement to and on the site, and are also actively enhancing the natural decay process.

Owing to the collapse of the walls and the trees growing around the structure, it is nearly impossible to determine the floor plan of the structure at present.

The walls of the building consist of banded ironstone semi-dressed stones as can be seen in the photographs mortared with mud. Andalusite stone slabs were dressed for window sills, and inside walls were possibly built from unfired semi-fired clay bricks

From casual inspection no functions could be positively ascribed to defined areas, but one will assume that the northern side would have been fronted with a “stoep” with two bedrooms and a “voorkamer” or sitting/dining room in the middle as the northern rooms. The southern side could have been a kitchen, a dining room and another bedroom. According to the mining officials there is also a “bakoond” somewhere to the south of the building that were not seen on this occasion.

According to Williams’s map a spring in the kloof above the house provided water for the family, but the “kloof” is now covered by the spoil-dump. Similarly in the valley below the homestead there are plantations of eucalyptus trees and a deep hole that appears to have been a well.

3.12.3.2 Thabazimbi Town

In Mollie’s there are a number of old photographs that gives us at least some idea of what the early days of Thabazimbi looked like, and also what it appeared like at its heyday in the early 1960’s. Some of the building techniques of the architecture are unique in the sense that the buildings were concrete cast with horizontal plank-shuttering. Especially the stores shop and the garage have distinct late Art Deco features in the sweeping patio-facade of the shop and the curved concrete roof of the garage. Small detail of this style is also to be found in the old “bottle-store” and at the entrance to the “heartbreak hotel”. All the photographs in Mollie’s can be used to in the partial compilation of at least a usable document on the past and present appearances of buildings.

Even though time was limited Mr E. Botha could name most of the buildings, their use and who was associated with them. It is the opinion of the author that many more of the retired miners are still alive that will have memories and photographs that will bolster a compilation of information of the old town and its inhabitants.

In the time available most of the buildings were photographed at random as part of the present survey, but no specific details such as plan, material and style were documented. A visit to the local drawing office did not render any detail from the past building and no old “town plan” could be found. The only town plan that was available is a relatively late document possibly associated with the time that some properties were sold off to private owners.

In Mollie’s there is some information available regarding some of the mine managers, but specific information relating to either white of black miners are not forthcoming.

Although some of the buildings have been altered in appearance most were well maintained as could be expected from a well run mining company. Even though some buildings have been lost either through mishaps such as fire, or renewal, the greater part of the town is well preserved, especially with the enhancement of atmosphere by the ample planting of indigenous trees.

The conservation efforts of the mine could also be noticed by a number of commemorative plaques that were placed in focal areas on large ore boulders. These include the 50th year of Union, the arrival of the railways and the 50th commemoration of the existence of the mine.

Efforts to restore the first mine manager’s home were made in the past, but typically, because no actual use was ascribed to the building, it was eventually subjected to vandalism. This type of conservation / vandalism is more often than not a negative influence on people associated with conservation action, and should be more carefully planned and executed.

The effort of the mine and its officials that went into the establishment of “Mollie’s” is praiseworthy. In this one little building a wealth of material and information was gathered, that now, and in the future, will be the foundation of further conservation efforts and awareness.

What is most important to realise though with efforts such as this one (and the manager’s house), is that the process of conservation is a journey and not a destination. Once a restored “manager’s house” or a “Mollie’s” is established and “completed” the concerned parties must ensure a continuation of the process by including the projects in a company’s budget and to ensure the continual use or tender of such building or depository on a daily base.

3.12.4 Mostert tunnel cave

The Mostert tunnel cave (MTC) site is situated within the mining area of the Thabazimbi Mine just south of the town of Thabazimbi. Access to the MTC site is through the Mostert Tunnel constructed

during the underground mining of the Thabazimbi Mine during the 1950's. Martini (1986) documented the layout of the MTC refer to Figure 18. The potential exists that the MTC may be affected by mining operations in the Van der Bijl pit. During the EIA the extent of such impact will be assessed and appropriate mitigation identified.

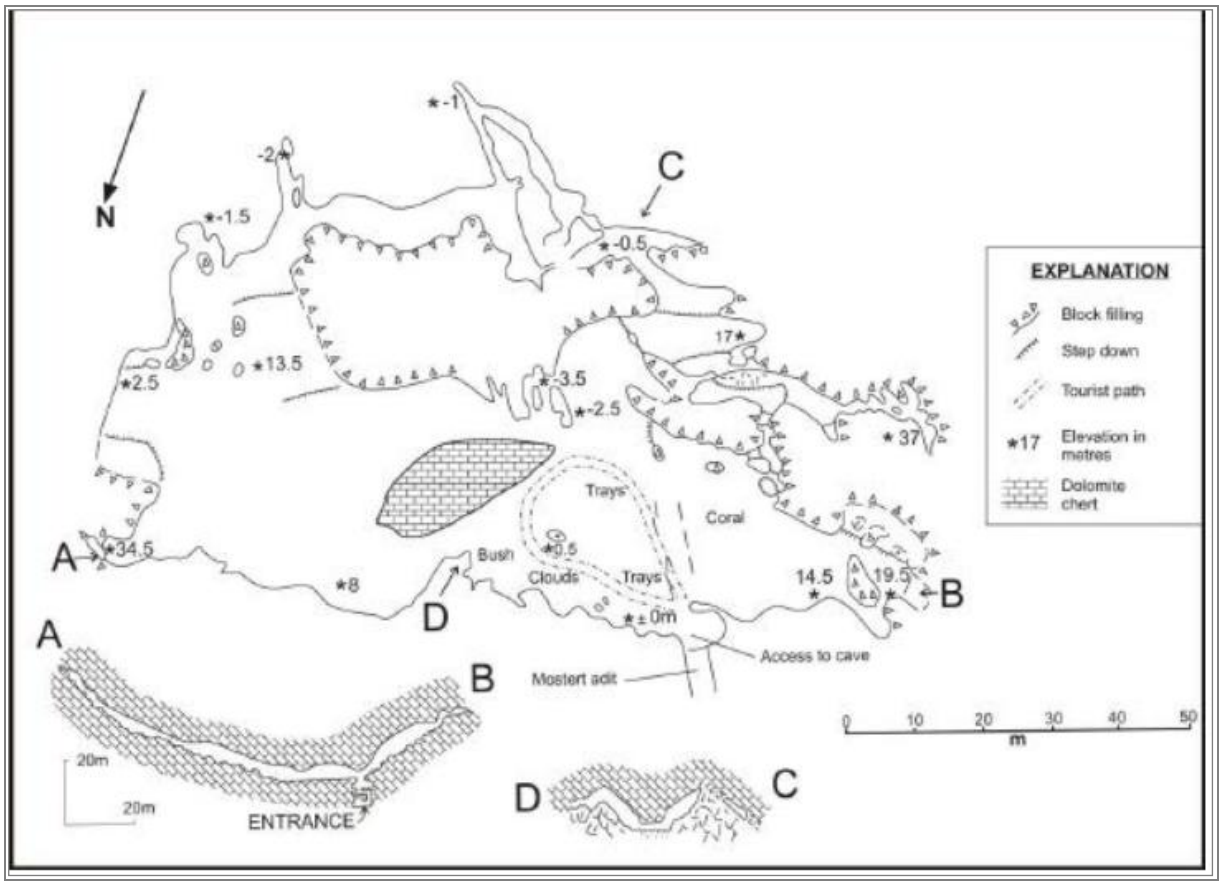

Figure 21: Schematic diagram of Mostert tunnel cave

3.13 Sensitive Landscapes

The following areas were identified on the mine as sensitive landscapes:

- *Acacia erioloba* Camel thorn which occurs along the southern slopes of the Swartrantjie on Buffelshoek 351 KQ.
- *Python natalensis* African Rock Python listed as vulnerable in IUCN 2009, on appendix 2 CITIES, NEMBA 2004 protected species. *Python natalensis* African Rock Python utilises the river banks and rivers. Can be seen as a large predator which control small mammal's populations.
- CR 2 aquatic monitoring point situated at the low water bridge inside of the Ben Albert's Nature Reserve below Rooikuilspruit.
- CR 3 aquatic monitoring point situated upstream of Crocodile and Bierspruit rivers.
- Heritage sites located within Ben Albert's Nature Reserve.
- *Combretum imberbe* (Tamboti) trees in Meyer's myn and Tambotikloof.

- The Mostert Tunnel Cave is deemed to be a potential sensitive area as previous studies have indicated the importance of this site.

3.14 Visual Aspects

The WRDs of Donkerpoort pit and Van der Bijl Pit as well as the WRDs of Donkerpoort West are visible from the main route between Rustenburg and Thabazimbi. The mining operations at Buffelshoek Pit are also visible from the Rustenburg and Brits roads. This includes the WRDs, haul roads and the pit operations. The Kwaggashoek East pit and WRDs can be seen from the eastern residential areas of Thabazimbi. The plant, the workshops and materials management are visible upon entry of town either from the Dwaalboom or Rustenburg roads.

3.15 Socio-Economic Aspects

A Socio-Economic Impact Assessment was undertaken by The Mineral Corporation. This Socio-Economic Baseline Study (hereafter referred to SEBS) is aligned to the framework of the State of the Environment Report (hereafter referred to as SOER) as set out in the Anglo American Mine Closure Toolbox Version 1, 2007.

3.15.1 Mining in Thabazimbi Local Municipality

TLM is endowed with a wealth of minerals and metals especially platinum and iron ore. A number of platinum mining operations such as Amandelbult and Union Mine (Anglo Platinum) and Northam Platinum Mine are situated south of Thabazimbi Town. Other commodities such as andalusite and dolomite are mined from the Rhino Andalusite Mine and PPC's Dwaalboom Cement Operation. There are seven active mines in the Thabazimbi local municipal area. The mining sector is the primary pillar of the Thabazimbi economy and employs 62% of the labour force.

There are still a number of unexploited mineral deposits in the Thabazimbi municipal area. A number of prospecting applications have been submitted to the DMR in recent years. Aquila has three New Order prospecting rights, namely Rotterdam 547 PR, Klipgat 613 PR and Vlaknek 614 PR. In 2007 a mining right application was lodged for the Continental Cement Mine project that is located on Portion 11 of the farm Nooitgedacht 136 JQ and Portion 2 of the farm Krokodilkraal 545 KQ.

Other farms that will be prospected by the South Africa Steel Company (SASCO) pending the conversion of prospecting permits are Weikrans 539 KQ, Weihoek 540 KQ, Groenfontein 458 KQ, Lockshoek 453 KQ, Badenoch, 454 KQ, Buffelshoek 448 KQ, Zandfontein 478 KQ, Paardekraal 502 KQ, Groothoek 278 KQ, Olifantshoek 499 KQ, Donkerhoek 501 KQ, Boschfontein 445 KQ en Donkerpoort 448 KQ.

The mining industry has been affected in several ways by the global economic meltdown in the final quarter of 2008. This has led to mine closures and retrenchments across all commodities. Before the

global economic crisis, mines were expanding in the municipality and new mining projects were in early planning phases. The expectations were that more employment opportunities and increased residential and business development would be created in the area. The high prices of bulk commodities such as iron ore were expected to continue in the near future and this would contribute towards development in all economic sectors.

The current situation in 2009 and beyond seems challenging for both platinum producers as well as Thabazimbi Mine as commodity prices have come down significantly. Recently some signs of recovery in metal prices have been noticed.

3.15.2 Overview of Kumba Iron Ore's Thabazimbi Mine

Thabazimbi Mine is an established open pit operation, with ore processed through a single processing facility. Thabazimbi Mine is located 220 km north-west of Johannesburg and 200 km north-west of Pretoria, in the Limpopo Province. The Mine is situated in the town of Thabazimbi which falls under the jurisdiction of the TLM and the WDM (see Figure 19). Refer to Figure 20, to view the Google image.

Thabazimbi Mine is operated through conventional opencast methods, including blasting, drilling, loading and hauling. Rotating drills, haul-trucks and rope shovels, as well as supportive equipment are some of the major infrastructure and equipment used. The Mine produces a total annual tonnage of 2.7 Mt. The operation is considered to be a short-life operation although investigations into The Project Infinity, a significant LoM extension project, are well-advanced.

3.15.3 History of Thabazimbi

Iron has been mined in the Thabazimbi district since approximately 1500 AC. Ancient mining shafts were discovered when ISCOR started with exploration activities in the area in 1919. However, large-scale exploration began only in the early 1930s when ISCOR acquired the mineral rights. Substantive mining operations began in 1934, primarily providing ore for consumption at ISCOR's furnaces in Pretoria. Mining activities started underground and then with surface mining in 1942.

The town of Thabazimbi, which means "mountain of iron" in Tswana, was officially proclaimed in 1953. By 1975 it had attained a town council. Thabazimbi Mine remained the main supplier of iron ore in South African until 1958, when Sishen in the Northern Cape came into production. The Thabazimbi plant was the template for the first beneficiation plant of Sishen. Underground mining was stopped in 1997, with surface mining being the current method of operation.

The major South African steel producer for more than 70 years, ISCOR, was privatised in 1989. In 2001 it was unbundled into two separately listed mining and steel companies, namely Kumba Resources and ISCOR, respectively. ISCOR was renamed AMSA with effect from 11 March 2005 and

was listed on the JSE in the same year. In the following year, 2006, Kumba Resources was unbundled as part of an empowerment transaction that resulted in the JSE listing of Kumba Iron Ore (KIO) on 20 November 2006, and the re-listing of Kumba Resources as Exxaro on 27 November 2006.

Today, KIO operates Thabazimbi Mine in a town that has been transformed from a small mining town into a bustling economic centre with a friendly and proud population of almost 25 000 people. The town is the main hub of the municipal area and is centrally located. The town provides the majority of services to the rest of the municipal area and has a well-established business and industrial area. Although the town is still largely dependent on mining, it is becoming one of the fastest growing eco-tourist growing points in the country.

3.15.4 Thabazimbi Mine Labour Demographics

Every effort has been made during this study to understand the nature and demography of the workforce and the location of the labour-sending and other dependent communities. The point of departure was to analyze payroll information in detail, tracing postal codes to towns, towns to municipalities and municipalities to provinces, establishing a demographical database or map set of the workforce.

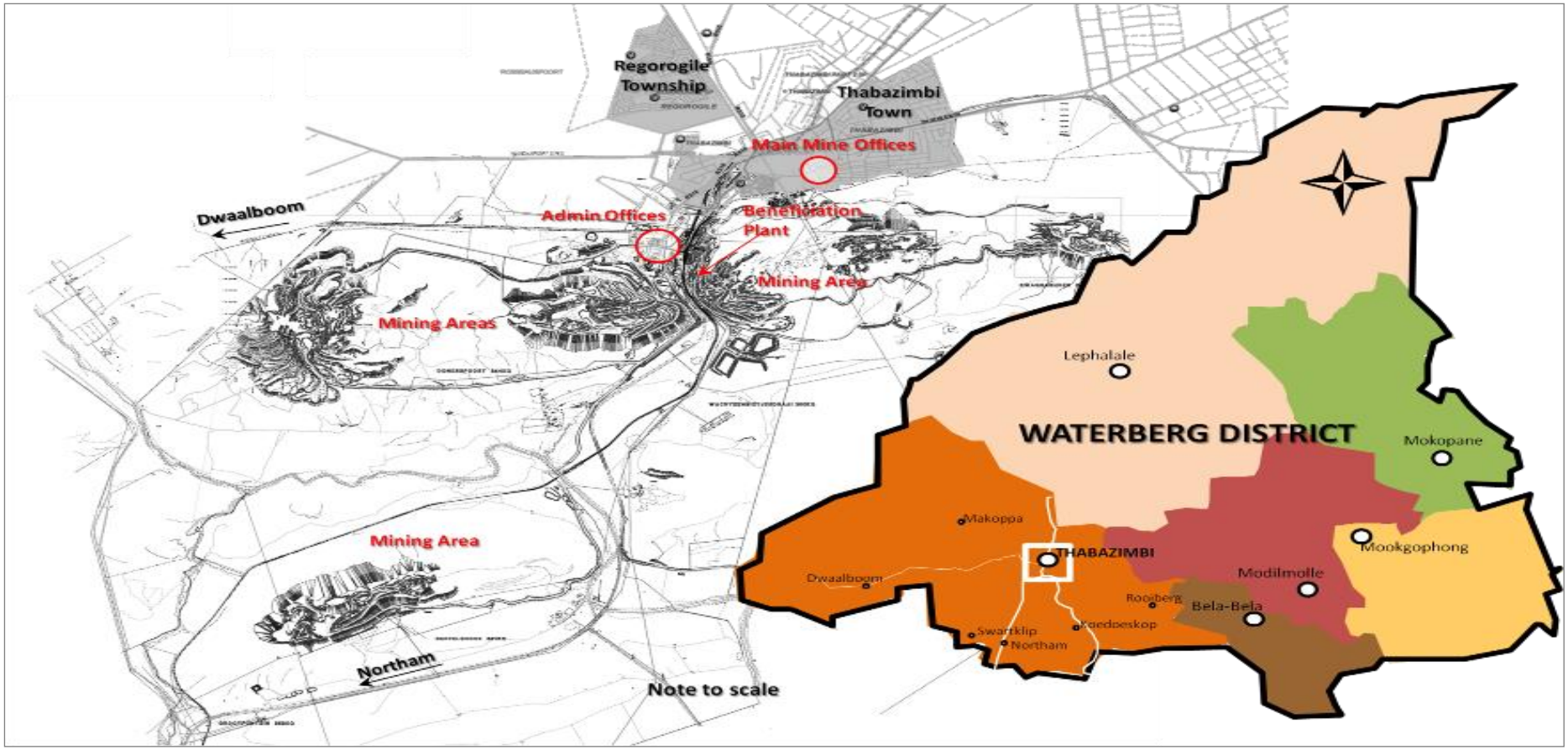

Figure 22: Thabazimbi Mine Locality Map

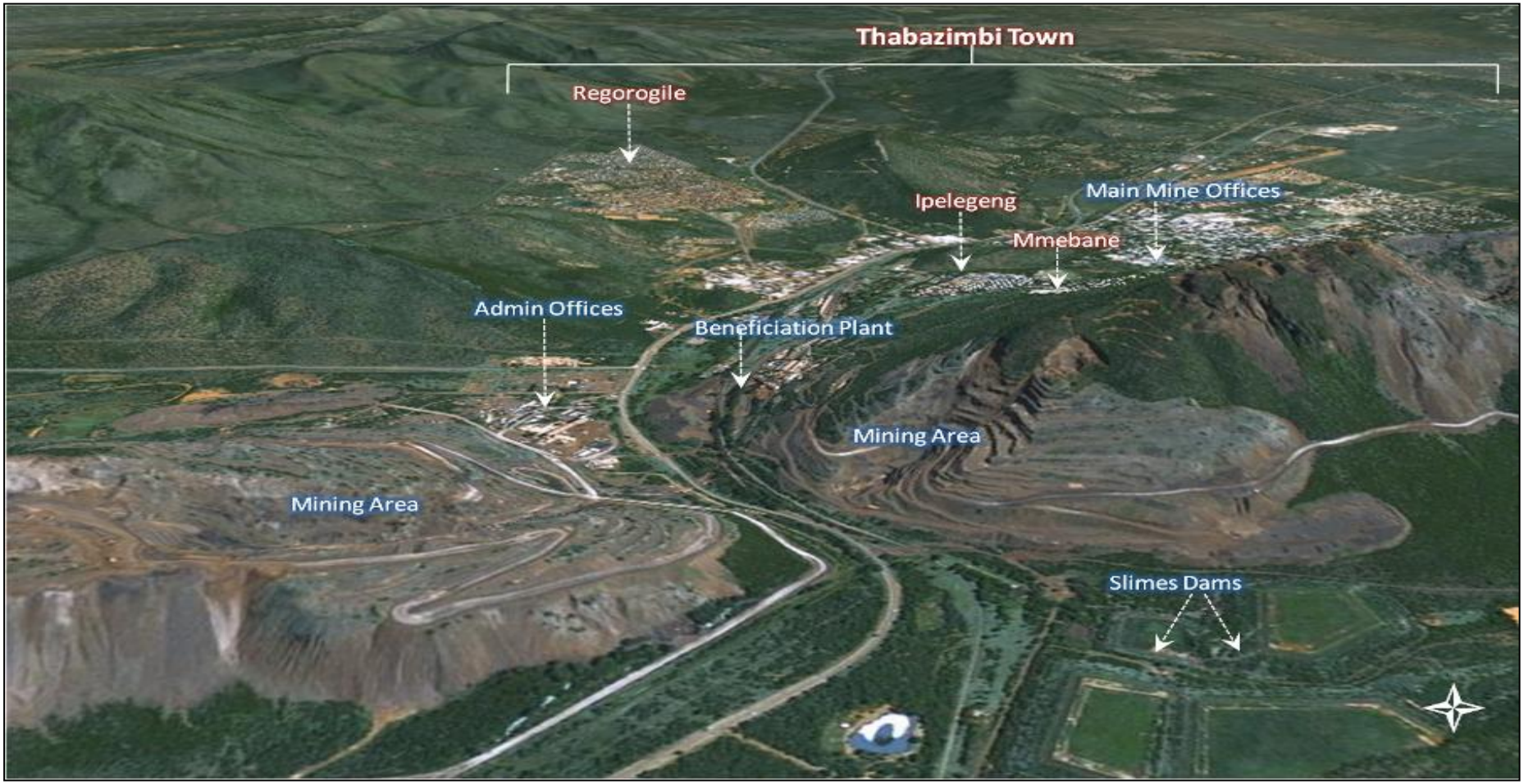

Figure 23: Google Image of Thabazimbi Mine

3.15.4.1 Defining Mine Labour

In this study, mine labour is defined as those employees who are employed directly by Thabazimbi Mine (hereafter referred to as permanent employees) and the Mine's full-time contractors (hereafter referred to as contractor employees). Note that when reference is made to mine employees it will include both permanent and contractor employees.

The labour demographic analysis was conducted on a sample of 626 permanent employees out of a total of 835. The Mine's total workforce is employed in the following departments:

- Safety, Occupational Health & Hygiene;
- Mining Operation;
- Beneficiation Plant;
- Engineering;
- Materials Management;
- Human Resources;
- Mine Management; and
- Finance and Administration.

A total of 365 contractor employees are employed in a full time-capacity. A sample of 209 contract employees was used in the demographic analysis.

Table 33 provides a list of Thabazimbi Mine's contractor employees that will form part of this study. These contractors, specifically those based in Thabazimbi, are dependent on the existence of Thabazimbi Mine. Some of the contractors such as Apies Cleaning, FJR Services, Tsakane Cleaning Service, Mmebane Cleaning and Bingo Paradys Cleaning & Garden Services were assisted by the Mine as part of its SMME development programme.

Table 33: List of Full Time Contractors

CONTRACTOR COMPANY	NO OF EMPLOYEES	WORK AREA	TOWN
Makgabo	1	Security	Thabazimbi
Ewaltie	2	Safety, Occupational Health & Hygiene	Thabazimbi
Rosond	14	Mining	Thabazimbi
Bakone	6	Mining	Thabazimbi
Bonec Mining	2	Mining	Lephalale
SPH	21	Mining	Rustenburg
ITP	65	Labour hire	Thabazimbi
Roux Engineering	78	Engineering	Thabazimbi
Waterkloof	30	Engineering	Thabazimbi
Mckeep	10	Engineering	Thabazimbi

CONTRACTOR COMPANY	NO OF EMPLOYEES	WORK AREA	TOWN
Trentyre	9	Engineering	Johannesburg
Robbies	9	Engineering	Thabazimbi
Cummins	2	Engineering	Johannesburg
Diesel Electric	1	Engineering	Rustenburg
Africa Explosive Ltd	2	Drilling and Blasting	Johannesburg
Fidelity Super	21	Cleaning	Johannesburg
Dust A Side	19	Cleaning	Pretoria
Tsakane Cleaning Services	12	Cleaning	Thabazimbi
Apies Cleaning Services	9	Cleaning	Thabazimbi
Mmebane Hostel Cleaning	7	Cleaning	Thabazimbi
Bingo Paradise	5	Cleaning	Thabazimbi
Makenzie Pebane	1	Civil Works	Thabazimbi
Royal Foods	15	Catering	Thabazimbi
Royal Sechaba	2	Catering	Thabazimbi
Hosch Scrapers	2	Beneficiation Plant	Johannesburg
JC De Lange	7	Beneficiation Plant	Thabazimbi
Frazer Alexander	13	Beneficiation Plant	Johannesburg
Total	365		

Both permanent and contractor labour fall into one of three categories:

1. Local employees are those who originate from the TLM and usually speak Setswana as their first language;
2. Migrant workers are those who come from labour-sending areas to the Mine for the purpose of employment. These migrant workers generally return to their rural homes during annual leave or when their employment with the Mine has been terminated. During their employment at the Mine, these workers reside in the mine hostel or in other local quarters; and
3. Transitional workers are those who bridge the definition of local and migrant workers, by falling into both categories. They are migrant workers who have worked at the Mine for a long period and have established urban (second) families locally. These employees are effectively semi-permanent local residents who continue to maintain and support other (first) families in rural areas. It is these workers that will not return to their rural homes and first families when the Mine closes down.

3.15.4.2 Defining the Mine Community

In this study the mine community is defined as those towns, villages and settlements that fall within a 5 km radius of the Mine (see Figure 21). It includes areas such as Regorogile (Extensions 1 – 7), Ipelegeng, Mmebane and the town of Thabazimbi.

Figure 21 shows that 96% of Thabazimbi Mine's employees are currently living in the town of Thabazimbi and its neighbouring townships (the mine community). These employees can be classified as local, migrant and transitional. Only 4% of these employees live in areas such as Dwaalboom, Makoppa, Northam and Koedoeskop - they are mostly contractors, who travel to the Mine on a daily basis.

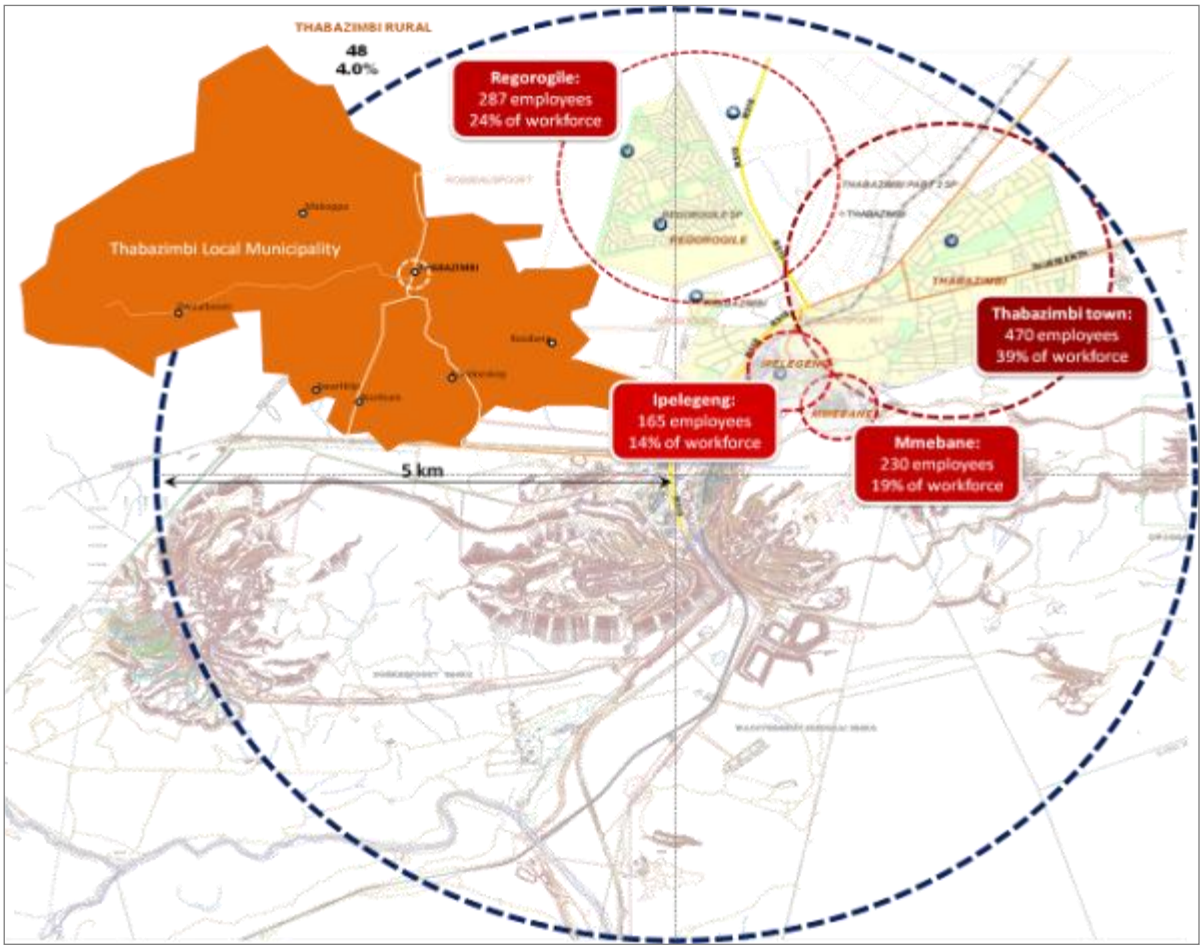

Figure 24: Mine Community – Labour Demographics

3.15.4.3 Defining Labour-Sending Areas

A labour-sending area is a municipality outside the mine community from which the Mine sources its labour i.e. migrant labour or transitional employees. Those municipalities, outside the TLM, from which more than 2% (+25 employees) of labour is sourced, are considered as labour-sending areas. Technically, only those local municipalities, where more than 10% (+120 employees) of the Mine's labour are sourced from, can be classified as major labour-sending areas. However, those labour-sending areas that have a significant direct and indirect community dependency on Thabazimbi Mine's wages will also be considered as a major labour-sending area. In this case it will be Moses Kotane Local Municipality (hereafter referred to as MKLM) and Molemole Local Municipality (hereafter referred to as MLM).

The Thabazimbi Mine labour complement of 1 200 employees is sourced from some 77 local municipalities across South Africa's nine provinces. Of these municipalities, only nine contribute more than 2% of the Mine's labour complement and are considered labour-sending areas (**Figure 22**).

It is estimated that almost 87% of the mine employees that originate from these areas are migrant workers. Approximately 13% are transitional workers who have indicated that they will not return to their rural homes upon mine closure and will continue to stay in the mine community (Thabazimbi) with their second families. It must be noted that Thabazimbi Mine has started to convert its single sex hostels to family units and some migrant employees have already brought their families to come and stay with them.

The demographic analysis of the Mine's workforce shows that 59.1% of the workforce come from the Limpopo Province, followed by North West (24.3%) and Gauteng (6.1%). Only 25.4% of the entire workforce originally came from the TLM with a significant number of employees migrating from Moses Kotane (15.1%) just south of the municipal border and Molemole (7.5%) some 300km towards the north-east of Thabazimbi.

Permanent employees' demographic patterns are interestingly different from that of the contractor employees. Proportionally, more contractors are recruited from the platinum mining areas of North West Province and the labour-sending area of the Eastern Cape, while Thabazimbi Mine employees are mostly recruited from Limpopo and Gauteng Provinces (**Figure 22**). The assumption is that contractor companies source their workers from those areas where mining companies operate.

3.15.4.4 Migrant Labour

Migrant labour refers to workers who originate from the labour-sending areas, live in hostels or other mine-provided accommodation, and who have no formal local dependants. These migrant workers have different social, economic and development issues to the mine community residents.

Three types of migrant labour are referred to in this study:

1. Provincial migrant workers are those migrant workers who come from areas within the Mine's host province Limpopo but outside the mine community – these workers come from areas such as Soekmekaar in MLM, Lephalale (previously Ellisras), Thohoyandou in the Thulamela Local Municipality, Polokwane, and Tzaneen.
2. South African migrant workers are those migrant workers who come from other South African provinces namely North West Province (Saulspoort, Ramokokastad, Rustenburg and Brits), KwaZulu Natal (Dannhauser and Newcastle) and the Eastern Cape (Elliotdale).

3. Foreign migrant workers are those migrant workers who come from neighbouring SADC states. A total of 19 employees (1.5%) come from countries such as Botswana (0.5%), Namibia (0.5%), Zimbabwe (0.2%), Zambia (0.2%), and Ghana (0.1%).

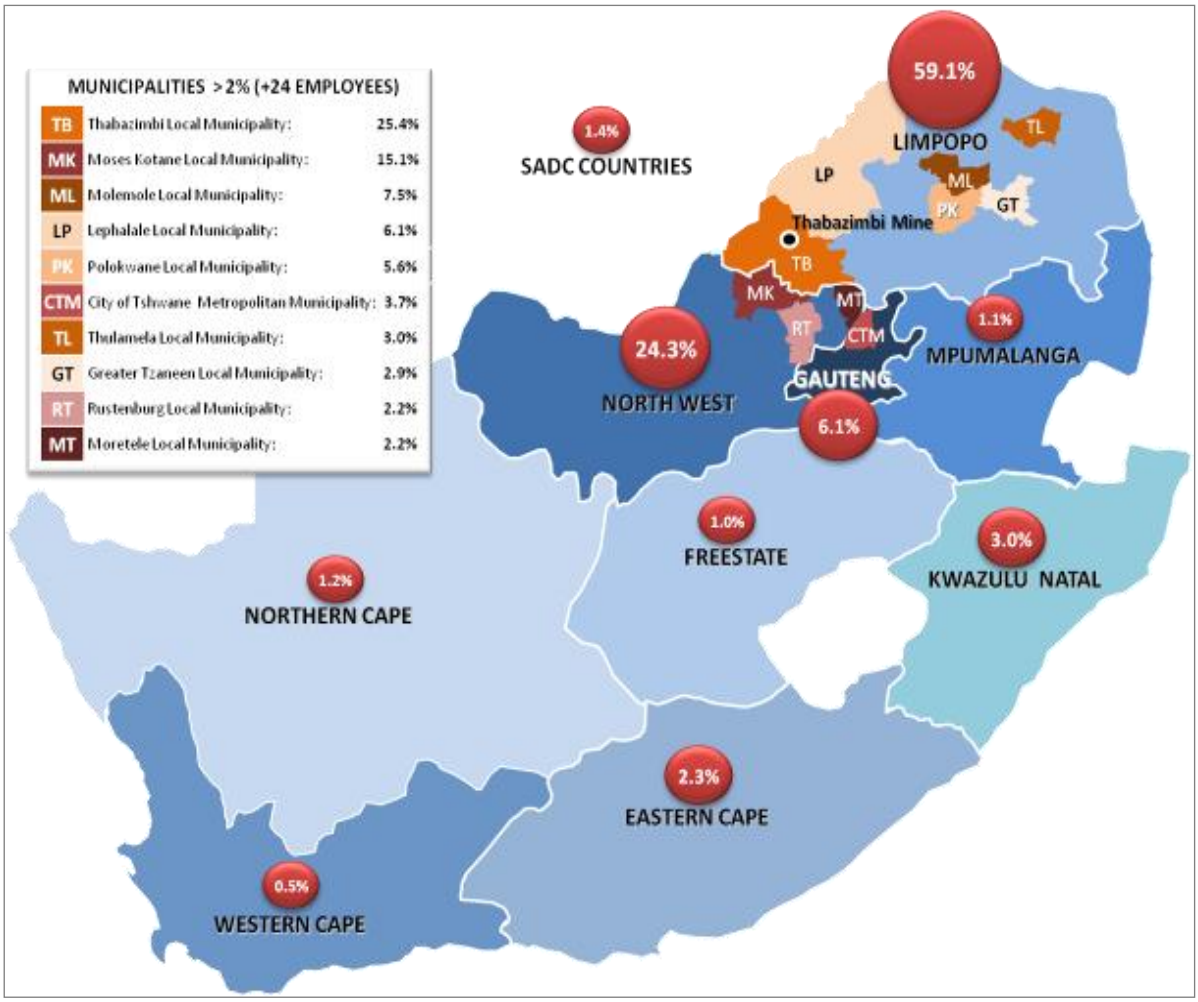

Figure 25: Thabazimbi Mine's Labour Sending Areas

3.15.4.5 Transitional Workers

These are 'migrant' workers who have been working at the Mine for a long period and have either established urban (second) families locally or have taken advantage of the Mine's home ownership schemes to bring their families to the mine community. Transitional workers are effectively 'semi-permanent' local residents that will continue to maintain and support those dependents in labour-sending areas that have been left behind.

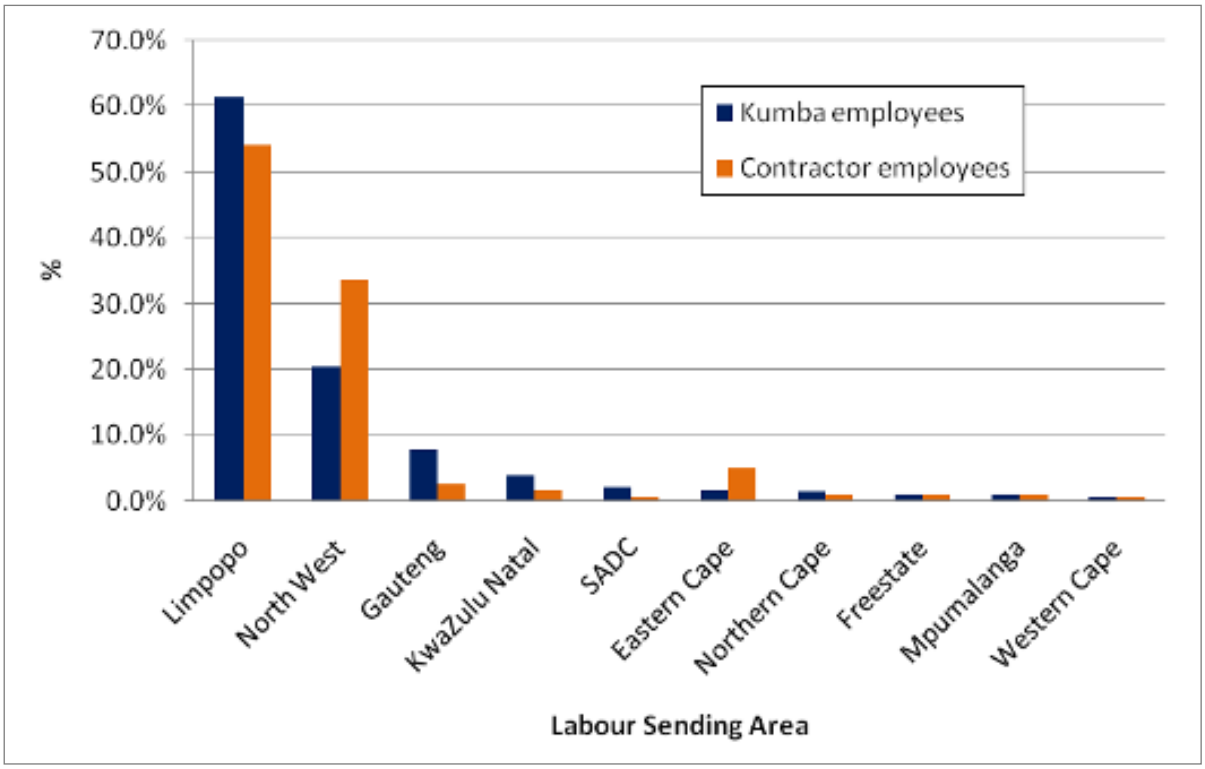

Figure 26: Employee Demographic Comparison

A significant number of employees above the age of 50 years old can be classified as transitional workers as these employees have established themselves in Thabazimbi and will not necessarily return to their labour-sending municipalities. A sample survey, where employees (>50 years old) indicated their preferred town/city of retirement, shows that 110 employees wants to retire in TLM compared to only 63 who were originally sourced from this particular municipality (refer to Figure 22). This means that about 47 transitional workers will remain in Thabazimbi upon retirement. On the other hand, only four of the ten employees from Moretele Local Municipality may ultimately return to their rural homesteads on retirement. It can also be inferred from Figure 22 that in three other municipalities (Molemole, Moses Kotane and Greater Tzaneen) more than 80% of the migrant workers will return to their rural homesteads.

3.15.4.6 Thabazimbi Mine Labour Profile

The following information is only applicable to the permanent employees at Thabazimbi Mine because limited information was available regarding full-time contractors.

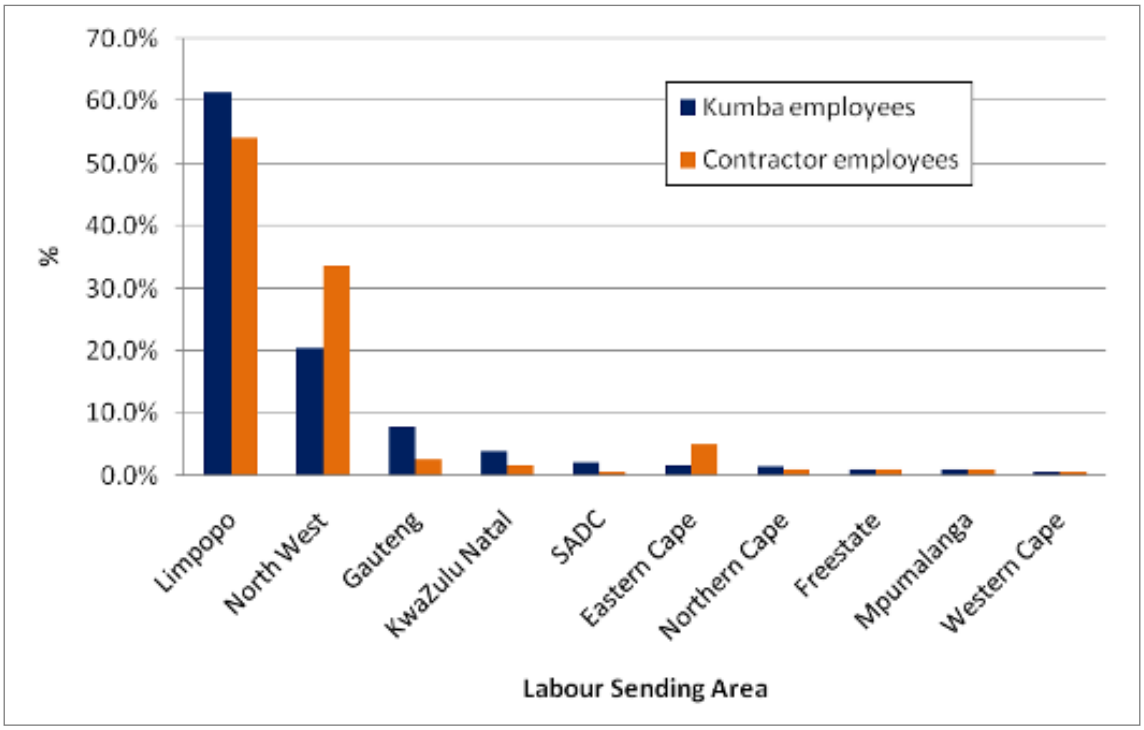

Figure 27: Employee Demographic Comparison

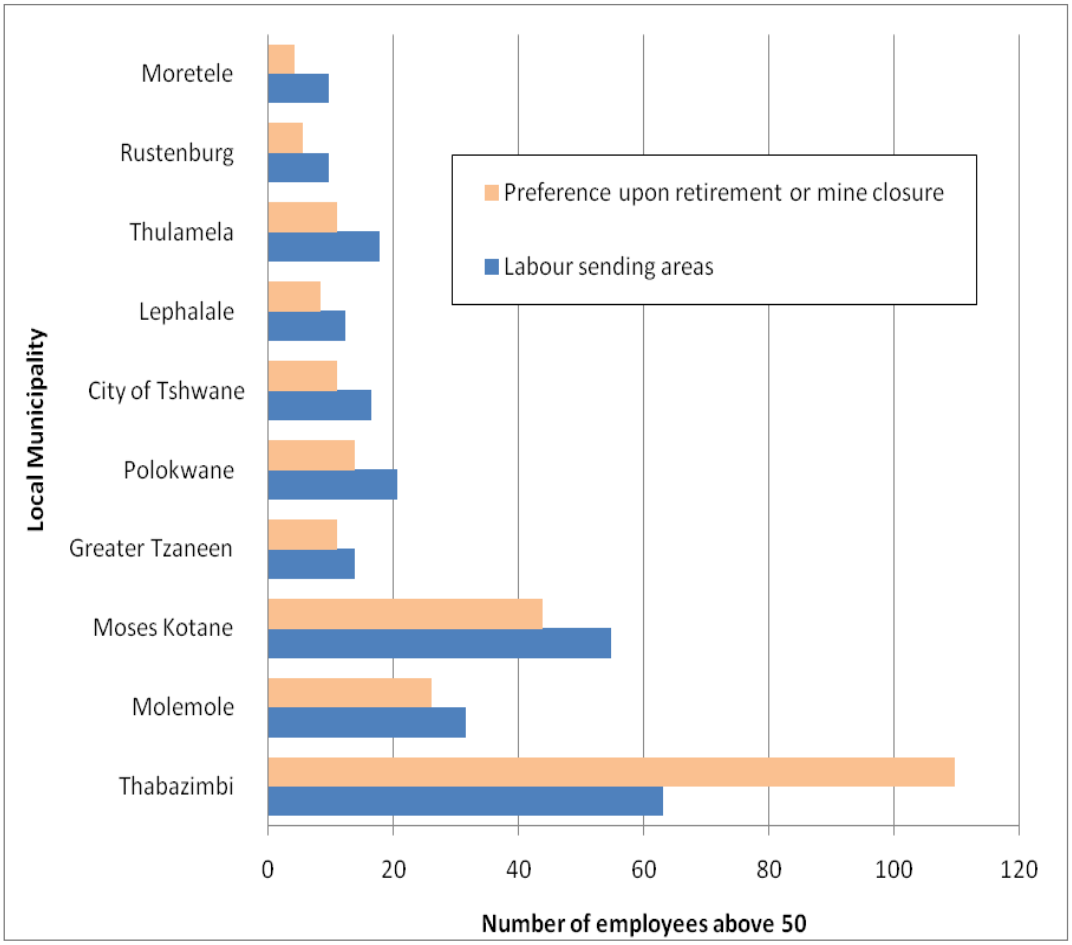

Figure 28: Labour-Sending Area vs. Preferred Municipality of Retirement

3.15.4.7 Race and Gender

Thabazimbi Mine's permanent employees comprise mainly of Historically Disadvantaged South African (HDSA) workers (73%), black Africans in particular. White employees comprise 27% of the workforce with 10% of the workforce being female and 90% being male, refer to Table 34.

Table 34: Race and Gender of Permanent Employees

CATEGORY	PERMANENT EMPLOYEES			
	Male		Female	
	HDSA	White	HDSA	White
Number of employees	568	189	47	31
Percentage employees	67%	23%	6%	4%

3.15.4.8 Language

The major language spoken by the workforce is Setswana (41%). This is followed by Afrikaans (26%), and Sepedi (19%). The large Sepedi workforce reflects the migrant labour component from the village of Soekmekaar in the MLM, north of Polokwane. Refer to Figure 26.

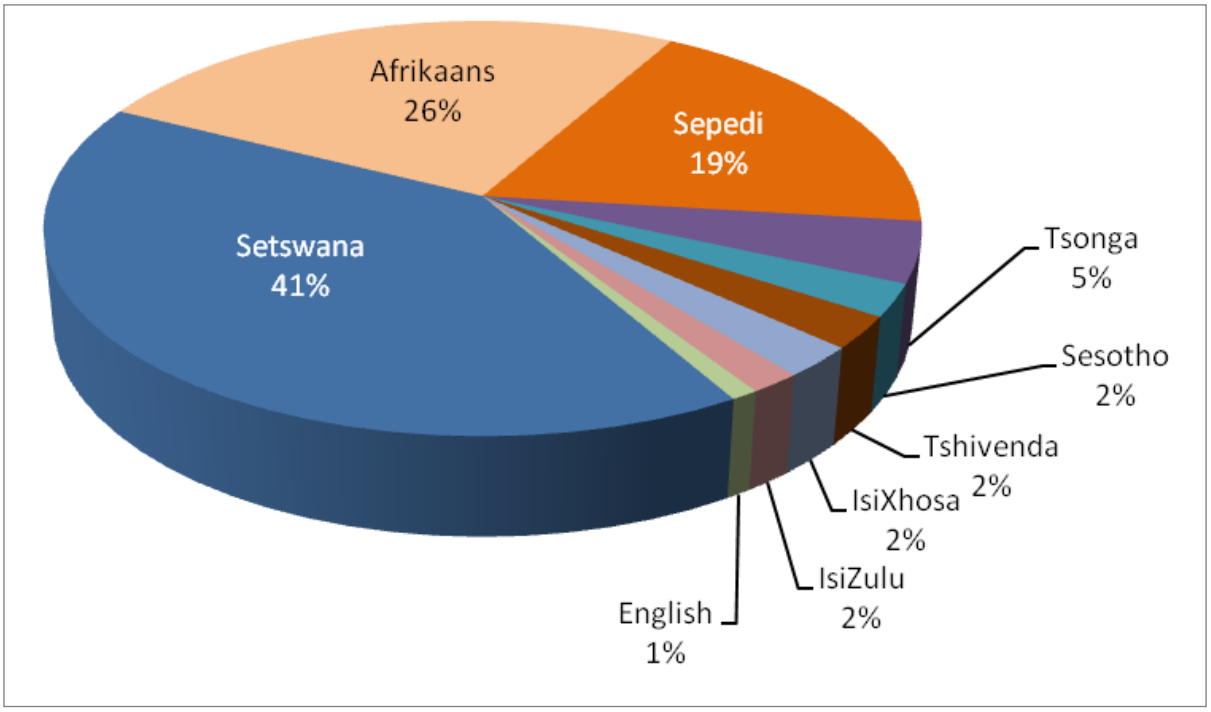

Figure 29: Language Profile of Permanent Employees

3.15.4.9 Age and Service Profile

The age and service statistics indicate a high degree of workforce stability, maturity and experience. The Thabazimbi Mine's permanent workforce is relatively mature with an average age of 42 years; 30% of the workforce is 50 years and older, while only 9% are below the age of 30.

The average length of service for the permanent workforce is 20.6 years, with 17% having been with the Mine for over 30 years and a 64% having been employed for more than 20 years. Only 20% of the 835 permanent employees have been with the Mine for less than 10 years.

Figure 27 compares the age and service profiles of the different race and gender groupings at Thabazimbi Mine. HDSA males, which comprise mainly black Africans, are on average the oldest (47 years) and have the longest service records with the Mine (23 years), while their HDSA females are the youngest (36 years) and have the shortest service profiles (6 years).

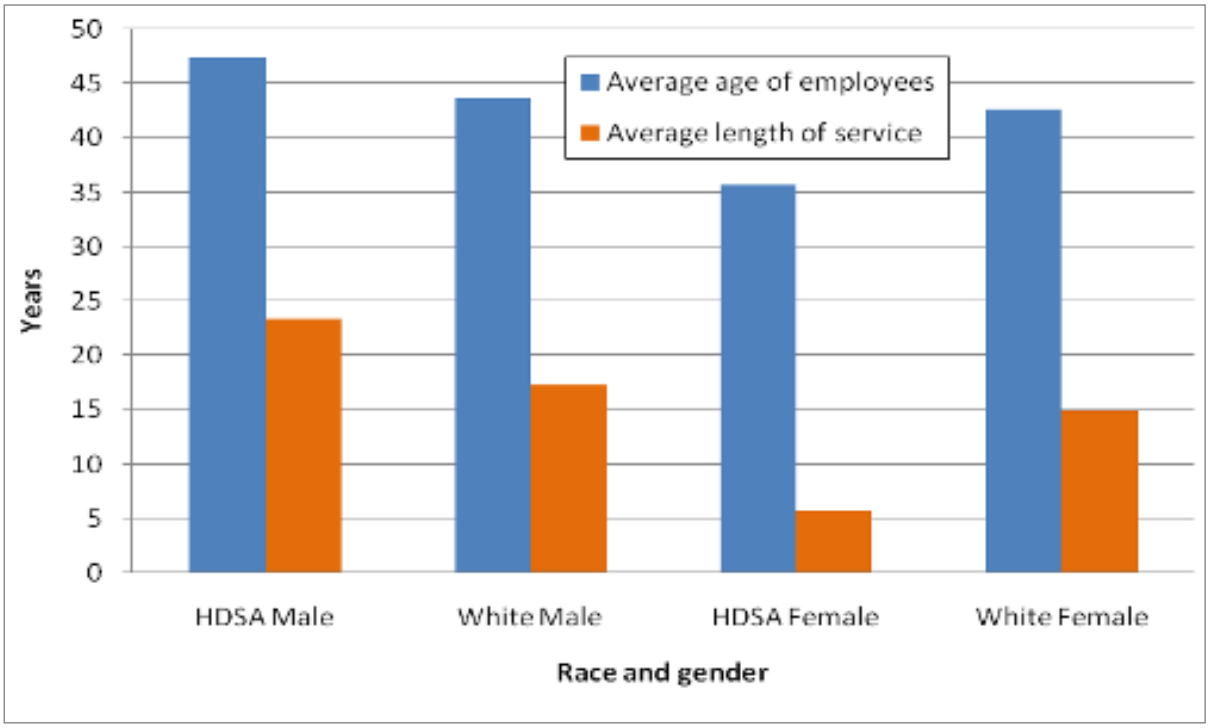

Figure 30: Average Age and Length of Service of Permanent Employees

3.15.4.10 Educational Levels

The overall education levels for the Thabazimbi Mine's permanent workforce are given in Table 35. Taken directly from the 2009 Workplace Skills Plan, it shows that 39.3% of the workforce is regarded as functionally illiterate as they have a qualification less than ABET Level 4. HDSA males have the highest illiteracy rate at 47% followed by HDSA females at 12%.

Thabazimbi Mine supports the national ABET drive and is committed to the targets as set out in the Mining Charter. Thabazimbi Mine has implemented an ABET programme where ABET candidates are screened and counselled on the requirements of ABET.

With reference to a matriculation certificate - 100% of white females, 84% of white males and 76% of HDSA females have Matric, while only 20% of HDSA males have attained a Matric. Table 35 further shows that proportionally females have more tertiary qualifications than their male

counterparts with 17% and 30% respectively for HDSA and white females having a first degree/higher diploma or higher.

Table 35: Educational Levels of Permanent Employees

CATEGORY	PERMANENT EMPLOYEES			
	Male		Female	
	HDSA	White	HDSA	White
Illiteracy (<NQF 1)	47%	0%	12%	0%
Employees with Matric (NQF 4)	20%	84%	76%	100%
Employees with first degrees/higher diplomas and higher (NQF 6-8)	2%	10%	17%	30%

3.15.4.11 Occupational categories

Figure 28 demonstrates the distribution of the permanent workforce's occupational categories. Specific trends are evident. White males are mostly employed as managers, professionals, technicians and trade workers such as artisans. HDSA males are employed to a large extent in lower skill jobs such as plant and machinery operators, and elementary workers.

Most female employees are employed as clerks, admin workers and professionals.

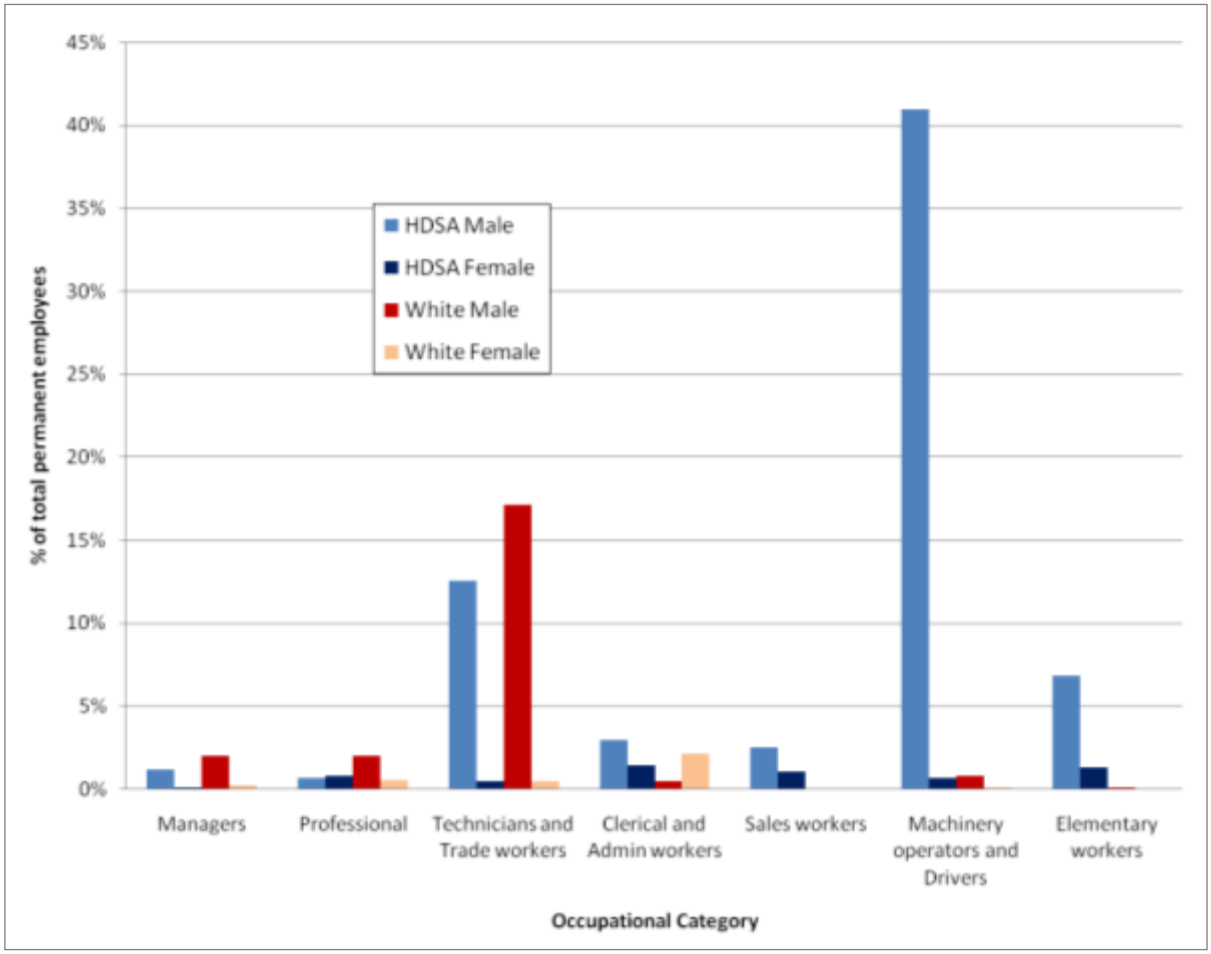

Figure 31: Occupational Category

3.15.4.12 Remuneration

In terms of annual remuneration white males and females are earning significantly more than their HDSA colleagues. HDSA females are earning slightly higher salaries than their HDSA male counterparts. The average net salary (disposable income) per employee, including bonuses, is R 13 462 per month or R 161 548 per annum. For HDSA employees this figure is just over R 11 000 per month.

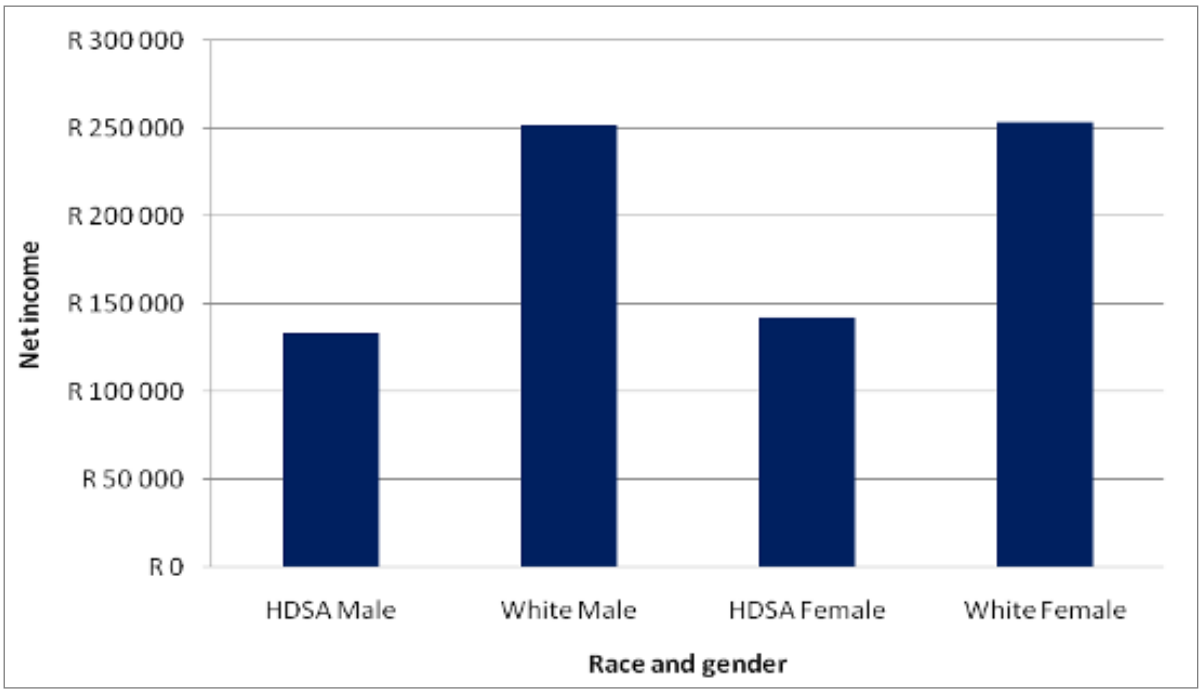

Figure 32: Average Net Income for Permanent Employees

3.15.4.13 Health of Employees

Thabazimbi Mine is committed to eliminating all occupational illnesses and injuries from Thabazimbi Mine. The Safety, Health and Environment (hereafter referred to as SHE) policy outlines the commitment to develop, communicate and review responsible and innovative policies, programmes and guidelines that provide safeguards for employees and contractors.

Unfortunately mining inherently causes certain illnesses such as pneumoconiosis, asbestosis, chronic obstructive airways disease, hand-arm vibration syndrome, Noise-Induced Hearing Loss (hereafter referred to as NIHL) and occupational asthma.

According to the views and opinions from Organs of State as captured during the consultation exercise, it was found that a certain number of long serving older employees suffer from pneumoconiosis and NIHL due to underground activities some 20 years ago. Although these cases need confirmation, the impact, management and mitigatory measures in this study will make reference to this issue.

The hostel system on mines has contributed to the high incidence of HIV/AIDS in mining communities. Thabazimbi Mine's wellness programmes aim to LDEDETI with the effects HIV/AIDS has on its employees, the affected primary and extended families, the community and on its operations. The Mine has a HIV/AIDS committee that is registered with the provincial Department of Health. The Mine also collaborates with an NGO, the Human Health Development Trust, on a broader HIV/AIDS capacity building project in Thabazimbi. Employees receive awareness education, peer educators have been trained and an Employee Assistance Programme (EAP) has been implemented.

3.15.4.14 Housing

Thabazimbi Mine's employees are accommodated in four residential areas: the Mmebane Hostel, Ipelegeng Township, Regorogile Township and Thabazimbi Town. Mmebane was an old concrete hostel originally consisting of nine blocks with cement slab beds, built in 1943 for migrant labourers. Six extra blocks with steel stack-type beds were added in the 1960s to accommodate an increased workforce. The hostel eventually had a total of 3 120 residents. On average, 24 people shared one room at a time and living conditions were unsatisfactory. These conditions had a serious impact on social well being and on production.

Ipelegeng was built in 1948 by ISCOR to be the first residential area where HDSA employees could live with their families. At the time, 100 families were accommodated at Ipelegeng. The semi-detached houses consisted of two bedrooms, a kitchenette and a living area, while residents had to make use of communal ablution facilities.

At the time Kumba Resources began to improve the living conditions of employees in these residential areas by upgrading houses at Ipelegeng and de-densifying Mmebane. In Ipelegeng some houses were converted into four- and three-bedroom detached units and others into two-bedroom semi-detached houses. Ablution facilities were added to all units.

The de-densification of the Mmebane Hostel was completed in the early 1990s with each room reduced to accommodate 12 people at first and later to eight people. In 2003 these dormitory-type rooms were further converted into two- and three-bedroom units, which now house one family or a single employee. Thabazimbi Mine has spent significant resources on upgrading hostels to family units and single quarters thus far.

Thabazimbi Mine also introduced a housing strategy which encouraged home ownership. This initiative involved selling houses previously owned by the Company, to employees. First preference was given to employees with a long-service record. To date, of the 199 houses at Ipelegeng, 78 have been sold to employees. Of the 405 houses, owned by Thabazimbi Mine in Thabazimbi, 325 have been sold thus far. It is anticipated that more of the remaining Company

houses will be absorbed by employees in 2011 when they receive their payouts from the Thabazimbi Mine Employee Share Participation Scheme (Envision).

Today, a total of 405 (33.8%) mine employees (including full-time contractors) are accommodated in mine-owned accommodation, which includes 230 people in Mmebane Hostel, 121 in Ipelegeng and 54 in Thabazimbi Town.

3.15.4.15 Labour Analysis

This labour analysis shows a few predictable trends:

1. Women have only being employed in recent years as a result of the targets set for women in mining by the MPRDA and Mining Charter. These women, mainly black African, are young, single (only 38% are married) and have an adequate level of education. Those with higher educational levels are employed as clerks or professionals and in few cases in management positions. Those with low educational levels are employed as cleaners, general workers and helpers. White women, on the other hand, have been employed for many years mainly in office positions such as clerks. These women are either wives (77% are married) or family members of white male employees or ex-employees. All of them have Matric.
2. HDSA males, which comprise almost entirely of black Africans, are in the majority at Thabazimbi Mine. They have the typical mine worker profile which means that they are mostly migrant by nature, the longest serving employees, have a low educational level, are employed as operators and general workers, earn the lowest salaries, and are supporting their families (77% are married) in labour-sending areas. White males, in contrast, are well educated, earn the highest salaries, and are employed mainly in managerial or supervisory positions.
3. Employees from Soekmekaar in the MLM have an average age of 49 years and an average length of service of 28 years. More than 80% of these workers indicated that they would go back to their rural homes when the Mine closes or when they retire. The majority (59%) of them is illiterate and therefore these employees deserve specific attention in the Mine Closure section.

3.15.5 Waterberg District

3.15.5.1 Waterberg District Municipality Mining Development Strategy

The purpose of this strategy formulation process, which started in 2006, is to provide the WDM with a policy instrument by which leadership and strategic direction can be given to the mining industry. The goal of the WDM Mining Development Strategy is provide leadership and interventions to increase the contribution from the mining sector to job creation and economic growth in the Waterberg district by:

1. Creating a conducive environment for mining expansion and new mine developments, specifically by facilitating the removal of constraints to such developments;
2. Promoting the capacity of black economic empowered companies from within the Waterberg district to supply the procurement needs of mines according to the required quality standards; and
3. Augmenting the capacity of local municipalities, traditional leaders and communities to respond to and consolidate the benefits of mining developments within a cluster context.

Strategies to achieve some of the above objectives are to improve spatial planning and land-use management systems at the local level; to improve local economic development planning and management capacity with specific reference to the mining sector; and to promote community co-operatives for mining development. These aspects are important for this study due to the possible implications of mine closure and the associated collaborative strategies between local government, the private sector and Thabazimbi Mine.

Furthermore, the MPRDA, 2002 gives the WDM no direct authority in terms of mining, but it is obliged to facilitate the economic and mining development processes by building networks and promoting good working relationships between various institutions in the sector.

4. PUBLIC PARTICIPATION PROCESS

Section 24 of the Constitution of the Republic of South Africa of 1996 guarantees everyone the right to an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations. In order to give effect to this right, the NEMA, 2008 came into effect in May, 2009.

In terms of Section 24 (4) of the NEMA, 2008, procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment must, *inter alia*, ensure, with respect to every application:

- Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state.
- That the findings and recommendations flowing from an investigation, the general objective of integrated management laid down in NEMA, 2008 and the principles of environmental management set out in Section 2 of NEMA, 2008 are taken into account in any decision made by the organ state in relation to any proposed policy, programme, process, plan or projects, consequences or impacts.
- Public information and participation procedures which provide all integrated and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures.

One of the general objectives of integrated environmental management laid down in Section 23(2) (d) of NEMA, 2008 is to: “ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment.”

The National Environmental Management Principles as stipulated in NEMA, 2008 say;

- “Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- The participation of all interested and affected parties in environmental governance must be promoted, and all people must have an opportunity to develop the understanding, skills and capacity necessary to achieve equitable and effective participation, and participation by vulnerable and disadvantage persons must be ensured”.

The EIA Regulations of 2010 require that public participation must be done after submission of an application for a Scoping and Environmental Impact Assessment Report (S&EIR).

The public participation process for this project has been conducted in terms of the procedures and provisions of the public participation process in terms of the NEMA, 2008 and Chapter 6 of the EIA Regulations of 2010, as well as other relevant legislation such as the PAJA, 2000 and the PAIA, 2000.

4.1 Method of Notification

4.1.1 Press advertising

The proposed project was advertised in English and Afrikaans in a local newspaper, the Kwêvoel, on 17 August 2012. The Kwêvoel was found to be the most appropriate newspaper in terms of its accessibility and language to the I&APs. A copy of the advertisement and proof of the placement thereof is attached in **Appendix D1**.

4.1.2 On-site advertising

Notice was also given to I&APs by notice boards. Notice boards were placed three different, noticeable and conspicuous places (the entrance gate to the mine, Thabazimbi Spar, Thabazimbi Library and Thabazimbi pick and Pay) on the 21st of Augustus 2012. A copy of the site notice and photographs of the site notices are attached in **Appendix D2**. The location of the site notices are indicated in Plan 5 in Appendix A.

4.1.3 Background Information Document

The Background Information Document (BID) developed for the proposed project provides background information pertaining to the project and is intended to inform I&APs of the proposed project. The BID also includes a registration form which I&APs, stakeholders and organs of state are encouraged to complete in order to register as an I&AP for the proposed project.

The BID was made available to all landowners within and surrounding the mine boundary area of the proposed project, as well as to all organs of state that may have jurisdiction over any aspect of the activity on 15 August 2012. The BID will also be made available to any other person who becomes involved in the ongoing Public Participation Process.

Copies of the BID and proof of distribution of the BID to the adjacent landowners and organs of state have been attached as **Appendix D3**.

4.2 List of I&APs and stakeholders identified

All landowners within and surrounding the mine boundary area of the proposed project are considered to be registered I&APs.

Table 36 below, indicates the list landowners and adjacent landowners identified and notified (by means of e-mail, fax and/or post) of the proposed project. Copies of the notifications to the I&APs have been included in **Appendix D4**.

Table 36: List of I&APs notified

Farm	Landowner	Method of Notification
Klipgat	Bossie Boshoff	e-mail
	Chris Klopper	e-mail
	Flip Steenkamp	Post
	Dr. G.H Boshoff	Post
	Trevor van Zyl	Post
	Hans Pelser	Post
Mooivallei	B. Bronkhorst	e-mail
	Wessel de Clercq	e-mail
	Fred Few	Post
	Roets Nolte	Post
	Gert Swanepoel	Post
	M.F Reinecke	Post
	Mr. De Wet	Post
	M.S.A. Erasmus	Post
	Hans Human	e-mail
Wachteenbietjiesdraai	Henk Broeze	e-mail
	Willie Grimes	e-mail
	D. Lambrecht	Post
	Kallie Stassen	Post
Haakdoringdrift	Johan Coetzee	e-mail
	J. du Buys	Post
Spitskop	George Hattingh	e-mail
	Dave Jooste	e-mail
	Koos Myburg	Post
	Coert Pelser	Post
Langpan	Piet Human	e-mail
Hanover	Janse van Rensburg	e-mail
Grootfontein	Hendrik Jones	e-mail
	P. Rheeders	e-mail
Brakvlei	Marius Schrenk	e-mail
Doornhoek	M. Miller	e-mail
Varshvly	Harm Schutte	e-mail
	John Trollope	e-mail
	Peter Trollope	e-mail
Roodedam	F. van der Merwe	Post
Rosseauspoort	Pieter van Schalkwyk	Post
	Jan C. Viljoen	e-mail

4.3 List of organs of state identified

All organs of state which may have jurisdiction in respect of the proposed project is considered to be registered I&APs.

Table 37 below, indicates the list of organs of state notified of the proposed project. Copies of the notifications to the organs of state have been included in **Appendix D5**.

Table 37: List of organs of state notified

Company Name	Contact Person	Method of Notification
Limpopo Department of Agriculture	Makananisi Funzani Mary	Registered post
Department of Water Affairs	Boatshe Molokwane	Registered post
Limpopo Department of Economic Development, Environment and Tourism	Tinkiyo Malungani	Registered post
Limpopo Department of Mineral Resources	Mr. Kolani Thivhulawi	Registered post
The South African Heritage Resources Agency	Philip Hine APM Impact Assessor	Registered post
Thabazimbi Local Municipality)	Councillor Patricia Mosito	Registered post
Waterberg District Municipality	Councillor Rosinah Mokgotlane	Registered post
Limpopo Department of Agriculture	Makananisi Funzani Mary	Registered post

4.4 I&AP register

All organs of state and landowners within and surrounding the mine boundary area of the proposed project is considered registered I&APs.

Table 38 below, indicates the list of all registered I&APs of the project.

Table 38: List of all registered I&APs

No.	Name	Interest
1	Limpopo Department of Agriculture	Organ of State
2	Department of Water Affairs	Organ of State
3	Limpopo Department of Economic Development, Environment and Tourism	Organ of State
4	Limpopo Department of Mineral Resources	Organ of State
5	The South African Heritage Resources Agency	Organ of State
6	Thabazimbi Local Municipality)	Organ of State
7	Waterberg District Municipality	Organ of State
8	Limpopo Department of Agriculture	Organ of State

No.	Name	Interest
9	Makananisi F. M	Organ of State
10	Hendrik Jones	Public
11	Ampie Venter	Public
12	Dave Jooste	Public
13	Carel Pelser	Public

4.5 Comments and responses report

All issues, comments and questions received from the I&APs up to date have been summarised in Table 39. Where responses are already available as part of the scoping process, these have been included in the Scoping Report in the table below. In all other cases, responses will be provided as part of the final Scoping Report. Copies of the comments received have been included in **Appendix D6**.

Table 39: Issues received to date, and responses to these issues

I&AP	Date	Contact Person	Method of comment	Issue raised	Response
Agric Resource Technician (Thabazimbi Municipality)	17 September 2012	Makananisi F. M	Email	Would like to register as an I&AP	Noted, have been registered.
Rhino Andalusite Mine	23 August 2012	Hendrik Jones	Email	Would like to register as an I&AP	Noted, have been registered.
Ampie Venter	5 September 2012	Ampie Venter	Email	The public meeting should include a facilitator who could speak various languages. Please provide the notule of personnel (farmers associations) consulted.	Noted
Dave Jooste	15 August 20012	Dave Jooste	Email	Confirm will attend public meeting	Noted
Carel Pelser	29 Augustus 2012	Carel Pelser	Email	Confirm will attend public meeting	Noted
Limpopo Department of Economic Development, Environment and Tourism	30 July 2013	Meshack Masindi	Email that the consultant drafted after the site meeting held at the mine on the 30th July 2013.	The Marula tree, *Scelerocarya birrea*, is a protected species and therefore a permit is required to remove a Marula tree. Marula trees were found on the Thabazimbi Mine and the department indicated that permits should be applied for with the Department of Agriculture, Forestry and Fisheries (DAFF) before any of the Marula trees on the mine is removed.	This comment was noted. If any Marula tree has to be removed a permit will be applied for with the Department of Agriculture, Forestry and Fisheries (DAFF).

I&AP	Date	Contact Person	Method of comment	Issue raised	Response
				Heilet showed the area to be covered by the Slimes dam and indicated that the ridge will be used as a wall for the Slimes Dam. The Department indicated that the design of the Slimes Dam should be revisited to provide for a buffer of approximately 25 to 50 m between the ridge and the valley bottom/drainage area in order to create a corridor for biodiversity in the valley bottom/drainage area. This should be addressed and the design included in the draft Environmental Impact Report (EIR) to be submitted to the department for comment.	This comment was noted and this will be investigated in the EIA phase.
				The Department indicated that there are many drainage lines present on site and that Department of Water Affairs should be consulted in this regard and that the design of the Slimes Dam should include sufficient storm water management, as well as clean and dirty water separation.	There is currently an application for a Water Use License for Section 21 (c) impeding or diverting the flow of water in a watercourse; and (i) altering the bed, banks, course or characteristics of a watercourse for the drainage lines around the Slimes dam. A storm water management study is currently underway and will be included in the EIA report.
				The Department indicated that it is evident that there are many protected and endangered species evident on site (with specific reference to the vegetation, small-mammals and reptiles), these species should be listed in the draft EIR and their conservation status should be indicated.	A biodiversity report which includes the fauna and flora will be included in the EIA report.

I&AP	Date	Contact Person	Method of comment	Issue raised	Response
				The ridge may provide a habitat for many reptile species and a reptile study should be conducted.	A reptile and amphibian study will be done during the EIA phase and be included in the EIA report.
				Many alien invasive species are evident on site and an alien invasive species management programme should be conducted and included as part of the draft EIR.	The mine has an alien invasive species management programme this will be included in the EIA report.
				The rehabilitation plan and end land use plan should be discussed and included in the draft EIR.	This comment was noted. The mine currently has a rehabilitation plan that addresses the closure and the end land use of the mine. The rehabilitation plan will be included in the EIA report.
				The Vegetation species, Small mammals and Reptiles should be discussed in detail in the draft EIR in terms of their distribution and conservation status. This should also be included as part of the Ecology study.	This comment was noted.
				Fire could have an impact on the biodiversity in the area. Fire breaks should be prepared and the management of veld fires should be included as part of the draft EIR.	This comment was noted. The mine currently has a land management plan that address the management of fires and firebreaks. The land management plan will be included in the EIA report.

I&AP	Date	Contact Person	Method of comment	Issue raised	Response
				It was concluded that the items above should also be applied to the other proposed infrastructure areas and not only the Slimes Dam. The vegetation, small mammal and reptile studies should form part of the draft EIR and the Rehabilitation, Alien invasive species control plan, fire management and drainage management should be included in the EMP.	This comment was noted. All specialist studies will be done for the entire affected project area and not just for the Slimes dam.
				The department will also comment on the draft EIR (incl. EMP) once it has been submitted and indicate if the points above have been sufficiently addressed.	This comment was noted.

4.7 Public meeting

A public meeting was held on the 4th of September 2012. Stakeholders were notified of this meeting via the newspaper advertisements and on-site notices (refer to Part 4.1), as well as in the BID. The minutes of the public meeting are attached as **Appendix D7**.

4.8 Access and opportunity to comment on the final scoping report

The final scoping report was made available to the public for review for a period of thirty (30) days, (excluding the holiday period from 15 December to 2 January) from the **4 December 2013 - 22 January 2014** (see **appendix D10**). An electronic copy of the final scoping report was posted on the Shangoni Management Service's website (www.shangoni.co.za) for public comment for the same period of thirty days.

All the registered I&APs were notified of the availability of the final scoping report on the website and at Thabazimbi Local Library for public review on 4 December 2013. The I&APs were also informed to complete the register subsequent to reviewing the final scoping report and also to submit any comments no later **than 22 January 2014.**

EAP contact details: Mrs Lee-Anne Fellowes, Shangoni Management Services, P.O. Box 74726, Lynnwood Ridge, 0040, Cell: 082 456 3208 Tel: 012 807 7036 Fax 012 807 1014 , e-mail: leeanne@shangoni.co.za.

5. DESCRIPTION OF ALTERNATIVES

As required in term of the requirements of Regulation 28 (j) (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998 the identified potential alternatives as well as the advantages and disadvantages that they may have on the environment and the community that may be affected have been discussed in this part of the Scoping Report. Also included here is the advantage and disadvantage the proposed project may have on the environment and the community that may be affected.

Alternatives considered in the Draft Scoping Report for the proposed bridge and conveyor system for Project Phoenix are not relevant anymore. There will no longer be a bridge and the conveyor system will only be upgraded.

5.1 Slimes Dam

Three methods for the construction and operating of the slimes dam have been considered:

5.1.1 Disposal Methods

5.1.1.1 Impoundments

The slimes dam will be constructed as an impoundment in which an embankment consisting of waste rock will be constructed to contain the fine slimes. A significant volume of waste rock is produced by the mining operations that can be placed on the embankment instead of on the waste rock dump and thus minimizing the environmental footprint. The cost to construct the wall is therefore only a function of the longer haul distance and controlled placement of the material. Construction of the wall and deposition of the slimes are relatively low risk, as construction will be carried out by contractor experienced in the field.

5.1.1.2 Slimes outer wall

The outer wall will be constructed using slimes deposited by means of spray bars. Spray bars are pipes laid along the outer edge of the perimeter of the slimes dam. The pipes have a series of holes drilled in them, typically 20mm to 30mm in diameter at 1.0m centres. Spray bars are used to reduce the velocity of the slurry on deposition to allow the coarse particles to segregate. The coarse particles then settle out in the outer wall zone at the head of the beach while the fine particles flow down the beach towards the decant structure, thereby improving the consolidation and strength characteristics of the outer wall zone. As the predicted Thabazimbi Project Infinity slimes will be extremely fine (60% -10µm), coarser material will need to be added through a modification of The Project Infinity Plant for this system to be effective. It is estimated that the slimes volume will increase by approximately 20% with the addition of this coarse material. The method poses a high risk and accordingly would have to be managed by an external specialist contractor.

5.1.1.3 Thickened Slimes/ Paste Thickening

The density of the slurry is thickened beyond the conventional range of between 30% and 50% solids, to above 65% solids. The slimes are then deposited using a system such as Robinsky Towers, which allow the slimes to stack as a function of the yield stress. The primary objective of thickened slimes would in this case be to reduce water loss and a reduction in the amount of land sterilized. As water is readily available due to dewatering of mine pits and as the required capital outlay for thickening and pumping the slimes is extremely high, this system will not be considered further.

5.1.1.4 Conclusion in terms of disposal methods

The primary advantage of an impoundment over a facility in which the outer wall is constructed using slimes is the reduction of the hazard posed by the facility. The embankment can be constructed such that it is inherently stable and independent of the rate of consolidation and strength of the slimes. The disadvantage is that the waste rock could take up a significant portion of the available capacity on the site and could also prove to be relatively costly, depending on the haul distance from the pit. Both methods of impoundment and outer wall constructed by slimes deposition have advantages and disadvantages. Therefore, each method was considered on a site-specific basis for each of the various proposed sites for the new slimes feasibility.

5.2.2 Site selection

An initial site selection was undertaken by Fraser Alexander. The Tailings Dam Feasibility Investigation is attached as Addendum 8. A total of five sites were identified and investigated for various deposition methods. Concerns were raised regarding the recommended sites and hence an additional three sites were evaluated. All the sites are indicated in Figure 32.

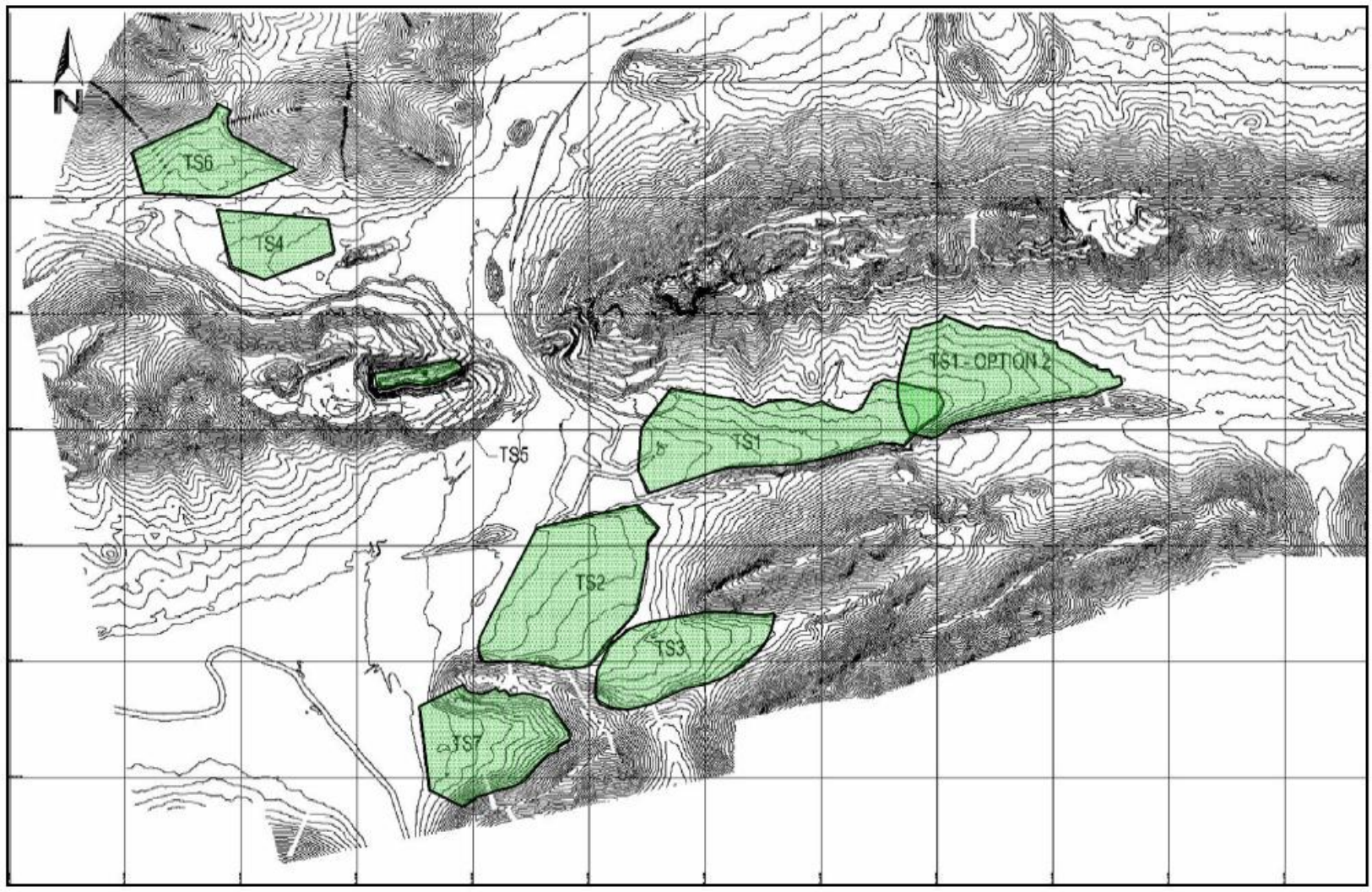

Figure 33: Site Selection

TS1 Option 1

TS1 Option 1 is located east of the existing slimes dams. The site is formed by a natural valley.

TS1 Option 2

TS1 Option 2 is located further east in the valley from TS1 Option 1 with the upper extent of the dam located immediately below the natural water shed to the east.

TS2

TS2 is located south of the ridge used to form two of the existing slimes dams. The mine's explosives magazine is located on the site. An archaeological site is also reportedly located on the site although its importance and exact location have not been verified. The site was shown to be technically suitable in terms of capacity and constructability, however, a significant thrust fault traverses the site in the east-west direction. The fault is considered to be highly permeable and hence there is a potential for contaminating the ground water. The site was therefore discarded.

TS3

TS3 is located in the valley east of TS2. The dam would also be developed as a valley dam. The capacity of the site is limited and hence the site was discarded.

TS4

TS4 is located to the west of the proposed Thabazimbi Project Infinity Plant. The site is the closest to the plant. The site was originally recommended as one of the preferred sites, however further investigation showed that the site is located on deep colluvial gravels, which are hydraulically connected to the aquifer, from which the mine extracts potable and process water. The site was therefore discarded due to the potential risk of contaminating the aquifer.

TS5

TS5 is located in the Donkerpoort Pit. The capacity of the pit is limited and therefore the site was discarded.

TS6

TS6 is located to the west of TS4 across the national road. The storage capacity of the site exceeds the predicted life of mine, however the topography results in a high initial rate of rise thereby requiring a 30m high starter wall if the outer wall is to be constructed using slimes (Tailing outer wall method). The topography also results in a very large embankment being required which would consume approximately 33% of the available storage capacity. The site was therefore discarded due to its inefficient storage characteristic.

TS7

TS7 is located in a valley to the south of TS2. The topography results in an inefficient dam in terms of capacity similar to TS6 and hence has also been discarded.

Remaining Options

The option of utilizing two or more of the sites could be explored if required. A combination of sites TS6 and TS7 for example would assist in reducing the height of the required starter walls or embankments. Due to the additional cost and complexity of operating two detached sites this option was invalidated during the Bankable Feasibility Study (BFS).

The only remaining potential site on mine property is located on the southern boundary, approximately 10km from the plant. It was accepted that this site would be investigated only as a last resort due to the distance from the plant and the lack of a topographic survey of the site.

The only viable potential sites are the two TS1 sites.

TS1 Option 1

The site has sufficient capacity for the predicted life of mine and can be extended further by constructing the outer wall along the southern ridge. Due to the close proximity to existing and future waste rock dumps, it is proposed that the site is developed as an impoundment. The site has an advantage that all storm water from the waste rock dumps will be intercepted by the slimes dam, thereby preventing the flow of contaminated water into the environment as well as allowing this water to be harvested for use as process water. This additional volume of water would then reduce the Plant's demand on the aquifer, which would make more water available for Thabazimbi.

A disadvantage of the site is that its catchment area is some 11km^2 and that it is not technically feasible to divert the flow from the catchment past the dam. It is estimated that in the peak flood resulting from a 1 in 100 year flood event, approximately 1.2 million cubic meters of water would need to be stored on the dam. Preliminary discussions were conducted with the Department of Water Affairs and Forestry's Civil Engineering Department to determine their requirements for permitting the dam. Due to the height and location of the dam and the large catchment area, the dam would be classified as a Category III Dam in terms of dam safety legislation. The classification would raise the technical, permitting and monitoring requirements for the dam. For example, the outer face of the embankment would have to be constructed at a flatter slope of 1(v):5(h) instead of the proposed 1(v):2.5(h), the embankment would have to be founded on bed-rock and a spillway would have to be constructed continuously with the raising of the wall.

The site also falls within the area proposed for the waste rock dump from The Project Infinity Pits. It will not be possible to accommodate the waste rock dump and hence the waste rock will have to be dumped elsewhere, which would increase the haulage costs.

TS1 Option 2

The site is located at the head of the valley to eliminate the storm water concerns with Option 1. The disadvantage of the site is that it is located further from the plant and that the topography makes routing of pipelines and power lines to the dam difficult. The site has sufficient capacity for the life of mine and could be extended to 66 years by raising the embankment further.

The proposed future waste rock dump impacts on the north-west corner of the dam. The layout of the dam can however accommodate the waste rock dump with a marginal sacrifice of storage capacity.

All clean storm water falling uphill of the site can be diverted through the neck to the east of the dam. All storm water from the waste rock dump slopes can be diverted past the dam to the west of the dam to the collection system for run-off from the rest of the waste rock dump.

After discussion with the project team it was decided that TS1 Option 2 was the optimal site and that the conceptual design would be carried out for this site.

Based on the findings of the slimes dam feasibility investigation it was decided that the most appropriate construction design for the identified site would be to develop the facility as an impoundment with the wall constructed of waste rock from the mining operations, which is readily available and will contribute to the re-use practices on the mine. Figure 33 indicated that proposed wall construction of the slimes dam.

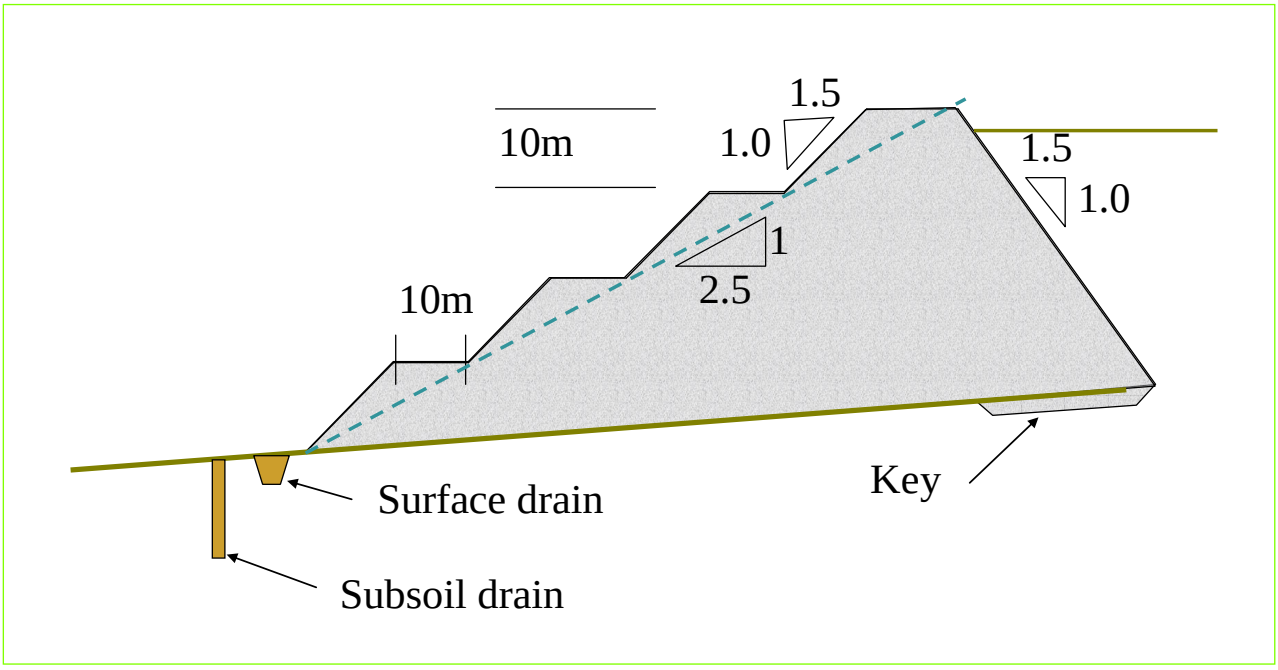

Figure 34: Proposed wall construction of the slimes dam

5.3 The 'No Project Option'

The 'No Project' alternative has been investigated in terms of the above-mentioned alternatives. Without the Project Infinity closure of the Thabazimbi Mine is inevitable.

Expected benefits of the proposed project include:

- Continued employment of staff.
- Potential for the creation of additional jobs.
- Continued upliftment of the surrounding communities.
- Continued supply of ore to the local, national, and international markets, and therefore contribution to local, provincial and even national economies.

The 'No Project' option will be further assessed as part of the EIA process for the proposed Thabazimbi Project Infinity.

6. IDENTIFICATION OF ANTICIPATED ENVIRONMENTAL IMPACTS

This part of the Scoping Report document focuses on the identification of the major potential impacts the activities, processes and actions may have on the surrounding environment. Furthermore it indicates the major impacts these activities have on the environmental components associated with the site, as required in terms of Regulation 28 (g) (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998.

6.1 Impact assessment methodology

Regulation 31 (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998, requires that an EIR includes an assessment of the status, extent, duration, probability, reversibility, replaceability of resources and mitigatory potential of the major potential environmental impacts of the proposed mining operation be undertaken.

The identification of the major potential impacts has therefore only been included as part of the requirements for the compilation of the Scoping Report. The prediction of the nature of each impact, the evaluation of each impact by rating its significance and the management and mitigation measures adopted to address each impact, will be assessed during the EIR using the criteria presented below. A description of the parameters used in this impact assessment is listed in the Table 40 (refer to Section 7).

6.2 Impact identification

6.2.1 Construction Phase

It is envisaged based on the type of activities for which authorisation is applied for, that the most significant impacts (if any) will occur during the construction phase.

6.2.1.1 Geology

The construction of foundations for the infrastructure are limited to small areas and do not pose a significant risk on the geology on the area. The permanent destruction of the geology due to open pit mining has already taken place. Remining of abanded pits will not have a significant impact on the geology.

6.2.1.2 Climate

It is envisaged that the construction activities will have no impact on the climate around the construction site as well as the larger environment.

6.2.1.3 Topography

The nature of the proposed construction activities for the slimes and return water pipelines, slimes dam, upgrading of the conveyor structures, extending the railway siding, haul roads and stand-alone plant and retrofitting of existing plant has an impact on the topography of the area. Part of the construction activities includes excavation operations and storage and stockpiling of materials, which will have a temporary impact on the landscape. The slimes dam would form an impoundment wall across a natural valley. The construction of the slimes dam will have a long term impact on the topography of the area due to the disposal of the slimes.

6.2.1.4 Soils

The impacts on soil related to the construction activities relate to the removal of soil from construction sites for the slimes dam and changing the chemical compound due to spillages from construction vehicles. Removal of soil will be confined to the immediate vicinity of the construction areas. Impacts will be severe for the slimes dam due to the area that needs to be cleared but they will be insignificant in a local and regional context. The permanent removal of the topsoil for storage and re-use will have a temporary localised impact of moderate significance.

6.2.1.5 Land capability

Prior to the mining activity commencing the land was mainly used for game farming. Areas next to the river possessed the potential for agricultural purposes but were never exploited as such. Considering the size of the activities and the area to be disturbed the effect of construction on the potential land capability is seen to be of low significance. The impact will be of local extent and the duration is short term (to permanent. The severity is moderate as the affected environment is altered but processes continue in a modified way. It is probable that the impact will occur. During construction of the proposed activities the land capability will be changed and may be permanent. A large area is available to pursue the land use prior to mining, namely game farming.

6.2.1.6 Land use

The land use related to the construction of the slimes and return water pipelines, slimes dam, upgrading of the conveyor structures, extending the railway siding, haul roads, stand-alone plant and retrofitting of existing plant is related to game farming. Construction activities related to the construction of the mining and related infrastructure will have an impact on the land use of the site. The closure objectives are aimed at game farming. The current rehabilitation strategy of the mine focuses on rehabilitation to promote the possibility of game farming once mining activities, have ceased.

6.2.1.7 Vegetation

Clearing the site of vegetation prior to construction will have a low, short term effect considering the fact that concurrent rehabilitation and re-vegetation of the site will take place. The areas that will not

be utilised for infrastructure related to the proposed activities will be rehabilitated after construction to ensure they return to the original vegetation state.

6.2.1.8 Animal life

A study conducted on the area indicated that no Red Data fauna species were recorded in the proposed area. However, some rare species do occur. The proposed activities will have an initial impact on the fauna in the sense that the animals would move away from the construction site. The significance of the impacts will be high over the site, but they will be insignificant in a regional context.

6.2.1.9 Surface water

Various potential sources of surface water pollution have been identified on site. The main potential sources of pollution of surface water during the construction phase include hydrocarbon pollution from construction vehicles, siltation and chemical pollution from the use of chemical toilets by construction workers. Surface water will be generated from runoff from the road surfaces as well as rain falling onto the construction sites. The conveyor system will span the Rooikuilspruit. The construction of above-mentioned activities can potentially impact on the Rooikuilspruit flow and on the banks of the spruit. The construction of the new stand alone circuit plant will be constructed outside of the 1:100 year floodline.

6.2.1.10 Ground water

It is anticipated that groundwater levels will not be affected by the proposed construction of the mining and related infrastructure. The only impacts on the ground water from the construction of the proposed activities are with regards to ground water quality and dewatering of water from the pit areas.

6.2.1.11 Air quality

The sources of air pollution related to the proposed construction of the mining and related infrastructure includes dust generation and emissions from construction vehicles, open pit mining and the stand-alone plant area and retrofitting of existing plant and stockpiling of ore at the Donkerpoort and Van der Bijl crushers. The impact is expected to have a low, short-term negative impact on the air quality of the immediate surroundings of the site.

The concern from an air quality perspective is the potential that exists for increased impacts on the surrounding environment and human health. Based on the current and proposed operations at Thabazimbi Mine, particulates were regarded as the pollutant of concern. Gaseous emissions from on-site vehicles and equipment and from power generation (not continuous source) were regarded as negligible.

Key performance indicators against which progress may be assessed form the basis for all effective environmental management practices. Source based performance indicators include the following:

- No visible dust on unpaved roads when trucks/vehicles drive on the roads. It is recommended that dust fallout in the immediate vicinity of the road perimeter be less than 1.200 mg / m² / day and less than 600 mg / m² / day at the sensitive receptors.
- The absence of visible dust plume at all tipping points and outside the primary crusher would be the best indicator of effective control equipment in place. In addition the dust fallout in the immediate vicinity of the tipping and crushing sources should be less than 1.200 mg / m² / day.
- From all activities associated with Thabazimbi Mine, dust fallout levels should not exceed 600 mg / m² / day at the sensitive receptor areas.

Receptor based performance indicators include the following:

- In addition to placing single dust buckets close to the main haul roads, open pits, screening plant and concentrator plant, it is proposed that single dust buckets be positioned close to all the sensitive receptor sites (including the informal settlement) and monitoring should be undertaken using the American Society for Testing and Materials Standard Test Method for the collection and analysis of dust fall (ASTM D1739) or any other method which can demonstrated to give equivalent results (SANS, 2004).
- It is also recommended that a PM10/PM2.5 monitor be installed at the town of Thabazimbi due to the concern for health impacts and to ensure the mining and processing plant operations are in compliance with the relevant ambient air quality guidelines. The monitor should however be calibrated at least once a year and the data validated.

6.3.1.12 Noise

Noise will be generated by construction vehicles and plant area during the construction phase. The effect will be medium term, once the construction has been finished the noise caused by these vehicles will be gone, but the noise from the operation of the project will still continue.

6.3.1.13 Sites of archaeological and cultural interest

From the Heritage Impact Report on proposed mining activities of Thabazimbi Project Infinity, conducted by PGS Heritage and Grave Relocation Consultants in August 2012, it was found that a cave is situated on portions of the farms Wachteenbietjesdraai 350 KQ and Kwaggashoek 345 KQ. From the study it is evident that there will be no impact on archaeological resources. There is no evidence of fossil or living creatures in the cave and that future mining operations make the continued existence of the cave uncertain and local disturbances caused by surrounding mining activity may already be having an impact on the cave's contents refer to appendix D9 for correspondence received

from SAHRA. The impact the proposed Thabazimbi Project Infinity will have on the cave during the construction phase will be further assessed in close corporation with SAHRA, during the EIA phase.

No evidence of other sites with archaeological and cultural interest has been identified for the proposed project during the scoping exercise.

6.3.1.14 Sensitive landscapes

During the construction phase of the activities the impact on sensitive areas will be limited to the impact on vegetation. Sensitive species will be relocated or removed as part of the mitigation measures.

6.3.1.15 Visual aspects

Considering the fact that the construction site will take place next to the road the entire development will result in a visual impact during construction. This will include impacts such as visibility of construction equipment, slimes dam wall construction and new pipes or conveyors.

6.3.1.16 Interested and Affected parties

A detailed public participation process was followed and has been described in section 4. TIOM and Project Infinity will continue to have an open door policy in case that any concerns or issues is raised by interested and affected parties.

6.3.1.17 General

Traffic

This site enjoys excellent regional accessibility in that it is located adjacent to R510 national road. The conveyor system spans the R510, and the upgrading thereof, considering that it will occur adjacent to the R510, will have a significant impact on the traffic. Since the construction traffic of the slimes dam will mostly be confined to the site area, little impact on the traffic is expected.

6.2.2 Operational Phase

6.2.2.1 Geology

The destruction of the geology due to progressive open pit mining will continue during the operational phase of the project.

6.2.2.2 Climate

It is envisaged that the proposed activities will have no impact on the micro climate of the area as well as the climate of the region. A micro climate study is underway and will form part of the EIA phase.

Changing the atmosphere (airflow, moisture, light) of the cave will destroy the pristine aragonite and calcite crystals therein and the impact of the mining and related activities on the cave will be further assessed as part of the EIA phase.

6.2.2.3 Topography

The proposed mining and related activities will have a permanent affect on the topography on site and may the impact may be reduced during the decommissioning Phase.

6.2.2.4 Soils

Once construction of the mining and related infrastructure has ceased it is foreseen that the operations will have little impact on the soils mainly due to soil contamination that may take place.
Various sources of soil contamination include the following:

- Ineffective management and disposal of waste
- Ineffective temporary waste storage facilities
- Spillage during the storage and use of hydrocarbons
- Chemical spillages (i.e. paints, thinners, etc.)
- Spillages from handling and storage of hazardous substances
- Spillage during the refuelling of equipment and vehicles
- Slimes spillages and spillages of affected and dirty water

6.2.2.5 Land capability

The land capability not considering mining as an option would be agriculture use and related to farming of game. Once the development has commenced the impact on the land capability is permanent until the mining activities cease to exist and the infrastructure is removed and the soil made available for the original use namely grazing or game farming.

6.2.2.6 Land use

Prior to the mining operations commencing in 1931 the land use was mainly focused on cattle farming and the areas next to the Crocodile River had the potential for planting crops. The mountainous areas and the valley enclosed by the Northern and Southern mountain ranges were used for cattle farming. These areas were also frequented by various game species. Although the areas next to the Crocodile River had the potential for planting crops this was however never done. The proposed end land use is game farming for mining and related activities.

The impact on land use by mining and related activities during the operational phase is insignificant.

6.2.2.7 Vegetation

During the operational phase the progressive development of the opencast pit may have a significant impact due to the clearance of vegetation, no additional impacts on the vegetation due to the operational phase of the mining related activities will occur, as vegetation has been cleared during construction.

6.2.2.8 Animal life

The disturbance caused by the proposed activities will cause animals to relocate to areas with lesser noise, movement and busy areas around the mining area. Some fauna will become accustomed to the disturbance and noise of the operations. Once mining operations have ceased and the end land use objective of wildlife management has been achieved management measures will be taken in accordance with the land management plan to ensure the re-establishment of animal communities in the mining area.

6.2.2.9 Surface water

To minimise erosion and contamination of storm water, the storm water will be diverted by storm water management infrastructure. Contamination of the surface water during the operational phase of the proposed activities will impact on surface water quality.

6.2.2.10 Ground water

Groundwater quality can be impacted on by the operational activities due to contamination from spillages, waste and seepage from the mining and related infrastructure. The impact on ground water levels in the surrounding boreholes as a result of dewatering of pits will become clearer as monitoring continues during the operational phase. Modelling will contribute to the understanding of the potential impact.

6.2.2.11 Air Quality

The source of air pollution has been identified as the following:

- Through release of previously generated dust during operations such as loading, dumping and transferring material
- Through dispersion of previously generated dust by wind or by movement of vehicles and wind erosion of storage piles
- Dust emission from the conveyor system and plant area.
- Dust emissions from the stockpiles at the crushers,
- Vehicle emissions

Vehicle traffic on gravel roads could become a source of dust. Off-site transport along paved roads could also be a source of dust. These contributors of dust only add a small increment to the regional dust mobilization potential. In the case where dust is deemed to be a concern, dust suppression

practices will be used to minimize the potential effect. Haulage routes will be treated with a dust suppression agent who is highly effective.

6.2.2.12 Noise

During a noise survey conducted in 2006 on Project Infinity the following conclusions were drawn. Even without the contribution of mining and plant production activities, the residual noise level in the Thabazimbi town exceed the SANS standard. This can mainly be contributed to high residual noise levels ambient in the environment and not as a result of the proposed mining activities.

Noise generated during the site operations of the miming and related activities will be limited to the vehicles entering the site as well as the operations of the plant area and conveyor system. A new noise study will form part of the EIA phase.

6.2.2.13 Sites of archaeological and cultural interest

The possibility does exist that mining of Van der Bijl pit may impact on the cave. This will be verified during the EIA phase and appropriate mitigation measures will be identified for implementation.

No evidence of other sites with archaeological and cultural interest has been identified for the proposed project during the scoping exercise.

6.2.2.14 Sensitive landscapes

No sensitive landscapes were identified on the proposed development sites.

6.2.2.15 Visual aspects

The visual impact of the proposed development during the operational phase is significant. The mining and related infrastructure will have a visual impact due to the alteration of the topography of the natural valley in which it will be constructed.

6.2.2.16 Interested and Affected parties

Interested and affected parties have the opportunity to provide their inputs at any stage of the operations of the facility. Continuous feedback from The Project Infinity will be provided to the Interested and Affected Parties.

6.2.2.17 General

Traffic

The mine access road (and access) intersects the R510 within the urban context. The impact of the proposed Project Infinity is virtually nil, since no additional trips are loaded onto the road network and no change in access is planned.

Waste

Waste on the mine is managed according to the waste management procedure (TZ-OPR-MW-001). The different waste streams and the disposal method are identified in the procedure as well as the requirements of temporary storage areas.

The main waste types identified were the following:

General waste is the generic term for waste that, because of its composition and characteristics, does not pose a significant threat to public health or the environment if properly managed and which is not inherently hazardous. General waste comprises for example of the following:

- Rubble (e.g. Building rubble)
- Garden waste (e.g. Grass and leave cuttings)
- Domestic waste (e.g. plastics, food rests, wood related items, glass etc.)

Hazardous waste is that waste which can, even in low concentrations, have a significant adverse effect on public health and/or the environment.
Hazardous waste can be divided into the following categories:

- Oil related waste or oily waste (Used oil, grease, oil contaminated rags, diesel, petrol etc.)
- Organic waste (e.g. Pesticides)
- Other waste (e.g. medical waste, explosive containers redundant chemicals - battery acid etc.)

The principles applied in the waste management procedure focus mainly on the principle of recycling as much material as is practicable.

Recycling is the process where waste material is taken out of the waste stream with the purpose of re-using the waste or transforming the waste into a new usable product or source material. Wastes that must be recycled on the mine are:

- Paper (e.g. cartons and office paper)
- Scrap metal (e.g. steel)
- Ink cartages from printers, etc.

6.2.3 Decommissioning Phase

This phase would involve the decommissioning of the facilities already constructed on site at the particular date, if ever required. This would depend on whether the entire project would be decommissioned or only part thereof.

This phase will be addressing issues such as the removal of building material, ripping of soil, the sowing of seeds and the maintenance of vegetation until established. Soil conservation measures would also have to be implemented. This phase will be addressed in the Environmental management Plan. Effective monitoring of the expected impacts described above, and the application, monitoring and maintenance of the impact mitigation measures described in the Environmental Management Plan will reduce the amount of rehabilitation needed to be undertaken during the decommissioning phase.

It will be necessary to inspect and maintain the rehabilitative measures for a period of two years (twice a year) following the cessation of the operational phase.

Some time will be needed for the rehabilitated areas to stabilise and for the soil to become biologically active. Land use on these areas will be limited to grazing during this period. During the decommissioning phase, infrastructure will be demolished and removed. Rehabilitation of the spoils and other affected areas will be completed. Some changes in the stream diversion / storm water control measures will be required. Work in this regard will also be completed during this phase. The impacts during the decommissioning phase are not likely to differ meaningfully from the impacts anticipated after mine closure.

6.2.4 Conclusion and recommendations

A number of potential impacts have been identified in the scoping phase, which will require confirmation as part of specialist studies in the EIA phase. It is recommended that the outcome of these studies be used to identify appropriate mitigation measures to minimise the potential impact of the activities on the environment.

7. IDENTIFICATION OF KNOWLEDGE GAPS AND PLAN OF STUDY FOR EIA

In accordance with of Regulation 28 (of Regulation 543) of the EIA Regulations (2010), under the NEMA, 1998, the knowledge gaps identified and a description of the tasks that will be undertaken as part of the EIA process, including any specialist reports or specialised processes (including the manner in which such tasks will be undertaken), are discussed in this part of the Scoping Report.

7.1 Knowledge Gaps

The following knowledge gaps and uncertainties have been identified during the scoping process of the proposed Project Infinity and require further investigations that will be comprehensively carried out as part of the EIA process for the proposed Project Infinity:

- Since the initial development of the EMP and EIA under the MPRDA, 2002 numerous specialist studies have been completed to improve the understanding of the environment and mitigation measures applied to minimise the impacts of the mining operations. As part of this Project Infinity additional specialist studies and the revision of some of the previous specialist studies are underway.

7.2 Plan of Study

7.2.1 Tasks to be undertaken as part of the EIA process

The EIA process, which will be undertaken subsequent to the Scoping Process, will be conducted in accordance with Regulations 31 of the EIA Regulations R.543 (2010), under the NEMA (1998). The EIR document for the proposed project will include detailed information pertaining to anticipated or potential impacts that may be associated with the proposed project.

The EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will reflect amongst other, the following:

- Details and expertise of the independent EAP.
- A detailed description of the proposed activity and its location.
- An assessment of the environment likely to be affected by the proposed activity.
- Details of the Public Participation Process followed.
- An assessment of the need and desirability of the proposed activity including potential alternatives and their advantages and disadvantages.
- A description of the methodology in determining the significance of the potential environmental impacts.
- An assessment of the identified alternatives and their impacts of the proposed activity on the environment, including cumulative impacts on the environment.

- A summary of the findings of all specialist reports generated (no specific requests have been received from the competent authorities to date).
- A description of environmental issues and potentially significant impacts including a description of the nature, extent, duration, probability, reversibility, loss of irreplaceable resources and degree of mitigation of impacts. Cumulative impacts will also be assessed.
- Identification of knowledge gaps, assumptions and uncertainties.
- An environmental impact statement as well as an opinion whether the activity should be authorised or not.
- A Environmental Management Programme including, amongst other, environmental management objectives and goals, mitigation measures and management of significant impacts, description of persons responsible for mitigation implementation, description of time periods applicable to mitigation implementation, and monitoring and performance assessment.
- Inclusion of technical and supporting information.

The process of undertaken to compile the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following:

- Commence with the compilation of the EIA under the NEMA (1998) as per the EIA Regulations R.543 (2010) [Regulation 543 (31)]
- Provide the draft EIA (including a draft EMP) to the client for input prior to public and authority comment.
- Conduct a Public Participation Process in accordance to EIA Regulations R.543 (2010), including providing the draft EIA Report to the competent authority as well as for public comment for a period of 60 days [Regulation 543(56)].
- Consider all objections and representations received during the Public Participation Process and finalise the EIA.
- Provide the final EIA (including a draft EMP) to the client for input.
- Prior to the submission of the final report to the LDEDET, the I&APs will be provided opportunity to comment on the final EIA Report in terms of the requirement of Regulation 543(56)(6).
- Comments on the final EIA report by I&APs should be submitted directly to the LDEDET and copied to the applicant and EAP.
- The final EIA will be submitted to the LDEDET after which they have 60 days, after acknowledging receipt of the final EIA Report to consider it and in writing accept or reject the report or request additional information or amendments to the document [Regulation 543(34)(2)].
- A final Authorities meeting will be scheduled to present the submitted documentation and verify progress with the approval process of previously submitted documentation.
- Continued consultation with the relevant authority until issuing of the decision.

7.2.2 Impact assessment methodology

Regulation 31 (of Regulation 543) of the EIA Regulations, 2010, under the NEMA, 1998, requires that an EIR includes an assessment of the status, extent, duration, probability, reversibility, replaceability of resources and mitigatory potential of the major potential environmental impacts of the proposed mining operation be undertaken.

The prediction of the nature of each impact, the evaluation of each impact by rating its significance and the management and mitigation measures adopted to address each impact, will be assessed during the EIR using the criteria presented below.

Different impacts are associated with the construction and operational phases of the proposed activity. The significance will be determined by both the extent and duration of the impact. The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk. A description of the parameters used in this impact assessment is listed in the Table 40 below.

Table 40: Environmental impact assessment parameters

Parameters	Description
Extent	Refers to the physical or geographical size that is affected by the impact. It can be categorised into the following ranges: • Onsite – Within specific site boundary (weight value – 1) • Local – Within municipal boundary (weight value – 2) • Regional – Outside municipal boundary (weight value – 3)
Duration	Time span associated with impact: • Short term – 1 Year or less (weight value – 1) • Medium term – 1-5 Years (weight value –2) • Long term – Longer than 5 Years (weight value – 3)
Intensity and reversibility	The severity of an impact on the receiving environment: • Low – Natural and/or cultural processes continue in a modified way and is reversible (weight value – 1) • Medium – Natural and/or cultural processes stop and is partially reversible (weight value – 2) • High – Natural and/or cultural processes disturbed to an irreversible state (weight value – 3)
Significance of Impact / Consequence	Adding the extent, duration and intensity together provides the significance of the impact (High, Medium or Low). **Extent + Duration + Intensity = High/Medium/Low Impact**
Probability	The likelihood of an impact occurring: • Unlikely – 0% - 45% chance of the potential impact occurring (weight value – 1) • Possible – 46% - 75% chance of the potential impact occurring (weight value – 2) • Likely - >75% chance of the potential impact occurring (weight value – 3)

Parameters	Description
Environmental Risk Refer to Table 15 below	Multiplication of the significance of the impact by the probability of the impact occurring produces a final conclusion of the overall risk that an impact poses to the surrounding environment. **High/Medium/Low Impact X Probability = High/Medium/Low Environmental Risk**

Significance of Impact				
		Low Impact (3 → 5)	Medium Impact (6 → 8)	High Impact (9)
Probability	Definite / Very Likely 3	9 - 15 L - M	18 - 24 M - H	27 H
	Possible 2	6 - 10 L - M	12 – 16 M	18 M - H
	Unlikely 1	3 - 5 L	6 – 8 L	9 L

ENVIRONMENTAL RISK	Guidelines for Control Strategies
(H) - High	Proactively reduce risk level, short term response.
(M- H) Medium to High	Proactively reduce risk level, short term response.
(M) – Medium	Management strategies to reduce risk level, short to medium term response.
(L – M) Low to Medium	Management strategies to reduce risk level, short to medium term response, operational control and housekeeping.
(L) - Low	Operational control and housekeeping.

7.2.3 Further investigations

The EIA Regulations dated 2010, under the NEMA, 1998, states that a Scoping Report, in relation to a proposed mining operation, must, amongst others, describe the nature and extent of further investigations required in the EIA Report.

Consequently, in compliance with the mentioned Regulations, the following specialist studies have been identified and are in the process of being completed:

- Climate assessment.
- Geo-hydrological assessment.
- Traffic study.
- Social Impact Assessment.
- Paleontological Study.
- Visual Study.
- Noise Study.
- Economic Study.
- Air quality Study.
- Biodiversity Study.
- Hydrology Study.
- Blasting and Vibration Study.
- Reptile and amphibian Study.

7.2.4 Stages at which the competent authority will be consulted

The stages at which the LDEDET will be consulted in the process of compiling the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following:

- During the Public Participation Process in accordance to EIA Regulations R.543 (2010), the draft EIR will be provided to the competent authority as well as for public comment for a period of 60 days [Regulation 543(56)].
- The final EIR will be submitted to the LDEDET after which they have 60 days, after acknowledging receipt of the final EIR to consider it and in writing accept or reject the report or request additional information or amendments to the document [Regulation 543(34)(2)].
- A final Authorities meeting will be scheduled to present the submitted documentation and verify progress with the approval process of previously submitted documentation.
- Continued consultation with the relevant authority until issuing of the decision.

7.2.5 Public participation during the EIA process

The process of undertaken to compile the EIR (and a draft Environmental Management Programme under the NEMA (1998) as per the EIA Regulations R.543 (2010)), will include amongst other, the following public participation:

- The draft EIR (including a draft EMP) will be provided to the Client for input prior to public and authority comment.
- The Public Participation Process be conducted in accordance to EIA Regulations R.543 (2010), including providing the draft EIA Report to the competent authority as well as for public comment for a period of 60 days [Regulation 543(56)].

- Hereafter all objections and representations received during the Public Participation Process will be considered for finalising the EIA.
- Prior to the submission of the final report to the LDEDET, the I&APs will be provided opportunity to comment on the final EIA Report in terms of the requirement of Regulation 543(56)(6).
- Comments on the final EIA report by I&APs will be submitted directly to the LDEDET and copied to the applicant and EAP.

I&APs will include land owners / users, adjacent land owners / users, regulatory authorities, key stakeholders, and any I&APs registering as part of the Public Participation Process for the project.

7.2.6 Alternatives

Alternatives will continue to be investigated by discussion with Authorities, I&APs, and the client, and the 'No Project Option' will be included in the assessment. The EIA (including EMP) document will include the alternatives identified and investigated for the mentioned project as well as the advantages and disadvantages of each. Refer also to Part 5 for more details pertaining to alternatives being considered, including the 'No Project' Option.

8. DISCUSSION AND CONCLUSION

It is the purpose of this part of this Scoping Report to summarise the potentially significant findings of the scoping process. A short description of the key aspects relating to the Public Participation Process, impacts on the various aspects of the environment, the knowledge gaps identified as part of the EIA process of the proposed project are included below.

The details pertaining to the proposed project have been fully described in Part 2 of this report. The current state of the environment has been described in Part 3 of this document.

8.1 Public Participation Process

A full Public Participation Process in terms of the requirements of the NEMA, 1998 has been undertaken as part of the Scoping Process. Issues of concern raised during this process will be used to focus the specialist studies of the EIA on the potentially significant impacts associated with the proposed Thabazimbi Project Infinity. Part of this process is also to identify project alternatives, and to determine the feasibility of these alternatives, in the context of financial, practical and environmental aspects.

Part 4 of this Scoping Report explains in detail the process that has been undertaken thus far to involve the I&APs in the Scoping Process of this proposed optimisation of the existing Thabazimbi Mine. The following tasks have already been performed as part of the Public Participation Process:

- The project has been advertised in the Kwêvoël newspaper.
- The project has been advertised with the use of on-site notices.
- Background Information Documents have been distributed.
- A public meeting was held on the 17th of September 2012.
- The I&AP's were notified of the changes to the project.

8.2 Alternatives identified

The following alternative were identified as part of the Scoping Process for the proposed Thabazimbi Project Infinity:

- Alternatives in terms of the layout, design and structure of the Slimes dam.

8.3 Identified potentially significant impacts

A number of potentially significant impacts have been identified during the scoping process. Specialist studies are in the process of being completed, and additional potentially significant impacts may be highlighted at a later stage. The extent of the identified potentially significant impacts will be

quantified, and will be reported on as part of the EIA document. The identified potentially significant impacts are listed below:

- The extensive mining of additional reserves by opencast mining methods within the Thabazimbi Mine will result in impacts on all aspects of the environment due to the large scale of the proposed opencast mining activities.
- The "sense of place' will be changed further due to the retrofit of the plant and associated activities.
- The topography of the site will be altered due to mining and related activities.
- Surface water quantity and quality will be affected by the use and storage of surface water run-off as well by mining and related activities.
- Groundwater quantity will be affected by the abstraction of water during dewatering activities and the alteration of geological strata.
- Sites of archaeological and cultural interest will be impacted on since a cave is located within close proximity of where the proposed mining activities will take place.

Part 6 of this Scoping Report includes more detail pertaining to the identified possible impacts that will be further assessed and quantified during the EIA phase of the project.

8.4 Further investigations

The EIA Regulations dated 2010, under the NEMA, 1998, states that a Scoping Report, in relation to a proposed mining operation, must, amongst others, describe the nature and extent of further investigations required in the EIA Report. Consequently, in compliance with the mentioned Regulations, the following specialist studies have been identified and are in the process of being completed (refer also to Part 6):

- Climate assessment.
- Geo-hydrological assessment.
- Traffic study.
- Social Impact Assessment.
- Paleontological Study.
- Visual Study.
- Noise Study.
- Economic Study.
- Air quality Study.
- Biodiversity Study.
- Hydrology Study.
- Blasting and Vibration Study.
- Reptile and amphibian Study.

8.5 Conclusion

This scoping process has been carried out in accordance with the NEMA, 1998, and the Regulations there under.

The potential impacts due to the mining and related activities and their expected significance have been identified in Part 6 of this Scoping Report. Mitigation measures to address possible environmental impacts of the mining and related activities of the proposed Project Infinity will be included in the EIA document.

I&APs have been identified and will be involved in the Scoping process to provide their input with regards to the identification of potential impacts and alternatives for the proposed Thabazimbi Project Infinity. This input as well as any additional input received during the EIA Phase will be used to focus the EIA process on the important issues, and to ensure that proper planning takes place in order to promote sustainable development. The concerns raised by I&APs will be addressed in the EIA as required by the relevant Regulations under NEMA, 1998.

Based on the findings of the Scoping Phase, it is recommended that the “No-Project” option not be considered yet for the proposed Thabazimbi Project Infinity, and that the project viability be assessed further.

The EIA process, which will subsequently follow, will be conducted in accordance with the EIA Regulations, under the NEMA, 1998.