SISHEN IRON ORE
THABAZIMBI MINE
REVIEW AND UPDATE OF THE ENVIRONMENTAL MANAGMENT PROGRAMME LP30/5/1/3/2/1(45) and (47) EM

Tel: +27 12 348 0272
Fax: +27 12 361 6191
E-mail: jan@shangoni.co.za

PO Box 74726
Lynnwood Ridge
Pretoria
0040

EXECUTIVE SUMMARY

PURPOSE

Subsequent to consultation with the Department of Mineral Resources (hereafter referred to as DMR) - Polokwane office, dated the 12th of March 2010 it was agreed that an Environmental Scoping Report (hereafter referred to as ESR) and a revised Environmental Management Programme (hereafter referred to as EMPr) for Kumba Iron Ore - Thabazimbi Mine (hereafter referred to as Thabazimbi Mine) has to be submitted to incorporate the amendments made that were identified in the three ESR's that were submitted to the DMR and to Limpopo Department of Economic Development, Environment and Tourism (hereafter referred to as LEDET) in April 2008, June 2008 and November 2010 respectively.

The titles of the ESRs were as follows:

1. Phoenix ESR / Environmental Impact Assessment (hereafter referred to as EIA), dated April 2008
2. Bioremediation ESR / EIA, dated June 2008; and
3. ESR for the Review and Update of EMPr, dated November 2010.

Therefore this EMPr provides additional information on the proposed projects as well as current operations. All the proposed projects are in effect a continuation of mining operations. No new activities are included which fall outside the existing mining right area (mining license area). Project Phoenix became an option due to improved technology to beneficiate material previously classified as waste. A full EIA (under MPRDA and NEMA – listed activities only) was conducted to address the proposed Phoenix Project.

HISTORY

The mining of high-grade iron in the Thabazimbi area started during 1931. Mining included both surface and underground activities. Up to the early 1970's the bulk of the mining was focused in the East Mine area (East Mine ore body). This area was sub-divided into the Vanderbijl Pit, East Mine Pit and East Mine Underground. Different underground mining methods were used to extract the ore. Underground mining operations ceased in 1997. Two underground mining areas (East Mine and Kwaggashoek East underground) were in operation up to the end of 1997. In most cases the adits have been closed for security and safety purposes.

Iscor Ltd. was the original owner of the properties currently held by Kumba Iron Ore. Iscor Ltd. operated in the area since the establishment of Thabazimbi Iron Ore Mine in 1931. In late 2001 the original Iscor Ltd. unbundled to form Kumba Resources and ISPAT-Iscor. Kumba Resources later evolved into Kumba Iron Ore and Exxaro. ISPAT Iscor changed into Arcelor Mittal South Africa (hereafter referred to as AMSA). Mineral rights from the original company were transferred to Kumba Resources and later to Kumba Iron Ore and its subsidiary company, the Sishen Iron Ore Company (hereafter referred to as SIOC). The surface and mineral rights for the current mining operations and project areas now belong to SIOC.

INTRODUCTION

Thabazimbi Mine is an established open pit operation, with ore processed through a single processing facility. The Mine, which is owned and operated by Kumba Iron Ore, 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 Thabazimbi Local Municipality (hereafter referred to as TLM) and the Waterberg District Municipality (hereafter referred to as WDM).

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; 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. Eight open pits (East pit, Buffelshoek East, Buffelshoek West, Bobbejaanwater, Donkerpoort West, Donkerpoort, Kwaggashoek East and Vanderbijl) are present on site. Only four (Buffelshoek West, Kumba, Donkerpoort Nek and Kwaggashoek East) pits are currently actively mined. According to the LoM plan the inactive pits may be mined in the future.

The Proposed Project Phoenix target areas were defined on the western portion of the East Mine ore body. The proposed Project Phoenix will extend the current Life of Mine (hereafter referred to as LoM) by approximately 30 years. If this project goes ahead the tonnage will be increased to 3 Mt per year. In addition to this various smaller projects are also under investigation.

MINING METHOD

Thabazimbi Mine is operated through conventional opencast methods, including drilling, blasting, loading and hauling. Rotating drills, haul-trucks and rope shovels, as well as supportive equipment are some of the equipment used. The existing pits are excavated with benches of 10-15 m and double benches at the final boundaries. Historically underground mining took place on site. These adits have been sealed where not used anymore. Some access is currently gained to the underground operations for prospecting purposes. The prospecting is done to verify the estimated ore body size and quality, which forms the Phoenix project resource. No underground mining will however take place. Only open pit mining will be practiced.

LIFE OF MINE

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 Phoenix Project, a significant LoM extension project, are well advanced, with a prediction of extending the LoM to 2040.

ENVIRONMENTAL MANAGEMENT SYSTEM

Thabazimbi Mine achieved ISO 14 001 and OHSAS 18 001 certification in 2004. Thabazimbi Mine is committed to manage the environmental aspects of its operations that can cause environmental impacts by minimizing any potential and actual environmental risk through effectively implementing the ISO 14001 Environmental Management System (hereafter referred to as EMS) requirements.

Part of Thabazimbi Mine’s commitment is to manage legal compliance through the effective implementation of the mine’s EMS.

IDENTIFIED ENVIRONMENTAL IMPACTS

The main impacts of the current mining activities at the opencast workings on the environment can be summarized as follows:

- Disturbance of the natural topography;
- Disturbance of the natural vegetation;
- Potential contamination of clean water through siltation and hydrocarbon spillages;
- Potential pollution of the atmosphere through dust generation;
- Natural resource consumption through water, electricity and fuel usage;
- Erosion on Waste Rock Dumps (hereafter WRD); and
- Temporary storage of general and hazardous waste prior to final disposal off-site.

MONITORING PERFORMANCE

Monitoring is done on all identified characteristics of the operations as specified in the Monitoring and Measurement System Procedure. The monitoring data is used as part of the ISO 14001 management systems to manage the aspects that can cause potential environmental impacts on the mine. This information is also used as predictive measure to identify potential impacts.

The overall aims with the final closure of the mine are to make the affected areas as visually and ecologically acceptable as possible and reuse the largest extent of the mine area as a potential game farm and also to sell or lease all structures that can be economically re-used for other purposes. This can be done by

- Rehabilitation of the WRDs built after 1991 by shaping and re-vegetating, and re-vegetation of the old WRDs built before 1991;

- Demolition of structures that will not be re-used and rehabilitation of soil surfaces by ripping and re-vegetating where necessary;
- Securing of all workings; and
- Identifying buildings / structures that can be sold, leased or demolished.

The effective implementation and the appropriateness of the EMPr will be verified every two years by means of the EMPr Performance Assessment Report (hereafter referred to as PAR) conducted in line with Regulation 55 of the Mineral and Petroleum Resource Development Act, 2002 (No 28 of 2002) - hereafter referred to as MPRDA Regulations requirements. This EMPr PAR will be submitted to DMR every two years.

Safety and Sustainable Development in Anglo American

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd
Thabazimbi Mine

	SAFETY	OCCUPATIONAL HEALTH	ENVIRONMENTAL MANAGEMENT
OUR VISION			
ZERO harm	Our vision is to achieve Zero Harm through effective management of safety in all our managed operations. We believe our people are our key asset and we do not accept that it is necessary for people to be injured whilst working for us. All employees should be able to return home fit and well at the end of each shift. We believe that one injury is one too many.	Our vision is to achieve Zero Harm and a healthy and productive workforce through the effective management of occupational health risks in all our managed operations. We believe our people are our key asset and we do not accept that it is necessary for people to be injured whilst working for us. All employees should be able to return home fit and well at the end of each shift. We believe that one injury is one too many.	Our vision is to minimise harm to the environment by designing, operating and closing all of our operations in an environmentally responsible manner.
OUR PRINCIPLES			
ZERO mindset	All injuries and occupational illnesses are preventable	All occupational illnesses are preventable	We shall apply the mitigation hierarchy of avoiding, minimising and mitigating environmental impacts arising from our activities, products and services
NO repeats	All necessary steps are taken to learn from incidents in order to prevent recurrence	Learn from our monitoring of exposure and surveillance of disease incidence and use this information to prevent the occurrence of occupational disease	All necessary steps will be taken to learn from environmental impacts, incidents, audit findings and other non-conformances, to prevent their recurrence
SIMPLE non-negotiable standards	Safety standards and rules are consistently applied throughout the Group	Health standards and rules are consistently applied throughout the Group	Common, non-negotiable Environmental Management and Performance Standards and procedures shall be applied throughout the Group as a minimum requirement

OUR POLICY

CORNELIA HOLTHAUSEN
General Manager, Thabazimbi Mine

We at Kumba Iron Ore Thabazimbi Mine care for the Environment, Safety and Health of all employees which include contractors and host communities. During our opencast mining operations, iron ore beneficiation activities, processes and rail operations we will through appropriate leadership establish a culture within which we will effectively implement, document and maintain our systems and minimize potential health and safety risks and actual and potential environmental impacts, while meeting the needs of our businesses.

To fulfill this commitment, Kumba Iron Ore Thabazimbi Mine management will:

- Consult with employees and employee representatives. Communicate with interested and affected parties and other stakeholders in appropriate forums. Develop, communicate and review responsible and innovative policies, programmes and guidelines that provide safeguards for the community, employees and the environment;
- Implement proper organizational structures and resources to support the management of safety, prevention of ill health, improvement of occupational hygiene and environmental matters including social development;
- Be committed to comply with all applicable safety, health, environmental, social and rail safety legislation and as a minimum requirement implement company standards, including Anglo American plc three principals (zero mindset, no repeats and simple and non-negotiable rules) programmes, processes and other safety, health and environmental requirements Thabazimbi Mine subscribes to;
- Maintain hazard identification and risk assessments regarding safety, health and environmental risks;
- Establish competence and awareness of employees regarding relevant safety, health, hygiene, social and environmental matters through training, mentoring and communication,
- Conserve our natural resources and focus on prevention of pollution by reducing the environmental burden of waste generation and emissions to the air, water and land through strategies focussing on reducing, re-using, recycling and appropriate deposition of waste and water. Demonstrate active stewardship of biodiversity and land and effectively rehabilitate disturbed areas in accordance with the standards set out in the EMP;
- Respect and protect the culture, beliefs and heritage of the communities in which we operate.
- Be committed to continually improve our Safety and Sustainable Development performance and effectiveness by establishing and reviewing objectives and targets, considering the organisations significant risks and legal compliance with regards to safety, health, hygiene and environment and establish and maintain periodic audits and reviews, to ensure that this policy is implemented, updated and maintained;
- Identify incidents or complaints that could lead to environmental impact, injury, occupational disease or damage to property. Report and analyse these incidents in order to determine contributing factors and implement corrective and preventive action,
- Establish and maintain plans and procedures to identify the potential for, and responses to, emergency situations for preventing and mitigating the likely safety, health, social and environmental impact that may be associated with them;
- Formalise a system to ensure that management is visible in the field and utilize their time to demonstrate safety, health, social and environment leadership (VFL) and commitment;
- Review the policy annually to ensure it remains relevant to the mine's operation and to the needs of our stakeholders.

THIS POLICY WILL BE REVIEWED ANNUALLY TO ENSURE IT REMAINS RELEVANT TO THE MINE'S OPERATION AND TO THE NEEDS OF OUR STAKEHOLDERS.

Rev 06 (13 October 2010)

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
ADMS	Atmospheric Dispersion Modelling System
ALARP	As Low As Reasonable Possible
AMSA	Arcelor Mittal South Africa
AQMP	Air Quality Management Plan
ASTM	Society for Testing and Materials Standard Test Method
BA	Basic Assessment
BAP	Biodiversity Action Plan
BAR	Basic Assessment Report
BID	Background information document
BIF	Banded Iron Formation
BIS	Banded Iron Stone
BTA	Bow Tie Analysis
℃	Degrees Celsius
COD	Chemical Oxygen Demand
CERC	Cambridge Environmental Research Consultants
CAPCO	Chief Air Pollution Officer
CTI	Critical Task Inventory
DEAT	Department of Environmental Affairs and Tourism
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ESR	Environmental Scoping Report
EMS	Environmental Management System
FRAI	Fish Response Assessment Index
GN	Government Notice
HDV	Heavy Duty Vehicle
HQI	Habitat Quality Index
IHAS	Integrated Habitat Assessment System
I&AP's	Interested and Affected Parties
IP	Improvement Plan
ISO 14 001	International Standard: Environmental Management System
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
JSA	Job Safety Analysis
KIO	Kumba Iron Ore
Km	Kilometres
km/m^2	Kilometres per square meter
kV	Kilo Volt
LDV	Light Duty Vehicle

ABBREVIATION	DESCRIPTION
LEDET	Limpopo Economic Development Environment and Tourism
LoM	Life of Mine
m	Meter
m^2	Cubic meters
m^3/s	Cubic meters per second
mamsl	Meters above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Run-off
MKLM	Moses Kotane Local Municipality
MLM	Molemole Local Municipality
mm	Millimetres
MP	Management Plan
MPDRA	Mineral and Petroleum Resource Development Act, 2002 (No 28 of 2002)
MSDS	Material Safety Data Sheet
MWP	Mining Work Programme
MWS	Magalies Water Scheme
m/s	Meter per second
Mt	Million tons
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998) or (No 28 of 2002)
NIHL	Noise-Induced Hearing Loss
NWA	National Water Act, 1998 (Act No. 38 of 1998)
PAR	Performance Assessment Report
PCA	Principle Component Analysis
PPE	Personal Protective Equipment
PPP	Public Participation Process
RHP	River Health Program
SASS5	South African Scoring System Version 5
SANRAL	South African National Road Agency Limited
SASCO	South Africa Steel Company
SEBS	Socio-Economic Baseline Study
SOER	State of the Environment Report
SHE	Safety, Health and Environment
SIOC	Sishen Iron Ore Company
SLP	Social and Labour Plan
SWMP	Storm Water Management Plan
T	Tons
TLM	Thabazimbi Local Municipality
TSP	Total Suspended Particles
TWQR	Target Water Quality Requirements
WA	Water Act, 1956 (No.54 of 1956)
WMA	Water Management Area
WRAC	Workplace Risk Assessment and Control
WRD	Waste Rock Dump
WWTW	Waste Water Treatment Works

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CHAPTER 1: GENERAL INFORMATION OF THE THABAZIMBI IRON ORE MINE

1.1 Contact Names and Numbers

Table 1 provides a summary of the contact details of Thabazimbi Mine. **Table 2** provides a summary of the environmental consultant contact details.

Table 1: Contact Details of Mine

Name of Mine	Thabazimbi Iron Ore Mine
Applicant	SIOC (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

Table 2: Contact Details of Consultant

Consulting Company	Shangoni Management Services (Pty) Ltd
Project Consultant	Jan Nel / Salome Venter
Postal Address	P.O. Box 74726 Lynwood Ridge
Postal Code	0040
Telephone Number	(012) 348 0272
Facsimile Number	(012) 361 6191
Cell Phone Number	082 379 5935
E-mail address	jan@shangoni.co.za

1.2 Magisterial District and Administrative Boundaries

Table 3 is a description of the administrative details wherein Thabazimbi Mine is situated.

Table 3: Magisterial District and Administrative Boundaries of the Mine

Magisterial District	Thabazimbi
District Municipality	Waterberg District Municipality (DC36)
Local Municipality	TLM (NP361)

1.3 Location and Regional Setting of the Mine

The mining area is located within 16 km from the town of Thabazimbi, in a mountainous terrain. Thabazimbi Mine is situated in the TLM, which falls within the 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). Refer to **Figure 1** and **Figure 2**, respectively.

1.4 Surface Infrastructure and Servitudes

Thabazimbi Mine is connected to all neighbouring towns by tarred roads. There is one railway line from Lephalale to Tshwane via Thabazimbi. Coal from Exxaro opencast mine Grootegeluk at Lephalale (Ellisras) and Thabazimbi Mine's beneficiated iron ore are transported via this route. Refer to **Figure 2**, for the location and boundary of the Thabazimbi Mine.

Thabazimbi Mine makes use of various boreholes on site that supply water to the mine and supplement the water to town if required. Thabazimbi Mine is furthermore connected to the Magalies Water Scheme (hereafter referred to as MWS) pipeline, which receives water from Vaalkop Dam. The town also receives water for potable use from Vaalkop Dam via the MWS.

Power is supplied to the mine via Eskom power lines, which include:

- A 132 kV line from Lephalale (Ellisras) to the substation;
- A 22 kV line for power supply at Buffelshoek; and
- Two 11 kV lines.

The power is distributed on the mine from the 11 kV lines. The power is transformed to the required power levels where required e.g. 6.6 kV, 3.3 kV.

Table 4 below provides a list of all the private properties and servitudes, which exist inside the area.

Table 4: List of Private Properties / Farms and Servitudes in the Area

FARM NAME	PORTION	TYPE
Donkerpoort 344KQ	Portion20	Property Local Council
Grootfontein 352KQ	Portion 2	TRANSTEL property
Grootfontein 352KQ	Portion 6	TRANSTEL property
Grootfontein 352KQ	Portion 7	TRANSTEL property
Buffelshoek 351KQ	Portion 2	TRANSTEL property
Buffelshoek 351KQ	Portion 5	TRANSTEL property
Buffelshoek 351KQ	Portion 6	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 6	Private property

FARM NAME	PORTION	TYPE
Wachteenbietjesdraai 350KQ	Portion 7	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 8	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 20	Private property
Wachteenbietjesdraai 350KQ	Portion 26	Private property
Wachteenbietjesdraai 350KQ	Portion 28	Private property
Wachteenbietjesdraai 350KQ	Portion 34	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 35	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 36	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 37	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 38	TRANSTEL property
Wachteenbietjesdraai 350KQ	Portion 39	TRANSTEL property
SERVITUDES		
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

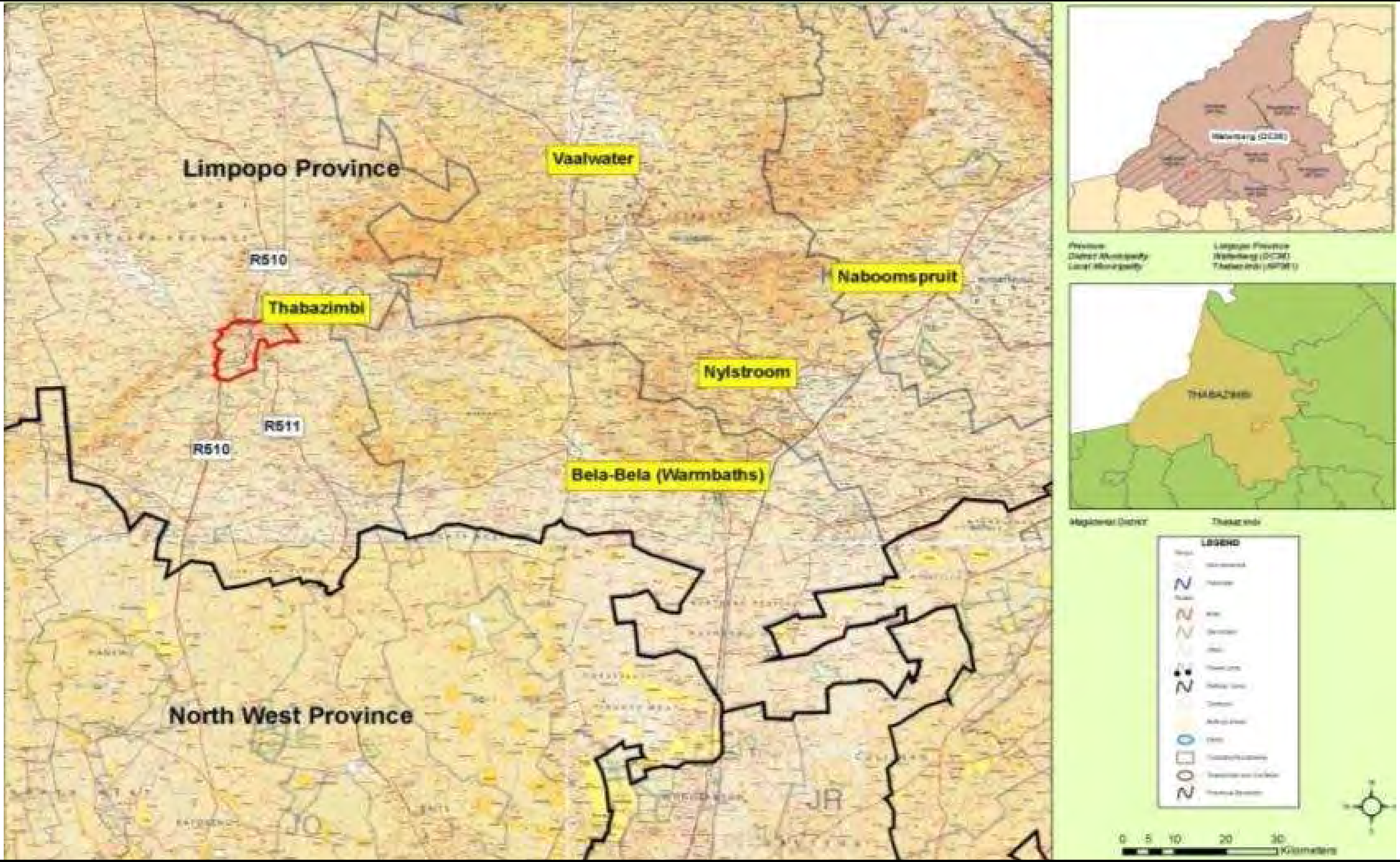

Figure 1: Regional Location of Thabazimbi Mine

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

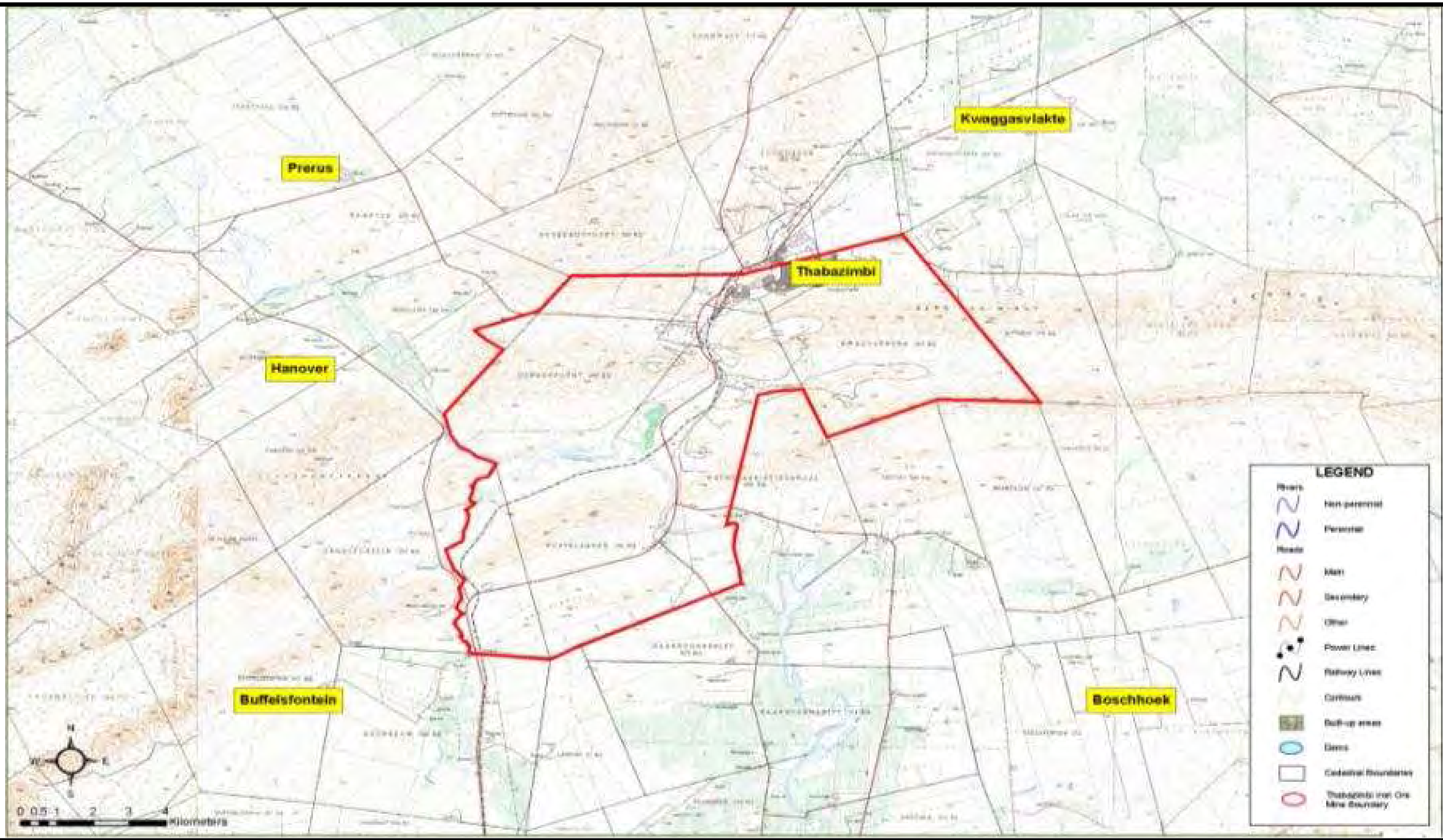

Figure 2: Location and boundary of the Thabazimbi Iron Ore Mine

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

1.5 Surface Rights, Mineral Rights and Mining Rights Holder

The surface rights, mineral rights and mining rights holder are held by the same owner. **Table 5** below provides the contact details of the owner.

Table 5: Contact Details of the Surface Rights, Mineral Rights and Mining Rights Holder

Owners Name (Applicant)	SIOC (Pty) Ltd, trading as Thabazimbi Iron Ore Mine
Postal address	PO Box 9679 Centurion 0046
Telephone Number	(012) 298 2910
Facsimile Number	(012) 326 4721
Company registration no.	2000 011 085 07

Iscor Ltd. was the original owner of the properties currently held by SIOC. Iscor Ltd. operated in the area since the establishment of Thabazimbi Iron Ore Mine in 1932. In late 2001 the original Iscor Ltd. unbundled to form Kumba Resources and ISPAT-Iscor. Kumba Resources later evolved into Kumba Iron Ore and Exxaro. ISPAT Iscor changed into AMSA. Mineral rights from the original company were transferred to SIOC. The Old Order Mineral Rights were converted into New Order Mining Rights in 2009.

The Mine Right areas of Thabazimbi Mine are listed in **Table 5**. **Table 6** provides detailed information identifying the farm names in relation to the surface right holder, the Old Order Mineral Rights Holder and the New Order Mining Right Holder. **Figure 3** gives an indication of where Thabazimbi Mine's farm portions are. The mining authorizations are held on five farms including Donkerpoort 344KQ, Wachteenbietjesdraai 350KQ, Kwaggashoek 345KQ, Buffelshoek 351KQ and Grootfontein 352KQ. Refer to **Figure 4** for a photographical overview of where the mining areas lie.

The areas included in the current mining authorization that are not disturbed due to mining activities as well as those areas that the mine owns the surface rights but which falls outside of the mining authorization are managed by Thabazimbi Mine to promote game farming.

1.6 Land Ownership of Adjacent Land

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 farm Grootfontein 352 KQ remaining portion, 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.

Table 6: Pit names and Farm Portions associated with Mining Right Numbers

PIT	FARM	RELEVANT SURFACE PORTION NUMBER	MINERAL PORTION NUMBER	TITLE DEED NUMBER	SG NUMBER	HOLDERS	MINING RIGHT NUMBER
Donkerpoort West, Donkerpoort West-West and Donkerpoort Neck	Donkerpoort 344 KQ	Remainder of Portion 10	K5512/2001RM	T103881/2002	4020/62	Donkerpoort Iron Ore Limited	Old Oder: 8/2002 New Order: LP/45/MR
	Kwaggashoek 345 KQ	Remaining Extent	K5512/2001RM	T103881/2002	5633/52 9993/2001 994/2001	State	
East Mine (U/G)	Kwaggashoek 345 KQ	Claim license 213					Old Oder: 8/2002 New Order: LP/45/MR
East Mine Pit	Kwaggashoek 345 KQ	Mine license 452/1950					Old Oder: 8/2002 New Order: LP/45/MR
Bobbejaanwater	Kwaggashoek 345 KQ	Mine Lease 4/1984					Old Oder: 8/2002 New Order: LP/45/MR
Kwaggashoek East	Kwaggashoek 345 KQ	Mine License 11/2001					Old Order: 11/2001 New Order: LP/47/MR

PIT	FARM	RELEVANT SURFACE PORTION NUMBER	MINERAL PORTION NUMBER	TITLE DEED NUMBER	SG NUMBER	HOLDERS	MINING RIGHT NUMBER
Donkerpoort	Wachteenbietjesdraai 350 KQ	Remainder of Portion 1	K5512/2001RM	T103881/2002	7847/85	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
Meyer Mine	Wachteenbietjesdraai 350 KQ	Remainder of Portion 2	K5512/2001RM	T103881/2002	2594/17		Old Oder: 8/2002 New Order: LP/45/MR
Vanderbijl	Wachteenbietjesdraai 350 KQ	Remainder of Portion 3	K5512/2001RM	T103881/2002	2593/17	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Wachteenbietjesdraai 350 KQ	Portion 4	K5512/2001RM	T103881/2002	2594/17	SIOC	
Vanderbijl	Wachteenbietjesdraai 350 KQ	Remainder of Portion 5	K5512/2001RM	T103881/2002	2593/17	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
Meyer North Project	Wachteenbietjesdraai 350 KQ	Portion 9	K5512/2001RM	T103881/2002	865/40 (7435/2000)	SIOC	
	Wachteenbietjesdraai 350 KQ	Remainder of Portion 12	K5512/2001RM	T103881/2002	2129/48	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Wachteenbietjesdraai 350 KQ	Portion 13	K5512/2001RM	T103881/2002	414/49	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Wachteenbietjesdraai 350 KQ	Portion 40		T103881/2002		SIOC	
	Wachteenbietjesdraai 350 KQ	Portion 46		T103881/2002 (T73475/2001)	7433/2000	SIOC	

PIT	FARM	RELEVANT SURFACE PORTION NUMBER	MINERAL PORTION NUMBER	TITLE DEED NUMBER	SG NUMBER	HOLDERS	MINING RIGHT NUMBER
Buffelshoek East-East	Buffelshoek 351 KQ	The Remainder	K5512/2001RM	T103881/2002	571/1895 3333/2000 3335/2000	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
Buffelshoek West	Buffelshoek 351 KQ	Remainder of Portion 1	K5512/2001RM	T103881/2002	1814/38 571/1895	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Buffelshoek 351 KQ	Portion 3	K5512/2001RM	T103881/2002	3417/38	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Buffelshoek 351 KQ	Portion 4		T103881/2002 (T16781/1939)	3418/38	SIOC	
	Grootfontein 352 KQ	Remainder of Portion 1	K5512/2001RM	T103881/2002	7596/81 3335/2000	SIOC	Old Oder: 8/2002 New Order: LP/45/MR
	Mooivallei 342 KQ	Portion 12		T103881/2002 (T84013/1993)	A733/59	SIOC	

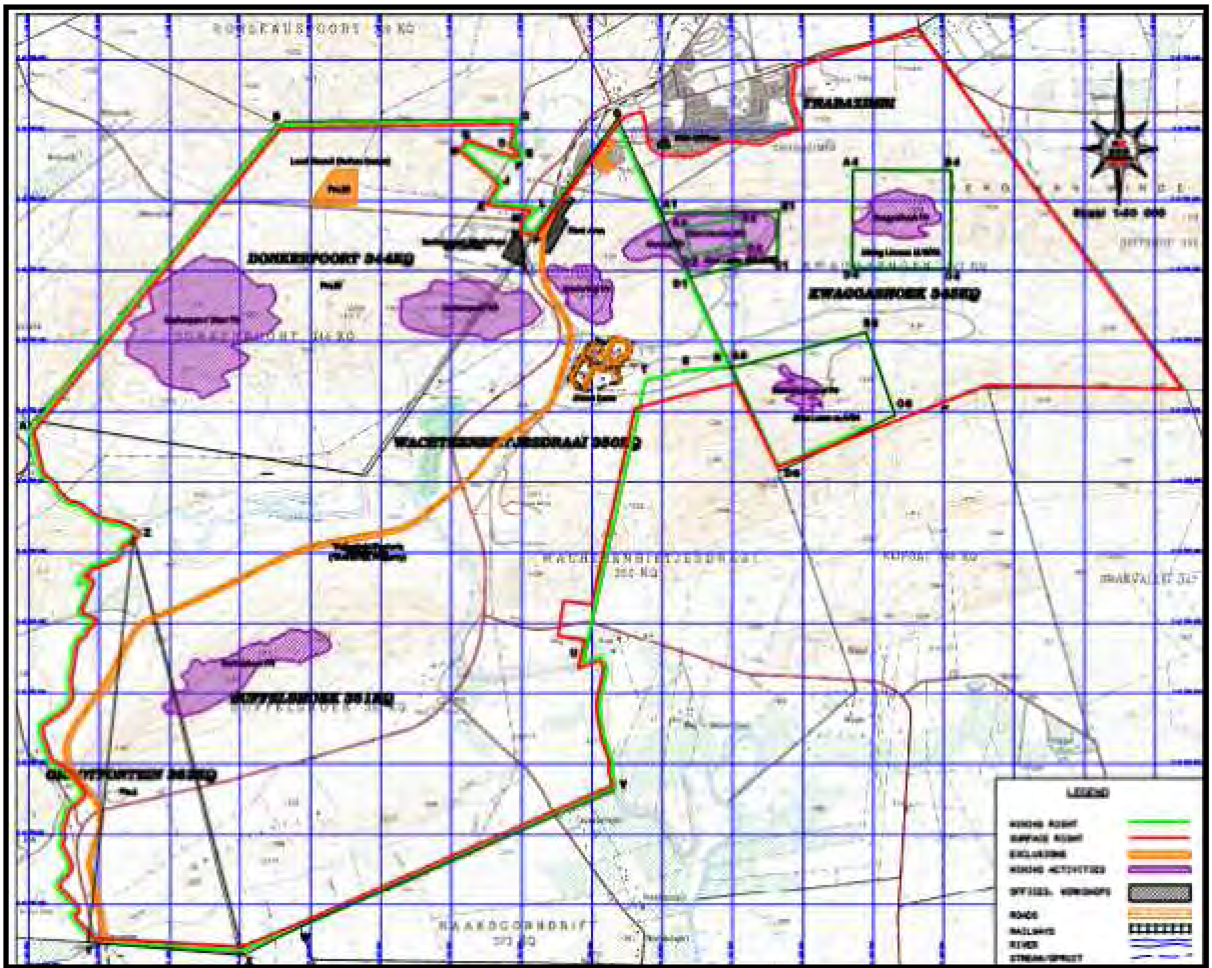

Figure 3: Mining Rights of the Thabazimbi Mine

Client: Thabzimbi Mine	Date: December 2010	SHANGONI Management Services (Pty) Ltd
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr	

1.7 Brief Project Description

1.7.1 Brief History of the Mine

Iron ore has been exploited in the area since 1500. Reminisce of old smelting ovens have been discovered in the Ben Albert's Nature Reserve. This discovery points to a dynamic community in the area who's economy was based on iron ore and mining prior to 1452.

At the start of the 18th century farmers settled next to the Crocodile River and the main agricultural activity was aimed at tobacco farming.

Dwaalboom, Koedoeskop and Matlabas settlements started emerging in the early 19 century. It was at this stage, 1919 that a Mr JH Williams started conducting prospecting in this area. Mr. Williams sold his prospecting rights to Mr. Delfos. Mr. Delfos in turn sold his rights to the Dusnswart Iron and Steel works. Iscor purchased the rights in 1920's.

During the following year, 1931, Mr. C.J.N. Jourdan managed a workforce of 15 employees whom commenced with the mining of Iron ore at Thabazimbi Mine.

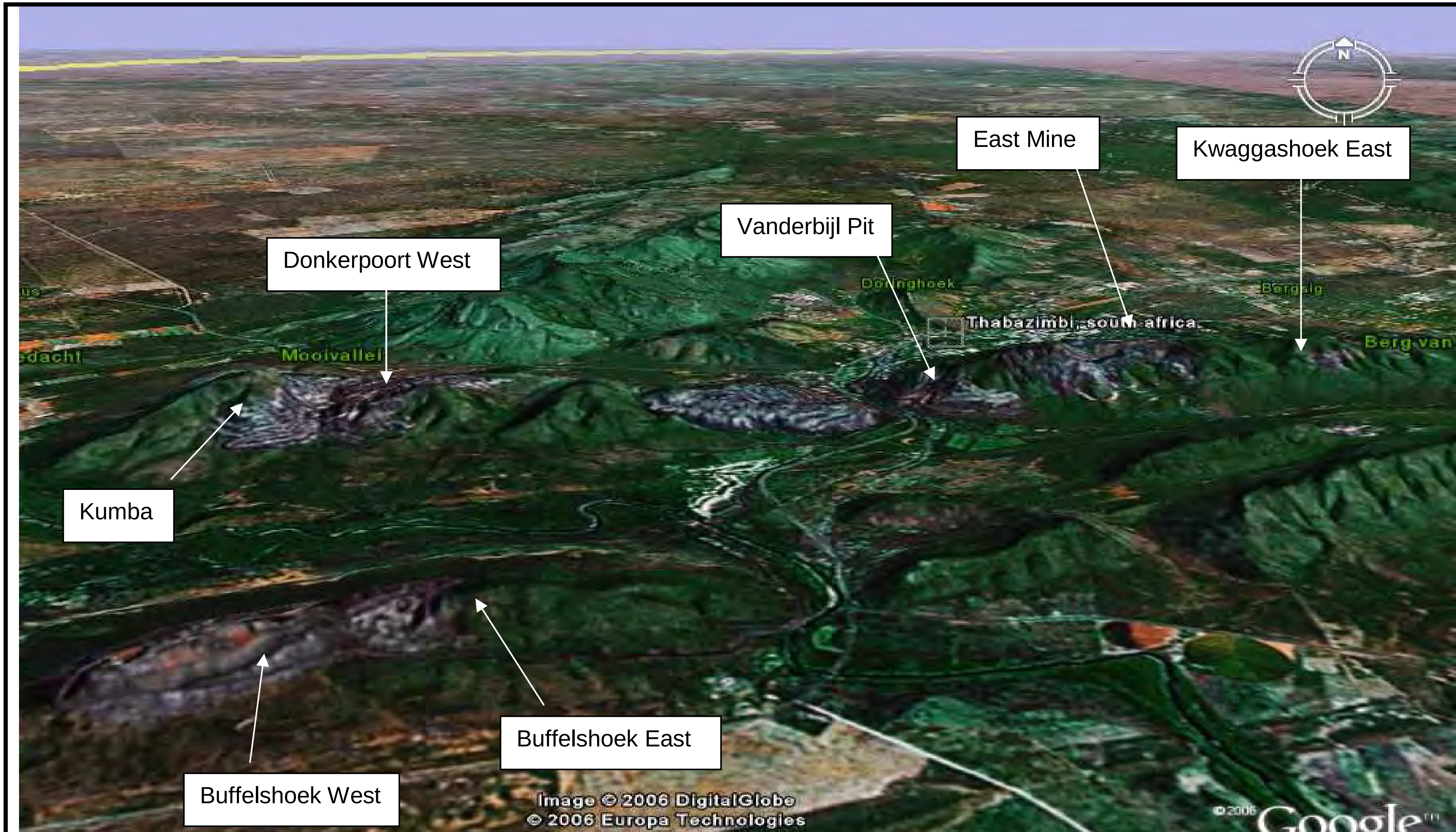

Figure 4: Mining Areas of the Thabazimbi Mine	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

The railway line between Northam and Thabazimbi was completed in 1933 and this resulted in the first 5 000 T of iron ore being delivered to Pretoria Steel works by March 1934. The first Mt was produced by June 1937. At this stage Thabazimbi started developing into a town with a school, churches, tar roads and received council status by 1975.

The mining of high-grade iron in the Thabazimbi area started during 1932. Mining included both surface and underground activities. Up to the early 1970's the bulk of the mining was focused in the East Mine area (East Mine ore body). This area was sub-divided into the Vanderbijl Pit, East Mine Pit and East Mine Underground. Different underground mining methods were used to extract the ore. Mining activities in the East Mine area were terminated in 1998.

1.7.2 Mining Operation

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 950 m (valley floor) to 1 280 m 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; water is obtained from boreholes on the mine's properties as well as from the local municipal supply.

Currently only opencast mining takes place at Thabazimbi Mine. Eight open pits (East pit, Buffelshoek East, Buffelshoek West, Bobbejaanwater, Kumba, Donkerpoort Nek, Donkerpoort West, Kwaggashoek East and Vanderbijl) are present on site. Only four (Buffelshoek West, Kumba, Donkerpoort Nek and Kwaggashoek East) pits are currently actively mined. According to the LoM plan the inactive pits may be mined in the future.
Two underground mining areas (East Mine and Kwaggashoek East underground) were in operation up to the end of 1997. All the adits have been closed as far as possible for security and safety purposes by some or other means.

Sand mining from the river beds at Thabazimbi Mine was previously undertaken, but has since been discontinued. For more detail regarding the discontinued underground mining, and sand mining that were previously undertaken at Thabazimbi Mine, refer to the approved EMPr, dated 1995. These historical sand mining areas were left for natural rehabilitation and have recovered as such.

1.7.3 Mineral Deposit

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 Donkerpoort West deposits. The middle range consists of Bobbejaanwater and the Southern Range includes Buffelshoek East and Buffelshoek West.

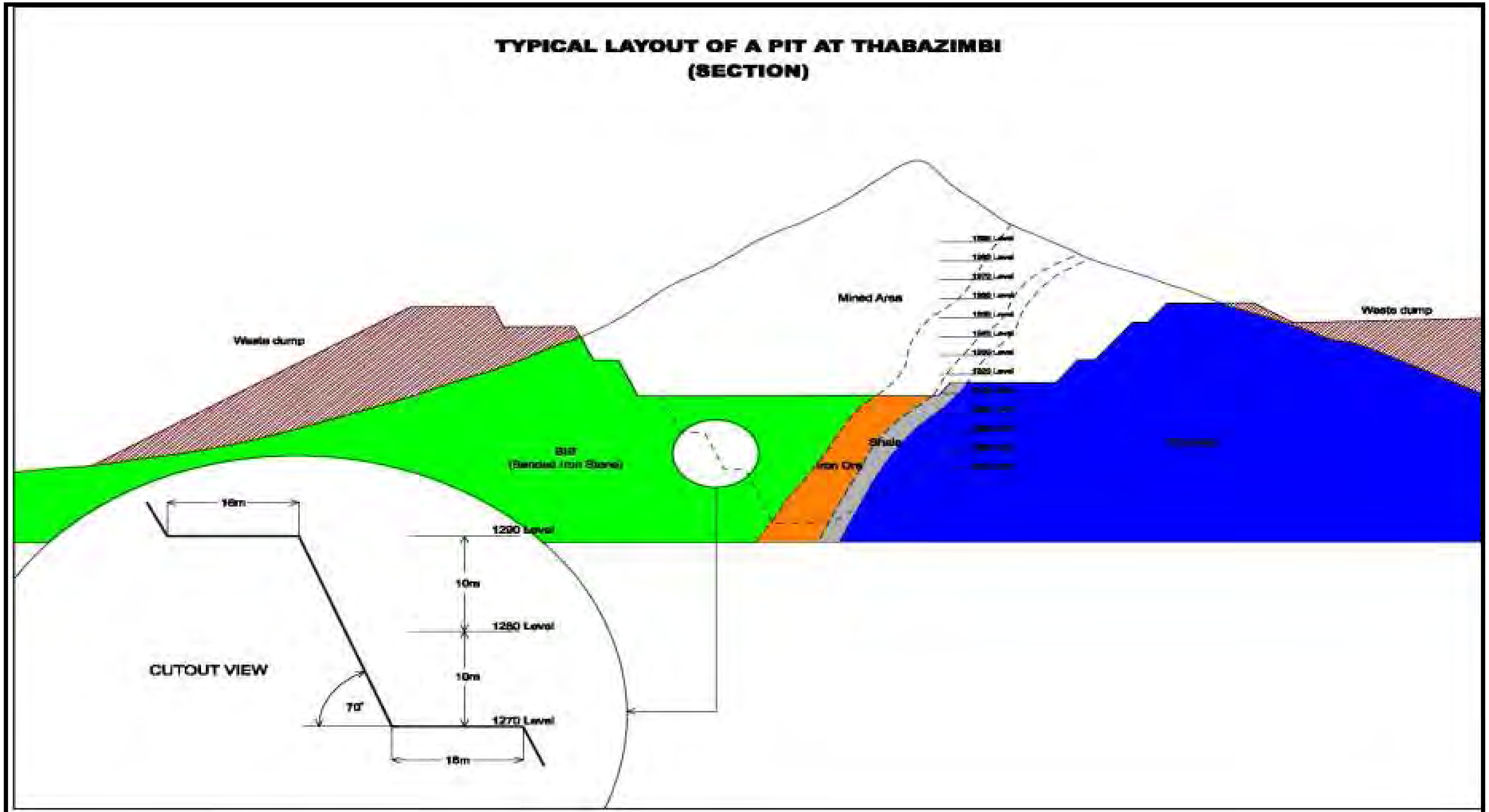

Figure 5: Side View of the Pit Layout		
Client: Thabazimbi Mine	Date: December 2010	SHANGONI Management Services (Pty) Ltd
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr	

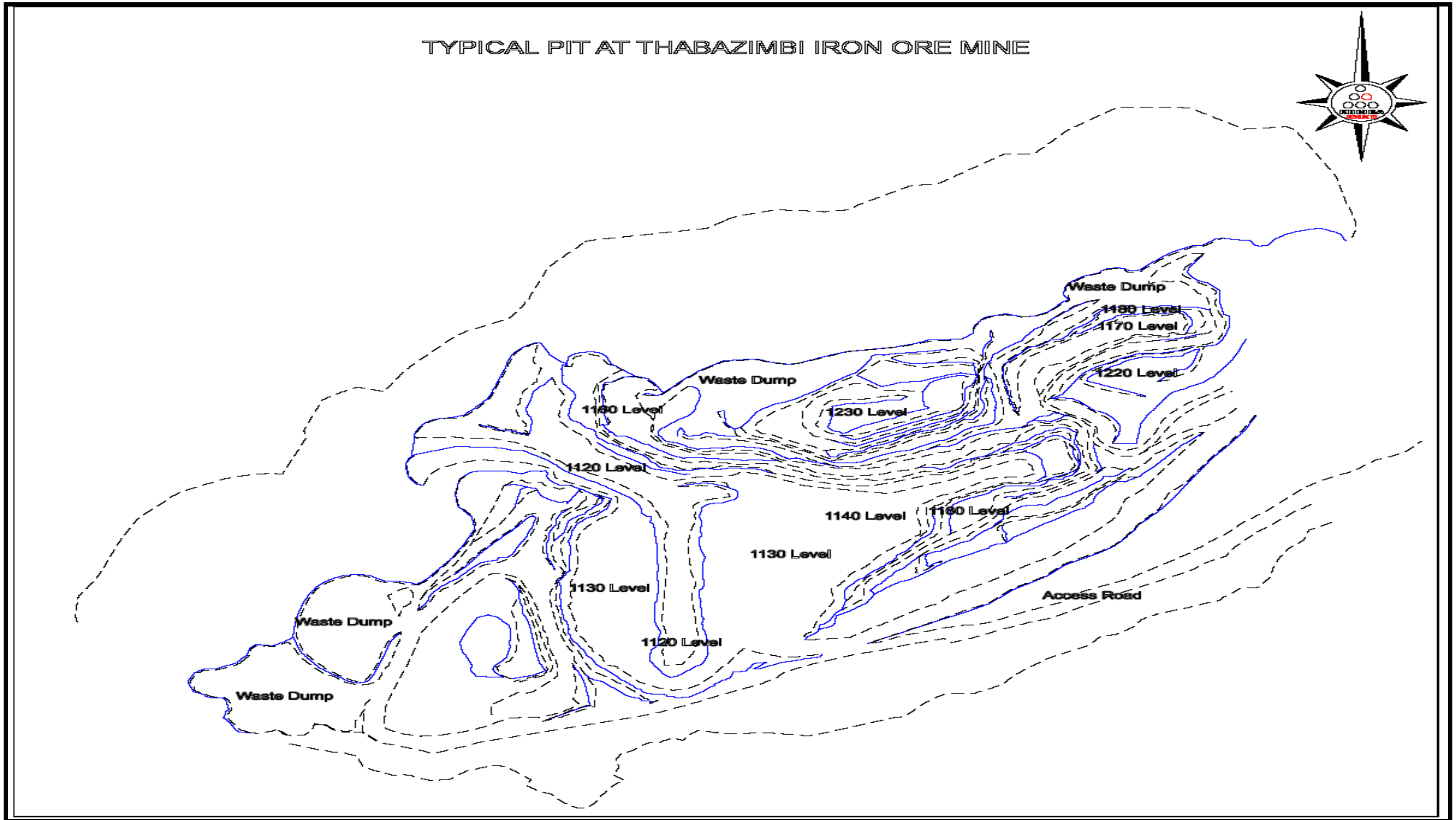

Figure 6: Top View of a Typical Pit	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

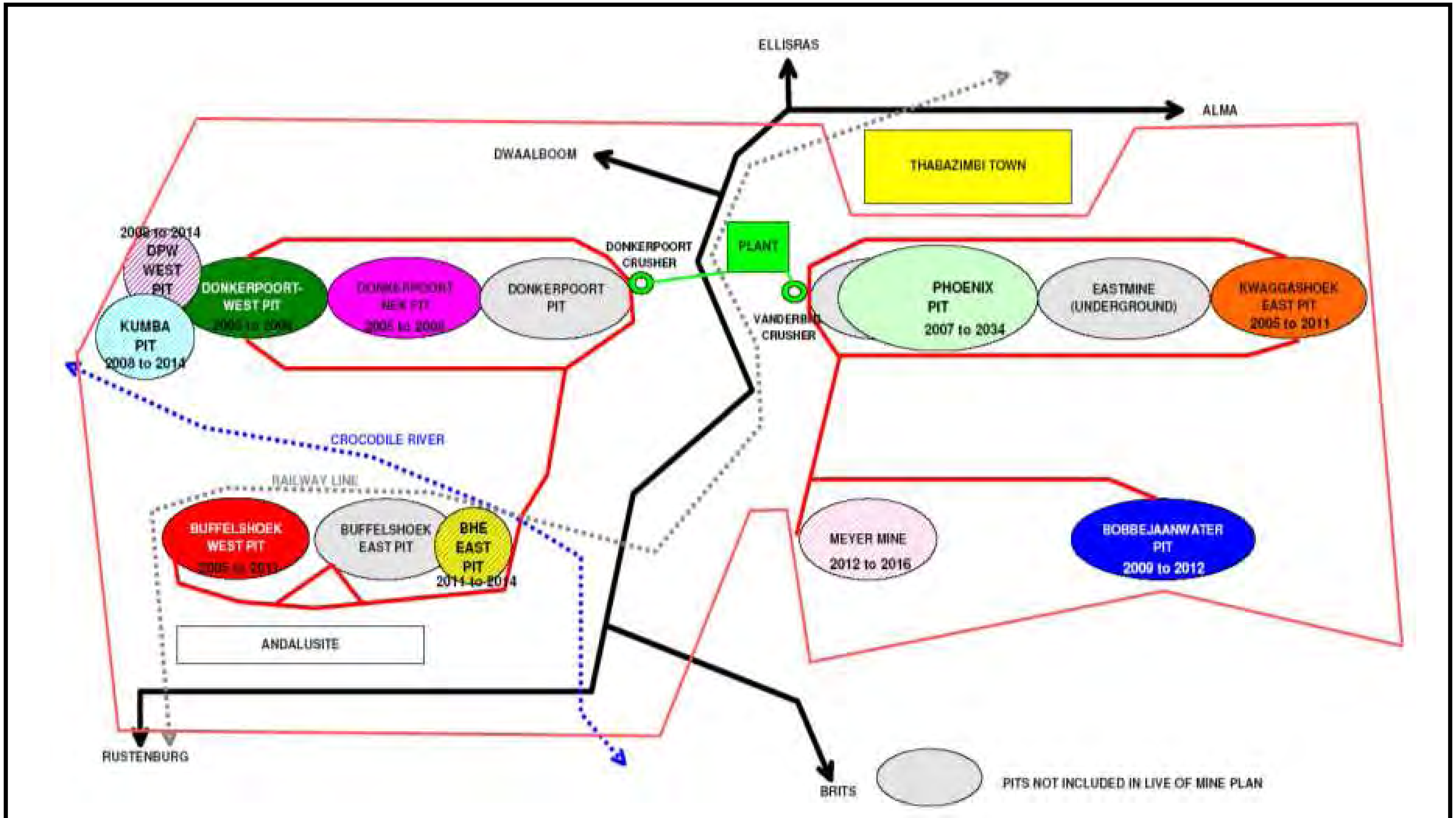

Figure 7: Current and Proposed Mining Activities

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

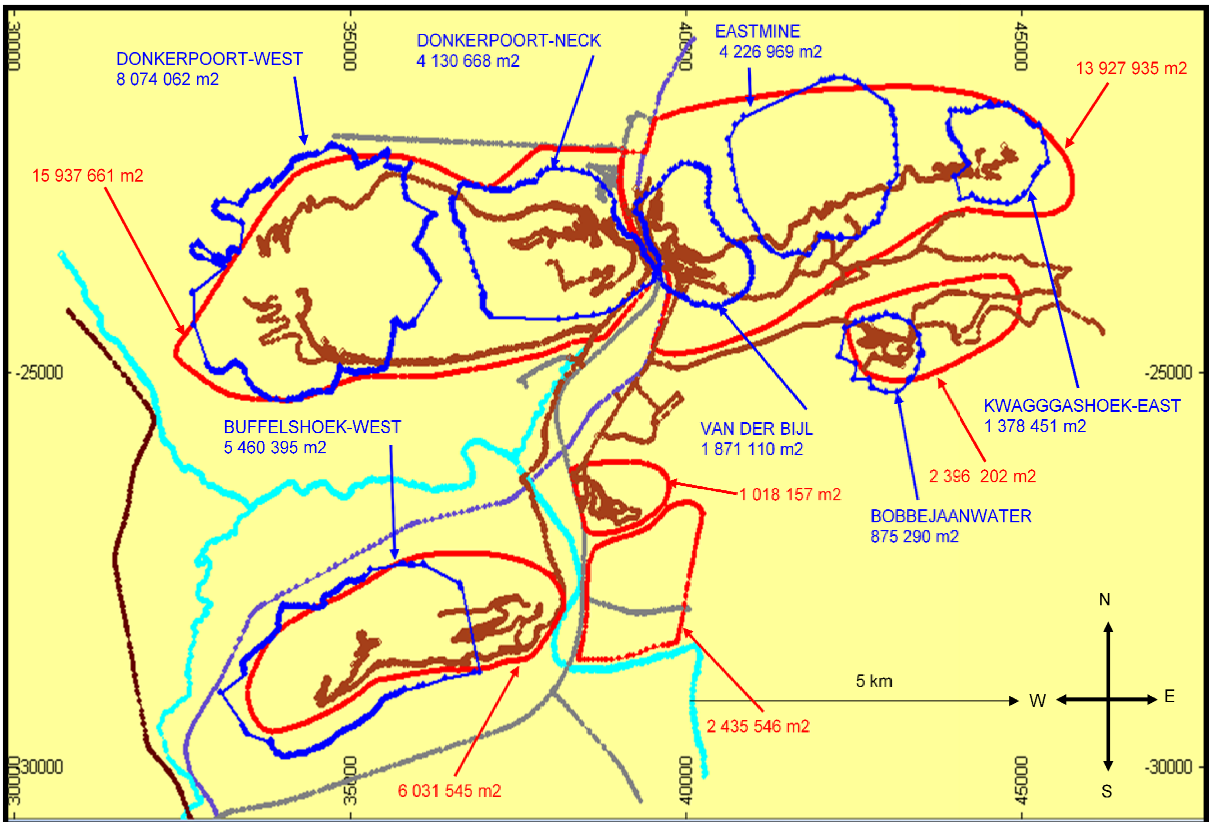

Figure 8: Effected area in relation to the EMPr (Red Highlight)	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

1.7.4 Mine Products

Thabazimbi Mine supplies approximately 3 Mt of iron ore a year to AMSA operations in Newcastle and Vanderbijlpark where the end products are produced.

Potential mining areas have been identified. Reference is specifically made to the proposed new development named Phoenix. The Phoenix activities will concentrate on the exploitation of the ore reserves in and around the old Vanderbijl Pit. The main reason for the expansion is due to the technology becoming available to exploit the minerals that was previously classified as mineral waste.

1.7.5 Estimated Reserves

Table 7 and **Table 8** indicate the estimated ore reserves for Thabazimbi Mine including Bypass and Dense Media Separation (hereafter referred to as DMS). The reserves, as indicated in the two tables, exclude the possible addition of the Phoenix Project due to the feasibility study not being completed as yet. The target date for the completion of the feasibility study is 2014. **Figure 10** indicates the proposed LoM if Project Phoenix feasibility indicates that the operation will go ahead.

Based on information available from the pre-feasibility study report it is envisaged that the ore reserves (BIF) are adequate to support the proposed extension of the LoM to 30 years.

For clarity a mineral resource is defined as a concentration or occurrence of material of economic interest in or on the earth's crust in such form, quality and quantity that there are reasonable and realistic prospects for eventual economic extraction. The location, quantity, grade continuity and other geological characteristics of a Mineral Resource are known, or estimated form specific geological evidence, sampling and knowledge interpreted form an appropriately constrained and portrayed geological model.

Table 7: Mineral Reserves for Thabazimbi Mine (2009)

SITE NAME	RESERVE CATEGORY	ORE RESERVES					
		Bypass		DMS		Total T	Average Grade (%Fe)
		T	Average Grade (%Fe)	T	Average Grade (%Fe)		
Kumba	Proved	0	0.0	6,677,270	62.2	6,677,270	62.2
	Probable	0	0.0	2,698,197	61.2	2,698,197	61.2
	TOTAL	0	0.0	9,375,467	61.9	9,375,467	61.9
Donkerpoort West	Proved	0	0.0	0	0.0	0	0.0
	Probable	0	0.0	0	0.0	0	0.0
	TOTAL	0	0.0	0	0.0	0	0.0
Donkerpoort Neck	Proved	0	0.0	0	0.0	0	0.0
	Probable	0	0.0	651,882	59.9	651,882	59.9
	TOTAL	0	0.0	651,882	59.9	651,882	59.9
Kwaggashoek East	Proved	0	0.0	848,488	62.2	848,488	62.2
	Probable	0	0.0	395,770	61.3	395,770	61.3
	TOTAL	0	0.0	1,244,258	61.9	1,244,258	61.9
Buffelshoek West	Proved	0	0.0	1,954,058	59.7	1,954,058	59.7
	Probable	0	0.0	16,188	60.1	16,188	60.1
	TOTAL	0	0.0	1,970,246	59.7	1,970,246	59.7
Buffelshoek East East	Proved	0	0.0	0	0.0	0	0.0
	Probable	0	0.0	0	0.0	0	0.0
	TOTAL	0	0.0	0	0.0	0	0.0
Bobbejaanwater	Proved	0	0.0	0	0.0	0	0.0
	Probable	967,747	62.5	0	0.0	967,747	62.5
	TOTAL	967,747	62.5	0	0.0	967,747	62.5
Kwaggashoek Prospect	Proved	0	0.0	0	0.0	0	0.0
	Probable	0	0.0	0	0.0	0	0.0
	TOTAL	0	0.0	0	0.0	0	0.0
Mooivallei Prospect	Proved	0	0.0	0	0.0	0	0.0
	Probable	0	0.0	0	0.0	0	0.0
	TOTAL	0	0.0	0	0.0	0	0.0
Thabazimbi Mine	Proved	0	0.0	9,479,816	61.7	9,479,816	61.7
	Probable	967,747	62.5	3,762,037	61.0	4,729,784	61.3

SITE NAME	RESERVE CATEGOR	ORE RESERVES					
		Bypass		DMS		Total T	Averag
	GRAND TOTAL	967,747	62.5	13,241,853	61.5	14,209,600	61.5

1.7.6 Planned Production Rate

The proposed LoM (30 years) which includes Project Phoenix was made based on some assumptions. The assumptions used include the following:

- Phoenix estimated production (2.7 mil/year);
- Phoenix in production mid 2018;
- Phoenix total yield @ 55 %;
- Phoenix stripping ratio @ 1:3; and
- Ramp-up period 2016 and 2018.

1.7.7 Planned Life of Mine

The LoM plan is revised every year. Pits and projects included in the LoM plan include current workings as well as future ones that have proved to be feasible through optimisation. To support the determination of the LoM calculation and the conversion process a Mining Work Programme (hereafter referred to as MWP) has been developed.

The LoM is defined in terms of the SAMREC Code. Refer to **Figure 9**, (i.e. geological confidence of 85 % and 70 % respectively). Exploration is an ongoing process and therefore the LoM will be updated and refined as more information becomes available, refer to **Figure 10**, for current LoM proposal.

Pits and projects currently included in the LoM plan are:

- Buffelshoek – West;
- Donkerpoort – West;
- Kwaggashoek – East;
- Kumba;
- Donkerpoort – Neck;
- Bobbejaanwater;
- Meyer Mine – MMD;
- Phoenix;
- Wachteenbietjesdraai; and
- Buffelshoek - East East.

Table 8: Mineral Resources of Thabazimbi Mine for 2010 Reported in Million Tonnes

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
Kumba	Measured	247,073	55.4	1,568,479	62.5	1,815,552	61.5	0	0.0	0	0.0	0	0.0	100
	Indicated	47,183	57.6	263,758	62.2	310,941	61.5	0	0.0	0	0.0	0	0.0	100
	Inferred (outside LoM)	43,598	58.2	285,789	61.8	329,387	61.3	20,057	58.3	102,357	62.4	122,414	61.7	100
	Inferred (inside LoM)	121,835	58.4	320,217	62.1	442,052	61.1	145,375	58.3	741,909	62.4	887,284	61.7	-50
	SUB TOTAL	459,688	56.7	2,438,244	62.3	2,897,932	61.4	165,432	58.3	844,266	62.4	1,009,698	61.7	100
Donkerpoort West	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Donkerpoort West South	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Donkerpoort Neck	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	93,050	51.7	57,403	62.1	150,453	55.7	0	0.0	0	0.0	0	0.0	100
	Inferred (outside LoM)	11,370	57.8	54,632	62.9	66,002	62.1	7,246	58.1	138,605	62.9	145,851	62.7	-55
	Inferred	6,624	58.7	286,908	63.0	293,532	62.9	11,881	58.1	227,286	62.9	239,167	62.7	23

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
	(inside LoM)													
	SUB TOTAL	111,044	52.8	398,943	62.9	509,987	60.7	19,127	58.1	365,891	62.9	385,018	62.7	32
Donkerpoort	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Vanderbijl	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
East Mine	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Kwaggashoek East	Measured	169	57.3	2,899	63.9	3,068	63.5	0	0.0	0	0.0	0	0.0	100
	Indicated	8,077	54.5	21,213	61.5	29,290	59.6	0	0.0	0	0.0	0	0.0	100
	Inferred	4,312	56.9	8,890	61.9	13,201	60.3	4,443	57.7	78,992	62.0	83,435	61.8	-84

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
	(outside LoM)													
	Inferred (inside LoM)	7,018		105,671	62.0	112,689	58.1	8,644	57.7	153,692	62.0	162,336	61.8	-31
	SUB TOTAL	19,576	35.5	138,672		158,248	58.7	13,087	57.7	232,684	62.0	245,771	61.8	-36
Buffelshoek West	Measured	55,741	56.1	142,195	62.0	197,936	60.3	0	0.0	0	0.0	0	0.0	100
	Indicated			1,373	60.4	1,373	60.4	0	0.0	0	0.0	0	0.0	100
	Inferred (outside LoM)	3,796	58.9	3,437	60.8	7,234	59.8	0	0.0	0	0.0	0	0.0	100
	Inferred (inside LoM)	8,894	59.5	5,250	60.6	14,144	59.9	12,690	59.2	8,687	60.6	21,377	59.8	-34
	SUB TOTAL	68,431	56.7	152,256	61.9	220,687	60.3	12,690	59.2	8,687	60.6	21,377	59.8	100
Buffelshoek West Neck	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Buffelshoek East	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Buffelshoek	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
East East	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Bobbejaanwater	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated			51,419	65.2	51,419	65.2	0	0.0	0	0.0	0	0.0	100
	Inferred (outside LoM)			3,715	64.6	3,715	64.6	0	0.0	20,020	64.6	20,020	64.6	-81
	Inferred (inside LoM)			48,541	64.7	48,541	64.7	0	0.0	32,236	64.6	32,236	64.6	51
	SUB TOTAL	0	0.0	103,675	65.0	103,675	65.0	0	0.0	52,256	64.6	52,256	64.6	98
Meyer Mine	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Measured	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Measured	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (inside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Thabazimbi Iron Ore Mine	Measured	302,983	55.5	1,713,573	62.4	2,016,556	61.4	0	0.0	0	0.0	0	0.0	100
- Mineral Resources inside pit layout	Indicated	148,310	53.7	395,166	62.6	543,476	60.1	0	0.0	0	0.0	0	0.0	100
	Inferred (outside LoM)	63,076	58.1	356,464	62.0	419,539	61.4	31,746	58.2	339,974	62.6	371,720	62.3	13
	Inferred (inside LoM)	144,371	55.6	766,586	62.6	910,957	61.5	178,590	58.3	1,163,810	62.5	1,342,400	61.9	-32
	TOTAL	658,740	55.4	3,231,789	62.4	3,890,529	61.3	210,336	58.3	1,503,784	62.5	1,714,120	62.0	100
Kumba	Measured	38,334	58.3	718,953	63.1	757,288	62.9	35,808	58.6	718,953	63.1	754,761	62.9	0
	Indicated	5,464	59.1	52,258	62.5	57,722	62.2	5,463	59.1	52,258	62.5	57,721	62.2	0
	Inferred (outside LoM)	17,314	57.3	24,946	62.5	42,260	60.4	11,574	59.2	25,005	62.5	36,579	61.5	16
	TOTAL	61,112	58.1	796,158	63.1	857,269	62.7	52,845	58.8	796,216	63.0	849,061	62.8	1
Donkerpoort West	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Donkerpoort	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
West South	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Donkerpoort Neck	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	80,717	58.6	220,399	62.4	301,116	61.4	79,011	58.7	220,399	62.4	299,410	61.4	1
	Inferred (outside LoM)	457	57.6	19,051	63.0	19,508	62.9	457	57.5	19,051	63.0	19,508	62.9	0
	SUB TOTAL	81,174	58.6	239,450	62.4	320,624	61.5	79,468	58.7	239,450	62.4	318,918	61.5	1
Donkerpoort	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Vanderbijl	Measured	2,571,544	59.3	5,539,976	64.4	8,111,520	62.8	2,571,544	59.3	5,539,976	64.4	8,111,520	62.8	0
	Indicated	97,538	59.2	1,673,710	64.6	1,771,248	64.3	97,538	59.2	1,673,710	64.6	1,771,248	64.3	0
	Inferred (outside LoM)	35,645	58.7	1,417,319	64.3	1,452,964	64.2	35,645	58.7	1,417,319	64.3	1,452,964	64.2	0
	SUB TOTAL	2,704,727	59.3	8,631,005	64.4	11,335,732	63.2	2,704,727	59.3	8,631,005	64.4	11,335,732	63.2	0
East Mine	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Kwaggashoek East	Measured	580	59.3	165,095	63.2	165,675	63.1	580	59.2	171,126	63.1	171,706	63.1	-4
	Indicated	19,216	59.4	258,729	62.7	277,945	62.5	19,216	59.4	265,029	62.7	284,245	62.5	-2

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
	Inferred (outside LoM)	14,500	59.4	212,530	62.4	227,030	62.2	14,500	59.4	215,910	62.4	230,410	62.2	-1
	SUB TOTAL	34,296	59.4	636,354	62.7	670,650	62.5	34,296	59.4	652,065	62.7	686,361	62.5	-2
Buffelshoek West	Measured	128,196	58.1	313,459	62.1	441,654	60.9	122,828	58.4	305,867	62.1	428,695	61.0	3
	Indicated	348	58.3	677	64.5	1,026	62.4	348	58.3	677	64.5	1,025	62.4	0
	Inferred (outside LoM)	2,642	58.0			2,642	58.0	2,224	58.9			2,224	58.9	19
	SUB TOTAL	131,186	58.1	314,136	62.1	445,322	60.9	125,400	58.4	306,544	62.1	431,944	61.0	3
Buffelshoek West Neck	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Buffelshoek East	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Buffelshoek East East	Measured	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)	37,167	58.3	100,790	61.7	137,957	60.8	37,167	58.3	100,790	61.7	137,957	60.8	0
	SUB TOTAL	37,167	58.3	100,790	61.7	137,957	60.8	37,167	58.3	100,790	61.7	137,957	60.8	0
Bobbejaanwater	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	20,486	63.6	20,486	63.6	0	0.0	20,486	63.6	20,486	63.6	0
	Inferred (outside	4,486	58.8	6,202	64.4	10,688	62.1	4,486	58.9	6,202	64.4	10,688	62.1	0

SITE NAME	RESOURCE CATEGORY	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVE GRADE (%FE)	GRADE CUT-OFF: 55 ≤ %FE < 60		GRADE CUT-OFF: 60 ≤ %FE		TOTAL T	AVERAGE GRADE (%FE)	% CHANGE
		Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			Total T	Average Grade (%Fe)	Total T	Average Grade (%Fe)			
	LoM)													
	SUB TOTAL	4,486	58.8	26,688	63.8	31,174	63.1	4,486	58.9	26,688	63.8	31,174	63.1	0
Meyer Mine	Measured					0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated					0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)					0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Measured	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Measured	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Indicated	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	Inferred (outside LoM)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
	SUB TOTAL	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Thabazimbi Iron Ore Mine	Measured	2,738,654	59.2	6,737,483	64.1	9,476,137	62.7	2,730,760	59.3	6,735,922	64.1	9,466,682	62.7	0
- Mineral Resources outside pit layout	Indicated	203,283	59.0	2,226,259	64.1	2,429,542	63.7	201,576	59.0	2,232,559	64.1	2,434,135	63.7	0
	Inferred (outside LoM)	112,210	58.4	1,780,838	63.9	1,893,049	63.6	106,053	58.7	1,784,277	63.9	1,890,330	63.6	0
	TOTAL	3,054,148	59.2	10,744,580	64.1	13,798,728	63.0	3,038,389	59.2	10,752,758	64.1	13,791,147	63.0	0

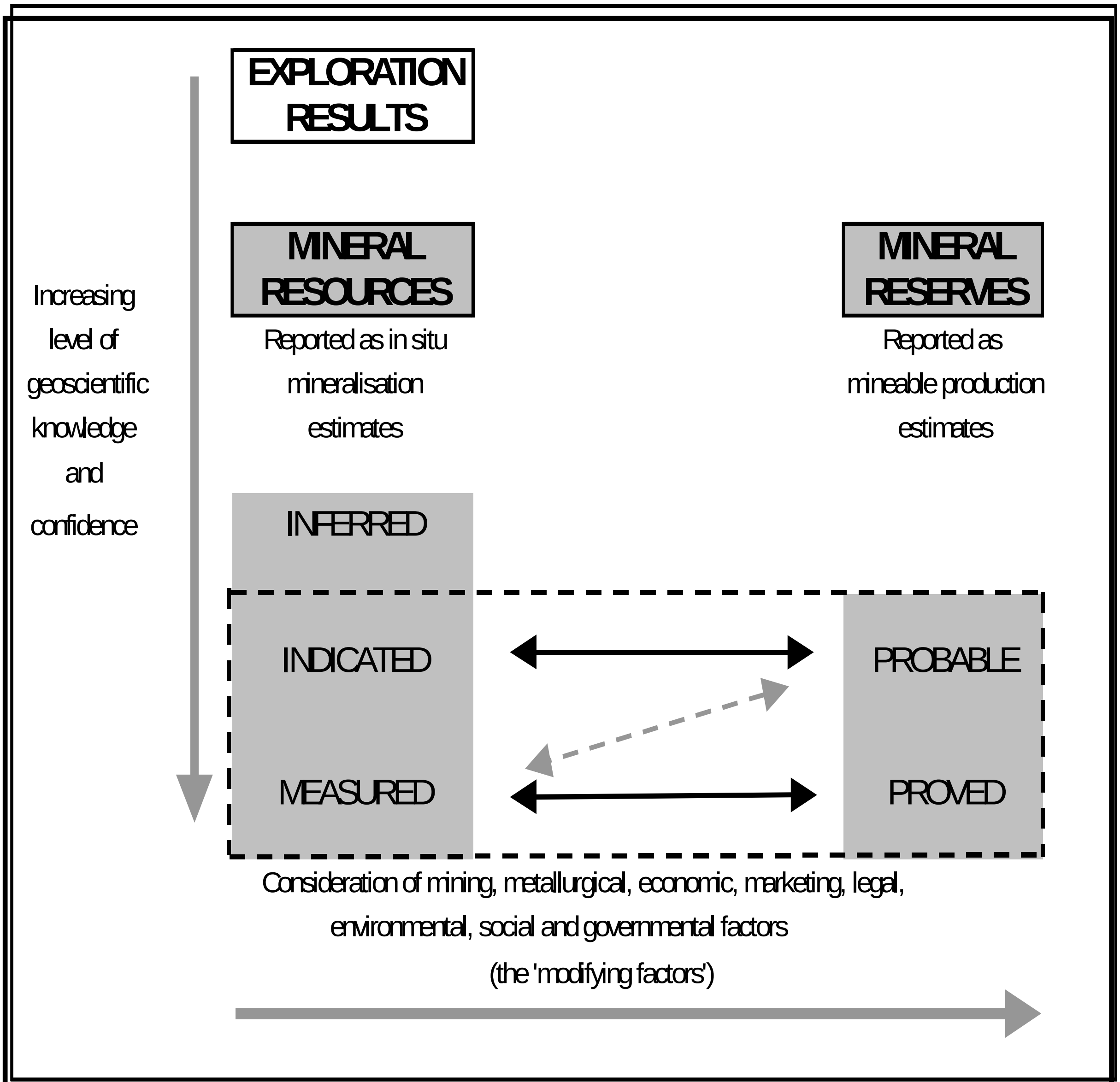

Figure 9: SAMREC Code of LoM	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

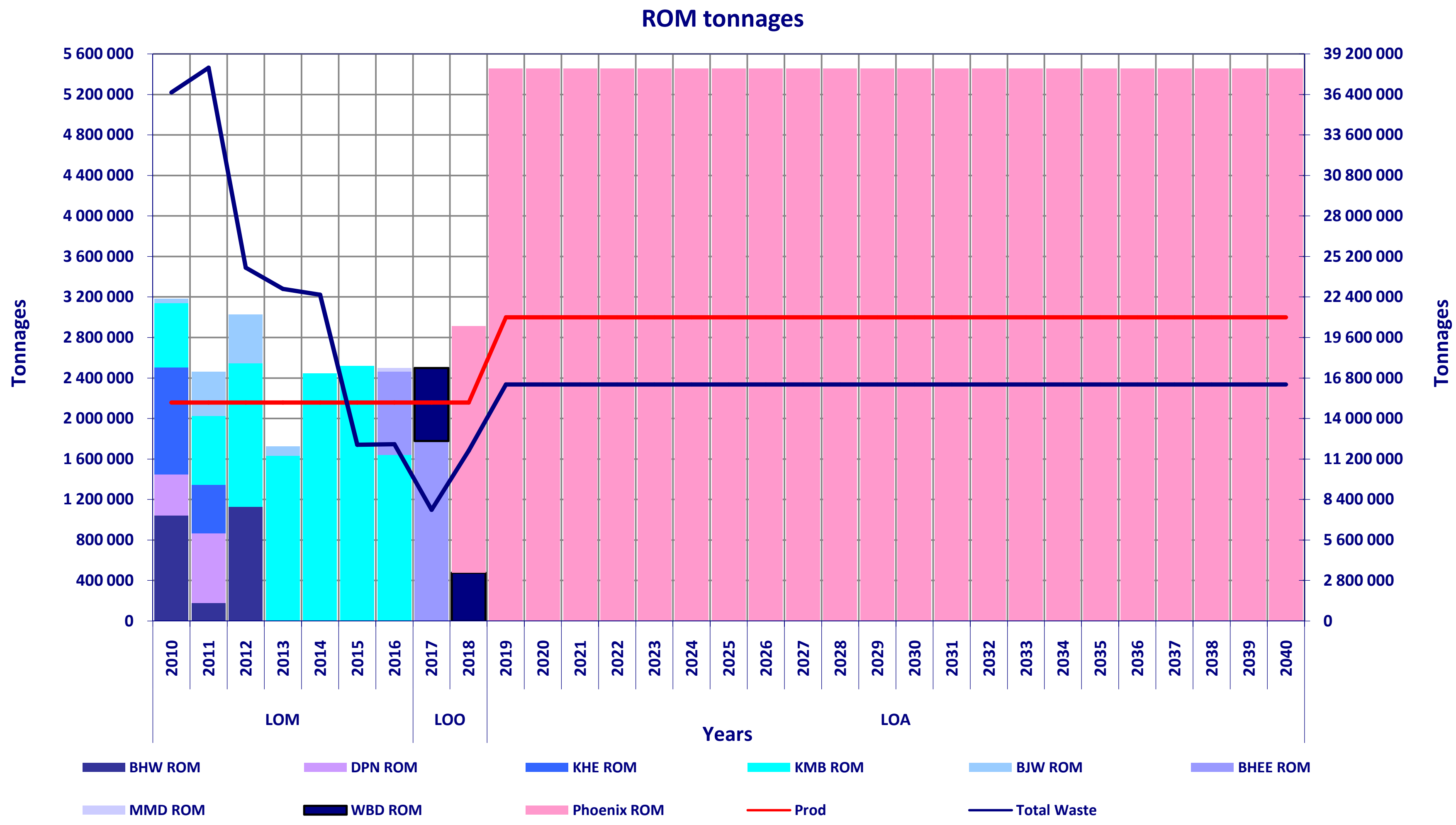

Figure 10: LoM Proposal

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

CHAPTER 2: DESCRIPTION OF THE ENVIRONMENT

This chapter provides for a description of the natural environment in which the mining activities take place. Since the initial development of the EMPr 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.

Various specialist studies have been performed since the approval of the revised EMPr in 2005. The detail information documented in these studies has been used to update **Chapter 2** of this document as well as to support the mitigation measures included in **Chapter 5**. This information was also used to increase the understanding of the potential impacts and was therefore used to provide support with regards to the ratings of the various environmental aspects and impacts. A list of specialist studies done is as follow:

SPECIALIST STUDY	DATE COMPILED
Climate Assessment	October 2010
Fauna and Flora Survey	June 2005
Fauna and Flora Survey Addendum	July 2010
Air Quality Management Plan (hereafter referred to as AQMP)	September 2009
Noise Impact Assessment	September 2006
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
Biodiversity Action Plan – hereafter referred to as BAP	August 2009
Traffic Impact Assessment Report	May 2007.
Revised Draft Report Comparative Social Impact Assessment	February 2007
Stormwater Management Plan	March 2006
Groundwater Model for the Dewatering of the Thabazimbi Mine Area	April 2007
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

2.1 Geology

2.1.1 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, see **Figure 11**, **Figure 12** & **Figure 13**.

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 9** 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 9: 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 Carbonaceous shale band, discoidal dolomite and possible collapse structure	30
		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 Phoenix project 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.

2.1.2 Local Geology within Production Areas

2.1.2.1 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 14**. 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.

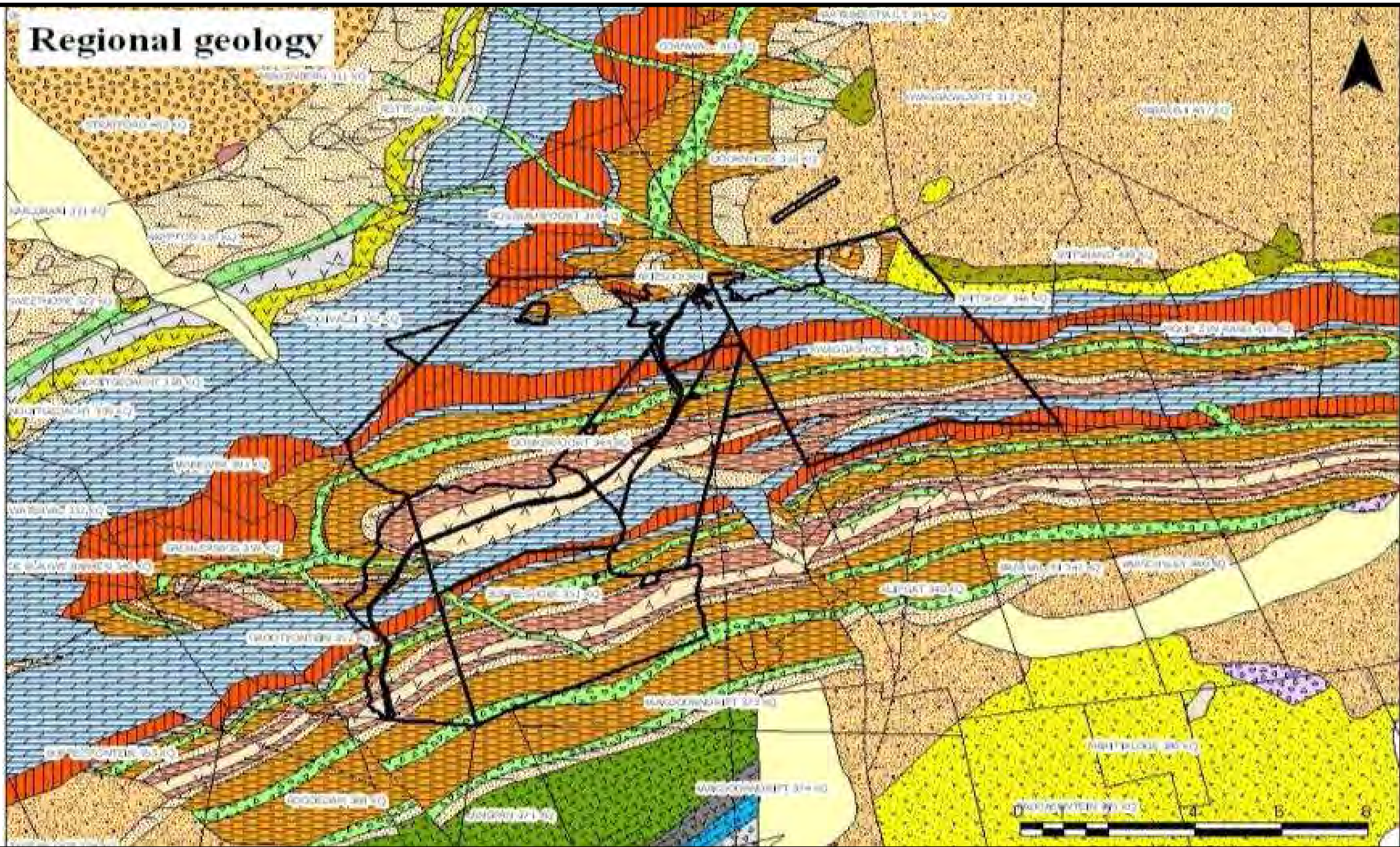

Figure 11: Geology Specific to the Mining Area

Client: Thabazimbi Mine	Date: December 2010
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fault

Acid lava

Acid lava (quartz porphyry , felsite and ryholite)agglomerate,

Alluvium

Andesitic lava

Andesitic lava with acid lava; quartzite

Anorthosite with Merensky Reef (Chromitite bands: Upper group -

Banded ironstone

Black soil, red soil, ferricrete (Qrf), surface conglomerate or

Diabase, granophyric gabbro, granophyre

Dolomite, chert, shale

Feldspathic graywacke, sandstone, grit, conglomerate, boulder-c

Ferrogabbro with magnetite bands and pipes

Ferruginous shale and hornfels

Gabbro, noritic at base and locally anorthositic

Gneiss, granulite, schist, talc schist, quartzite, arkose, band

Granite and granite-gneiss including small scattered occurrence

Granophyre

Main Granite, granophyric, porphyritic, pegmatitic or aplitic

Metamorphic rocks, metaquartzite

Norite, locally anorthositic

Pyroxenite

Quartzite

Quartzite , partly feldspathic and locally with conglomerate ba

Quartzite with interbedded shale, grit, agglomerate and locally

Quartzite, arkose, conglomerate

Quartzite, arkose, conglomerate-INFERRED

Quartzite, grit, conglomerate, shale

Quartzite, partly ferruginous, mainly at base with locally inte

Sandstone

Sandstone(subgraywacke), conglomerate, shale, siltstone

Shale(ferruginous) and hornfels

Shale(partly ferruginous and carbonaceous) and hornfels

Younger granite

Dolomite, with shaly dolomitic limestone at top

Legend to Geology Specific to the Mining Area	
Client: Thabzimbi Mine	Date: December 2010
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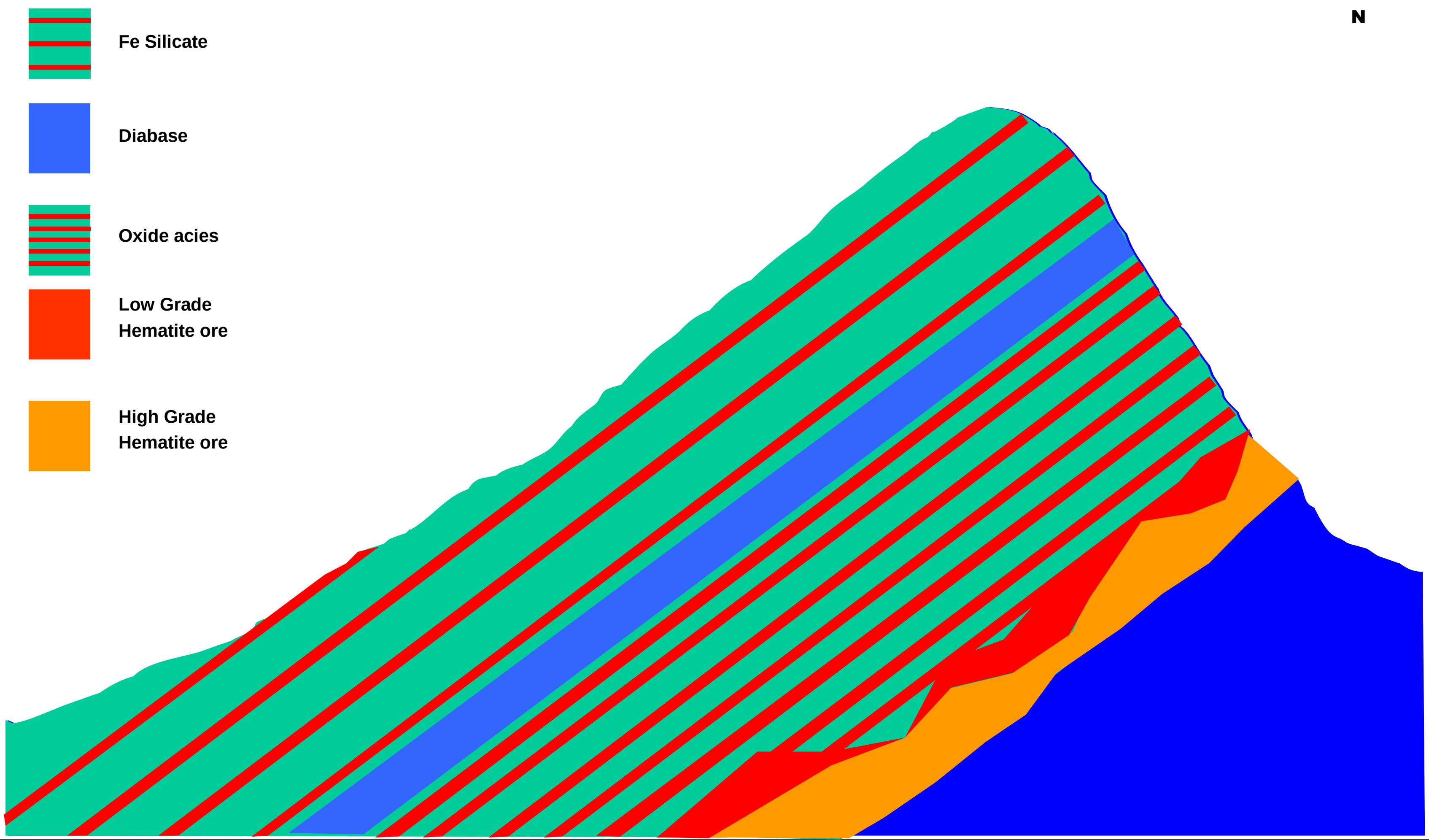

Figure 12: General Geological Profile to Illustrate Geology at Thabazimbi Mine

Client: Thabazimbi Mine	Date: December 2010
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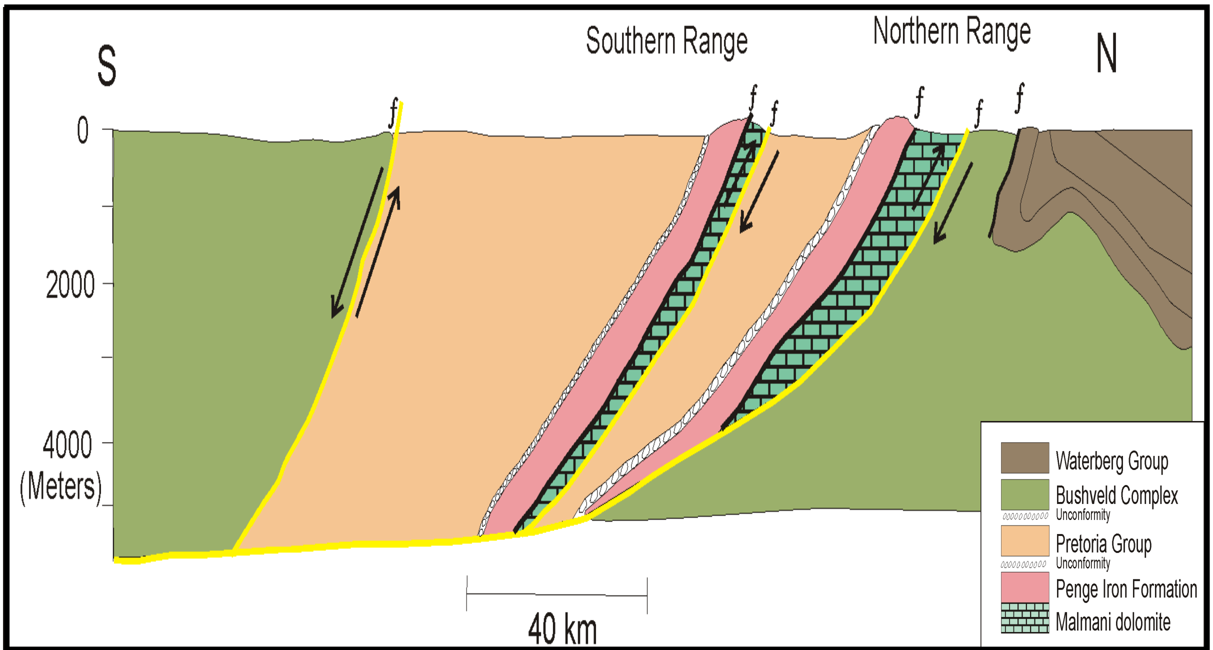

Figure 13: Generalised Geological Section of Thabazimbi Area	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

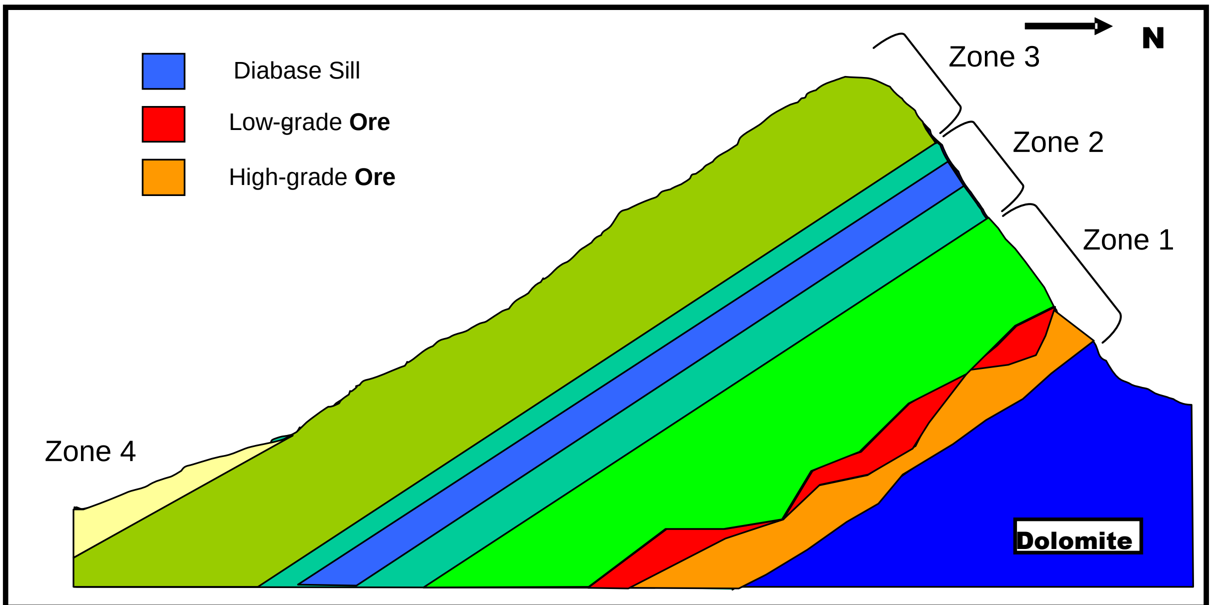

Figure 14: Stratigraphic Zones within the BIF of the N. Mountain Range	
Client: Thabzimbi Mine	Date: December 2010
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Intersections with varying or alternating rock types (small alternating bands BIF, shale, ferruginous BIF) occur at random. This type 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 14**, 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.

2.2 Climate

2.2.1 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℃ in summer. The mean maximum summer temperature is about 30℃.

Table 10: 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
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

THABAZIMBI RAINFALL REPORT													
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
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

THABAZIMBI RAINFALL REPORT													
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
MND GEM	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

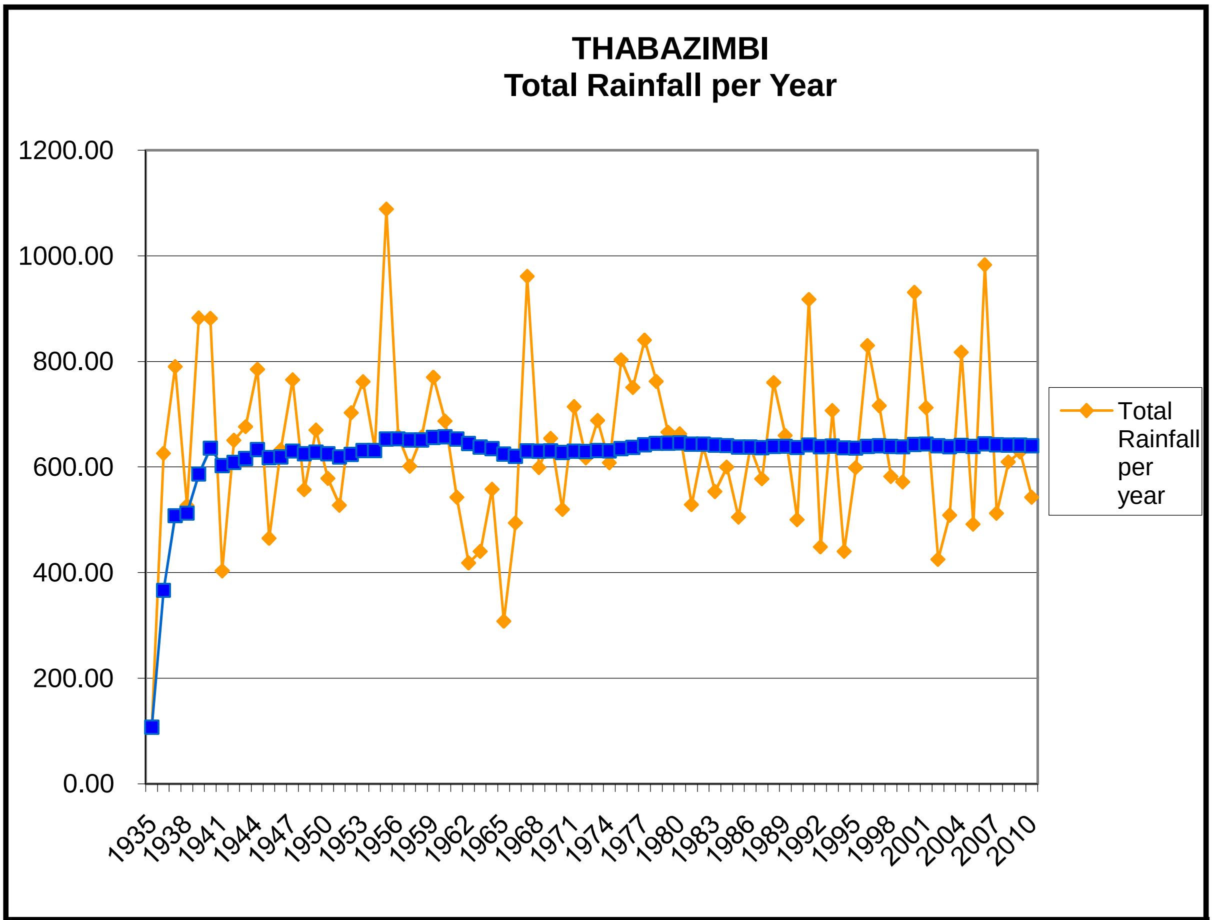

Figure 15: Average Rainfall from 1935 - 2010

Client: Thabzimbi Mine	Date: December 2010
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2.2.2 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 15**. **Table 10** presents the information used to develop the graphs to indicate the average rainfall as well as the monthly rainfall for the past 69 years.

2.2.3 Minimum, Maximum and Maximum Rainfall Intensity per Month

Table 11 below shows the maximum rainfall per 24 hours recorded for each month in the past year.

Table 11: 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

MONTH	MIN RAINFALL (mm)	MAX RAINFALL (mm)	AVG RAINFALL (mm)
April	0.8	95.5	23.4
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**

2.2.4 Mean Monthly Minimum and Maximum Temperatures

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

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

The mean monthly maximum and minimum temperatures are shown in the **Table 12** below.

Table 12: Mean Monthly Maximum and Minimum Temperatures

MONTH	MAX. TEMP. (°C)	MIN. TEMP. (℃)
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

2.2.5 Mean Monthly Wind Direction and Speed

Table 13 presents wind roses indicating the mean wind direction at Thabazimbi Mine. From the wind roses it is evident that the mean wind direction is North to North-east, refer to **Figure 16**.

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

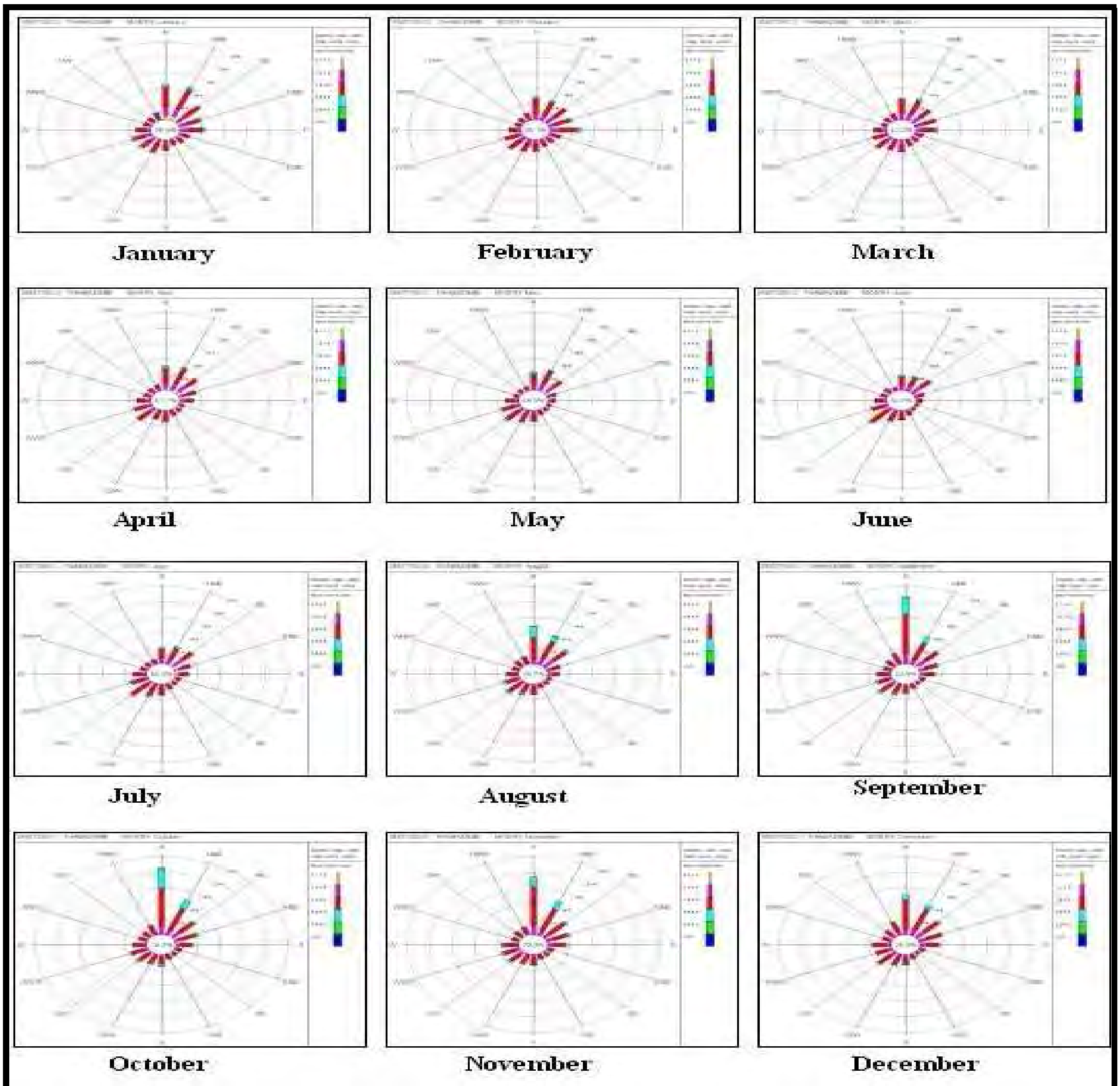

Figure 16: Annual Wind Direction

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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2.2.6 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 13** below.

Table 13: 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

2.2.7 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.

2.3 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 16** and **Figure 17** 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.

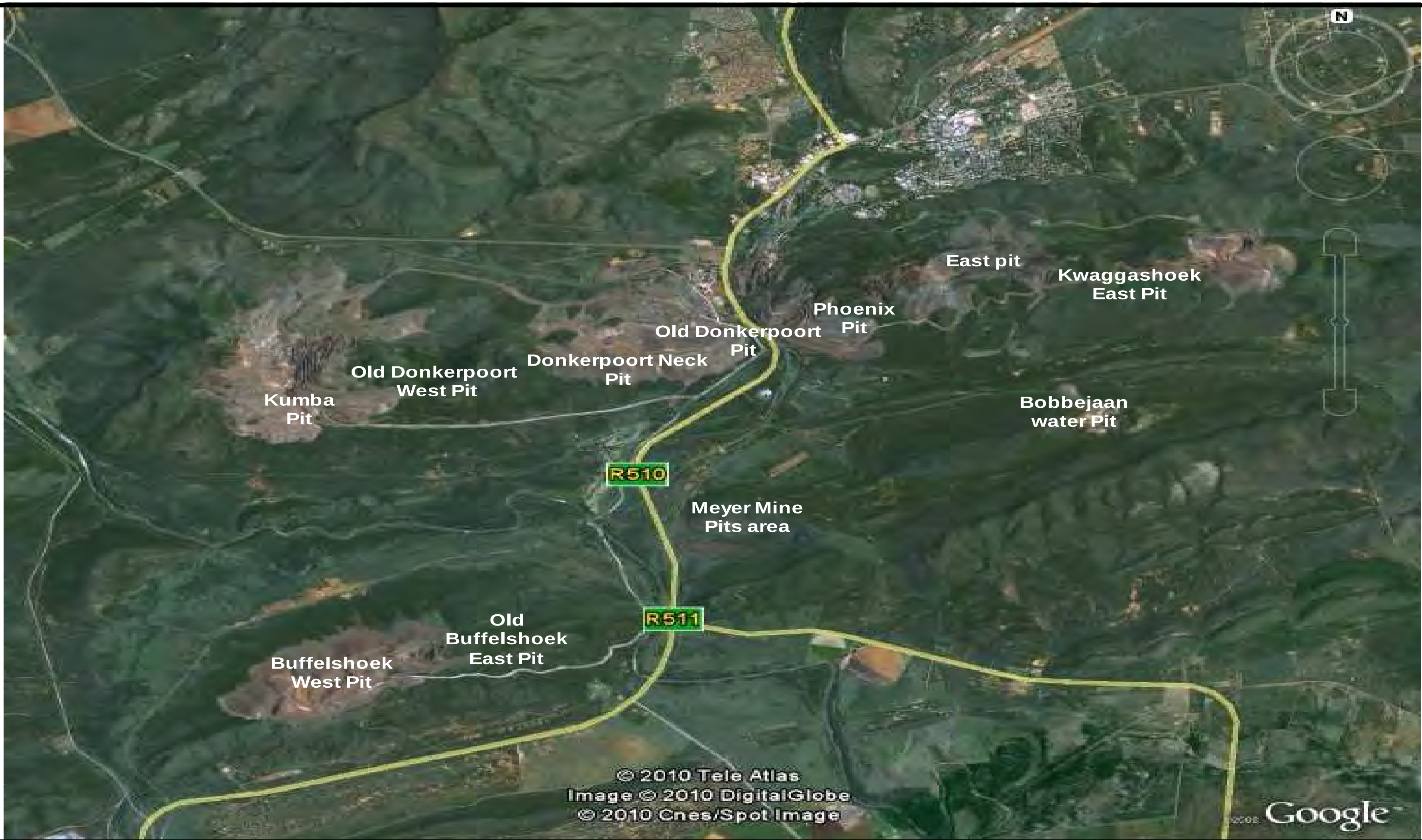

Figure 17: Topography of the Thabazimbi Mine Area

Client: Thabazimbi Mine	Date: December 2010
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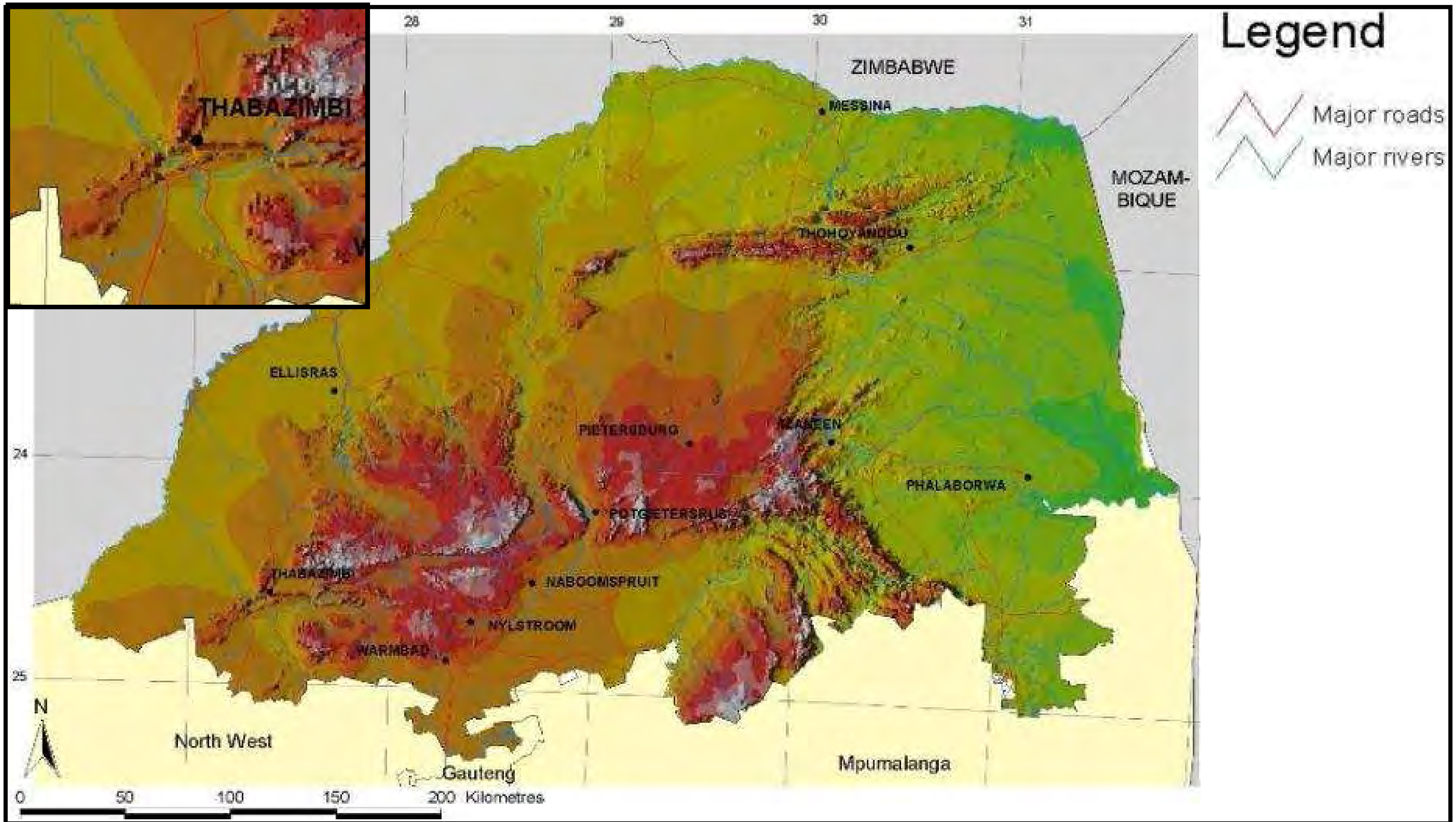

Figure 18: 3D Topography of the Thabazimbi Mine Area

Client: Thabazimbi Mine	Date: December 2010
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2.4 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 would most likely be shallow Mispah soils no topsoil stripping from an economical perspective was recommended.

2.5 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.

2.6 Natural Vegetation/Plant Life

Thabazimbi Mine falls within three different vegetation units. Refer to **Figure 18** for the vegetation in terms of Thabazimbi Mine. 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 14** for a list of all the protected trees found in the area, **Table 15** for a list of specially protected trees found in the area, **Table 16** for a list of vulnerable trees found in the area and **Table 17** for the detailed lists of plant species found during the survey.

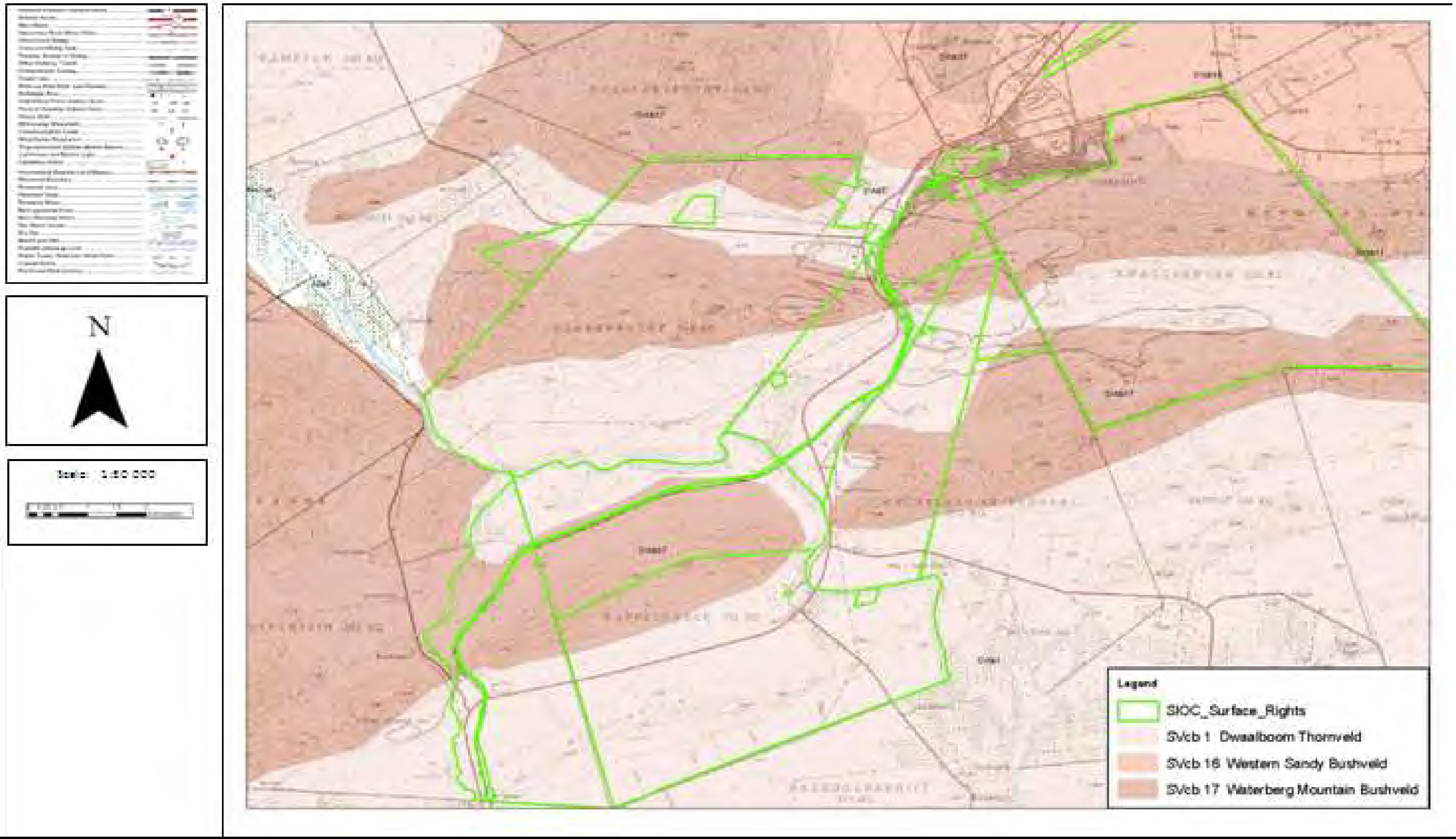

Figure 19: Vegetation Map of Thabazimbi Area

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Table 14: 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 15: Specially Protected Trees Found in the Area

SCIENTIFIC NAME	COMMON NAME
Erythrophysa transvaalensis	Transvaal red balloon

Table 16: 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 17: 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*	
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.

COMMON NAME	SCIENTIFIC NAME	STATUS
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*	
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*	

COMMON NAME	SCIENTIFIC NAME	STATUS
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*	
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*	

COMMON NAME	SCIENTIFIC NAME	STATUS
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*	
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*	

COMMON NAME	SCIENTIFIC NAME	STATUS
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*	

2.7 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 18**.

Table 18: 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*

COMMON NAME	SCIENTIFIC NAME
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 19** for the protected bird species found.

Table 19: 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.

2.8 Surface Water

2.8.1 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.

2.8.2 Surface Water Quantity

2.8.2.1 Streams and Catchment Boundaries

The catchment boundaries and relevant streams at Thabazimbi Mine are shown on **Figure 20**. 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 km². 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).

2.8.2.2 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 m³. The MAR of the Rooikuilspruit (28 195 ha) is 11 820 075 m³.

2.8.2.3 Mean Annual Precipitation

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

2.8.2.4 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.

2.8.2.5 Flood Peaks and Volumes

Table 20 indicates the flood peaks and volumes of the sub-catchment.

Table 20: 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 21** for the flood peaks and volumes as calculated at points 1 and 2 of the sub-catchment.

Table 21: Food 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

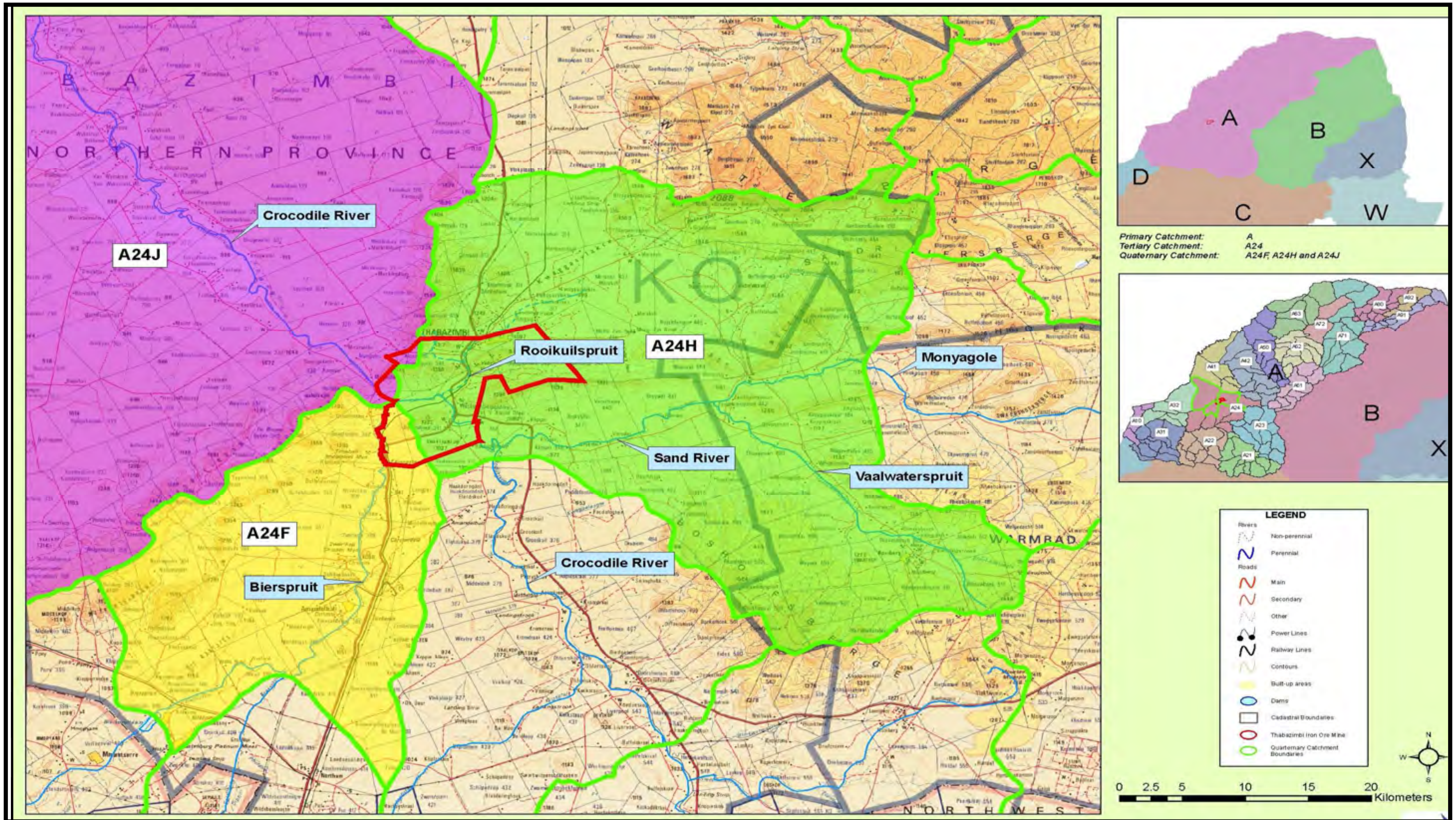

Figure 20: Catchment Boundaries and Relevant Streams	
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2.8.3 Drainage Density

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

2.8.4 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.

2.8.5 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.

2.8.6 Water Authority

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

2.8.7 Wetlands

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

2.8.8 River Diversions

In 1982, the Rooikuilspruit immediately south of the poort giving access to Thabazimbi 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 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.

In 1997 a temporary diversion of the flow of the Crocodile River was done to construct a bridge, Kwai Bridge, over the river to enable the mine to extend its mining operations to Buffelshoek pit. The construction period for the bridge was six months and was completed in 1997. The river diversion was approximately 150 m long with a bottom width flow of 5 m. The rehabilitation of the river diversion has been included in the rehabilitation plan.

2.8.9 Surface Water Quality

Econ@uj, a consortium of environmental specialists based in the Zoology Department of the University of Johannesburg, was requested to trends in 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.

2.8.9.1 Methods and Approach

The aim of this report was to determine the spatial trends amongst the various water quality monitoring points. Temporal variation within the various monitoring points was also determined. The spatial and temporal trends were analysed by means of Principle Component Analysis (hereafter referred to as PCA). This analysis was completed by using the statistical software Canoco version 4.5. The PCA, (**Figure 21**) depicts the regions in which the study was done), is based on a linear response model relating species and environmental variables (Van den Brink et al., 2003). The result of the ordination is a map of the samples being analysed on a 2 dimensional basis, where the placement of the samples reflect the (dis)similarities between the samples; in this case the various sampling surveys and/or sampling points. In a PCA plot each arrow points in the direction of steepest increase of values for the corresponding variable.

As the upper reaches of the Crocodile River falls within densely urbanised areas, it could be expected that the water quality of the Crocodile River will be influenced. Of special concern are the highly polluted tributaries (like the Hennops and Jukskei Rivers) in the upper catchment of the river. In addition the Hartbeespoort Dam has also experienced several water quality related problems, especially in the form of eutrophication (DWA, 2004). In addition, various mining activities have also contributed to deterioration in water quality in many of the systems associated with the Crocodile River and the Crocodile River itself. The minerals that are being mined in the Crocodile River Catchment include: platinum and its associated group of minerals such as palladium; gold; chrome; manganese; iron ore; diamonds; granites; mineral sands; vanadium; limestone and andalusite (DWA, 2004). Of particular concern is the iron ore mining activities in Thabazimbi. The Lower Crocodile Water Management Area (hereafter referred to as WMA is also characterised by large scale irrigation. The water for irrigation comes largely from the Crocodile River itself. The town of Thabazimbi is the largest town in the area.

2.8.10.2 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.

2.8.11 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.

2.8.11.1 Approach

The ecological integrity of two rivers was assessed during the current study. Both these rivers are tributaries of the Crocodile River. The two tributaries that were studied forms part of the Crocodile (West) Marico WMA and the Lower Crocodile Sub Management Area. These WMA cover several provinces, but the current study area is situated in the Limpopo Province. The Crocodile River is one of the larger rivers in our country and is a major tributary of the Limpopo River (Limpopo DFED, 2004).

2.8.11.2 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 22**, as well as in **Figure 22**.

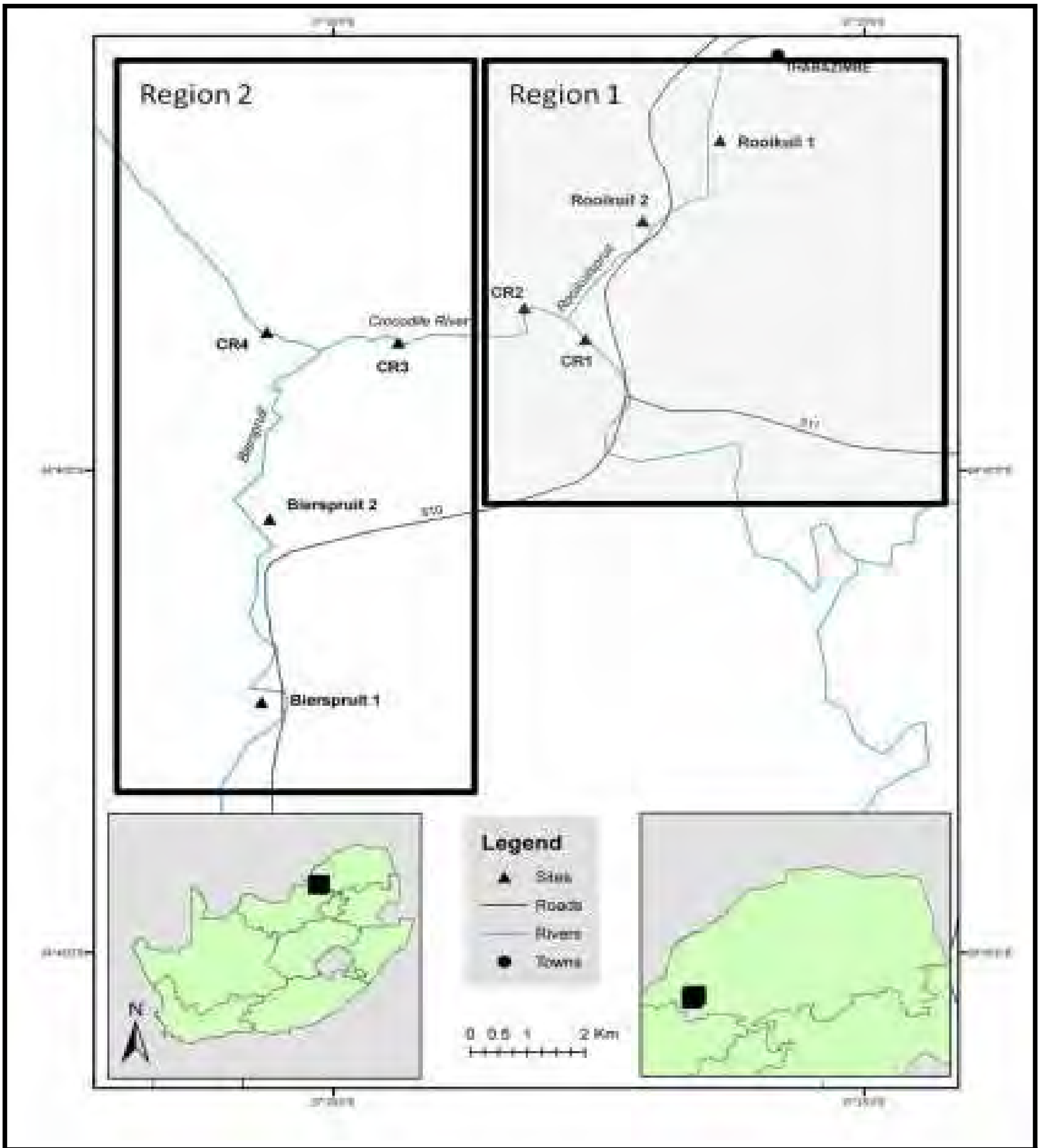

Figure 21: Regions used in PCA Analysis of Effluent and River Samples

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Table 22: 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'

2.8.11.3 Site Descriptions

2.8.11.3.1 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.

2.8.11.3.2 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.

2.8.11.3.3 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.

2.8.11.3.4 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.

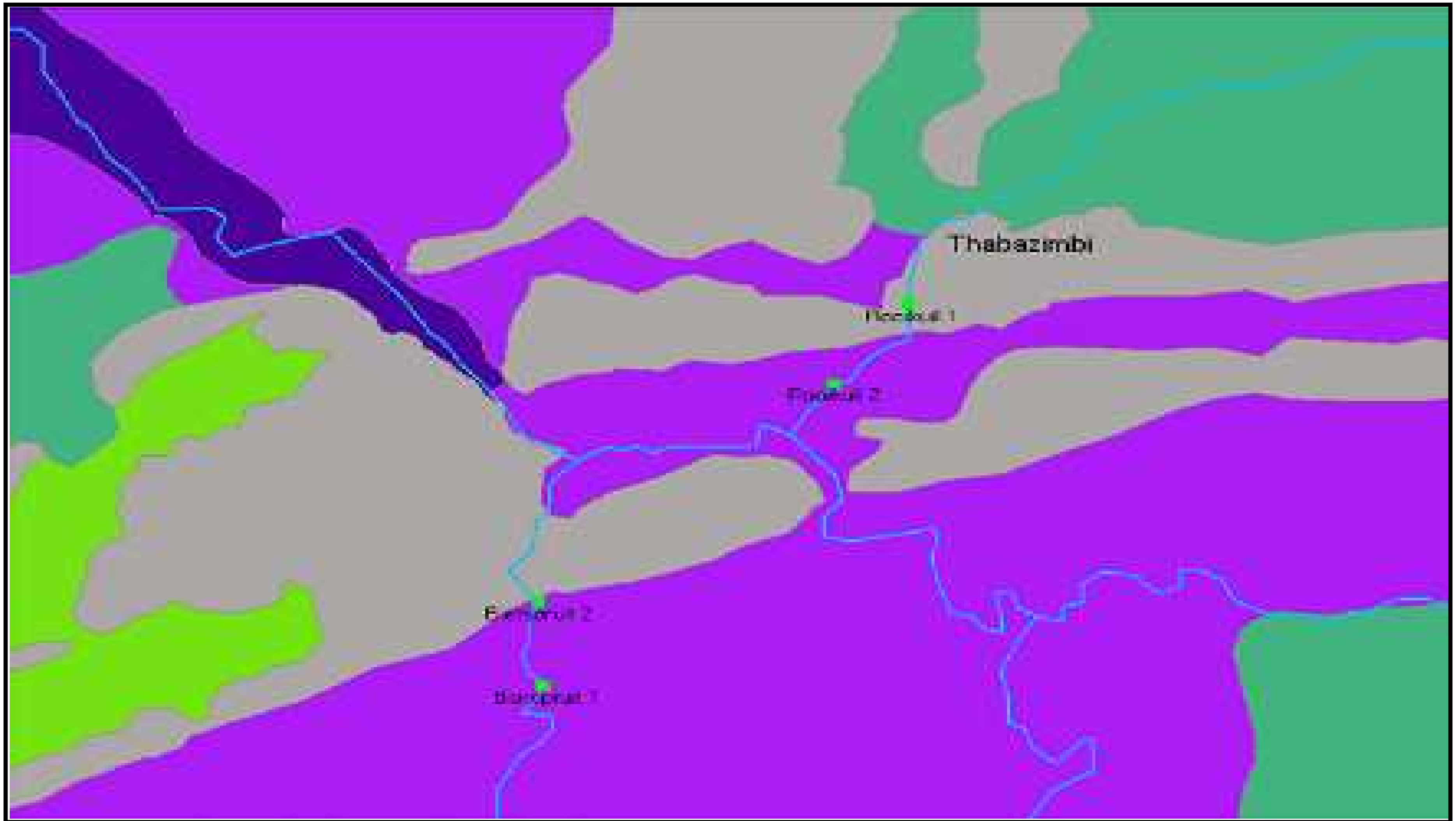

Figure 22: Locations of the Biomonitoring Points

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2.8.11.4 Water Quality Assessment

The results of the water quality analysis for the sites on the Bierspruit and Rooikuilspruit are presented in **Tables 23** 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 23** 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.

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Table 23: 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%

	UNIT	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
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
Sulphate, SO_4	mg/l	68	78	34	73	NA
Nitrate, NO_3	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 24** 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 24: 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

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2	TWQR
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
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.

Copper and aluminium occurs naturally in higher quantities with aluminium being the third highest occurring metal in the earth's crust. Copper is also one of the more widely used metals on earth but in significantly elevated levels it can pose a threat to aquatic ecosystems. Both copper and aluminium availability to aquatic biota are controlled to some extent by water pH. At pH levels above 6.5 most of the copper and aluminium is bound in various forms and as such is not bio available to aquatic organisms. 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 as steel industries are known to cause elevated selenium levels in aquatic ecosystems. Even though copper, aluminium and selenium were higher than the TWQR, follow-up monitoring should be carried out before any management actions are taken.

2.8.11.5 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 was also present at this site and this contribute to habitat availability at the site

2.8.11.6 Aquatic Macro Invertebrate Assessment

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 25**, for the results of the diversity of the invertebrate samples.

Table 25: 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

	ROOIKUIL 1	ROOIKUIL 2	BIERSPRUIT 1	BIERSPRUIT 2
Gyrinidae				X
Hydracarina			X	
Libellulidae			X	X
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

2.8.11.7 Fish Community Assessment

The results of the fish assessment are tabulated from **Table 26** 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 26** 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 26: 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 27 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 27: 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 28**. 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 28: 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.

2.8.11.8 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.

2.8.6 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 29** lists the farms situated adjacent to the Crocodile River downstream of the affected watercourse.

Table 29: 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.

2.9 Ground Water

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

- The report titled, “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; 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.

2.9.1 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 Phoenix indicated 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 Phoenix 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.

2.9.2 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.

2.9.2.1 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.

2.9.2.2 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 km².

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 m² / 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.

2.9.2.3 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.

2.9.2.4 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.

2.9.3 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 30** for estimated delivery of some of the Boreholes at Thabazimbi Mine.

Table 30: 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

2.9.4 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.

2.9.5 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.

2.9.5.1 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.

2.9.5.2 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.

2.10 Air Quality

2.10.1 Air Quality Management Plan

Airshed Planning Professional (Pty) Ltd was appointed by Anglo Technical to develop an AQMP for Thabazimbi Mine, dated September 2009.

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.

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.

2.10.2 Terms of Reference for the Air Quality Management Plan

The terms of reference for the study comprised of two main components, *viz.*, the establishment of *baseline conditions* and a *predicted* air quality impact assessment. The terms of reference for the baseline assessment were as follows:

A ***baseline air quality characterisation***, which included the assessment of:

- The regional climate and site-specific atmospheric dispersion potential;
- Preparation of hourly average meteorological data for input to the dispersion model:
  - Preparation of raw meteorological data;
  - Formatting of meteorological data for input to the dispersion model; and
  - Simulation of wind field, mixing depth and atmospheric stability.
- Extraction and processing of topographical data for input into the dispersion model;
- Identification of existing sources of emission and characterisation of ambient air quality within the region based on observational data recorded to date;
- Collation and analysis of all available monitoring data from existing mining operations in the region and recorded data from site (if available);
- Identification of potentially sensitive receptors within the vicinity of the current and proposed mining operation that would be susceptible to air quality impacts; and
- The legislative and regulatory context, including emission limits and guidelines, ambient air quality guidelines and standards, and dust-fall classifications with specific reference to the South African legislation and applicable international requirements such as the World Health Organisation, World Bank Group and European Community.

An ***air quality impact study**, which included:*

- Quantification of all proposed sources of atmospheric emissions including (but not limited to) the following sources:
  - Opencast mining operations;
  - Haul roads for the various mining operations
  - Crushing and screening operations;
  - Vehicle entrainment on paved and unpaved roads;
  - Materials handling operations (i.e. tipping, loading and off-loading); and,
  - Wind erosion from exposed areas such as the WRD and tailings/slimes dam.

- Dispersion simulations of ground level PM10 concentrations and dust fallout for the proposed operations reflecting highest daily and annual average PM10 concentrations and dust deposition due to *routine* and *upset* emissions from the opencast mining operations. Atmospheric Dispersion Modelling System (ADMS) developed by the Cambridge Environmental Research Consultants (CERC) to be used for the study.
- Analysis of dispersion modelling results, which included:
  - Determination of zones of maximum incremental ground level impacts (concentrations and dust fallout from each source); and,
  - Determination of zones of maximum predicted cumulative ground level impacts (concentrations and dust fallout from all sources at the mine).
- Evaluation of potential for human health and environmental impacts.

A ***dust management plan*** for the mine*:* Development of a dust management plan for the mine, which included:

- Estimation of emission control efficiencies required for each significant source;
- Identification of suitable pollution abatement measures able to realise the required dust control efficiencies, and possible contingency measures;
- Specification of source-based performance indicators, targets, and monitoring methods applicable for each source;
- Recommendation of receptor-based performance indicators comprising of a monitoring network and targets; and
- Recommendations pertaining to record keeping, environmental reporting and community liaison.

2.10.3 Evaluation Criteria

Air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. Ambient air quality guidelines and standards aim to protect public health therefore these are applied to off-site areas rather than on-site occupational impacts. Thus, the predicted impacts at the sensitive receptors identified were the main focus of the assessment. Reference was made to the South African legislation with emphasis on the proposed Ambient Air Quality Standards.

2.10.4 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).

2.10.5 Dispersion Model of the Site

Meteorological data for Thabazimbi Mine were obtained for the years 2006 to October 2008 and included hourly average wind speed, wind direction and temperature. Parameters not measured were estimated based on prognostic equations. The analysis of the meteorological data included a diurnal temperature profile and wind roses. Over the period (from 2006 to October 2008), the prevailing winds were recorded from the northerly, south westerly and north easterly sectors. Summer and autumn months mainly reflected westerly and southerly flow. The airflow in winter was characterised by more frequent northerly flow and south-south-easterly winds. The spring months indicated an increase in the north-westerly wind field.

2.10.6 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 / m^2 / 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%).

For the mitigated scenario:

- Unpaved roads (48.1% (PM10) and 43.5% (TSP);
- The second most significant source of PM10 was materials handling (20.5%) and this source was also the third most significant source of TSP (13.4%);
- Crushing and screening was predicted to be the fourth most significant source of PM10 (8.4%) and second most significant source of TSP (22.9%); and
- The third most significant source of PM10 was excavation (9.9%) and this source was the fifth most significant source of TSP (6.6%).

The ADMS model developed by the CERC was used in this study. ADMS is a Gaussian plume model regarded to be most accurate in near-field applications (less than 10 km). It is designed to predict pollution concentrations from continuous point, area, line, and volume sources. The model provides conservative values under unstable atmospheric conditions in that it predicts higher concentrations than the older models close to the source. Similar to other Gaussian plume models such as AERMOD, a disadvantage of the ADMS is that spatial varying wind fields, due to topography or other factors cannot be included. Also, the range of uncertainty of the model predictions could to be 50% to 200%. The accuracy improves with fairly strong wind speeds and during neutral atmospheric conditions.

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.

2.10.7 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. Although it proposed that open pit mining operations at Bobbejaan Water and Buffelshoek East East will commence when the current Buffelshoek West operations cease, it is unlikely that these operations will lead to an increase in ground level concentrations at the sensitive receptors. This is due to the close proximity of these proposed mining operations to the Buffelshoek West operations and the fact that all these operations are located further away from the sensitive receptors compared to the other open pits (current and proposed). The modelling did however follow a conservative approach to ensure that the worst-case scenarios were reflected in the assessment, especially for the proposed Phoenix project.

For the closure phase, it is likely that the predicted impacts will be much lower when mining activities cease due to extensive rehabilitation that is currently carried out in the mine. It is also possible that by the closure phase, the control efficiencies for the various wind erosion sources could be much higher than those used during the dispersion modelling, resulting in lower impacts at the sensitive receptor sites. It is expected that natural crusting of some of the stockpiled material will also occur once these sources are not disturbed. Reference data on the impacts of particulates on plants and animals are scarce and therefore the impacts of the current and proposed operations at Thabazimbi Mine on vegetation and animals could not be quantified. Given that the area around the mine has some relatively dense natural vegetation, it is expected that this vegetation will have a tolerance for dust impacts. This however will have to be confirmed through monitoring certain species in the area.

2.10.8 Monitoring Requirements

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) (**Figure 27**).
- 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.

2.11 Noise

Blasting at the pits takes place once a week on average. Only blasting at the Kwaggashoek East Pit can be heard from the town area. The equipment used in the opencast mines normally cannot be heard in the town area.

The Ellisras - Pretoria railway line handles a maximum of three trains per day and is clearly audible in the outskirts of the town, especially at night.

A Noise Impact Study was conducted for the proposed Project Phoenix, the results of which were incorporated into the report titled, *"Thabazimbi Iron Ore Mine (Project Phoenix Noise Impact Assessment)"*, dated September 2006, compiled by OH&AP Consulting Services. Although the mentioned report is not attached to this revised EMPr, the report will be made available by the Mine upon request.

The object of the study was to quantify and to assess the noise impact in surrounding areas expected from mining operations associated with the proposed Project Phoenix mining activities. The SANS 10328:2003 Standard (Methods for Environmental Noise Impact Assessments) was used as guideline for the study that was conducted.

The strategy employed during the investigation was as follows:

- Determine the existing noise levels (residual noise levels) in the area surrounding the proposed Thabazimbi mining zone;
- Identify possible noise sensitive environments;
- Determine and assess the current environmental noise levels as a result of current mining activities;
- Quantify the acoustic emission levels of all machines, equipment and processes to be employed in the proposed mining operation (Project Phoenix);
- Develop a computer model to simulate the emission of sound from the mining operation, as well as the propagation and dispersion of sound into the surrounding environment;
- Use the simulation model to compute contours of the expected increase in ambient noise level in the external environment as a result of future mining activities; and
- Employ criteria from National Noise Regulations and from SANS codes of practice to assess the expected impact of noise from the mining operation on the external environment.

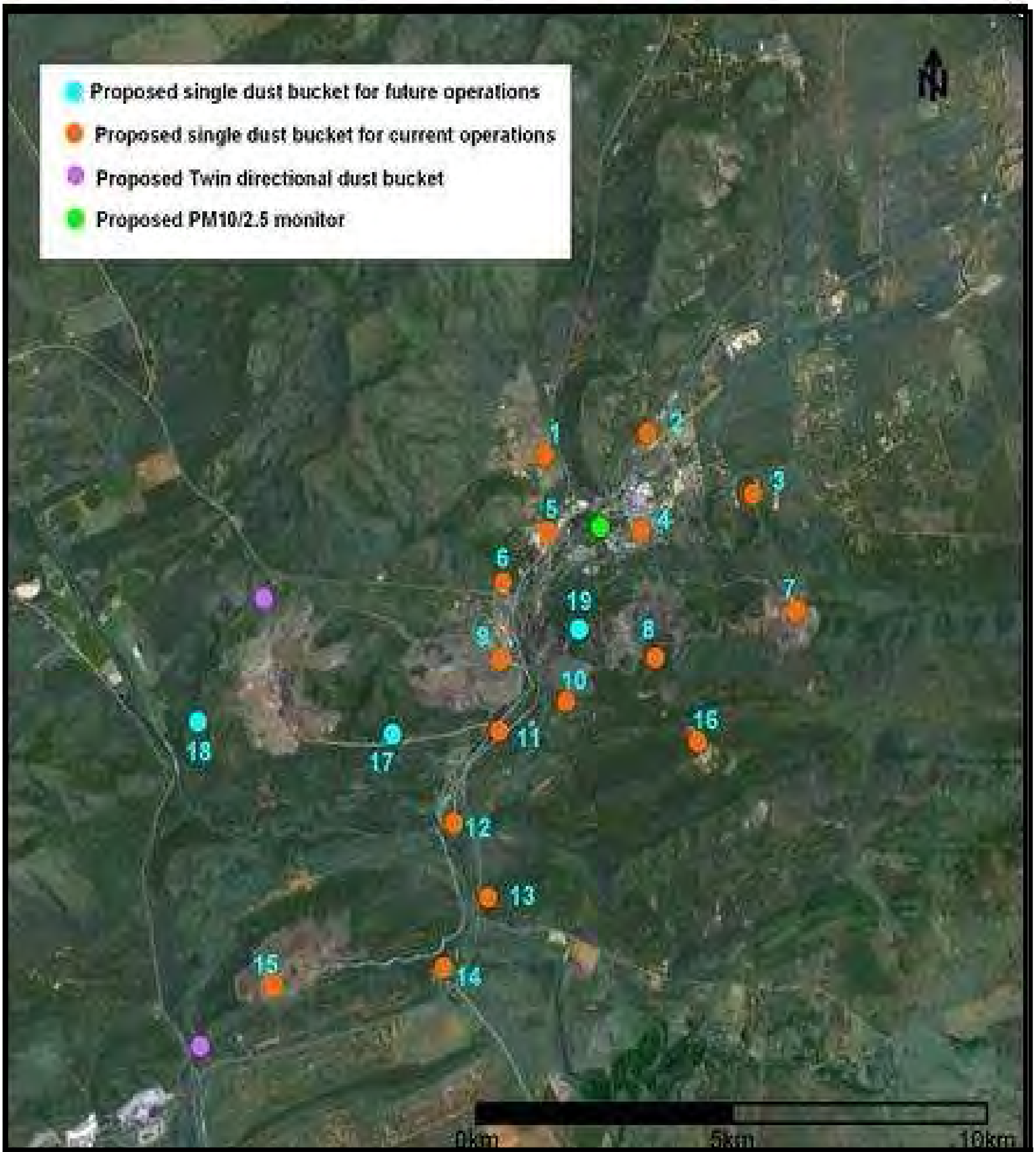

Figure 23: Proposed Dust-Fallout Network for Current & Future Mining

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As part of the above-mentioned Noise Impact Study, measurements were conducted to determine the current ambient noise levels at sensitive receptors near Thabazimbi Mine. The following findings of the study were taken into consideration during the impact assessment for the proposed Project Phoenix:

- The *daytime* residual noise level at the three measurement locations in the Thabazimbi town exceeded the SANS standard;

- The *night time* residual noise level at the two measurement locations in the Thabazimbi town exceeded the SANS standard;
- *Daytime* ambient noise levels (“residual noise and intrusive noise as a result of mining and plant production activities”) at the three measurement locations in the Thabazimbi town area, exceeded the SANS standard. This was expected, since the residual noise levels also exceed the standard;
- *Night time* ambient noise levels (“residual noise and intrusive noise as a result of mining and plant production activities”) at the three measurement locations in the Thabazimbi town area, exceeded the SANS standard. This was expected for two of these locations, since the residual noise levels also exceed the standard;
- During the *daytime* ambient noise levels at any of the sensitive receptor areas did not increase with more than 7 dBA. Ideally the increase should be as low as possible since the residual noise levels at the three Thabazimbi town locations already exceed the SANS standard. Due to the fact that the increases at these three locations are below 7 dBA, these impacts are viewed to not be disturbing; and
- During the *night time* ambient noise levels at three sensitive receptor areas in the Thabazimbi town increased with more than 7 dBA (“between 7 dBA and 15 dBA). The noise generated by Plant and mining activities at these three locations is thus considered to be intrusive.

For noise modelling purposes, the proposed Project Phoenix development has been divided into four phases. Sound propagation modelling was performed for each of the proposed phases.

The main findings were as follows:

- Based on the sound propagation modelling the increase in the residual noise level (“noise impact) at none of the selected critical receptor areas exceed 1 dBA (an increase of below 7 dBA is viewed as acceptable); and
- The SANS 10103:2004 standards for environmental noise is exceeded at the three locations selected inside the Thabazimbi residential area. This can mainly be contributed to high residual noise levels ambient in the environment and not as a result of the proposed mining activities.

2.12 Sites of Archaeological and Cultural Interest

Centuries before Iscor began mining the haematite ore in the Thabazimbi Mountain for smelting in its blast furnaces; native inhabitants recovered the iron-bearing ore in the area with hand tools and processed it with primitive smelting methods.

At the site of the present Bobbejaanwater pit, native "miners" used to dig up the reddish-brown ore to fabricate metal tips for their spears, axes and pickaxes. The prospecting trenches dug by Iscor officials up the hillsides a few years ago are just a few steps away from some of the ancient excavations – the old and the new side by side.

According to calculations by ethnologists, the black tribes responsible for the mines lived in these regions between 900 and 1 200 years ago. Yet these primitive ore diggers employed a modern-day mining method by leaving pillars in the excavations to support the roof.

It is assumed that these miners dug up the ore using stone and iron tools and carried it down the hill in hide bags and gourds for smelting somewhere in the valley on the present farm Kwaggashoek or in the Vliegepoort valley. It is unlikely that smelting was done on the slopes of the hill, as the hardwoods that must have been used to fire the clay furnaces grow mainly in the valleys. Remnants of smelting furnaces have in fact been found on the quartz hillocks between the northern and southern ranges.

Ancient smelting works discovered in 1955 consist of remnants of such furnaces on the outskirts of Thabazimbi. The conservation possibilities are being investigated in collaboration with the University of Pretoria.

A detailed heritage assessment was done. The assessment identified three applicable eras namely:

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

2.12.1 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.

2.12.2 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.

2.12.3 Current

2.12.3.1 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.

2.12.3.2 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.

2.13 Sensitive Landscapes

There are no proclaimed sensitive landscapes in the mining area.

2.14 Visual Aspects

The WRDs of Donkerpoort pit and Vander 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.

2.15 Socio-Economic Aspects

A Socio-Economic Impact Assessment and a plan to address the Socio-Economic Aspects of Mine Closure at Thabazimbi Mine, 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. The SEBS provides the baseline information needed to determine the opportunities and constraints that the socio-economic environment places on mine closure.

2.15.1 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%[1] 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.

2.15.2 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 24**). Refer to **Figure 25**, to view the Google image.

[1] As per the TLM Integrated Spatial Development Framework (ISDF), June 2008

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 Phoenix Project, a significant LoM extension project, are well-advanced.

2.15.3 History of Thabazimbi

Iron has been mined in the Thabazimbi district since approximately 1500 AC[2]. 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.

2.15.4 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.

[2] From an internet article - http://ujdigispace.uj.ac.za:8080/dspace/bitstream/10210/1965/14/Chapter1.pdf

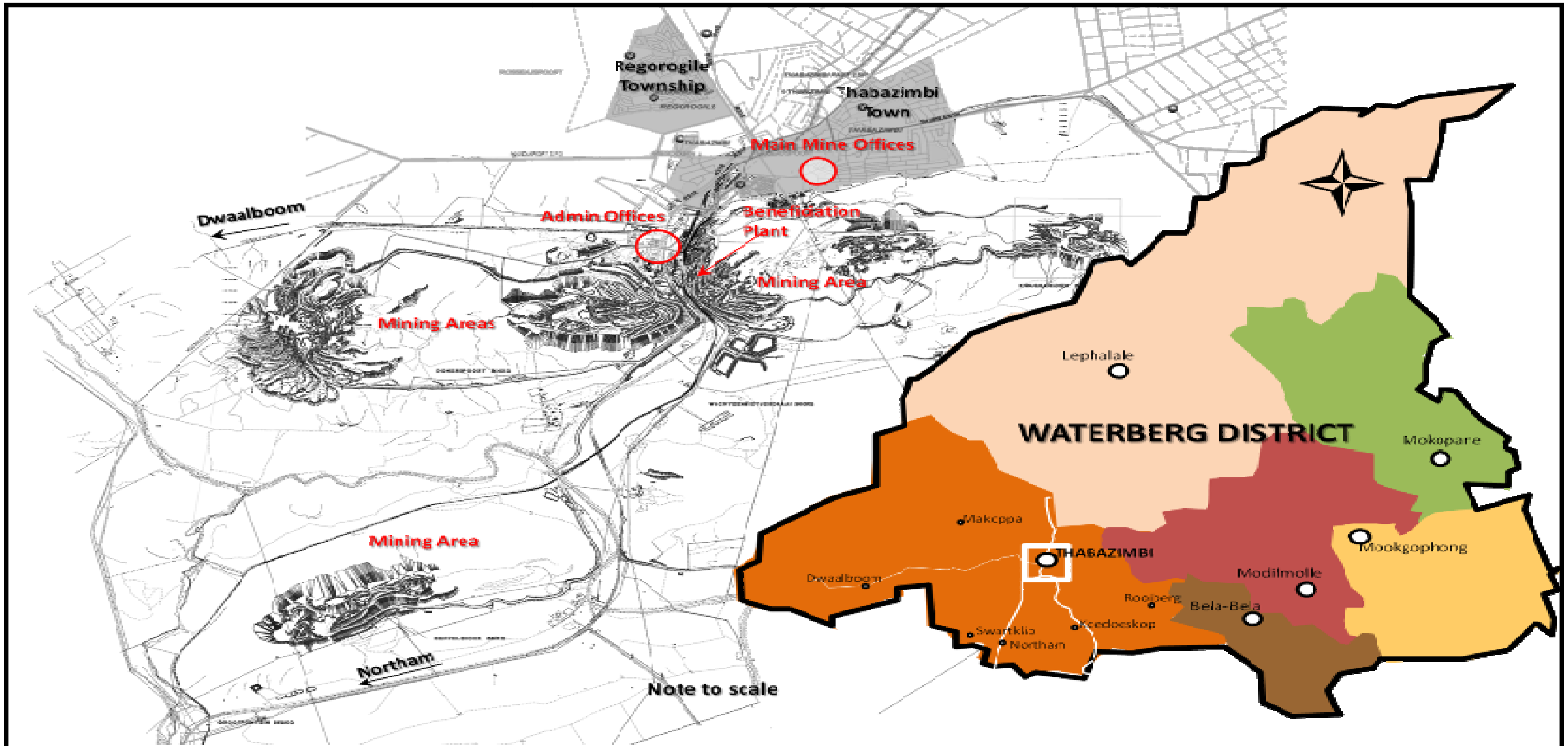

Figure 24: Thabazimbi Mine Locality Map	
Client: Thabazimbi Mine	Date: December 2010
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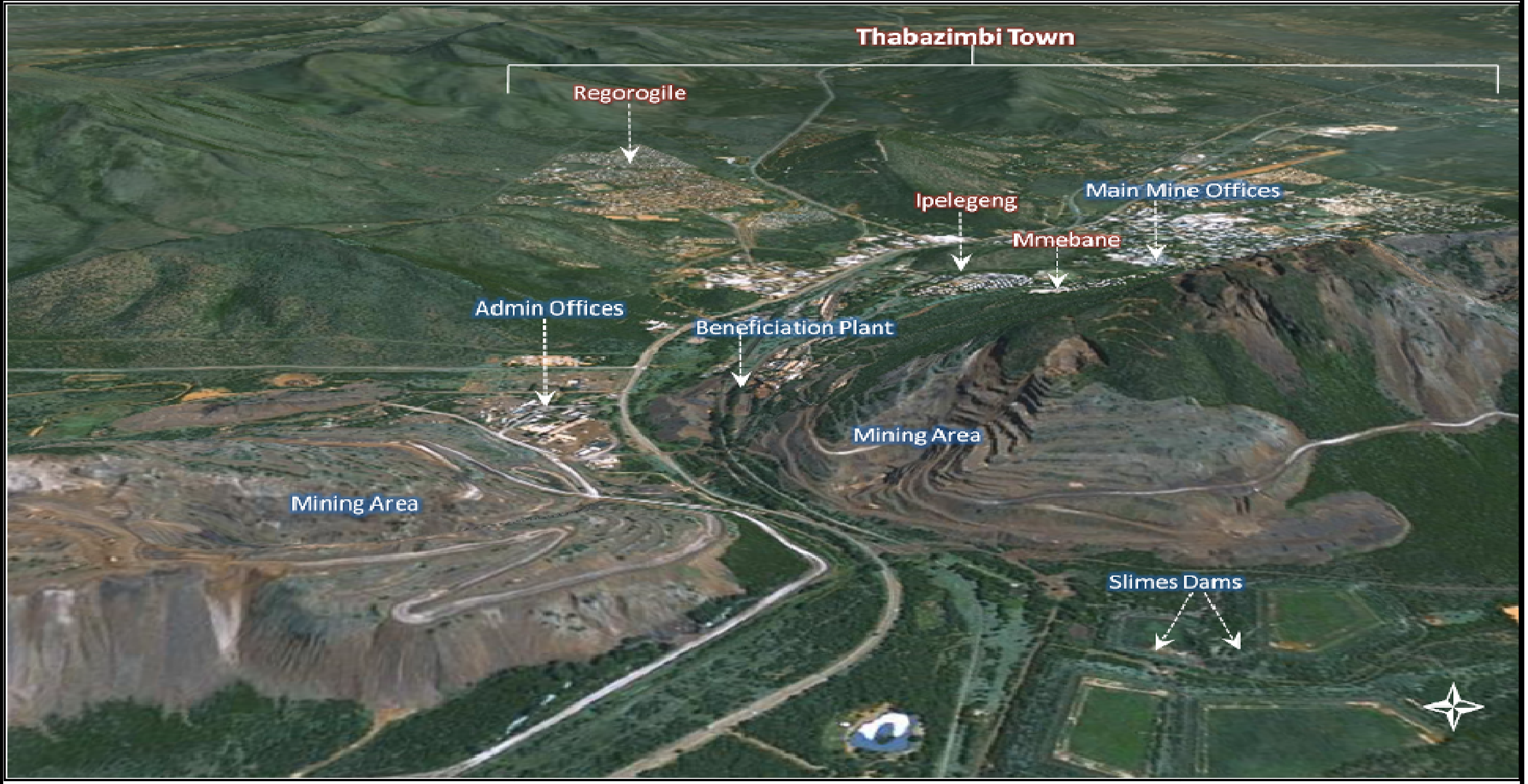

Figure 25: Google Image of Thabazimbi Mine

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2.15.5 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 31 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 31: 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
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

CONTRACTOR COMPANY	NO OF EMPLOYEES	WORK AREA	TOWN
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.

2.15.6 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 26**). It includes areas such as Regorogile (Extensions 1 – 7), Ipelegeng, Mmebane and the town of Thabazimbi.

Figure 27 above 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.

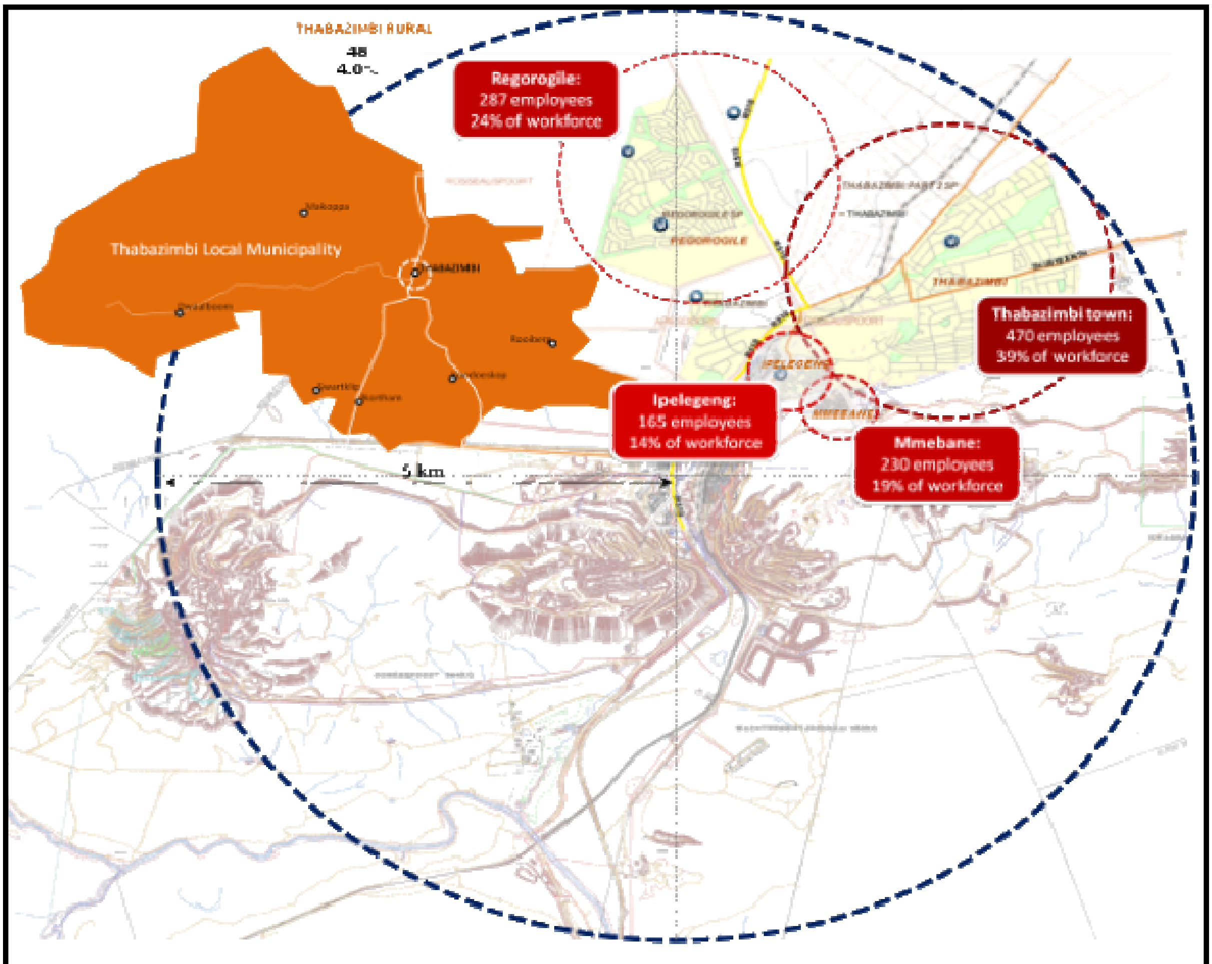

Figure 26: Mine Community – Labour Demographics	
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2.15.7 Defining Labour-Sending Areas

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 28**).

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 29**). The assumption is that contractor companies source their workers from those areas where mining companies operate.

2.15.8 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 [3] 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%).

[3] Whereas most mines recruited migrant labour from the traditional labour sourcing areas of the Eastern Cape, Thabazimbi Mine recruited a significant number of workers from Soekmekaar in earlier years. Currently 62 employees come from Soekmekaar while another 30 employees live in surrounding areas within the MLM.

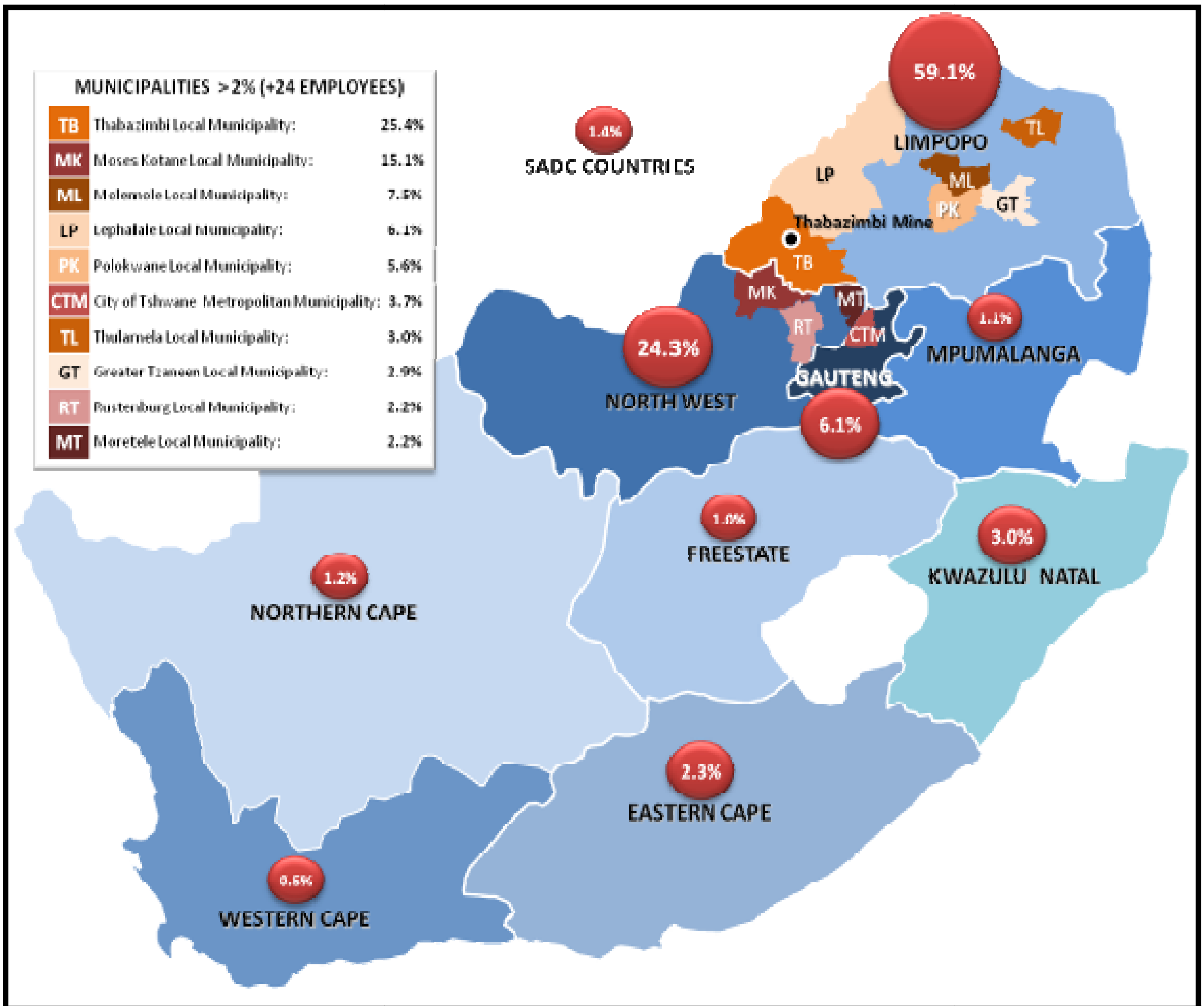

Figure 27: Thabazimbi Mine's Labour Sending Areas

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2.15.9 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.

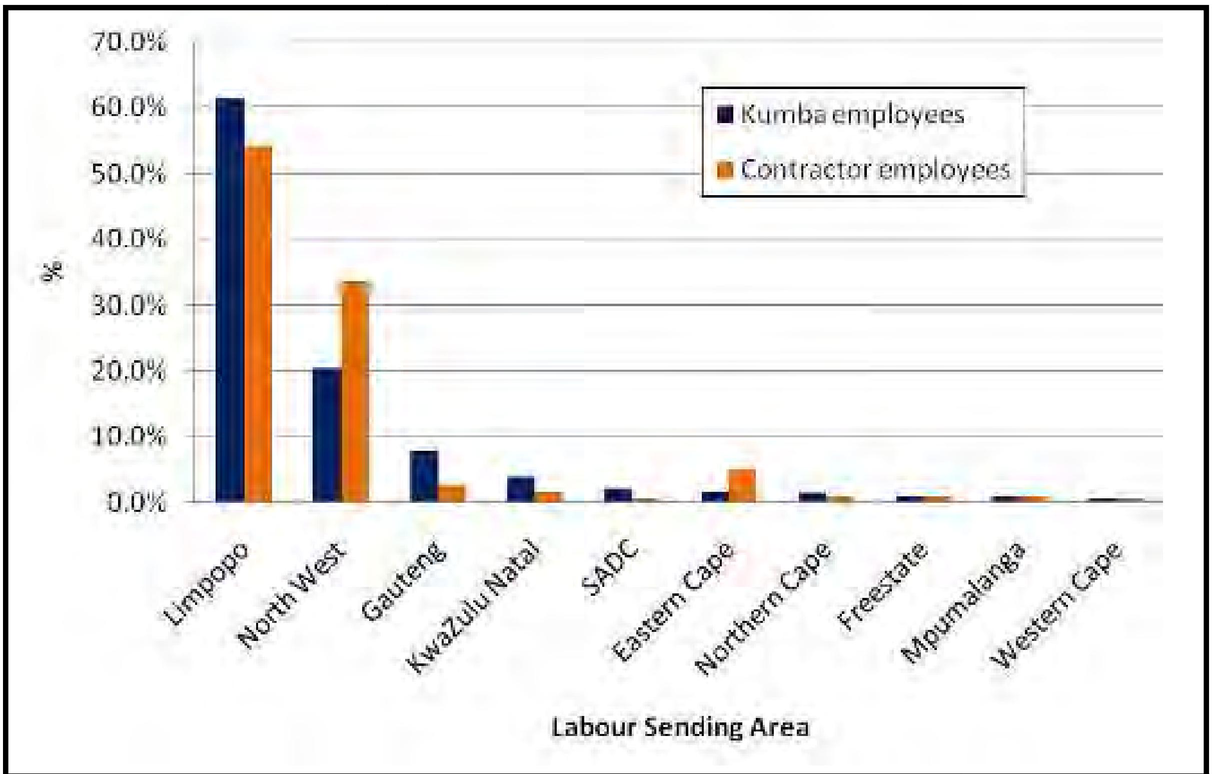

Figure 28: Employee Demographic Comparison		
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A significant number of employees above the age of 50 years old can be classified as transitional workers as these employees have established themselves in Thabazimbi and will not necessarily return to their labour-sending municipalities. A sample survey[4], 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 29**). 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 29** that in three other municipalities (Molemole, Moses Kotane and Greater Tzaneen) more than 80% of the migrant workers will return to their rural homesteads.

2.15.10 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.

[4] 70% of the total employees (KIO + contractors) at the mine completed the basic questionnaire. Of this sample, 246 are above the age of 50. The graph describes the status of the 10 labour-sending areas including TLM. Note that 13% of the 246 employees indicated that they have not decided yet where they would retire.

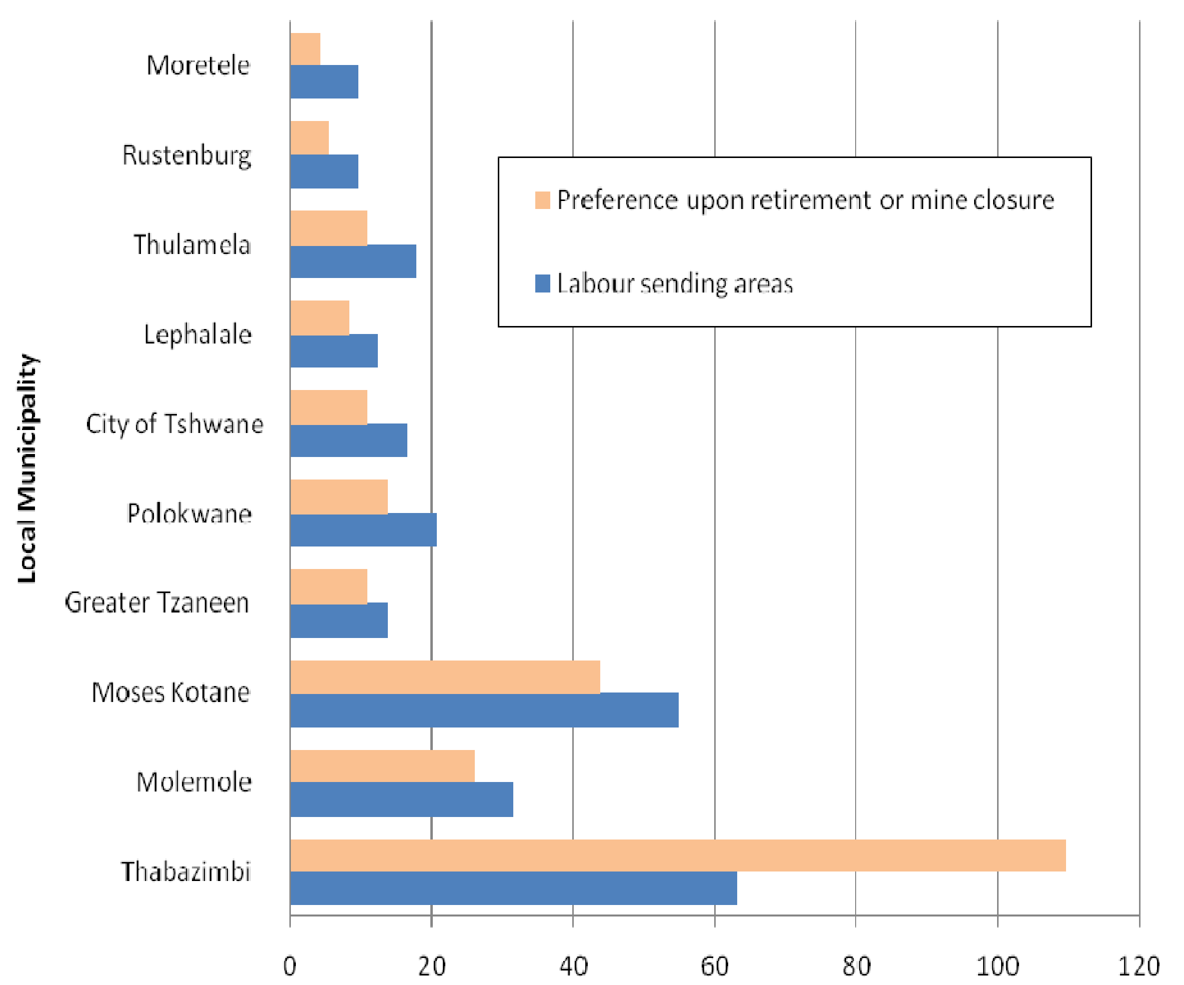

Figure 29: Labour-Sending Area vs. Preferred Municipality of Retirement

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2.15.11 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 32**.

Table 32: 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%

2.15.12 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 30**.

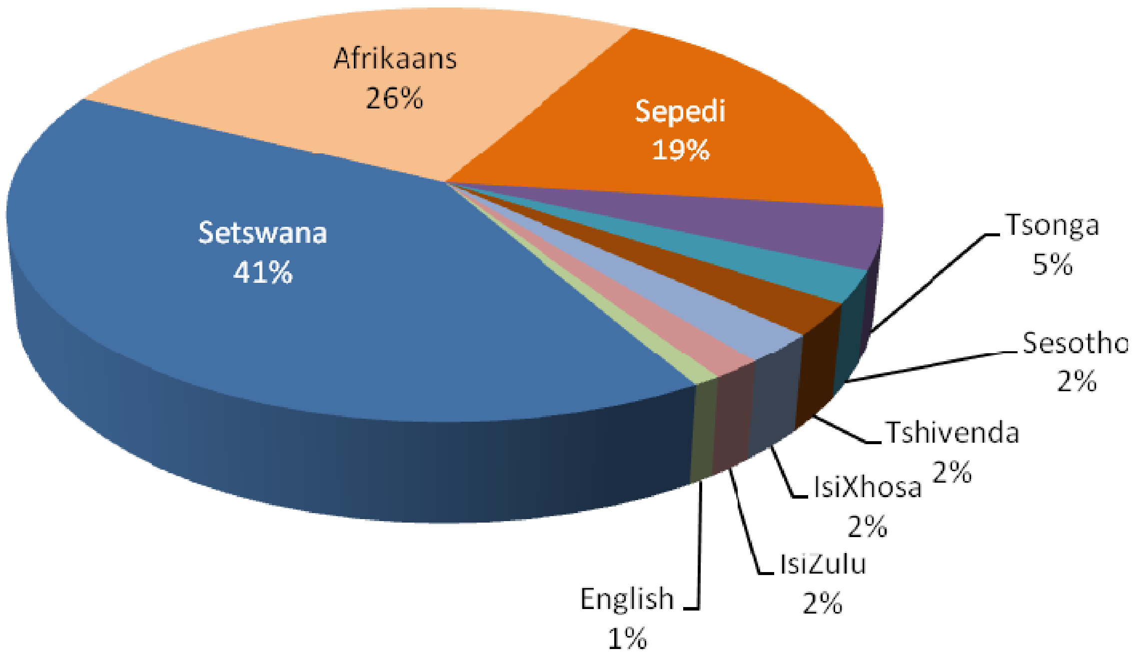

Figure 30: Language Profile of Permanent Employees	
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2.15.13 Age and Service Profile

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 31 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).

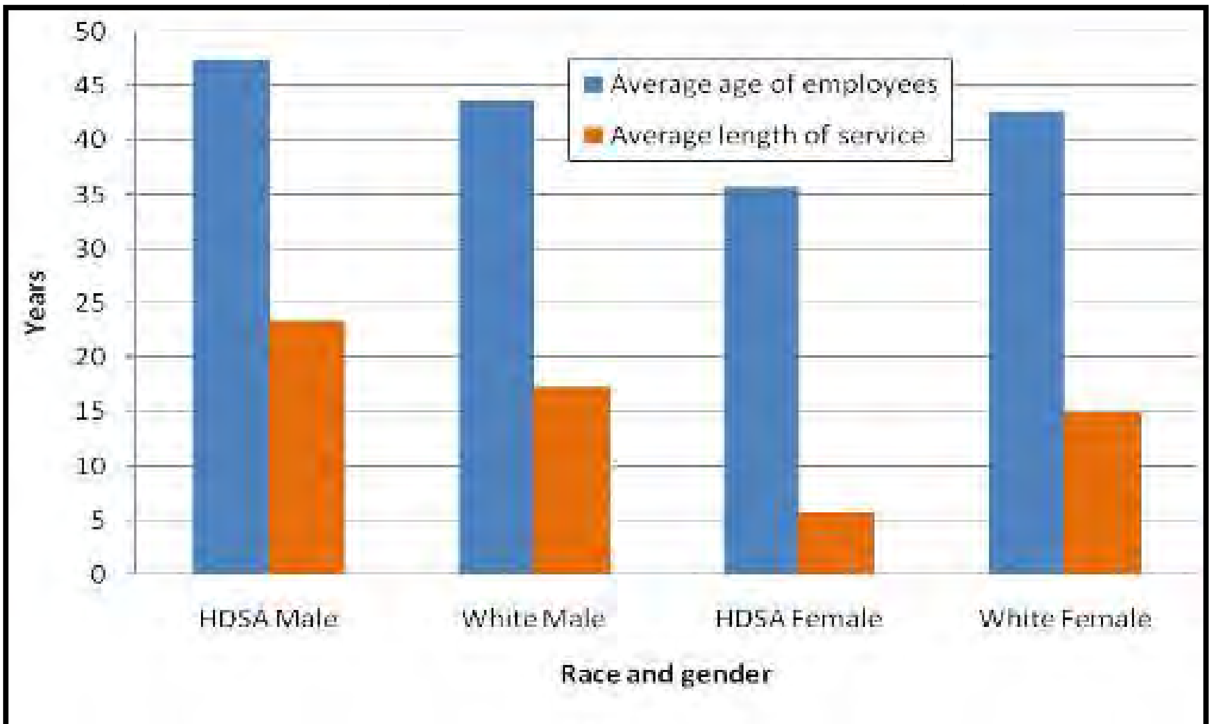

Figure 31: Average Age and Length of Service of Permanent Employees	
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2.15.14 Educational Levels

The overall education levels for the Thabazimbi Mine's permanent workforce are given in **Table 33**. 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 33** 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 33: 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%

2.15.15 Occupational categories

Figure 32 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.

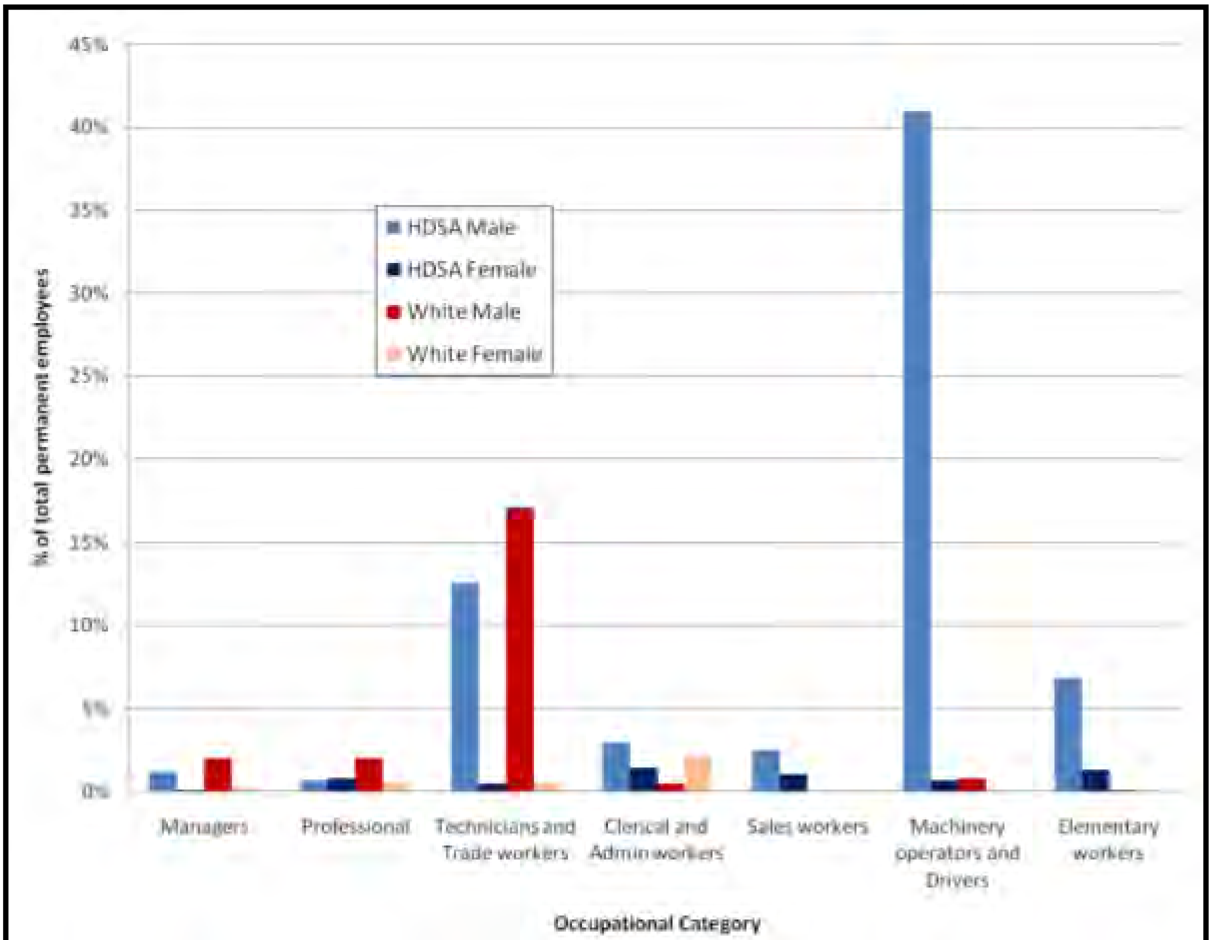

Figure 32: Occupational Categories of Permanent Employees

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2.15.16 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. Refer to **Figure 33**.

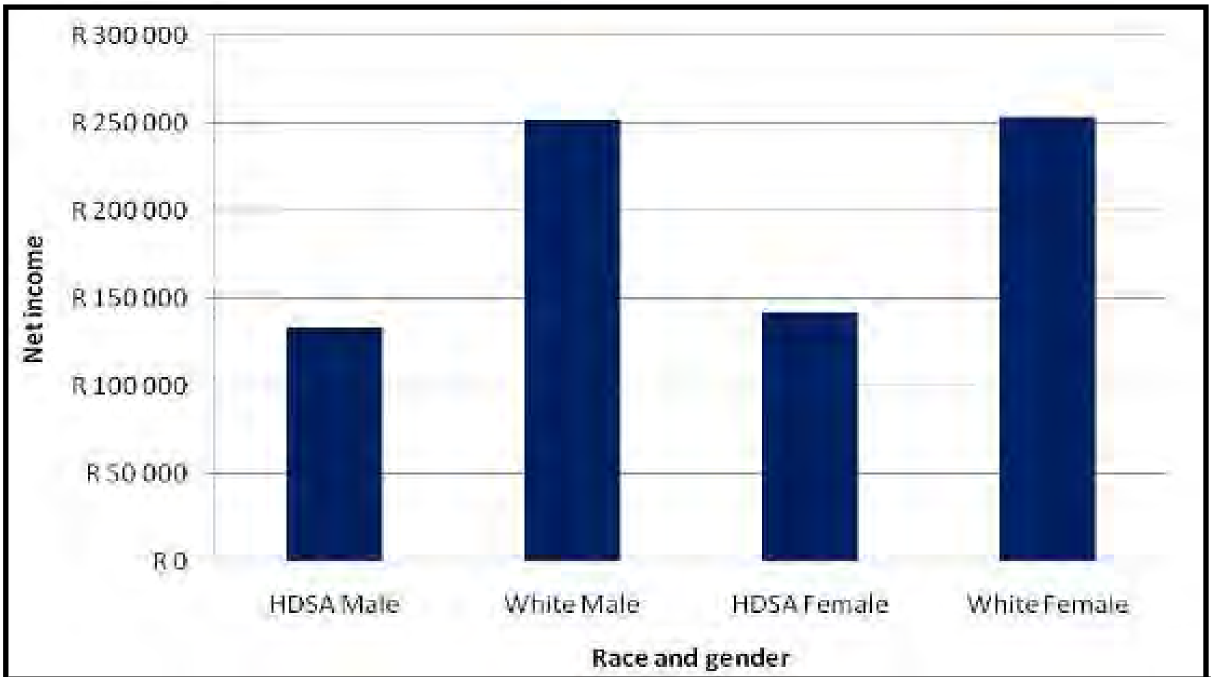

Figure 33: Average Net Income for Permanent Employees		SHANGONI Management Services (Pty) Ltd
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2.15.17 Health of Employees

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 [5], 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.

[5] Pneumoconiosis is an occupational lung disease caused by the inhalation of dust.

The hostel system on mines has contributed to the high incidence of HIV/AIDS in mining communities. Thabazimbi Mine's wellness programmes aim to deal 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.

2.15.18 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.

2.15.19 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 are illiterate and therefore these employees deserve specific attention in the Mine Closure section.

2.15.20 Waterberg District

2.15.20.1 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.

CHAPTER 3: DETAILED PROJECT DESCRIPTION

The following chapter provides a description of the current operations (activities) as well as planned operations for the future. The description of the operations provides information to guide the reader in determining the potential environmental impact that could be caused by these operations (activities). The following operations have been identified and are currently taking place on site.

3.1 Mine Infrastructure

A summary of the current infrastructure of the mine is as follow:

- Non-mineral waste handling facilities;
- Mine Residue Deposits;
- Slimes Dams;
- Open Cast Pits:
  Currently only opencast mining takes place at Thabazimbi Mine. Eight open pits are currently actively mined. Vanderbijl pit will be mined as part of Project Phoenix and other pit will be mined in the future as per the Resource and Reserve statement and LoM plan.

  The open pits are in the mountains. The pits have benches, start at top and goes down. These pits are:

  - Buffelshoek (East and West);
  - Donkerpoort – West;
  - Meyer mine
  - Kwaggashoek – East;
  - Bobbejaanwater;
  - Donkerpoort (Pit and Nek);
  - East pit; and
  - Vanderbijl.
- Plant:
  - Crushers;
  - Thickeners;
  - Conveyor belts;
  - Ore passes; and
  - Stockpiles.
- Water Reticulation System;
- Stormwater 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
- Game Farm and Lodge.

Refer to **Figure 34**, **Figure 35**, **Figure 36**, **Figure 37** and **Figure 38** for layout plans of Thabazimbi Mine.

3.2 Mining

3.2.1 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:

3.2.1.1 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.

3.2.1.2 Blasting

Drill holes are charged with 400 kg ANFO or HEF 100 emulsion in the areas where the holes are water logged. Each hole contains ANFO and a 400 grain 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. Blasting takes place once a week in each pit.

3.2.1.3 Loading

Blasted material is loaded onto 170 T haul trucks with 2 300 and 2 100 P&H shovels. Rubber wheel CAT 992 loaders or a Liebher 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).

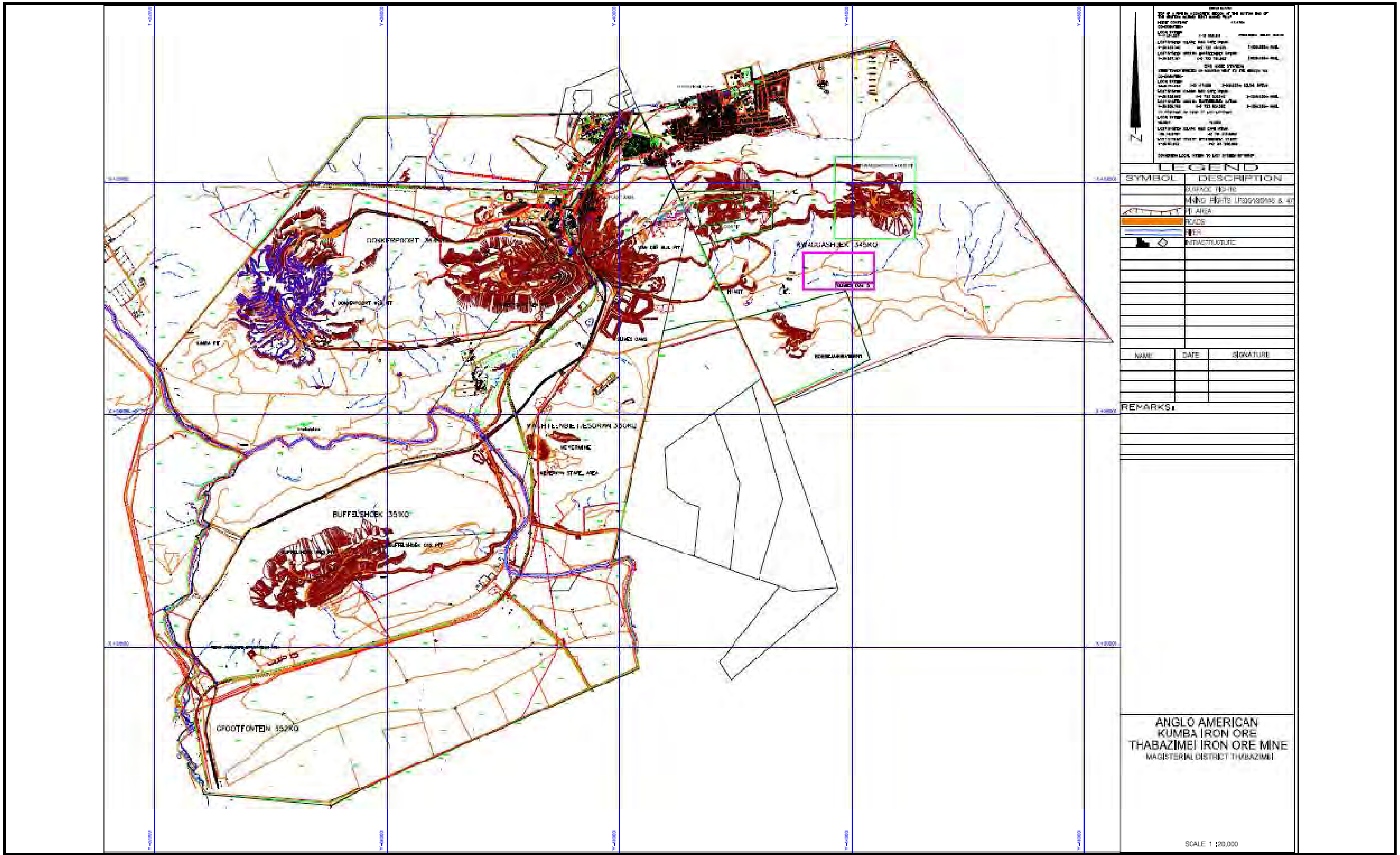

Figure 34: Thabazimbi Layout Plan	
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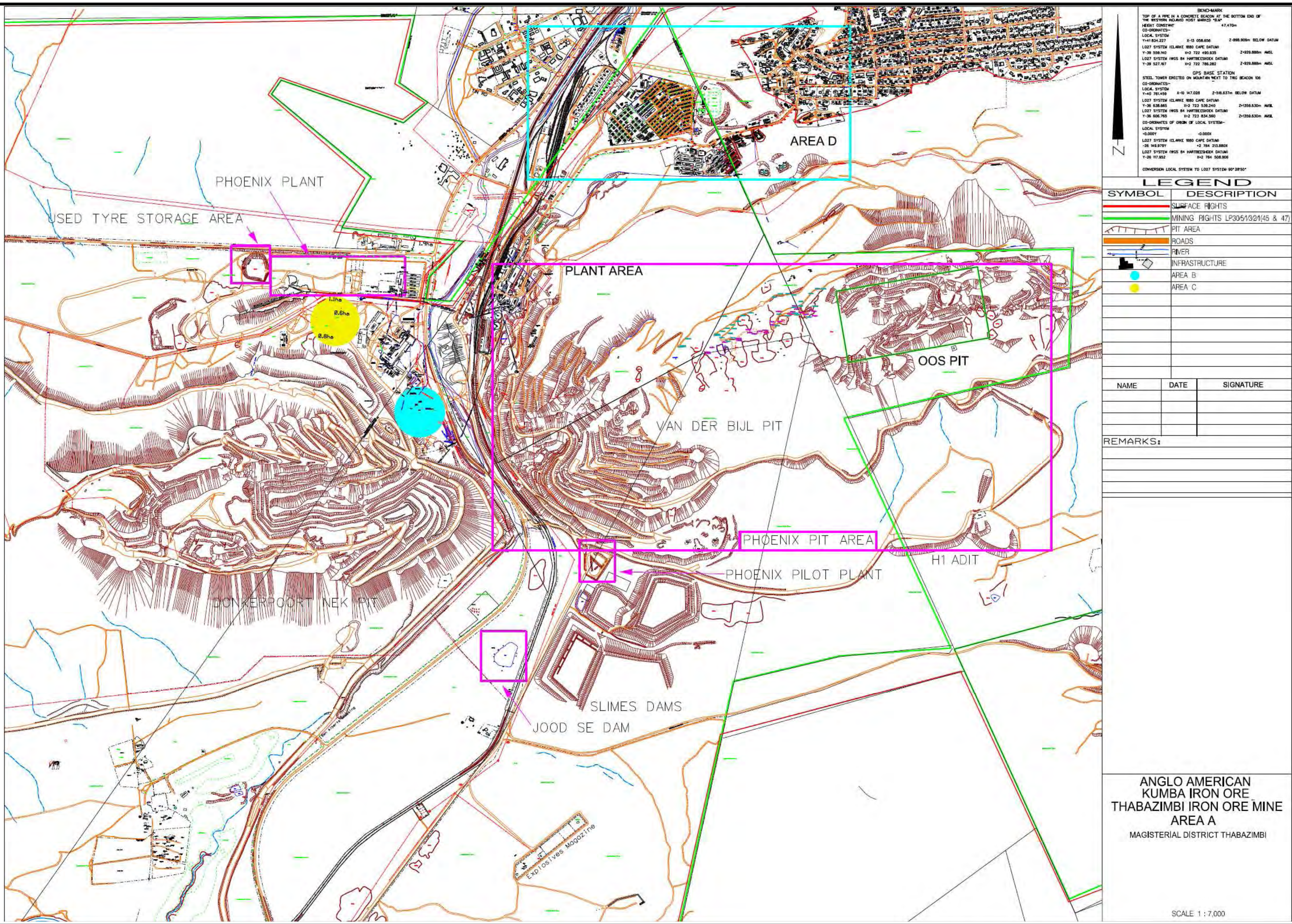

Figure 35: Layout Plan – Area A	
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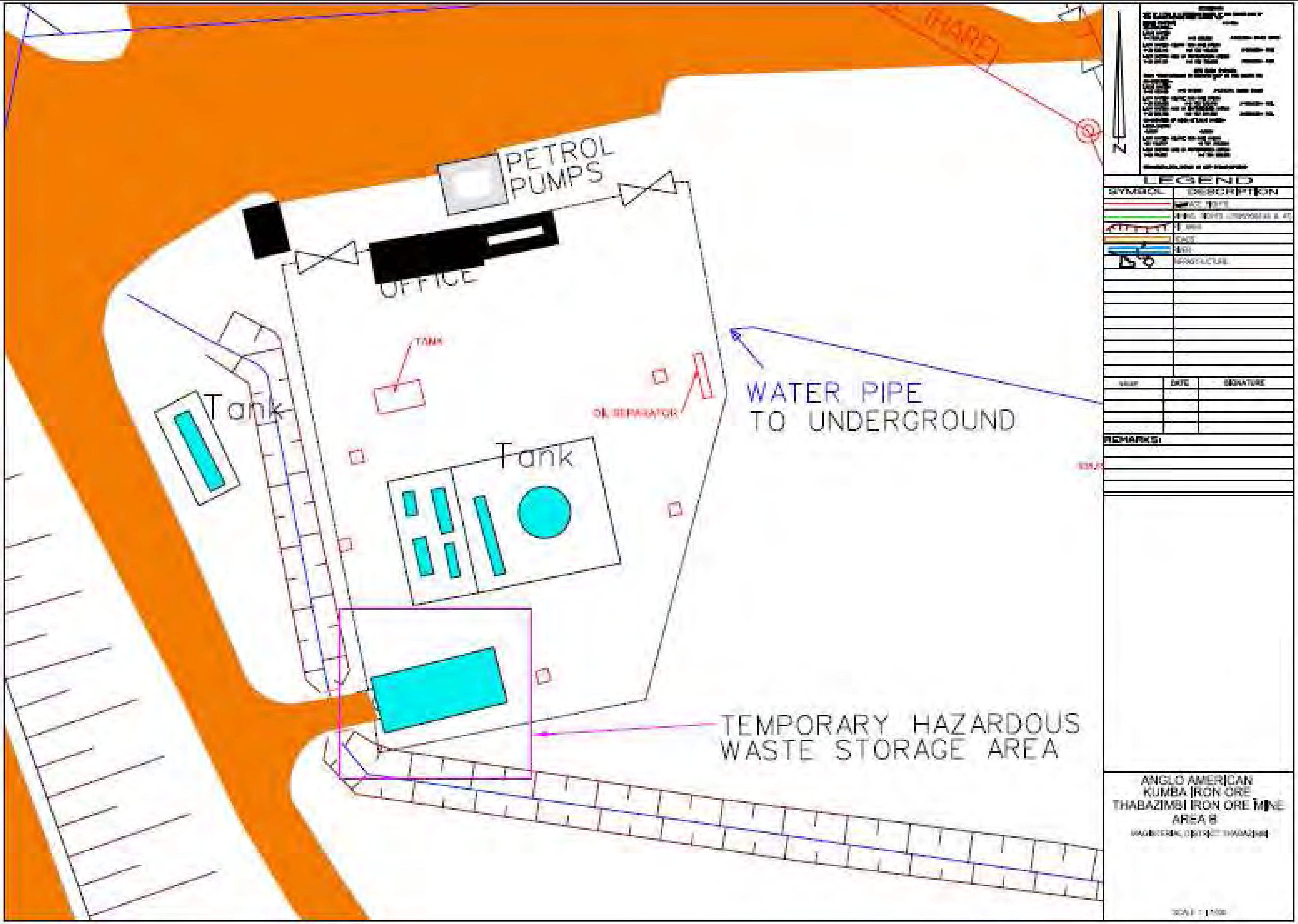

Figure 36: Layout Plan – Area B	
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Figure 37: Layout Plan – Area C	
Client: Thabazimbi Mine	Date: December 2010
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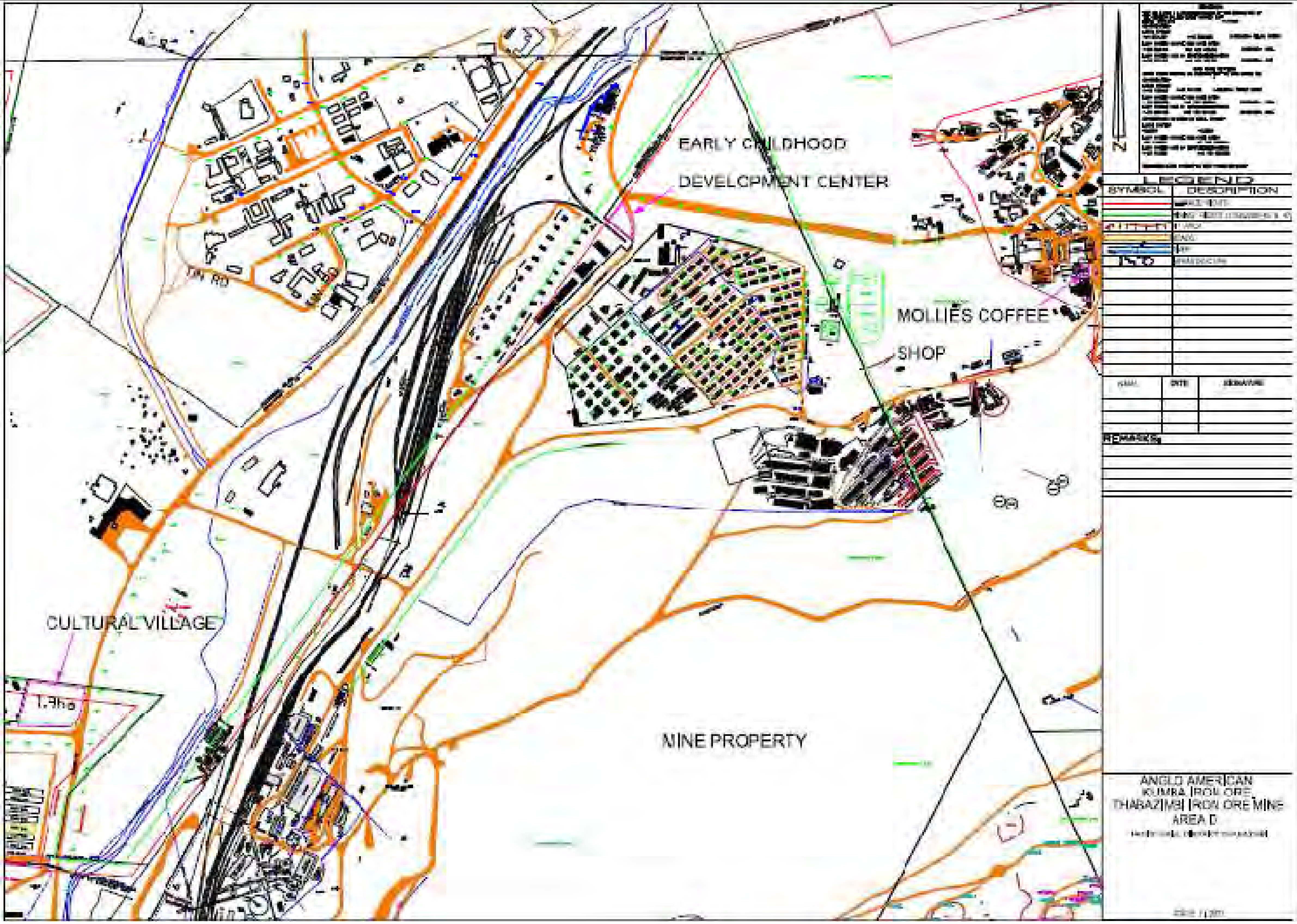

Figure 38: Layout Plan – Area D	
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3.2.1.4 Hauling

Ore is transported to the ore passes at Donkerpoort and Vanderbijl crusher with haul trucks. The mineral waste is transported to the waste tips on the side of the mountains.

3.2.1.5 Roads

CAT 16 graders are used to grade the roads in the pit to secure an even surface for the haul trucks. All haul roads are sprayed with Dust-A-Side to ensure an even surface for transport of Iron ore. Dust suppression in the pits is conducted by 100 t water browsers which spray water on the haul roads. The rest of the haul roads are covered with Dust-A-Side to prevent dust generation.

3.2.1.6 Pit Layout

Figure 5 and **Figure 6** in **Section 1.7** depict the layout of a typical pit at Thabazimbi Mine. The figures provide for a side view and top view of the pit. The figures indicate the various sections of a typical pit as well as the cut-out view of the benches in the pit.

3.2.1.7 Detrital Ore

This project revolves around the physical collection of iron ore material by means of handpicking. The mining method employed involves the disturbance of 300-500 mm of soil at a time (approximately 25 m^2) by using a back actor. Once the soil layer has been disturbed the pickers removes all the viable iron ore material from the site. The soil that is disturbed is not seen as topsoil because it is removed from among big boulders and contains much rubble. The soil is disturbed until the dolomite layers are encountered. Disturbed soil is placed on the previous disturbed area. The viable iron ore material is gathered in a bin which is loaded on a haul truck. The haul truck transports the material to the plant for processing.

Disturbance of vegetation also occur during the mining process. The impact however will be limited to densely vegetated areas and smaller plants for example where bush encroachment may already occur. Large and rare trees will be identified and not disturbed.

The disturbed areas will be monitored to determine if re-vegetation occur naturally. If this is not the case appropriate re-vegetation actions will be taken. The current activities will focus on the northern slopes of Vanderbijl Pit and will later move to Myer mine.

Considering the current rate of picking the ore, between 600 000 t and 1 Mt of ore can be produced over the life of the project.

3.2.2 Mining Services

3.2.2.1 Geology

The Geology section is responsible for the resource determination and providing inputs into mine planning. This is mainly general office activities. Where drilling is required it is addressed under the section Rosond.

3.2.2.2 Mining Engineering

This section is responsible for pit layout, mine design and long & short term mine planning.

3.2.2.3 Survey
Survey section is responsible for survey on the mine and keeping the mine plans up to date.

3.2.3 Mine Residue
Part of the mining process produces large volumes of waste rock which is disposed on the slopes of the mountains. 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.

Fraser Alexander is responsible for the management of the slimes dams. Two plant discard dumps are present on site. The oldest discard disposal site has been present since the early 1940’s. This discard dump has been placed on top of the old slimes dam which was constructed in the late 1930’s. Placement of the second discard dump commended in the 1960’s. This discard dump is still currently in use.

Slimes originating from the process are pumped from thickener dams in plant and disposed of at the slimes dam facility. Disposal on the slimes facilities are rotated between the various dams and managed by an external contractor. Slimes are transported via a pipeline from the plant to the dams.

3.3 Ore Processing Activities
3.3.1 Crushing and Screening
Crushing of material is done by means of a primary crusher and secondary crusher. Ore are beneficiated through a heavy medium. Separation process is used to produce iron ore of the right quality.

3.3.2 Beneficiation Plant
Figure 39 provides information regarding the flow of ore once it is deposited from the east and west pits into the different crushers. The diagram furthermore provides information regarding the plant activities and the final storage of the product prior to it being reclaimed and placed on a railway trucks or road transport destined for one of the AMSA Steel factories.

3.3.2.1 Laboratory
The laboratory is responsible for testing of ore samples and product samples to ensure that the right quality ore is being delivered.

3.3.2.2 Conveyors
The conveyor system is used for the transport of material in the plant.

3.3.3 Loading Station and Siding
The loading section is responsible for loading the train wagons. The siding is used for the storing of rail wagons used for the transport of ore to the market. The siding maintenance involves cleaning of the siding area and maintenance of the infrastructure.

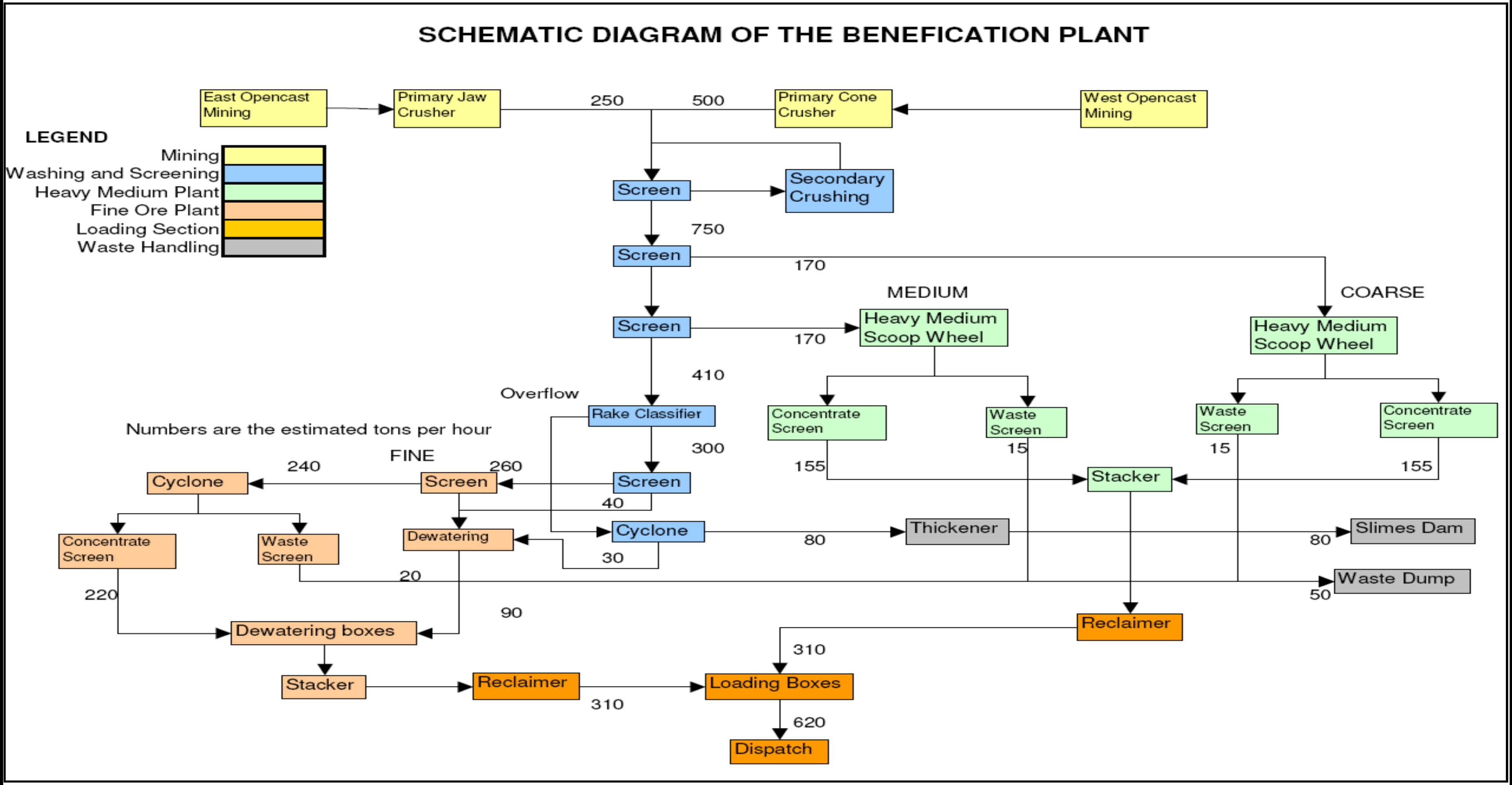

Figure 39: Ore Flow Diagram

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3.3.4 Return Water Dam

A return water dam ensures that water is recycled and reused in the plant.

3.3.5 Plant Buildings

General office activities take place at the plant offices. A small canteen is available for employees to use in the plant. Small amount of food is prepared in this canteen or food is heated and sold to employees.

3.4 Maintenance and Utilities

3.4.1 Workshops

The workshops are mainly responsible for maintenance activities, which take place in the mining areas and the workshops. The following workshops occur on site in the engineering section:

- Boilermaker workshop;
- CAT and secondary services workshop;
- Central workshop;
- Haul truck workshop;
- Petrol workshop;
- Tyre workshop;
- Drill workshop;
- Shovel maintenance;
- Service station;
- Power and water supply;
- Mc Keep; and
- Diesel electric.

3.4.2 Water Source and Usage

3.4.2.1 Potable and Process Water

Groundwater is 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. The boreholes supplying groundwater to the mine occur in the Donkerpoort basin area as well as five boreholes / wells in the alluvium next to the Crocodile River used for water supply to the pit and roads to Buffelshoek. Three of the six boreholes at the golf course are used for supplying irrigation water, as well as supplying water for domestic use to the rest camp in the Ben Alberts Nature Reserve.

Treated sewage water is purchased from the WWTW plant for process use.

3.4.2.2 Domestic Wastewater

The WWTW of Thabazimbi treats domestic sewage before discharging it to the Ore Processing Plant for use in the process or alternatively to the Rooikuilspruit.

3.4.2.3 Water Balance

A water balance was developed for the mining operations indicating the volumes used on-site for process and other purposes as well as the storage capacities of structures constructed for the purpose. The water balance is depicted in **Figure 40** (summary of where the water is sourced), **Figure 41** (summary of where the water is used) and **Figure 42**. This figure depicts the water reticulation network on the mine. The diagram includes clean and dirty water flow on site. The water balance is updated on an annual basis taking new information into account and changing circumstances.

3.4.3 Waste Facilities

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.).

3.4.3.1 Waste Disposal

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

AngloAmerican

IRON ORE
KUMBA IRON ORE LTD
Sishen Iron Ore Company

THABAZIMBI IRON ORE MINE

SUMMARY - SOURCE

TOTAL PUMPED FROM BOREHOLES — Minus (-) — WATER TO MUNICIPALITY FROM BOREHOLES — Minus (-) — NON MINING USE FROM BOREHOLES — Plus (+)

OTHER SOURCES — Equals (=) — TOTAL PROVIDED

TOTAL PUMPED FROM BOREHOLES

Previous month recorded	Average water pumped	Max. water pumped
197102	182618	372468

	Pump station 10	Pump station 19	Group 5 A	Dewatering	Group 5 B
Previous month recorded	99972	67167	29963	0	0
Average water pumped	94539	59893	14392	7931	5862
Max. water pumped	179573	150491	80275	77878	36704

Minus (-)

HOME

WATER TO MUNICIPALITY FROM BOREHOLES

Previous month recorded	Average water pumped	Max. water pumped
61430	54726	186594

	"Stadsraad 1"	"Stadsraad 2"	"Stadsraad" Group 5
Previous month recorded	10	29240	32180
Average water pumped	11657	31983	11086
Max. water pumped	70050	126432	95410

Figure 40: Thabazimbi Iron Ore Water Balance Summary (Sourced)

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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Minus (-)

HOME

NON MINING USE FROM BOREHOLES

Previous month recorded	Average water pumped	Max. water pumped
3968	6692	111641

	TPA	Gholfbaan	Jood se Dam
Previous month recorded	1115	2853	0
Average water pumped	979	583	5130
Max. water pumped	3162	9405	111090

Plus (+)

HOME

OTHER SOURCES

Previous month recorded	Average water pumped	Max. water pumped
34273.1	30108	82666

	TREATED SEWERAGE	Magalies water council	Municipality
Previous month recorded	33852.1	0	421
Average water pumped	21987	534	7588
Max. water pumped	65437	8155	14160

Equals (=)

HOME

TOTAL PROVIDED

Previous month recorded	Average water pumped	Max. water pumped
165977.1	151308	282542

Thabazimbi Iron Ore Water Balance Summary (Sourced) - Continued

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

AngloAmerican

IRON ORE
KUMBA IRON ORE LTD
Sishen Iron Ore Company

THABAZIMBI MINE

SUMMARY - USED

Plant Plus (+) Mining Minus (-) Municipality Plus (+)

OTHER WATER USERS Equals (=) TOTAL USED

HOME

Summary of usage and supply

TOTAL PROVIDED

Previous month recorded	Average water pumped	Max. water pumped
247896.1	234976	439 671

Minus (-)

TOTAL USED

Previous month recorded	Average water pumped	Max. water pumped
191920.1	214383	408 301

Equals (=)

Difference

Previous month recorded	Average water pumped
55976	20 592
23%	9%

Figure 41: Thabazimbi Mine Water Balance Summary (Used Water)

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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HOME

USED BY PLANT

Previous month recorded	Average water usage	Max. water usage
53929.1	68800	155 163

Plant clean water	Plant sewage water	"Terug vloei" water
Previous month recorded	Previous month recorded	Previous month recorded
20077	33852.1	0
Average water pumped	Average water pumped	Average water pumped
46814	21987	9052
Max. water pumped	Max. water pumped	Max. water pumped
109369	65437	60621

Plus (+)

HOME

USED BY MINING

Previous month recorded	Average water usage	Max. water usage
33198	40420	171 451

Donkerpoort	Buffelshoek	Kwaggashoek
Previous month recorded	Previous month recorded	Previous month recorded
27700	7930	421
Average water pumped	Average water pumped	Average water pumped
16369	9490	7213
Max. water pumped	Max. water pumped	Max. water pumped
45810	88130	32041

Dewatering
Previous month recorded
-2853
Average water pumped
7349
Max. water pumped
77878

Thabazimbi Mine Water Balance Summary (Used Water) - Continued

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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Plus (+)

HOME

USED BY MUNICIPALITY

Previous month recorded	Average water usage	Max. water usage
62545	55705	187 980

"Stadsraad" 1 & 2	Group 5	TPA
Previous month recorded	Previous month recorded	Previous month recorded
29250	32180	1115
Average water pumped	Average water pumped	Average water pumped
43640	11086	979
Max. water pumped	Max. water pumped	Max. water pumped
186594	95410	3162

Plus (+)

HOME

USED BY REST

Previous month recorded	Average water usage	Max. water usage
42248	49458	203 393

Engineering	Material Management	Personnel
Previous month recorded	Previous month recorded	Previous month recorded
14542	14005	16521
Average water pumped	Average water pumped	Average water pumped
18405	2822	18750
Max. water pumped	Max. water pumped	Max. water pumped
182306	20311	63044

JOOD
Previous month recorded
-2820
Average water pumped
9480
Max. water pumped
76720

Equals

Thabazimbi Mine Water Balance Summary (Used Water) - Continued

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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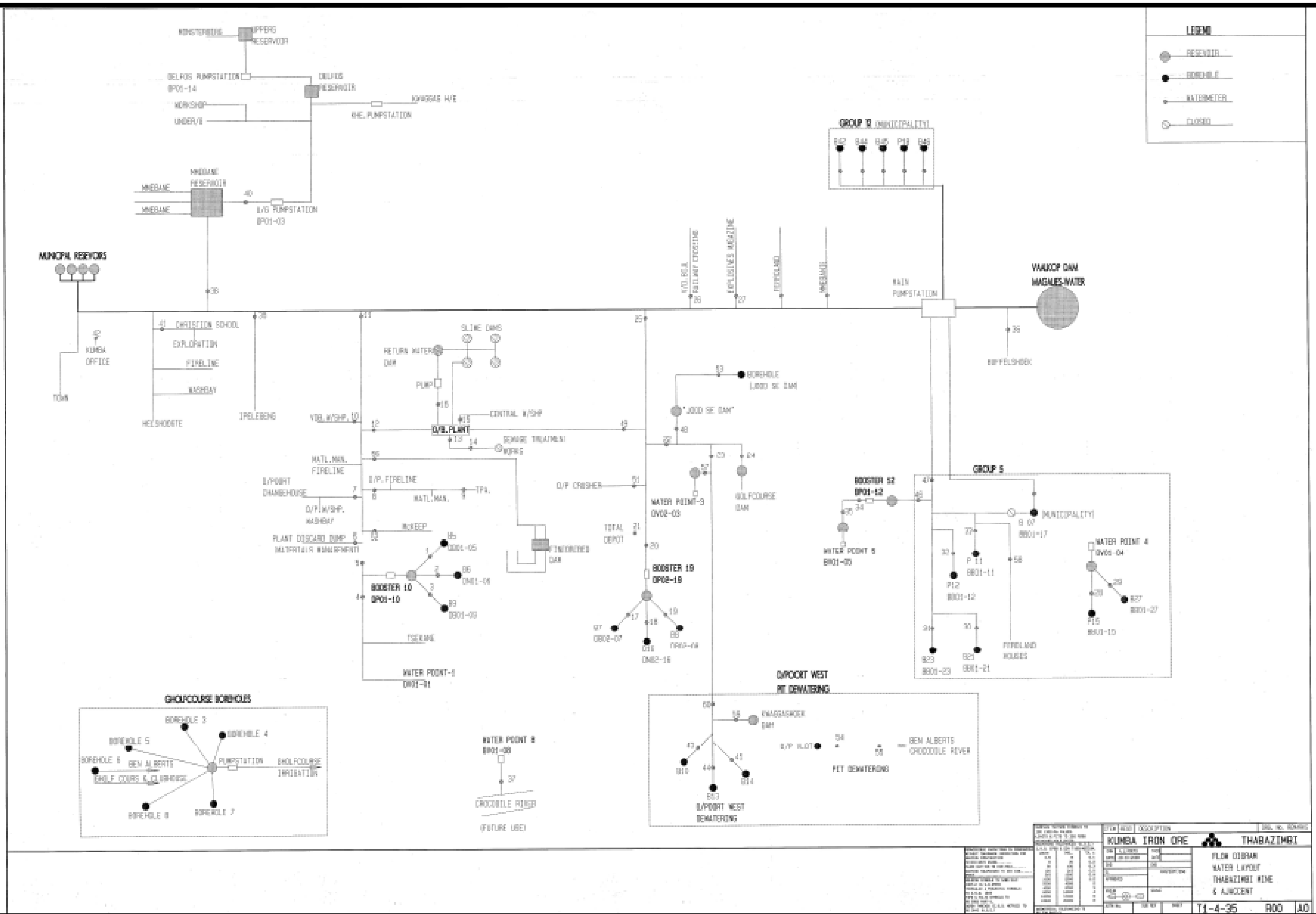

Figure 42: Water Reticulation System

Client: Thabazimbi Mine	Date: December 2010
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3.4.3.2 Temporary Hazardous Waste Storage Area

Hazardous waste is stored on site on a temporary basis prior to removal for final disposal by a recognized disposal company. The current temporary storage area has been constructed next to the Total area. The waste disposed of in this area includes the following:

- Used oil;
- Used grease;
- Oil contaminated rags;
- Fluorescent tubes; and
- Filters.

The used oil is recycled by a recycling facility through Oilkol and the other material is disposed of at permitted facility namely Holfontein and Rosslyn. The temporary storage facility is bunded and has a roof that covers the entire area to minimize water ingression during rain.

This facility was constructed to meet the minimum requirements of DWA and to minimise the potential for pollution. This single site has also ensured that hazardous waste is not stored in uncontrolled fashion across the mining area. It is handled and stored centrally from where it is removed for final disposal by a registered waste removal company. The mine does not generate sufficient quantities to warrant immediate removal of waste. This requires temporary storage as describes above. Refer to Layout Plan, Area B on **Figure 36**.

3.4.3.3 Tyre Storage Area

Thabazimbi Mine is currently storing used tyres from mining vehicles at the tyre storage area. The current tyre supplier is Trent tyre. The tyre storage area has been registered and a tyre abatement plan and a tyre management procedure have been developed to ensure effective management of used tyres on site. Tyres are stored once they have become unsafe for use either through damage or if the tyres life has been reached. A tyre life depends on amongst other road conditions, weight of loads etc. The used tyre storage area is only a temporary storage area. This area is required because the suppliers of the HDV tyres do not take back the tyres currently. There is however an extensive assessment of other uses for the tyres taking place. Once a feasible option has been identified this will be investigated and the tyres may then be disposed of accordingly.

3.4.4 Energy Supply

Power is supplied to the mine via Eskom power lines which include:

- A 132 kV line from Lephalale (Ellisras) to the Eskom substation;
- A 22 kV line for power supply at Buffelshoek; and
- Two 11 kV lines from Eskom to the main substation.

The power is distributed on the mine from the 11 kV substation to where it is used at the required levels e.g. 6.6kV or 3.3kV.

3.4.5 Railway Lines

There is one railway line from Lephalale to Tshwane via Thabazimbi. Coal from Exxaro opencast mine Grootegeluk at Lephalale (Ellisras) and Thabazimbi Mine's beneficiated iron ore are transported via this route.

3.4.6 Planning and Development

This section is responsible for the development and implementation of new projects. The technicians are responsible for the maintenance and fault finding on the equipment and mine systems. The impacts are mostly related to non-mineral waste disposal and ineffective planning.

3.5 Support Services

3.5.1 Finance

General office activities take place within the finance offices.

3.5.2 Human Resources

General office activities including training take place within the human resource offices.

Human resources are responsible to manage the housing supplied by the mine. This is mainly housing provided in Mmbane and surrounding areas. This also includes the kitchens.

3.5.3 Supply chain

Storage of air products (gas cylinders) takes place as well as the receiving of all goods required on the mine.

3.5.3.1 Total

Total is the main fuel storage facility on the mine and also provides for oil storage. The temporary hazardous waste storage area is also situated within the confines of this area. This has been done to ensure access control to this site.

3.5.4 Safety and Sustainable Development

3.5.4.1 Ben Alberts

This is a recreational facility where game is kept and accommodation is provided for visitors and holidaymakers.

3.5.4.2 Environmental

The environmental section is mainly responsible for ensuring sound environmental practices are implemented on the mine.

3.5.4.3 Occupational Health

The occupational health section is responsible to run the clinic. This section manage occupational health and monitor safety.

3.5.4.4 Emergency Response

The section is mainly responsible for fire management on site i.e. making fire breaks and ensuring sufficient fire fighting equipment is available.

3.6 Contractors

3.6.1 TFMC (Robbies Electrical and Fidelity Supercare)

TFMC is responsible to provide maintenance services with regards to the housing provided in town and office maintenance e.g. carpentry services, electrical repairs. They are also responsible to provide cleaning services on the mine. This includes the cleaning of ablution facilities and the collection of general waste for disposal in the waste bins provided.

3.6.2 Rosond

Rosond is the main exploration drilling contractor on site.

3.6.3 Roux Engineering and Mafulela

Roux Engineering and Mafulela are responsible for mining activities and is the main mining contractor on site. Roux engineering also has a workshop where all the maintenance on vehicles takes place.

3.7 Projects

3.7.1 Exploration

Future mining will take place in the following areas on the mine:

- Meyer Mine (MMD) area;
- Wagteenbietjes-draai area;
- Buffelshoek East East area; and
- Phoenix as extension of Vanderbijl pit – refer to **Section 3.7.2.**

The above mentioned areas fall within the current mining license area. The current mining methodology and all the mitigation measures to minimise the impacts will be applied to the extensions.

Prospecting (exploration) is planned in different areas within the current mining license area. Prospecting will take place in the areas on the mine as indicated in **Figure 43**.

Prospecting is mainly be done in the form of drilling as per normal practice.

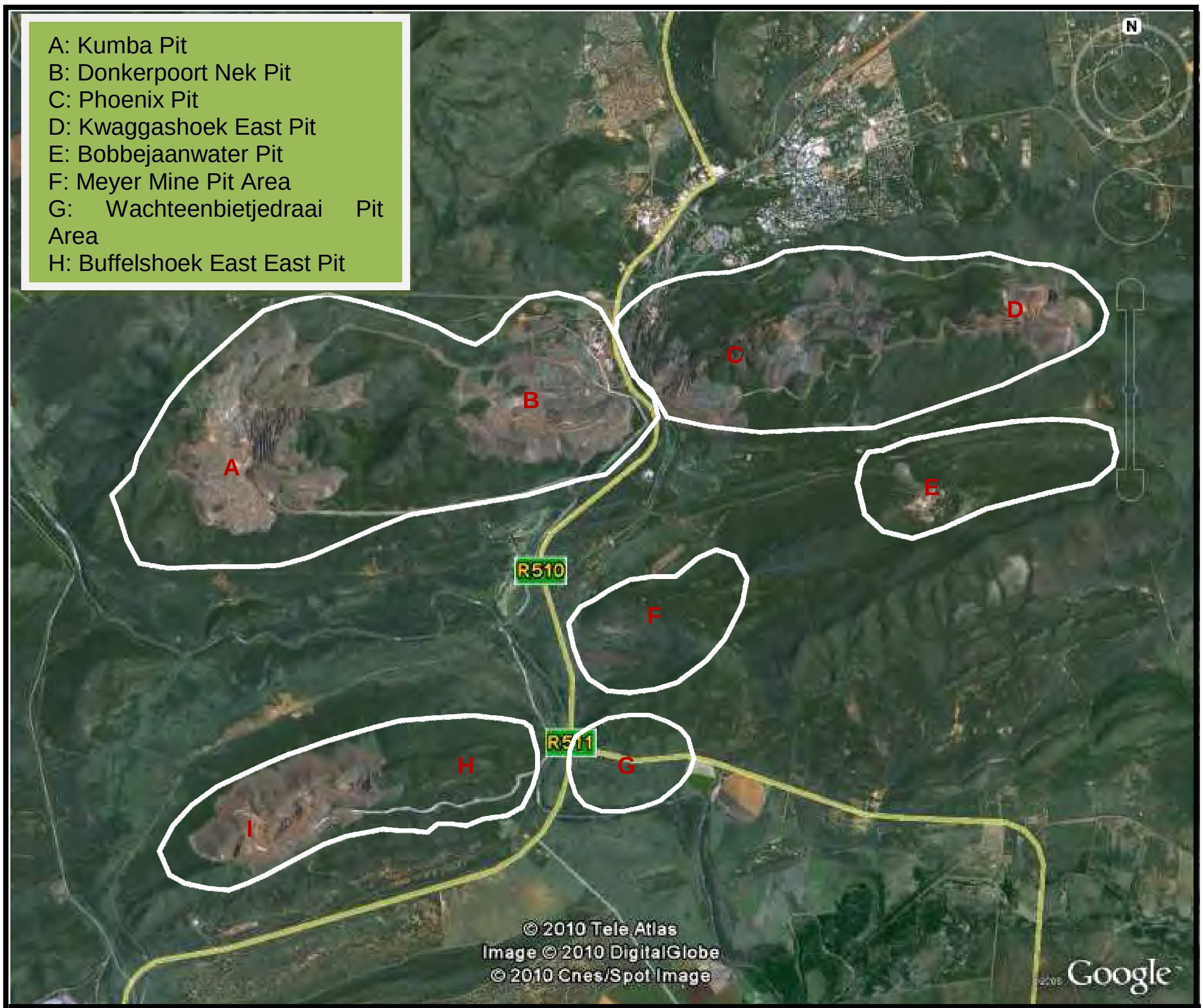

Figure 43: Exploration Areas

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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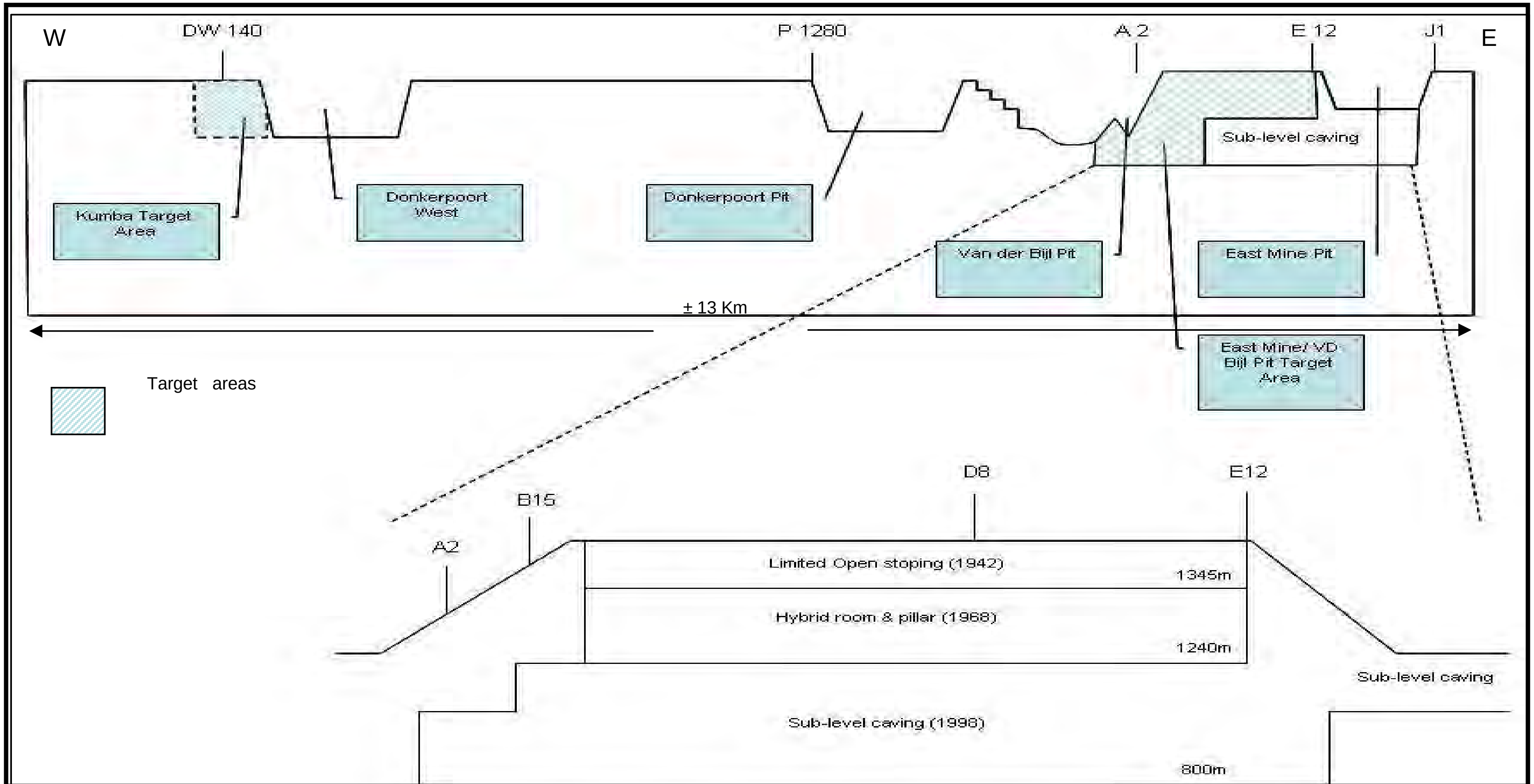

Figure 44: Schematic Representation of the Mining History in Thabazimbi

Client: Thabazimbi Mine	Date: December 2010
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Motivation for new mining area and prospecting activities

Prospecting is necessary to attempt to further extending the LoM. Prospecting is also important to ensure the identification of additional iron ore deposits which is important for the manufacturing of steel in South Africa. New mining activities will ensure optimization of ore extraction in the current license area.

3.7.2 Phoenix

The prospecting for Project Phoenix is done in old underground tunnels. Aboveground prospecting will involve a bulk sample process whereby the material will be removed and treated in a pilot plant (see later description of plant) as well as drilling. The bulk sample with be taken by means of general loading and hauling mining methods. Approximately 70 000 t of ore will be removed with the bulk sampling. This will take place in the Vanderbijl pit area. Refer to Layout Plan – Area A on **Figure 35**.

3.7.2.1 Phoenix Pilot Plant

This pilot plant will be situated in the Donkerpoort area and will be used to treat the bulk sample from the Vanderbijl pit area. The results of the bulk sample will be used to support the final feasibility study of the Phoenix Project. The plant will be a crushing and screening plant.

Motivation for the Phoenix Pilot Plant

The current operational plant is not equipped to treat the ore earmarked for the Phoenix Plant. The Phoenix Project will ensure beneficiation of material that has been classified as material that cannot be beneficiated or that has not been removed from the pit areas due to the nature of the material. The pilot plant will provide evidence on the successful treatment of the ore.

3.7.2.2 Chronology of Geological Investigations

June 2003 can be viewed as the watershed as pertaining to the period of investigation into the viability of extracting a hematite ore from low-grade BIF materials. Before 2003, a number of metallurgical studies were launched, including projects to investigate the properties of the BIF in different pit areas (1958 – 1970’s) and visits to mines in the Michigan-Minnesota area (1984) that mined similar deposits. Work done by several geologists in the seventies and eighties indicated that the BIF comprised different zones, based on the mineralogy of the iron minerals within the BIF. This led to the identification of distinct zones of ‘oxide – and iron silicate facies.

The foundation for the present Project Phoenix was laid in 1995, after sampling was done within the lower oxide facies, on two levels in the Vanderbijl pit. The assay values for the samples indicated a zone of iron enriched BIF, occurring in a zone above the basal hematite ore and below the diabase sill. The BIS project was initiated in 2001, but was discontinued in the same year.

Work started on Project Phoenix in 2003, with limited diamond drilling in the Vanderbijl pit to investigate the area identified in 1995. As the final product tonnages increased to

2.4 Mt and later to 3.4 Mt, the area under investigation increased in size to finally include both the Vanderbijl Pit and old underground section of the East Mine as well as an area to the west of the Donkerpoort West Pit (although this area was subsequently not included in the final project lay-out). A pre-feasibility study was completed by the end of 2005 after which work continued on the present Feasibility Phase.

The foundation for the present Project Phoenix was laid in 1995, after sampling was done within the lower oxide facies, on two levels in the Vanderbijl pit. The assay values for the samples indicated a zone of iron enriched BIF, occurring in a zone above the basal hematite ore and below the diabase sill. The BIS project was initiated in 2001, but was discontinued in the same year.

3.7.2.3 Historical Exploration and Mining information

Apart from the investigation into the beneficiation potential of the ferruginised BIF's, the normal day-to-day mining and exploration activities contributed to the accumulation of a vast database that provided the foundation for Project Phoenix.

Historical exploration and production drilling, and mapping information in the Vanderbijl pit provided enough information to delineate the hematite ore body. Extensive underground mining in the East Mine area yielded a wealth of information through channel sampling, grade control information and survey maps. At a point in time, most of the historical information was computerised and became readily available for use in the new Project Phoenix database.

During the final stages of the feasibility study, a sub-project was initiated to digitise the remaining historical data in the Block 4 area and use it for the resource classification. This information became invaluable to the project when drilling in this area proved very difficult due to the broken nature of the rock.

An ongoing exploration programme in the Thabazimbi Mine area provided the basis for proving the existence of a deposit similar to that of the Vanderbijl-East Mine area.

3.7.2.4 Exploration Programme Execution

The planning of exploration activities for the Project Phoenix pre-feasibility and feasibility studies was based on knowledge accumulated during normal mining operations. The purpose of the present study (pre-feasibility and feasibility) was to gather samples for a detailed geological and metallurgical study. Historically, percussion drilling provided general information but diamond drilling was needed to obtain intact diamond cores to study the characteristics of the different lithologies within the target zone.

3.7.2.5 Exploration Activities: Pre-Feasibility and Feasibility Phases

An exploration strategy was formulated to gather data in areas with no historical data, or where the existing data does not support any conclusion on the economic potential of the area under investigation. The target stratigraphy (diabase sill-dolomite) within the defined project area was intersected through surface and underground diamond drilling. This was essential for proper identification of different lithological types in order to simulate crushing processes and accurate compilation of MDS intersections. The overlying iron silicates (considered to be mineral waste) were investigated through percussion drilling as detailed information was not a prerequisite. Positioning of drill holes was constrained by accessibility and geological requirements

The project was divided into three drilling blocks, based on potential, previous mining activities, geology and drilling accessibility. The bulk of the work in Block 1 and 2 was done during the pre-feasibility investigation (April 2003 – December 2004). Drilling continued from January 2005 (as part of the feasibility study) to complete planned drill holes for Block 1 and 2. Simultaneously, a major investigation was launched in Block 4 (profile B15 – E12). This investigation was based on historical evidence that pointed towards significant in situ tonnage of both hematite and jig material that was left behind in the previously mined underground area. A total of 55 diamond drill holes were drilled since May 2003. Notwithstanding adverse drilling conditions, 46 (84%) of these holes were completed. Early in 2006 an increase in the scope of Project Phoenix necessitated the investigation of additional areas. The Thabazimbi Mine area was selected, as geo-chemical results indicated the presence of a jig zone.

The sampling was done representatively in order to obtain maximum reliability. In Block 1 and some East Mine drill holes the lithological types within the jig zones were individually sampled and forwarded to the pilot plant. Due to time limitations and certain metallurgical constraints, it was later decided to composite the remaining holes per total jig zone. Drilling information was plotted and interpreted on geological profiles. Percussion samples were logged and submitted to the local laboratory for chemical analysis.

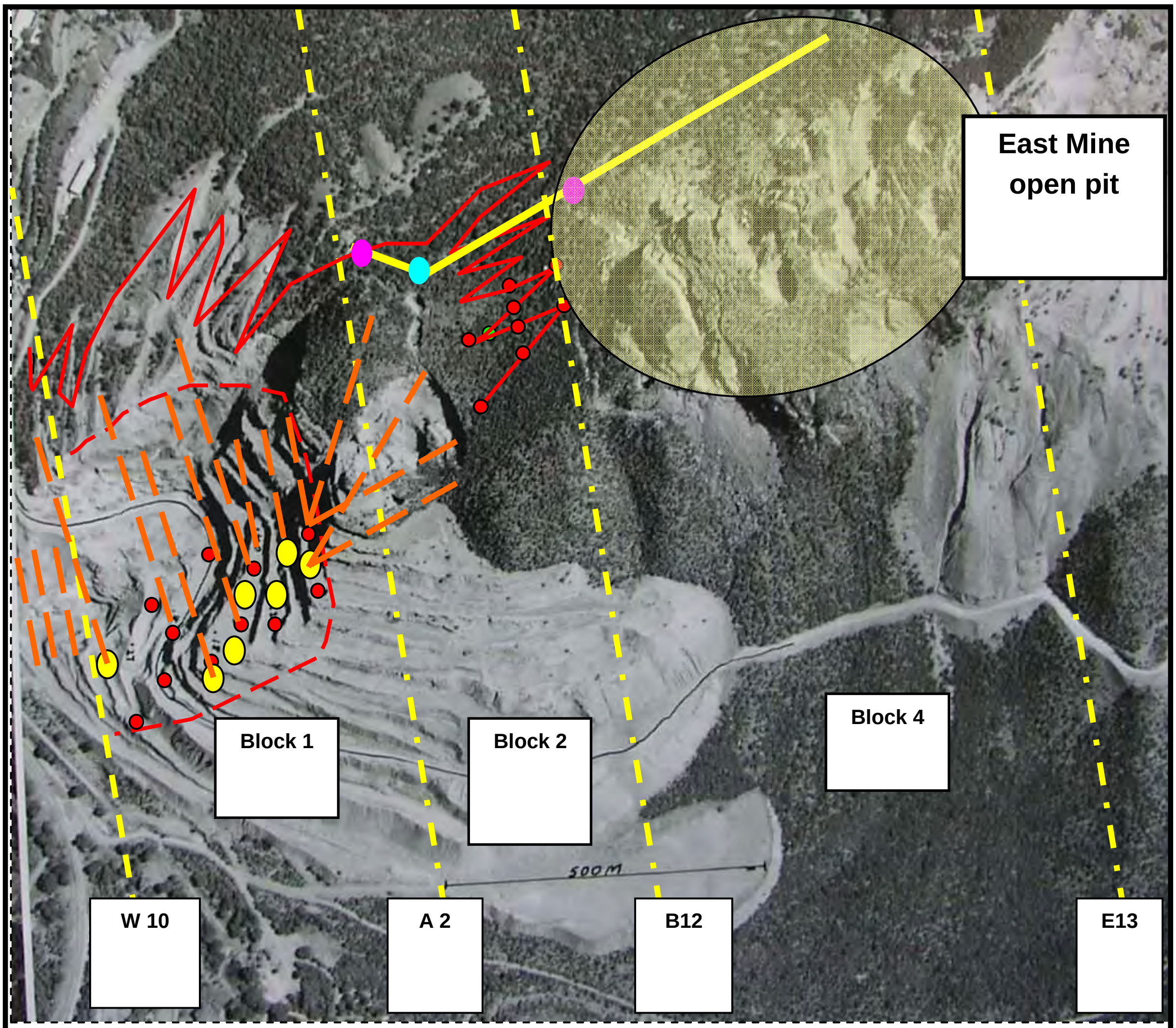

Figure 45 Vanderbijl Geological Reference Areas

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3.7.2.6 Infrastructure

Phoenix is a continuation of mining operations in the existing Vanderbijl- and East Mine pits using improved technology to beneficiate material previously classified as waste.

Considering the fact that Project Phoenix is a continuation of mining operations of the existing pit the only difference lies in the way the ore will be processed. The following points provide information on the Phoenix infrastructure.

- Underground exploration;
- Two open pit areas (current Vanderbijl pit and Sovereign Hill);
- Addittional WRD's;
- Bulk sampling;
- Maintenance workshop;
- Fuel storage;

- Pilot plant;
- Haul roads;
- Power lines;
- Plant
  - Crushing and screening;
  - Use of conveyor belts for transporting ore;
  - Stock piles to ensure the plant can be operated effectively;
  - Jigs;
  - DMS;
  - Thickener dam;
  - Mixing beds;
  - Use of existing plant discard dump to dump discard generated from new plant;
- New slimes dam;
- Slimes and return water pipelines;
- Return water dam;
- Possible construction of bridge over National road to link the eastern and western side;
- New loading station;
- New siding;
- Product beds; and
- Water management system.

3.7.2.7 Water Management Systems

3.7.2.7.1 Dewatering

Following rainfall, it will be necessary to remove the collected rain water from within the Phoenix 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. Pre-Feasibility Study for the Bulk Water Supply and De-Watering",* dated October 2006, groundwater will only need to be removed from the proposed Phoenix Pit 1 commencing in 2020, as a result of the altitude of the pit floor above the groundwater table. However, once the groundwater commences seeping into the proposed Phoenix Pit, the removal of the seepage will become necessary in order for mining to continue safely and efficiently. It is proposed that the groundwater table be lowered to below the Phoenix 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 Phoenix.

3.7.2.7.2 Boreholes

As part of the proposed Project Phoenix, it is anticipated that some of the existing production boreholes at Thabazimbi Mine may become dry due to the dewatering of the proposed Phoenix Pit. 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 follows:

- Borehole DON1177A (DP Groef), 90 m^3/h;
- Borehole DON1180 (Draai Donkerpoort West ertsvervoerpad), 108 m^3/h; and
- Borehole DON1181 (Begraafplaas), 25 m^3/h.

3.7.2.7.3 Potable Water

The proposed Phoenix Plant Clean water reservoirs (1 and 2) will be utilised for the storage of clean water obtained from various sources, including treated sewage water from the TLM, borehole water and water obtained from the MWS.

3.7.2.7.4 Process Water

The proposed Phoenix Plant Clean water reservoirs (1 and 2) will be utilised for the storage of clean water obtained from various sources, including treated sewage water from the TLM, borehole water and water obtained from the MWS. A portion of the water will be used to make up process water, while the remaining portion will be retained in each reservoir for use during fire emergencies at the proposed Phoenix Plant.

The mine makes use of treated sewage water and ground water abstracted from boreholes for process purposes. No water is abstracted from any of the non perennial rivers and streams in the area for process purposes.

3.7.2.7.5 Storm Water Catchment Dam

The proposed Phoenix Plant Thickener drainage dam will have the capacity to contain 4 370 m^3 of water.

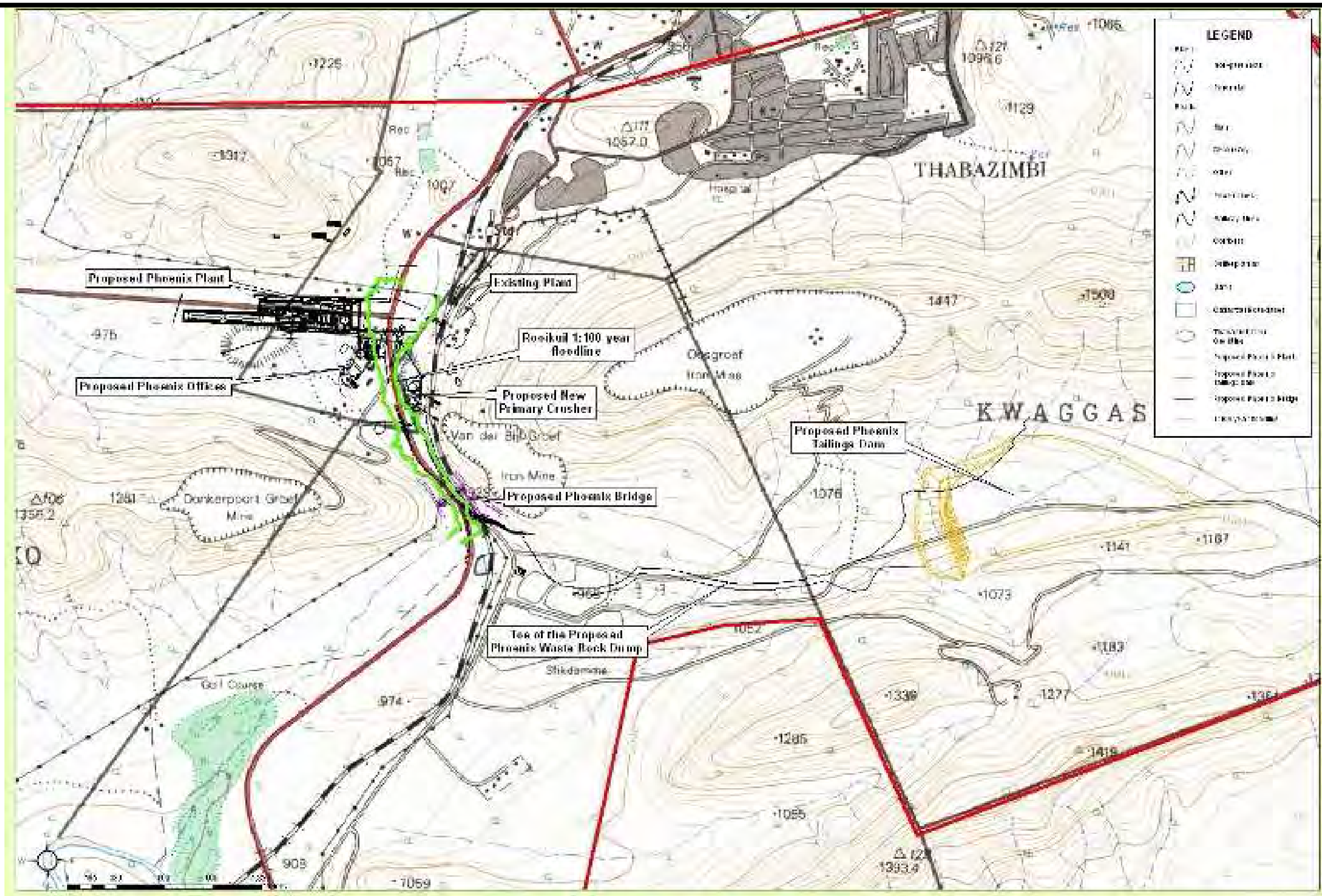

Figure 46: Phoenix Proposed Infrastructure	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

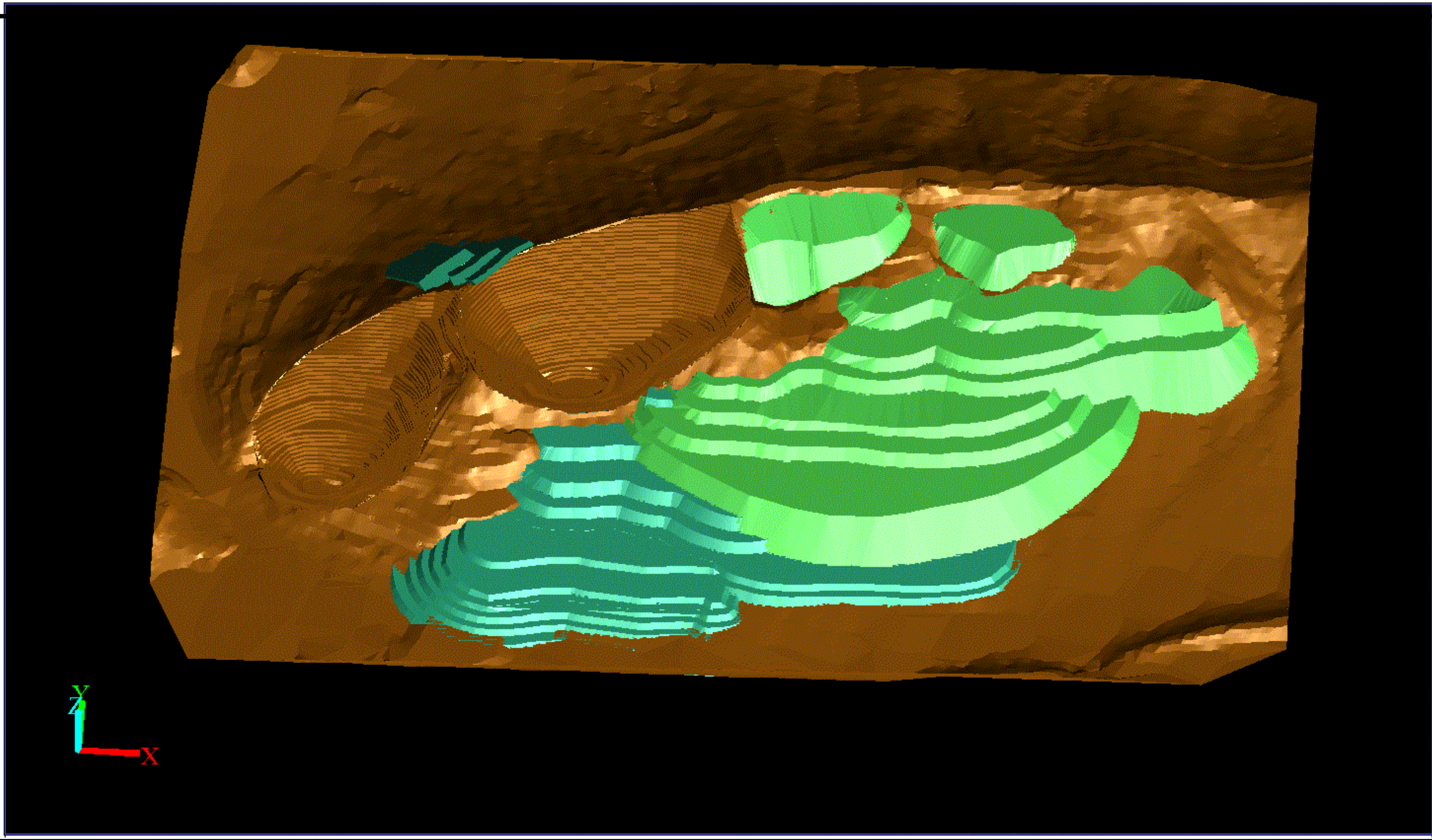

Figure 47: View from the South Including the Waste Rock Dumps	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

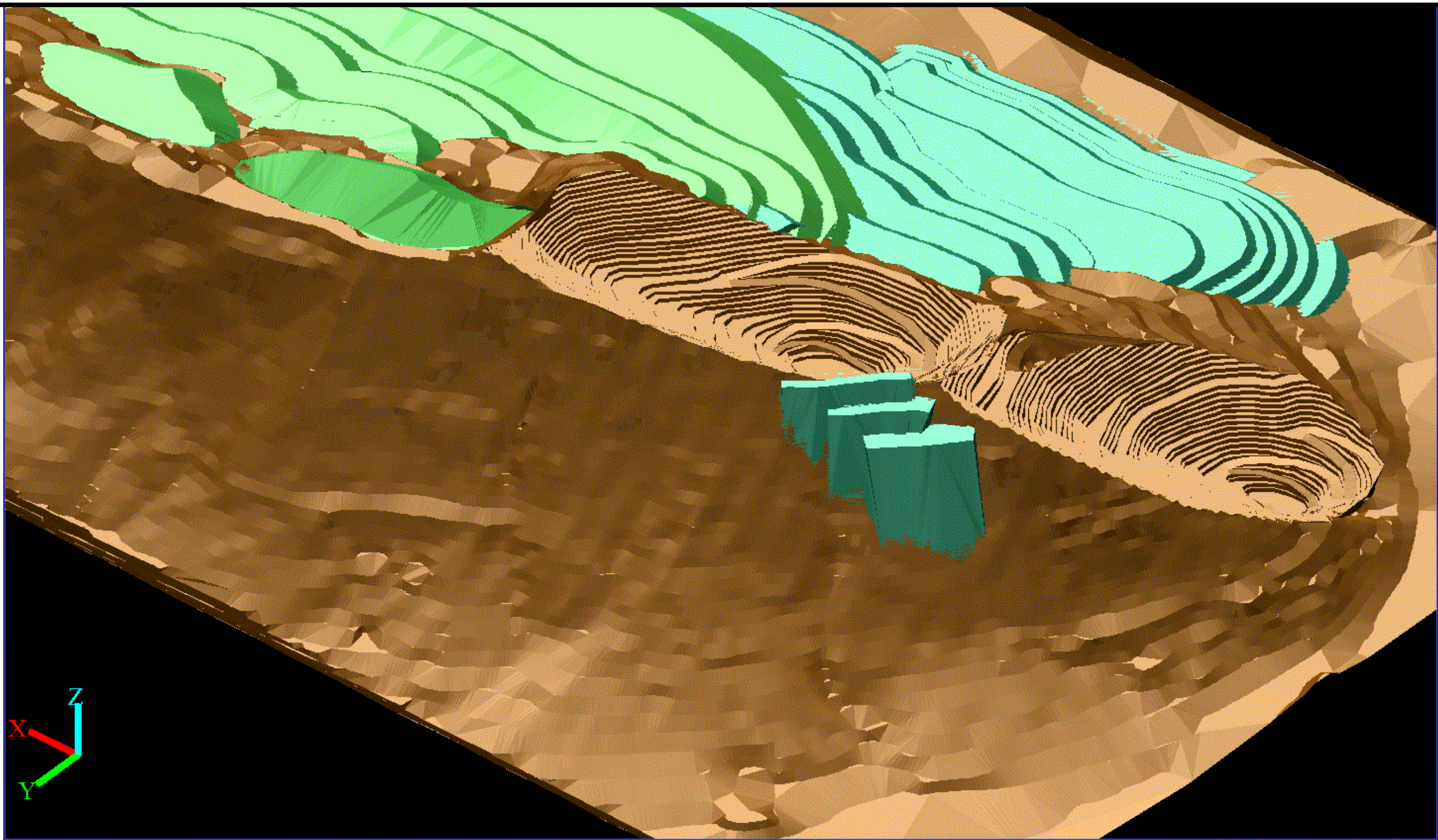

Figure 48: View from the Northern Side of Project Phoenix Including the Potential Waste Rock Dump

Client: Thabazimbi Mine	Date: December 2010
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3.7.3 Infrastructure

3.7.3.1 Meyer Mine Stockpile

Size of Iron Ore Stockpile area

The Iron Ore Stockpile area will be a temporary stockpile. Iron ore is transported from the plant to this stockpile area, where it is stored and then transported via road to Newcastle and Vanderbijlpark or back to the plant for transport via railway line. Originally the stockpile was 1.5 Mt but has been increased to 2.7 Mt.

Motivation for the Iron Ore Stockpile area

The area was originally a temporary site. Iron ore was transported via railway to Newcastle and Vanderbijlpark. However, due to a decrease in iron ore demand during the economic slump in 2009 and 2010 and the problems experienced with rail transport, the need to stockpile occurred. This area was chosen because of the following reasons:

- The iron ore stockpile falls within the old Meyer mine area; which is an already disturbed area;
- There is no space at the plant to stockpile the material; and
- Easy road access also formed part of the motivation to stockpile in this area.

Refer to the layout plan, **Figure 34**.

3.7.3.2 Parking Areas

In addition to existing parking areas at the mine new parking areas need to be constructed. These parking areas will be constructed at Donkerpoort and at the plant entrance area. The total size of the areas to be disturbed at the plant is less than 1 ha. The Donkerpoort area is an already disturbed area.

Motivation for the Parking areas at the Plant and at Donkerpoort

The main reason for the construction of new parking areas is to support the implementation of a new access control system for the mine. It will also improve the traffic flow on site.

3.7.3.3 Central Waste Sorting Area

This is a proposed facility. General waste from the mine will be sorted into the following categories:

- Paper;
- Plastic;
- Tins;
- Glass; and
- Organics.

This central waste sorting area is proposed in the Donkerpoort area and will be central to ensure that all general waste generated on the mine can be brought to this site and separated under controlled conditions. Waste that is recyclable will be recycled and all organics will go to landfill. No disposal of waste will take place in this area only temporary handling, sorting, storing and compacting.

Motivation for the Central Waste Sorting Area
The central sorting area will ensure that the control over waste is improved. This will ensure optimal recycling of material that can be recycled or re-used. This will decrease the volume of waste going to landfill considerably. It is the intention to use this project as a job creation initiative.

Refer to Layout Plan – Area C on **Figure 37**.

3.7.3.4 Bioremediation Facility

A bioremediation site is planned for the treatment of the contaminated materials. The wall around the site will have a height of 300 mm. This wall will extend to divide the site into two areas. Each area will be approximately 10X20 m. Each area will include filters and sumps.
The site will be approximately 20X20 m and 300 mm high. A concrete layer will cover the surface of the site.

The bioremediation product used allows windrows of soil to be stacked to a height of 1.5 m to 2.0 m and therefore reduces the footprint of the temporary site when compared to other products that only allow for a soil bed of ± 30 cm in depth. The product allows for a bioremediation time frame of 3 to 4 months after initial setup.

Trucks will bring all the contaminated soil from the various locations to the site. The soil will then by seeded with the bioremediation product Water will be used to wet onto soil to help the product with the process.

Refer to Layout Plan – Area C on **Figure 37**.

3.7.3.5 Low Grade Ore Pilot Plant

Currently a study is in progress to identify the need for a low grade ore plant. To support the final decision it will be required to construct a pilot plant. Four sites (already disturbed) have been identified for the purpose of this project as possible positions for the low grade ore processing plant.

They include the following:

1. Option 1: DP West (In pit processing)
2. Option 2: Area between TOTAL fuel depot and the Donkerpoort stockpile
3. Option 3: Old Screening area between Vanderbijl and Kwaggashoek pit
4. Option 4: Area adjacent to the current plant WRD

Motivation for the Low Grade Ore Pilot Plant

The pilot plant would be required to test the technology to see whether the low grade ore can be successfully crushed screened and beneficiated. This will lead to an extension in the LoM and consequently what is classified as the mines ore reserve.

3.7.4 Social

3.7.4.1 Jood se Dam

Jood se dam is a fishing recreational area. The area is 20 ha in extent and within the mining area. Jood se dam is included in the closure plan of the mine and forms part of the mines end land use objective. All water consumption is included in mine's IWUL.

The mine proposes to expand the accommodation and ablution facilities on the site, but not clearing vegetation where it is not necessary. Especially large trees that will provide campers with shade will be retained.

Motivation for Jood se dam

Considering that this facility has been operational for some years the motivation behind the project is to increase the capacity of the facility and provide a recreational facility for the community to utilize. This project is also in line with the proposed closure objectives of the mine.

Refer to Layout Plan – Area A on **Figure 35**.

3.7.4.2 Mollies Coffee Shop

This is an existing site that was developed as a museum/coffee shop and thus serves a historical purpose. The previous attempt did however not result in a sustainable business. The mine intends to preserve the old building and by doing so the need has been identified to reinstate the coffee shop/museum.

Motivation for the Mollies Coffee Shop

The main motivation is to preserve the history of the town by preserving some of the historical buildings (old mine buildings) and artifacts that have already been accumulated.

Refer to Layout Plan – Area D on **Figure 38**.

3.7.4.3 Cultural Village

The aim of the project is to establish sustainable crafts and market. The project will create 25 jobs and alleviate poverty. The historically disadvantaged individuals will be able to market their products. The intention is that the project will be managed by Thabazimbi tourism association in the future. The project will consist of two (2) phases which will focus on craft market and information centre.

Motivation for the Cultural Village

Focusing on eco-tourism for the Thabazimbi area this facility will add to the attraction and is aligned with the economic aspects of the tourism in this area. This is also proposed on a portion of the mining license area where no activities currently take place.

Refer to Layout Plan – Area D on **Figure 38**.

3.7.4.4 Early Childhood Centre

The facility is about improving the quality of education by providing early child development centre as well as grade R infrastructure.

Motivation for the Early Childhood Development Centre

The Early Childhood Development Centre will be providing quality early childhood development programmes to children between in ages of 4-5 years from the Thabazimbi area.

Refer to Layout Plan – Area D on **Figure 38**.

CHAPTER 4: ENVIRONMENTAL IMPACT ASSESSMENT

Chapter 4 provides the background to **Chapter 5** where the management / mitigation measures are identified which have been implemented to minimise the actual and potential environmental impacts caused by Thabazimbi Mine operations.

This chapter is comprised of three main parts. The first part (**Section 4.2**) gives an EIA associated with each of the project activities as described in **Chapter 3**. The second part (**Section 4.1**) is an Aspect Register summarizing the areas of focuses which has been included as well as the risk rating and level. The third part (**Section 4.3**) comprises of the closure impacts, which are the latent and residual impacts.

4.1 Aspect and Impact Register

Below is **Table 34** which is the aspect register for Thabazimbi Mine.

Table 34: Aspect Register

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
1	Engineering	Boilermaker workshop	General boilermaker workshop activities	Disposal of general waste	The following waste can be disposed scrap metal (Metal shavings / dust / replaceable parts). The waste can be disposed in the wrong bin and thus not recycled. The material can be contaminated with oil but is very unlikely because equipment is cleaned before use in workshop.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	1	NA	NA	NA	NA	2
2	Engineering	Boilermaker workshop	Operation and use of air chipper	Generation of noise	The chipper will generate noise which will be confined to the work area and limited exposure will take place outside the workshop area thus no environmental effect outside the boundaries of the work area.		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
3	Engineering	Boilermaker workshop	Bending of metal and use of machines in the workshop	Spillage of material	Hydraulic pipes can burst under pressure causing spillage inside the workshop. This will however be contained and cleaned. The contaminated material will be disposed as hazardous waste or remediated on the	Spill management procedure TZ-OPR-MW-003 and Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
						Control Measures	Significance										Final significance (Highest score)
					bioremediation site.												
4	Engineering	Boilermaker workshop	Cleaning of machines and workshop	Disposal of contaminated water	When workshops are cleaned contaminated water is generated. This water flows into the dirty water system but in the event of overflowing it can cause pollution.	Spill management procedure TZ-OPR-MW-003 and Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4
5	Engineering	Boilermaker workshop	CO_2 welding, profile and gas cutting.	Generation of emissions to atmosphere	During the welding, profiling and gas cutting activities emissions will be generated in the workshop area. The emissions will disperse in the atmosphere. Welding takes place on a daily basis.		NA	NA	NA	NA	NA	NA	NA	11	NA	NA	11
6	Mine wide	Mine wide	Use of vehicles, and other mobile equipment for operational activities	Generation of emissions to atmosphere	Vehicles will generate emissions to the atmosphere during general operations. The emissions are limited due to regular maintenance on vehicles.	Services of vehicles in accordance with maintenance schedule.	NA	NA	NA	NA	NA	NA	NA	14	NA	NA	14
7	Engineering	Boilermaker workshop	Friction cutter	Generation of noise	The friction cutter will generate noise which will be confined to the work area and limited exposure will take place outside the workshop area. Very little to no impact on the		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					surrounding environment is expected.												
8	Engineering	Boilermaker workshop	Gauging	Generation of noise	During gauging high levels of noise is generated inside the workshop. The noise will however have very little to no impact outside the mine area.		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
9	Engineering	Boilermaker workshop	Gauging	Generation of emissions to atmosphere	Small volumes of dust will be generated during the gauging process. This dust will however not go outside the workshop area thus the impact will be very little on the surrounding environment. The dust generated is also very heavy and will not disperse very far.		NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7
10	Engineering	Boilermaker workshop	Grinding work	Generation of noise	Grinding will generate noise which will be confined to the work area and limited exposure will take place outside the workshop area		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
11	Engineering	Boilermaker workshop	Mechanical saw	Generation of noise	The mechanical saw will generate noise which will be confined to the work area and limited exposure will		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					take place outside the workshop area												
12	Engineering	Boilermaker workshop	Outside services - veldt fires	Generation of emissions to atmosphere	When outside services perform maintenance their actions (welding, and cutting) may cause veldt fires which will generate emissions to the atmosphere.	Emergency and crisis management procedure TZ-OPR-MW-076 Fire extinguisher	NA	NA	NA	NA	3	NA	NA	3	NA	NA	3
13	Engineering	Boilermaker workshop	Painting	Spillage of chemicals	Spillage of chemicals such as paint and thinners can occur when painting. The volumes used is however very small. The impact on the environment is therefore seen as very small and limited.	Spill management procedure TZ-OPR-MW-003	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
14	Engineering	Boilermaker workshop	Painting	Disposal of hazardous waste	Hazardous waste will be generated as part of the painting activity in the form of paint tins and rags containing thinners. Other chemical containers can also be generated (thinners) which will require disposal. Disposal will take place into the hazardous waste bins which is removed to a	Waste management procedure TZ-OPR-MW-001	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					bunded area prior to final disposal by a recognized waste disposal company.												
15	Engineering	Boilermaker workshop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment. Nothing changed only repairs are done	Planning of new infrastructure procedure Change management procedure TZ-OPR-MW010	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
16	Engineering	Boilermaker workshop	Pre-heating	Generation of emissions to atmosphere	Small levels of emissions will be released into the atmosphere during pre-heating. This will however be limited to the workshop area. Very little impact is expected outside the workshop.		NA	NA	NA	NA	NA	NA	NA	11	NA	NA	11
17	Engineering	Boilermaker workshop	Profile cutting	Generation of noise	Profile cutting will generate noise which will be confined to the work area and limited exposure will take place outside the workshop area		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
18	Engineering	Boilermaker workshop	Punch and crimping	Generation of noise	Punching and crimping will generate noise which will be confined to the work area		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					and limited exposure will take place outside the workshop area												
19	Engineering	Boilermaker workshop	Storage of gas - leaking bottles	Generation of emissions to atmosphere	In the event of stored cylinders leaking it may cause emissions to the atmosphere. The Acetylene and oxygen, flux blend, carbon dioxide, LPG.	Standard	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
20	Engineering	CAT work shop	Changing air filters, air pipes, brake pads, caterpillar tracks, wear plates of front-en loaders, road grader and bulldozers 824 & 995, roller chassis, seats and control in cab, torque converter, transmission, turbo on mine equipment, v-belt, water pipes, windscreen wipers. Lancing (Oxygen cutting). Maintenance of vehicles in the pit. Removal of diff, bulldozer side frame. Repair equalizer bar on "dozer", diesel tank and oil tank, turn table gearbox. Replace or repair front-end loaders teeth sleeves, push arms, saddle liners on grader.	Disposal of general waste	General waste e.g. scrap metal will be generated during these activities. Recycling of metal takes place when scrap metal is disposed in the scrap metal bin.	PTO Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	1	NA	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
			Welding on drilling equipment. Welding with CO_2 welder.														
21	Engineering	CAT work shop	**Changing** caterpillar tracks, drive shaft and centaflex, hydraulic pump, oil filters, hydraulic pipes, cooler. **Maintenance** of vehicles in the pit. **Removing** of engine in pit. **Repair** of diesel tank and oil tank, turn table gearbox.	Disposal of hazardous waste	Disposal of hazardous waste e.g. old oil, oil rags, chemical containers, grease, old batteries, oil filters. The waste will be disposed in the hazardous waste bins prior to removal to Total. This does however not happen on a regular basis. Oil filters need to be disposed. Large volumes are generated per month. The filters are disposed at the Total storage area prior to final removal. Oil rags are also disposed in a similar manner.	Drip trays Use of zorb PTO Waste management procedure TZ-OPR-MW-001. Spill management procedure TZ-OPR-MW-003 Storage of old oil in bunded area	NA	NA	5	NA	NA	9	9	NA	NA	NA	9
22	Engineering	CAT work shop	**Changing** caterpillar tracks. **Lancing** (Oxygen cutting). **Repair** of A-Frame, equipment doors and buckets. **Replace** and repair front-end loaders teeth sleeves, pushing arms. **Use** of overhead crane	Generation of noise	Noise generated is limited to the workshop area and limited volumes leave the mining area if any. The noise does not pose an impact outside the mining area.		NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7
23	Engineering	CAT work	**Changing** caterpillar tracks,	Generation of	Emissions from cutting and		NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
		shop	roller chassis. **Lancing** (Oxygen cutting). **Removal** of caterpillar tracks, bulldozer side frame. **Repairing** of A-frame, equipment doors and buckets. **Replace or repair** front-end loaders teeth sleeves, pushing arms. **Welding** on drilling equipment. Welding with CO_2 welder.	emissions to atmosphere	welding will be generated during these activities. The emissions are limited.												
24	Engineering	CAT work shop	**Changing** diesel filter, hydraulic pump, hydraulic pipes. **Greasing** of equipment. **Removal** of diff. **Repair** of diesel tank and oil tank, turn table gearbox. **Topping up** grease system.	Spillage of chemicals	Spillage of material such as diesel, oil, grease etc. may occur. The spill will be localized and very small. The contaminated material will be disposed in the hazardous waste bin for removal to Total.	PTO Drip trays Spillage management procedure TZ-OPR-MW-003 Use of Zorb Waste management procedure TZ-OPR-MW-001	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8
25	Engineering	CAT work shop	Changing water pipes	Spillage of chemicals	Spillage of water containing engine coolant may occur. This contaminated water will end up in the wash bay at Donkerpoort. Engine coolant will not be removed by the oil separator but will	PTO	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
							Significance										
					be used for dust suppression on the roads.												
26	Engineering	CAT work shop	Maintenance of vehicles in the pit Removing of engine in pit	Spillage of chemicals	Spillage of material such as oil, grease, battery acid, hydraulic fluid may occur during maintenance.	Use of zorb Spill management procedure TZ-OPR-MW-003 Drip trays	NA	NA	8	NA	NA	8	5	NA	NA	NA	8
27	Engineering	CAT work shop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
28	Engineering	CAT work shop	**Removing** of engine in pit **Replace** cooler	Disposal of contaminated water	Water from the **engine** needs to be disposed when maintenance is performed on the vehicles in the pit. The volumes are small and the frequency is very low. This water is disposed in the washbay. Contaminated water will be generated from the **cooler** during maintenance. This water runs to the wash bay. This water is used for dust suppression once it has	PTO	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					gone through the separator.												
29	Engineering	Central workshop	Maintenance on equipment. Electric saw, Gas cutting, Line drilling machine, Standing drill. Using of lath	Disposal of general waste	Generation of scrap metal will take place during workshop activities. The volume is very small and will be disposed into the scrap metal recycling bin which is removed by a recycling company.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	1	NA	NA	NA	2
30	Engineering	Central workshop	Dismantling and fitting of spare parts. Hydraulic press. Maintenance of separator, on equipment. Wash bay operation.	Spillage of chemicals	Spillage of material during workshop activities Spillages are contained and volumes are small.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	5	NA	NA	NA	5
31	Engineering	Central workshop	Dismantling and fitting of spare parts. Gas cutting.	Generation of emissions to atmosphere	Emissions from cutting and welding can occur when parts are dismantled. This happens on an ad hoc basis.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
32	Engineering	Central workshop	Dismantling and mounting of spare parts. Operating the hydraulic press. Maintenance on equipment.	Disposal of hazardous waste	Hazardous waste such as grease and rags may be generated. This happens on a daily basis. The waste is stored at the Total site prior to final disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
33	Engineering	Central workshop	Electric saw, Standing drill, Steam cleaner.	Disposal of contaminated water	Disposal of contaminated water. This water is disposed into the dirty water	Dirty water separator	NA	NA	4	NA	NA	8	2	NA	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			Using lath Washing of workshop floors		system at the oil separator. The overflow runs into the sumps at the fine ore bed which is pumped back into the plant for use.												
34	Engineering	Central workshop	Workshop equipment	Generation of noise	Noise generation takes place but is confined to the workshop area.	Noise monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
35	Engineering	Petrol workshop	**Maintenance** of overhead lift **Application** of lubricants **Changing** engine, vehicle drive shaft, gearbox **Cleaning** of loading duct **Use** of high-up crane	Disposal of hazardous waste	Hazardous waste will be generated during these activities. This waste will be disposed in the hazardous waste bin. Hazardous waste is removed to Total and finally disposed by an external waste	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
36	Engineering	Petrol workshop	**Maintenance** of overhead lift **Changing**: engine vehicle drive shaft vehicle tyres gearbox **Cleaning** of diverting duct Electric **welding** machine **Gas cutting**	Disposal of general waste	General waste can be generated during the maintenance, changing components, cleaning, welding and cutting. . Small volumes will be generated. Scrap metal is recycled by a scrap metal recycling company. Vehicle tyres are all send back to the supplier.	Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	2	2	NA	NA	NA	4
37	Engineering	Petrol	Workshop activities	Spillage of	Oil and grease spillages may	Spill management	NA	NA	5	NA	NA	2	1	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
		workshop		chemicals	occur during these activities. This will be contained and cleaned.	procedure TZ-OPR-MW-003											
38	Engineering	Central workshop	Paint store	Spillage of chemicals	Spillages may occur during the handling, use and storage of paints due to leaks or accidental spills. This is however limited to the paint store and volumes kept are very small.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
39	Engineering	Central workshop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment. Nothing changed only repairs are done	Change management procedure TZ-OPR-MW-010	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
40	Engineering	Central workshop	Steam cleaner	Water use	Water is used in the steam cleaner. This is a resource effective way.		NA	NA	NA	NA	NA	NA	4	NA	NA	NA	4
41	Mine wide	Mine wide	General office activities, change house, cleaning services, waste disposal	Disposal of general waste	Disposal of general waste e.g. office waste, paper, plastic.	Waste management procedure TZ-OPR-MW-001	NA	NA	13	NA	NA	5	6	NA	NA	3	13
42	Mining	Mining production	Using change house	Water use	The change house uses a large volume of water. Spillage and leaks occur.	Maintenance system	NA	NA	NA	NA	NA	NA	8	NA	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
43	Plant	Crushing and conveyor	Driving vehicles - leaks from vehicles Maintenance of gearboxes, crusher Taking oil sample	Spillage of chemicals	Spillage of oil, hydraulic fluid, diesel and or petrol may take place when leaks occur on vehicles.	Regular maintenance Spill management procedure TZ-OPR-MW-003 Waste management procedure TZ-OPR-MW-001 PTO	NA	NA	5	NA	NA	8	NA	NA	NA	NA	8
44	Plant	Crushing and conveyor	Maintenance of conveyors and structure (replacing rollers, maintaining water sprays, crusher.	Disposal of general waste	Disposal of general waste e.g. scrap metal and conveyor belt will take place. Scrap metal will be recycled by a scrap metal dealer. Conveyor belts that can be reused by e.g. farmers will be sold as such.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
45	Plant	Crushing and conveyor	Maintenance of conveyors (replacing rollers, maintaining water spray), crusher.	Generation of emissions to atmosphere	Emissions from cutting and welding during maintenance.		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
46	Plant	Crushing and conveyor	Maintenance of crusher and gearboxes	Disposal of hazardous waste	Disposal of hazardous waste e.g. old oil, oil rags, grease will take place. This will be disposed in the hazardous waste bin. Subsequent to the disposal in the bin the waste is removed to Total	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					prior to final disposal.												
47	Plant	Crushing and conveyor	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	13	NA	NA	9	6	8	NA	NA	13
48	Plant	Crushing and conveyor	Removing steel from crusher	Generation of noise	Noise generation will take place during lancing but it is limited to the crusher building and will not cause nuisance outside the mining area.		NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
49	Engineering	Drills	Changing equalizer on 60R, aux compressor, drilling tower, drive motor, high voltage AC motors, mast cylinder, 1st & 2nd drive gear, 3rd chain, side frame, water level cylinder, oil cooler, oil cooler fan motor, rotation gearbox, rotation motor, transport chain on tower, water pump. Checking time marks on drive gear and links. Cleaning of drain, spare parts, workshop.	Disposal of hazardous waste	Hazardous waste will be generated e.g. old oil, oil rags, grease, oil filters, etc. This will be disposed at the Total waste storage area prior to final removal.	PTO Waste management procedure TZ-OPR-MW-001	NA	NA	9	NA	NA	NA	NA	NA	NA	NA	9

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			Guided cutting work. Installation of caterpillar tracks pan. Welding and cutting on drills.														
50	Engineering	Drills	Changing AC motors, drill tower, drive motor, high voltage AC motors, main air hose, 1st & 2nd drive gear, 3rd chain, side frame, oil cooler, rotation gearbox, rotation motor, transport chain on tower, v-belt of aux compressor, water pump, drain. Doing scheduled service. Drilling with drill. Gas cutting. Grinding work. Guided cutting work. Joining of 60R feeder chain. Welding and cutting on drills.	Disposal of general waste	Scrap metal will be generated. It will be disposed into the scrap metal recycling bin which is removed by a recycling company. Conveyor belts that can be reused by e.g. farmers will be sold as such. Rubber and plastics will be disposed or recycled where relevant.	PTO Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4
51	Engineering	Drills	Changing drilling tower, mast cylinder, water level cylinder, oil cooler, rotation gearbox. Doing scheduled service. Installing of caterpillar tracks pan.	Spillage of chemicals	Spillage of material e.g. oil and grease, etc.	PTO Spill management procedure TZ-OPR-MW-003 Use Zorb / drip trays	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
52	Engineering	Drills	Changing drive motor, high voltage AC motors, side frame,	Generation of emissions to	Small quantities of emissions will be generated.	PTO	NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			water level cylinder, rotation motor, transport chain on tower. Gas cutting. Guided cutting work. Joining GD 120 transport chain. Welding and cutting on drills.	atmosphere													
53	Engineering	Drills	Cleaning of drain, spare parts, workshop.	Disposal of contaminated water	Dirty water generated will be disposed in the dirty water system.	Central dirty water dam Pumped through separators Oil separated. Oil to pit and removed by OILCOL Dirty water to a dam and used for dust suppression in the pit.	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4
54	Engineering	Drills	Drilling with drill, Grinding, cutting work, gauging, guided cutting work. Installing of caterpillar tracks pan.	Generation of noise	The noise is limited to the workshop. No effect is expected outside the mining area.	PTO Monitoring	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
55	Engineering	Drills	Painting	Disposal of hazardous waste	Hazardous waste is generated when painting is done. Rags, paint tins, empty chemical containers	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	2	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					etc needs to be disposed.												
56	Engineering	Drills	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
57	Engineering	Drills	Washing of drills in pit	Disposal of contaminated water	Disposal of contaminated water when drills are washed. The dirty water remains in the pit.		NA	NA	12	NA	NA	8	NA	NA	NA	NA	12
58	Engineering	Fidelity Supercare	Cleaning of areas	Disposal of general waste	Disposal of general waste e.g. office waste, paper, plastic, dust from vacuum cleaner, etc.	Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	4	NA	NA	NA	NA	4
59	Engineering	Fidelity Supercare	Cleaning of areas	Disposal of wash water	When areas are cleaned contaminated water is generated. The wash water is disposed in sewage system.	Waste management procedure TZ-OPR-MW-001	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1
60	Engineering	Fidelity Supercare	Handling and storage of chemicals	Disposal of hazardous waste	Empty chemical containers need to be disposed. This will be done on a regular basis. Empty chemical containers stored in storage room in Donkerpoort and returned to	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					Supercare head office once a month.												
61	Engineering	Fidelity Supercare	Handling and storage of chemicals	Spillage of chemicals	Spillages of chemicals during the storage or use thereof can take place. Should a spillage occur, it will be washed and the dirty water will be disposed of in the sewage system. The chemicals are stored in a building with a concrete floor.		NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1
62	Engineering	Haul truck workshop	**Changing components**: hydraulic cylinders nose cone front / rear suspension main alternator engine wheel motor axle box hydraulic pumps dumpbody panhard pin diesel and oil filters. **Servicing** trucks. **Washing** equipment.	Disposal of hazardous waste	Hazardous waste will be generated during these activities e.g. old oil, oil rags, grease, etc. This needs to be disposed in a hazardous waste skip and taken to the Total area for final disposal.	Waste management procedure TZ-OPR-MW-001 Spill management procedure TZ-OPR-MW-003	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8
63	Engineering	Haul truck workshop	Changing components: hydraulic cylinders	Spillage of chemicals	Spillage of material during use or maintenance e.g. oil,	Waste management procedure TZ-OPR-	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			nose cone front / rear suspension main alternator engine wheel motor axle box hydraulic pumps dumpbody panhard pin diesel and oil filters. Operating hydraulic crane truck. Servicing trucks. Use of forklift, towing vehicle. Washing equipment and workshop floors.		diesel, petrol, grease etc. These volumes are however very small and the spill will be localized if it takes place. Spillage of material during use such as detergents. The spill will be washed into the dirty water system.	MW-001 Spill management procedure TZ-OPR-MW-003											
64	Engineering	Haul truck workshop	**Changing** front / rear suspension and accumulator-nitrogen **Cutting, welding and gauging**. **Operating** hydraulic crane truck. **Testing** machine / starting the machine. **Using** towing vehicle.	Generation of emissions to atmosphere	**Nitrogen emissions** can be released into the atmosphere when the rear suspension is changed. This will however not has an impact on the already large volume of nitrogen in the atmosphere. **Emissions from cutting and welding** are generated. These emissions are confined to the workshop		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					and limited volumes. **Vehicles will generate emissions** to the atmosphere during general operations. The emissions are limited due to regular maintenance on vehicles.												
65	Engineering	Haul truck workshop	**Changing components:** hydraulic cylinders nose cone front / rear suspension main alternator engine wheel motor axle box hydraulic pumps dumpbody panhard pin. **Cutting, welding and gauging**. **Operating** hydraulic crane truck. **Testing / starting** the machine. **Use** of impact hammer.	Generation of noise	Noise will be generated these activities, but it will be limited to the workshop. No impact on surrounding environment is expected.		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
66	Engineering	Haul truck workshop	**Changing** components: hydraulic cylinders nose cone	Disposal of general waste	Disposal of general waste e.g. scrap metal which is recycled for use. Scrap	PTO Waste management procedure TZ-OPR-	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			front / rear suspension main alternator engine wheel motor axle box. **Cutting, welding and gauging**. **Servicing** trucks		metal will be recycled by a scrap metal dealer.	MW-001											
67	Mine wide	Mine wide	Electrical usage in offices (Computers, lights, heaters, air conditioners), and for operational activities	Electricity use	Electricity use on the mine can improve. A renewed focus on the minimization of electricity is required.	Resource management procedure TZ-OPR-MW-004	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	18
68	Engineering	Haul truck workshop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
69	Engineering	Haul truck workshop	**Washing equipment**, e.g. cylinders, engine, suspensions, etc. Before servicing trucks **Washing** of work shops **floors**.	Disposal of contaminated water	When equipment is cleaned contaminated water is generated. This water flows into the oil separator. Water used for washing of workshop floors will be contaminated by detergents and hydrocarbons and the contaminated water will have	Water flows to oil separator	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					to be disposed of.												
70	Engineering	Light Vehicle transport shop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment. Nothing changed only repairs are done	Change management procedure TZ-OPR-MW-010	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
71	Engineering	Light Vehicle transport shop	Transport and disposal of waste	Disposal of general waste	This waste is removed and disposed of at the local domestic waste site.	Waste management procedure TZ-OPR-MW-001 Keep record of waste removal	NA	5	4	NA	NA	4	4	NA	NA	NA	5
72	Engineering	Light Vehicle transport shop	Use of HI-AB	Spillage of chemicals	Spillage of e.g., grease and diesel can take place when the HI-AB is used. The volume will be small and localized.	Spill management procedure TZ-OPR-MW-003 PTO Competence training for HI-AB	NA	NA	5	NA	NA	4	2	NA	NA	NA	5
73	Engineering	Light Vehicle transport shop	Washing vehicles	Disposal of contaminated water	Washing of vehicles will contaminate water with detergents and hydrocarbons and the contaminated water will be disposed of. This water will run into the oil separator at	Dirty water separator	NA	NA	2	NA	NA	5	2	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					the wash bay.												
74	Engineering	Mc Keep	Cleaning of work areas	Disposal of general waste	Disposal of general waste e.g. scrap metal, office waste, paper, plastic, wood, etc. The waste is gathered in skips and disposed on the municipal domestic waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4
75	Engineering	Mc Keep	Cutting and welding of material	Generation of emissions to atmosphere	Emissions will be generated from cutting and welding. This is done in the open areas and not inside a work shop		NA	NA	NA	NA	NA	NA	NA	11	NA	NA	11
76	Engineering	Mc Keep	Handling and storage of chemicals	Spillage of chemicals	Spillages during the handling and storage of chemicals. The volumes handled and stored are small and the spills will be localized.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
77	Engineering	Mc Keep	Spray painting of refurbished material	Disposal of hazardous waste	Hazardous waste e.g. thinners, paint will be generated during the spray painting process. Because spray painting does not happen on a daily basis the volume generated for disposal is limited.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
78	Engineering	Mc Keep	Spray painting of refurbished material	Generation of emissions to	Emissions to atmosphere may occur when spray		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
				atmosphere	painting takes place. This does not happen on a daily basis but does happen outdoors.												
79	Engineering	Mc Keep	Washing of complete dipper assembly	Disposal of contaminated water	When the shovel is washed contaminated water will fall on the soil. There is no specific washbay for the wash of this material. The contaminated water contains traces of grease. Access grease are removed before washing and then wiped from the shovel "bakke", thus there is only small amounts left on the shovel "bakke".	Waste management procedure TZ-OPR-MW-001 PTO	NA	NA	11	NA	NA	4	NA	NA	NA	NA	11
80	Engineering	Petrol workshop	Changing batteries	Disposal of hazardous waste	Use batteries are stored temporarily before they are returned to the supplier. No batteries are disposed.	All batteries are sealed Specially designed storage containers Handling, storage and disposal of batteries TZ-OPR-MW-008	NA	NA	1	NA	NA	2	NA	NA	NA	NA	2
81	Engineering	Petrol workshop	Cleaning vehicles High pressure hose	Disposal of contaminated water	When vehicles are cleaned dirty water is generated and when the high pressure hose	Dirty water separator	NA	NA	4	NA	NA	8	2	NA	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					at the workshop is used for cleaning. This water runs down to the oil separator and once it clears the separator it runs to the silt dams.												
82	Engineering	Petrol workshop	Electric welding machine Gas cutting	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
83	Engineering	Petrol workshop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment. Nothing changed only repairs are done	Change management procedure TZ-OPR-MW-010	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
84	Engineering	Petrol workshop	Spray painting	Disposal of hazardous waste	Subsequent to spray painting some hazardous waste will require disposal e.g. thinners, paint. This will be disposed in the hazardous waste skips provided.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	5	NA	NA	5
85	Engineering	Petrol workshop	Standing grinding stone	Generation of noise	Noise generation will take place but is limited to the workshop area.	Noise monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
86	Engineering	Power and water supply	Application of herbicides	Disposal of hazardous waste	Hazardous waste e.g. Chemical containers will be generated as a result of herbicide use. These drums are stored in demarcated areas prior to disposal or send back to supplier.	Contractor: Thabazimbi Pest Control	NA	NA	5	NA	5	4	NA	NA	NA	NA	5
87	Engineering	Power and water supply	Cement dam used for water management - ineffective management of dam	Disposal of contaminated water	All dirty water run-off from power and water supply ends up in the cement dam between the two railway lines. Overflows will end up in the Rooikuilspruit.	Dam on maintenance schedule	NA	NA	9	NA	NA	13	13	NA	NA	NA	13
88	Engineering	Power and water supply	**Changing** borehole pump **Cutting and welding** **Maintenance** of locomotive, overhead crane, sub-station, mini-substations, transformers, sewage pump, water lines **Phasing in** power lines **Working** on overhead lines	Disposal of general waste	Disposal of general waste e.g. scrap metal which is recycled.	Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	2	2	NA	NA	NA	4
89	Engineering	Power and water supply	Workshop activities	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use.	Chlorine gas use procedure?	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
90	Engineering	Power and water supply	Construction of / working on overhead lines	Destruction of flora	During the construction or moving of overhead lines	Change management	NA	2	2	2	8	NA	NA	2	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					flora may be damaged and removed. This does however not take place often and depending on the power lines a basic assessment (BA) or EIA or internal procedure 10 assessments will be done.	procedure TZ-OPR-MW-010											
91	Engineering	Power and water supply	Workshop activities	Generation of noise	Noise will be generated when grinding takes place. It will be confined to the workshop area and will not have an impact on the surrounding area.		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
92	Engineering	Power and water supply	General maintenance activities	Spillage of chemicals	During these activities spillage of chemicals e.g. oil and grease can occur. This is however small volumes and limited to the workshop area.	Spill management procedure TZ-OPR-MW-003	NA	NA	9	NA	4	5	8	NA	NA	NA	9
93	Engineering	Power and water supply	**Maintenance** of locomotive, sub-station, mini-substations, transformers, compressor.	Disposal of hazardous waste	During maintenance on the locomotive hazardous waste will be generated which will be stored at Total prior to final disposal. E.g. old oil, oil rags, grease.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	8	NA	NA	NA	8
94	Engineering	Power and water supply	Maintenance of work shop lighting	Disposal of hazardous	When maintaining the lighting at the workshop	Waste management procedure TZ-OPR-	NA	NA	1	NA	NA	1	1	NA	NA	NA	1

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				waste	hazardous waste e.g. fluorescent tubes will be generated which will require special disposal. This is stored in a bin and sealed for final disposal.	MW-001											
95	Engineering	Power and water supply	Maintenance on sewage pump	Spillage of chemicals	Spillage of other material e.g. sewage may occur during maintenance of the pumps. The volumes will be small and cleaned immediately.	Sewage handling procedure.	NA	NA	12	NA	NA	12	8	NA	NA	5	12
96	Engineering	Power and water supply	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	8	NA	8	n	13	2	NA	8	13
97	Engineering	Power and water supply	Use of sub-station and potential explosion of sub-station	Generation of emissions to atmosphere	An explosion at the sub-station can result in smoke entering the atmosphere as well as chemicals spilling on the ground and into the water systems. This will be seen as an emergency and acted upon accordingly.	Automatic fire extinguisher system. Regular maintenance on breakers. Yearly tripping tests on breakers.	NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
98	Engineering	Power and	Working at night	Ineffective	Lighting of areas may cause		NA	5	NA	NA	NA	NA	NA	NA	NA	2	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
		water supply		lighting practices	a nuisance to adjacent farm and lodge owners.												
99	Engineering	Power and water supply	Working on overhead lines - electrical arcing	Generation of emissions to atmosphere	Veldt fire can be caused if arcing takes place. This will be seen as an emergency situation and the emergency procedure will be applied immediately.	Emergency fire procedure.	NA	NA	NA	NA	8	NA	NA	4	NA	NA	8
100	Engineering	Projects	Building operations	Disposal of general waste	Building rubble is disposed on site due to letter received from DWA in this regard.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	1	1	NA	NA	NA	2
101	Engineering	Projects	Demolishing of buildings	Generation of noise	Noise will be generated when demolition of buildings are taking place. This noise will however be localized and will not affect anyone outside the mining area. The activity takes place infrequent.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
102	Engineering	Projects	Painting	Disposal of hazardous waste	During painting hazardous waste e.g. thinners, paint will be generated. The volumes used will be small and storage will take place in a bunded chemical store.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	1	NA	NA	2
103	Engineering	Projects	Painting	Spillage of chemicals	During painting chemicals such as paint and thinners can spill. This is however	Chemical procedure	NA	NA	4	NA	NA	1	NA	NA	NA	NA	4

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					small volumes and will be contained.												
104	Engineering	Projects	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	13	14	18	10	14	14	6	6	6	18
105	Engineering	Projects	Sandblasting	Generation of noise	Noise will be generated when sandblasting takes place. This is limited to the sandblasting area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
106	Engineering	Projects	Sandblasting	Generation of emissions to atmosphere	Dust generation will take place during sandblasting operation. This will be limited to the sandblasting area.		NA	NA	4	NA	NA	2	NA	2	NA	NA	4
107	Engineering	Projects	Stripping of old equipment	Disposal of hazardous waste	During stripping small volumes of waste will be generated. This will be disposed as hazardous waste e.g. old oil, oil rags, grease.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
108	Engineering	Projects	Stripping of old equipment	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
109	Engineering	Projects	Stripping of old equipment	Disposal of	Disposal of general waste	Waste management	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
				general waste	e.g. scrap metal which is recycled.	procedure TZ-OPR-MW-001											
110	Engineering	Projects	Transport	Spillage of chemicals	During the transport spillage of chemicals can occur. This relates to e.g. oil, diesel and petrol. The volumes can differ and the location of the spill can determine the level of severity e.g. next to the Rooikuilspruit.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	6	5	NA	NA	NA	6
111	Engineering	Projects	Use of equipment	Spillage of chemicals	Spillage of material during use, loading and off-loading, maintenance e.g. oil, diesel, petrol, fluden grease etc	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
112	Engineering	Projects	Use of equipment	Generation of noise	Noise will be generated during the use of equipment. This is however limited to the workshop area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
113	Engineering	Robbies electrical	Maintenance of houses	Disposal of general waste	Building rubble generated by the contractor is disposed on the mine in accordance with approval from DWA. Scrap metal, corrugated plates, electrical spares are generated and disposed at bins	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
114	Engineering	Robbies electrical	Cleaning of blocked sewage/drains	Spillage of chemicals	During the cleaning of sewage drains sewage can	Sewage handling procedure.	NA	NA	12	NA	NA	12	8	NA	NA	5	12

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					spill. This is however limited (Occurrence and volume).												
115	Engineering	Robbies electrical	Disposal of fluorescent tubes	Disposal of hazardous waste	Fluorescent tubes are generated as a result of maintenance of houses. The fluorescent tubes are stored in drums at material management prior to final disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	1	NA	NA	1	1	NA	NA	NA	1
116	Engineering	Secondary services	Changing batteries	Disposal of hazardous waste	In the event of changing batteries used batteries will be stored and send back to the supplier. No disposal of batteries should take place.	Demarcated bins Waste management procedure TZ-OPR-MW-001 Batteries back to supplier	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
117	Engineering	Secondary services	Changing batteries	Spillage of chemicals	When batteries are handled or stored battery acid can spill. The volume is however very small in the event of a spill.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
118	Engineering	Secondary services	Cutting with cutting equipment	Disposal of general waste	Scrap metal which is recycled will be generated during the cutting process. This is stored in a bin prior to removal by the scrap metal contractor.	PTO Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	1	NA	NA	NA	2
119	Engineering	Secondary services	Cutting with cutting equipment	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use.		NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
120	Engineering	Secondary services	**Draining** equipment oil **Fault finding** on hydraulic systems **Taking** oil sample **Topping up** oil **Use** of hydraulic lift on truck	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, grease will be generated during these activities and disposed in the appropriate bin provided. The waste can be mixed with general waste but all hazardous waste ends up at Total prior to final disposal.	Drip trays Use of zorb PTO Waste management procedure TZ-OPR-MW-001. Spill management procedure TZ-OPR-MW-003 Storage of old oil in bunded area	NA	NA	5	NA	NA	9	9	NA	NA	NA	9
121	Engineering	Secondary services	**Draining** equipment oil **Fault finding** on hydraulic systems **Taking** oil sample **Topping up** oil **Use** of hydraulic lift on truck **Use and maintenance** of crane	Spillage of chemicals	During these activities spillage of oil and grease may occur. This will however be localized and the volume very small.	PTO Drip trays Spillage management procedure TZ-OPR-MW-003 Use of Zorb Waste management procedure TZ-OPR-MW-001	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8
122	Engineering	Secondary services	Driving in pit	Generation of emissions to atmosphere	When driving in the pit dust will be generated. Water is used in the pit to suppress the dust. Dust will stay contained in the pit and will not leave the pit area.	Dust a side and wetting of roads takes place.	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
123	Engineering	Secondary	**Fault finding** on brake pads	Generation of	Noise will be generated but	Monitoring	NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY Significance	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
		services	**Use** of air pneumatic grease pump and overhead crane	noise	will be limited to the work shop and will have no effect on the area surrounding the mine.												
124	Engineering	Secondary services	Painting	Disposal of hazardous waste	Hazardous waste e.g. thinners, paint can be generated during the use thereof. Rags used to clean and tins will require hazardous waste disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	1	NA	NA	2
125	Engineering	Secondary services	Painting	Spillage of chemicals	Paint and thinners can spill when painting. The volumes will be small and the spill localized.	Spillage management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	1	NA	NA	NA	NA	4
126	Engineering	Secondary services	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
127	Engineering	Secondary services	Washing vehicles, Washing with high pressure unit Washing workshop floors	Disposal of contaminated water	When vehicles are washed dirty water will be generated which will run into the oil separator system for cleaning. This water is used for dust suppression once it has gone through the oil	PTO	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					separator.												
128	Engineering	Secondary services	Washing with high pressure unit	Water use	Water is used for washing of vehicles. The volumes are small but employees must made aware of the prevention of water wastage.	Resource management procedure	NA	NA	NA	NA	NA	NA	8	NA	NA	NA	8
129	Engineering	Service Station	**Changing** air cylinder on hoist control, air filters, alternator, broken vehicle windows, grease pipes, grit-blower, hydraulic pipes, mirrors, diode-bridge, suspension bolts, v-belt on blower, water pipes, parking brake, 24 Volt and main alternator V-belt **Use** of cutting torch **Welding** repair work	Disposal of general waste	Scrap metal is generated during the maintenance process. This metal is placed in the scrap metal bin for recycling. Glass will be generated when broken windows are disposed. This is disposed in the general waste and will end on the municipal waste site. General waste e.g. rubber from the v-belt will be generated and disposed in the general waste skip. This will be disposed at the municipal waste site.	PTO Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4
130	Engineering	Service Station	Changing batteries	Disposal of hazardous waste	Old batteries are send back to suppliers and should not be disposed in the hazardous waste stream	Handed back to the supplier Waste management procedure TZ-OPR-	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					anymore.	MW-001 Disposal of vehicle batteries											
131	Engineering	Service Station	Changing batteries	Spillage of chemicals	Spillage of chemicals during uses e.g. battery acid. The volumes will be small and localized.	Sealed batteries thus no spillage possible, apart from breakage Chemical procedure	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1
132	Engineering	Service Station	**Changing** brushes, grease pipes, hydraulic pipes, mass grease container, power steering pump (hydraulic pump), prop shaft, steering cylinder, suspension bolts, switch valve (paraffin and oils), wash bay sumps, park brakes **Greasing** of equipment **Taking** oil sample **Washin**g of vehicles	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, grease will be generated during these activities. This will be stored at Total prior to final disposal.	Waste management procedure TZ-OPR-MW-001 Spill management procedure TZ-OPR-MW-003	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8
133	Engineering	Service Station	Changing grease pipes, hydraulic pipes, mass grease container, power steering pump (hydraulic pump),	Spillage of chemicals	Grease, oil and/or diesel can spill during these activities, but this will be localized and will only cause a secondary impact related to disposal.	Waste management procedure TZ-OPR-MW-001 Spill management procedure TZ-OPR-	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			steering cylinder, switch valve (paraffin and oils), diesel truck nozzle Greasing of equipment Storage of oil, diesel (old/dirty) Taking oil sample Topping up oil			MW-003 Drip trays											
134	Engineering	Service Station	**Changing** mass grease container, rear brake calliper, **Cleaning** of wash bay sumps **Washing** of vehicles **Washing** with high pressure unit	Disposal of contaminated water	Disposal of contaminated water into the dirty water system where the oil separator will remove any oil. When cleaning the wash bay sump it has to be emptied. The contaminated water will be pumped to the silt trap. The water will not leave the area. In the event of a spill the water will run down to the Rooikuilspruit.	Bunded area	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4
135	Engineering	Service Station	**Changing** prop shaft **Leaking** acetylene or nitrogen bottles **Re-inflating** suspension **Use** of cutting torch, soldering equipment **Welding** repair work	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use. Emissions to atmosphere from leaking gas cylinders. This is only potential impacts and in the event of this happening it will be limited		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					and disperse quickly. Emissions to atmosphere when suspension is reinflated. This is however quickly dispersed and of no toxicity to the environment.												
136	Engineering	Service Station	Cleaning wash bay sumps	Spillage of chemicals	When the washbay sump is cleaned spillage of material removed from the sump can occur. This is however contained in the area of removal. Once removed it will be send to the bioremediation yard for treatment. Process of establishing permanent bioremediation facility	Spill management procedure TZ-OPR-MW-003	NA	NA	8	NA	NA	2	1	NA	NA	NA	8
137	Engineering	Service Station	Greasing of equipment	Generation of noise	Noise generation will take place but is limited to the workshop area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
138	Engineering	Service Station	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
139	Engineering	Service Station	Radiator refilling	Disposal of hazardous waste	When refilling the radiator chemical containers will be generated for disposal. This will be disposed in the hazardous waste skip. Changed to environmentally friendly product.	Waste management procedure TZ-OPR-MW-001	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1
140	Engineering	Service Station	Storage of diesel	Spillage of chemicals	During the storage of oil spillage can occur. This will be localized and the spill will be contained.	Storage in bunded area Use of zorb Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	1	1	NA	NA	NA	2
141	Engineering	Service station	Washing of vehicles	Water use	Water is used for washing of vehicles. The volumes are small but employees must made aware of the prevention of water wastage. Recycled water is used instead of clean water.	Recycled water used Water recycle system Hazardous procedure????	NA	NA	NA	NA	NA	NA	7	NA	NA	NA	7
142	Engineering	Shovel maintenance	**Changing** high voltage motors, motors, electrical wiring of electrical boxes and equipment, gearbox, Gas cutting, brazing, welding, guided cutting. **Maintenance** on low voltage	Disposal of general waste	Scrap metal is recycled by a scrap metal recycling company.	PTO Waste management procedure TZ-OPR-MW-001	NA	NA	4	NA	NA	NA	NA	NA	NA	NA	4

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
			panels, tracks of shovel.														
143	Engineering	Shovel maintenance	**Maintenance** on shovel machines. **Replacing** gearbox **Use** of forklift, hydraulic jack, compressor.	Spillage of chemicals	Oil and grease can spill during these activities. The volumes will be small and contained.	PTO Use of zorb Spill management procedure TZ-OPR-MW-003	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8
144	Engineering	Shovel maintenance	Gas cutting, welding, guided cutting work and brazing **General** shovel operations **Maintenance** on tracks of shovel (cutting and welding)	Generation of emissions to atmosphere	Emissions from these activities will take place. This is limited to the area of use.		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
145	Engineering	Shovel maintenance	Impact drill Maintenance on tracks of shovel Use of equipment in workshop	Generation of noise	Noise generation due to impact drill use. The drill is used in the workshop area. This will not have an affect outside the mining area.	PTO Monitoring	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
146	Engineering	Shovel maintenance	Maintenance on shovel machines Oil spillages on workshop floors Replacing gearbox	Disposal of hazardous waste	During these activities hazardous waste e.g. old oil, oil rags, grease, old batteries, brake pads, and oil filters are generated. This will be disposed at Total prior to final disposal. It will not be mixed with other waste according to the waste management procedure.	Waste management procedure TZ-OPR-MW-001 Spill management procedure TZ-OPR-MW-003 Use of zorb.	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
147	Engineering	Shovel maintenance	Oil spillages on work shop floors Washing of shovels	Disposal of contaminated water	When washed the water will go into the dirty water system which is linked to an oil separator. The oil separator water is used for dust suppression on the roads.	Water flows to oil separator	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4
148	Engineering	Shovel maintenance	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
149	Engineering	Shovel maintenance	Spray painting	Spillage of chemicals	Chemicals such as paint and thinners can spill during spray painting. The spillages will be small in volume and can be contained and will be addressed immediately.	Chemical procedure	NA	NA	2	NA	NA	NA	NA	2	NA	NA	2
150	Engineering	Shovel maintenance	Spray painting	Disposal of hazardous waste	Hazardous waste will be generated when spillages are cleaned and containers require disposal. The hazardous waste will be send to Total for temporary storage prior to final	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	2	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					disposal.												
151	Engineering	Shovel maintenance	Use of flatbed and 15 T	Generation of noise	Noise will be generated when the flatbed is used. No effect will be noted outside the mining area.	PTO Monitoring	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
152	Engineering	Planning and development	Replacing and repairing electric components Wiring	Disposal of general waste	Scrap metal which is recycled will be generated in the workshop. This will be stored in the scrap metal bin prior to removal by the scrap metal dealer for recycling.	Training Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
153	Engineering	Planning and development	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	13	14	18	10	14	14	6	6	6	18
154	Engineering	Planning and development	Replacing and repairing electric components Soldering	Disposal of hazardous waste	Electronic components deemed to be hazardous waste will require disposal. This will be removed by recycling companies. Spent soldering is very small quantities and could neglectable.	Waste management procedure TZ-OPR-MW-001 E-waste bin kept in building	NA	NA	3	NA	NA	NA	NA	NA	NA	NA	3
155	Engineering	Planning and development	Soldering	Generation of emissions to	Emissions to atmosphere will be generated when		NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				atmosphere	soldering is done. This is however limited.												
156	Engineering	Planning and development	Testing oil pressure	Spillage of chemicals	Oil can spill when oil pressure is tested. This spill will be contained and small in volume.	Spill management procedure TZ-OPR-MW-003 Drip trays	NA	NA	2	NA	NA	2	2	NA	NA	NA	2
157	Engineering	Planning and development	Use of radioactive sources	Disposal of hazardous waste	Radioactive sources can be generated for disposal. This is extensively permitted and legally managed by outside companies for handling and disposal. Appointed Radiation Protection Officers at Thabazimbi iron Ore Mine.	Waste management procedure TZ-OPR-MW-001 Radio active material TZ-OPR-MW-042	NA	NA	15	15	10	15	15	NA	NA	6	15
158	Engineering	Tyre workshop	Changing vehicle tyres	Disposal of general waste	Tyres are send back to the suppliers in most of the cases. In the event where it is not send back to the supplier it is stored in the tyre disposal area which has been permitted (Exemption application). This is mainly used for the larger tyres.	Demarcated bins Waste management procedure TZ-OPR-MW-001 back to supplier	NA	11	NA	NA	NA	NA	NA	NA	NA	NA	11
159	Engineering	Tyre workshop	Changing vehicle tyres - sealant spill	Spillage of chemicals	Chemicals such as tyre sealant can spill during the changing of tyres. This is however limited to a specific area.	Regular clean up Spill management procedure TZ-OPR-MW-003	NA	NA	11	NA	NA	7	NA	NA	NA	NA	11

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
160	Engineering	Tyre workshop	Changing vehicle tyres nitrogen used	Generation of emissions to atmosphere	Emissions to atmosphere from nitrogen leak. No impact on environment envisaged.		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
161	Engineering	Tyre workshop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
162	Engineering	Tyre workshop	Washing of tire workshop floor	Disposal of contaminated water	Contaminated water will be generated when the tyre workshop floor is washed.	Use zorb Spill management procedure TZ-OPR-MW-003 Waste management procedure TZ-OPR-MW-001	NA	NA	11	NA	NA	11	1	NA	NA	NA	11
163	Finance	Finance	Cleaning offices	Disposal of general waste	General waste e.g. Office waste, paper, plastic, cans, glass etc can be generated from normal activities in the office. This material is disposed of at the municipal waste site. On the mine it is disposed of into small dustbins in the office and then into an open skip.	Waste management procedure TZ-OPR-MW-001 TZ-OPR-FIN-001	NA	NA	1	1	2	4	1	NA	NA	1	4

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance										Final significance (Highest score)
							GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
					Problem with baboon with paper skip.												
164	Finance	Finance	Cutting vegetation	Disposal of general waste	Garden waste will generated from the garden services. The garden waste is disposed at the municipal waste site. Invasive and Alien plant material from the garden can be an issue	Waste management procedure TZ-OPR-MW-001 TZ-OPR-FIN-001	NA	NA	NA	2	2	1	1	NA	NA	1	2
165	Finance	Finance	Electrical usage in offices (Computers, lights, heaters, air conditioners)	Electricity use	Electricity will be used during office hours in the finance department. The volume used is very small compared to the rest of the site.	TZ-OPR-FIN-001	NA	NA	NA	NA	1	1	1	1	NA	NA	1
166	Finance	Finance	Placing of rat poison	Disposal of hazardous waste	Hazardous waste e.g. rat poison and the packaging / containers thereof will be generated. This is mainly handled by the contractor (Rentokil) responsible for pest control. This will either be removed from site or disposed in the hazardous waste stream.	???	NA	NA	NA	NA	11	1	1	NA	NA	1	11
167	Finance	Finance	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective	TZ-OPR-MW-010 TZ-OPR-MW-034 TZ-OPR-MW-073 Lease agreements	NA	NA	NA	13	8	2	2	4	9	5	13

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					controls over impacts. This will cause additional impacts on the environment.												
168	Finance	Finance	Replacing of printer cartridges	Disposal of hazardous waste	Hazardous waste in the sense of copier ink will be disposed as hazardous waste. The replacement is done by the contractor responsible for the machine. In this event the waste is removed by the contractor.	Waste management procedure TZ-OPR-MW-001 TZ-OPR-FIN-001 TZ-FM-IM-001	NA	NA	1	1	3	1	1	NA	NA	1	3
169	Finance	Finance	Replacement of computer equipment	Disposal of hazardous waste	Disposal of computer equipment which can include general as well as hazardous waste. The computer equipment is stored for final disposal. Where it is rented from a supplier the equipment is removed by the supplier.	Service level agreement - SharePoint	NA	NA	1	1	1	1	1	NA	NA	1	1
170	Finance	Finance	Use of printer cartridges	Use of resource	Incorrect disposal of hazardous waste e.g. printer cartridges, will result in impacts on the environment. The cartridges are however mostly removed by the suppliers.	Waste management procedure TZ-OPR-MW-001 TZ-OPR-FIN-001 TZ-FM-IM-001	NA	NA	1	1	3	1	1	NA	NA	1	3
171	Human	Housing	Cleaning Kitchen and canteen,	Disposal of	During cleaning general	Waste management	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
	Resources		offices, living quarters	general waste	waste e.g. office waste, paper, plastic, wood, food waste etc. will be generated. This will be disposed in the general waste skip prior to removal and final disposal on the municipal waste site.	procedure TZ-OPR-MW-001											
172	Human Resources	Housing	Cleaning yard	Disposal of contaminated water	Water is used during the cleaning of the yard. The volumes are small but employees must be made aware of the fact that they cannot waste water. The water is washed into the dirty water system.	Resource management procedure	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	2
173	Human Resources	Housing	Furniture disposal	Disposal of general waste	General waste such as old furniture is generated during the cleaning of the areas.		NA	NA	2	NA	NA	NA	NA	NA	NA	2	2
174	Human Resources	Housing	Mess (Barbeque of gas/open flame)	Generation of emissions to atmosphere	Emissions to atmosphere from cooking will take place. This is determined by the number of people served from the mess.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
175	Human Resources	Housing	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This	Change management procedure TZ-OPR-MW-010	NA	NA	NA	13	8	2	2	4	9	5	13

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
					will cause additional impacts on the environment.												
176	Human Resources	Housing	Washing vehicles	Water use	Water is used for washing of vehicles. The volumes are small but employees must made aware of the prevention of water wastage.		NA	NA	2	NA	NA	2	NA	NA	NA	NA	2
177	Human Resources	Housing	Weeding and sweeping	Disposal of general waste	Disposal of general waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder etc.		NA	NA	2	NA	NA	2	NA	NA	NA	NA	2
178	Human Resources	HR Offices	Placing of rat poison	Disposal of hazardous waste	Hazardous waste e.g. chemical containers may take place in the event of a box that breaks or needs to be disposed. The contractor will remove the box when conducting the regular visit.		NA	NA	5	NA	8	5	NA	NA	NA	NA	8
179	Human Resources	HR Offices	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	NA	13	8	2	2	4	9	5	13
180	Human Resources	HR Offices	Use of printer cartridges & Copiers	Disposal of hazardous waste	Hazardous waste in the sense of copier ink will be disposed as hazardous		NA	NA	5	NA	NA	2	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					waste. In most cases the refill is done by the contractor responsible for the machine. In this event the waste is removed by the contractor.												
181	Human Resources	Training	Cleaning activities	Water use	Water is used for cleaning purposes. This does however not happen often thus the impact is deemed to be very low.	Resource management procedure	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	2
182	Human Resources	Training	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	NA	NA	NA	2	2	NA	NA	NA	2
183	Human Resources	Training	Preparation of food and using kitchen	Disposal of general waste	During the preparation of food general waste is generated that will be disposed in the general waste skip and removed to the municipal site for final disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
184	Human Resources	Training	Washing vehicles	Disposal of contaminated water	When washing vehicles contaminated water is generated. The vehicles are		NA	NA	11	NA	NA	NA	NA	NA	NA	NA	11

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					washed on a concrete slab. Wash water are disposed onto the soil. The impact is only on a small area.												
185	Supply Chain Management	Air products	Receiving, storing and issuing of gasses	Generation of emissions to atmosphere	Fire may result when gas cylinders catch fire. This will cause extensive emissions to the atmosphere.	Fire extinguisher & fire hydrant Signage Well ventilated area	NA	NA	NA	NA	NA	NA	NA	3	NA	NA	3
186	Engineering	Diesel Electric	Storage of batteries (new and used)	Spillage of chemicals	Spillage can occur during the handling and storage of batteries. This will be contained and small spillages will occur.	All batteries are sealed Specially designed storage containers Handling, storage and disposal of batteries TZ-OPR-MW-008	NA	NA	1	NA	NA	2	NA	NA	NA	NA	2
187	Supply Chain Management	Offices	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	13	NA	NA	14	14	4	NA	13	14
188	Finance	Offices	Use of printer cartridges	Disposal of hazardous waste	Incorrect disposal of hazardous waste e.g. printer cartridges, will result in impacts on the environment. Printer cartridges are	Canon replaces and disposes of old cartridges as per contract	NA	NA	5	NA	NA	2	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					removed by the supplier in most cases.												
189	Supply Chain Management	Receiving	Delivery of goods	Spillage of chemicals	Spillage of chemicals during use, loading and off-loading	Use of zorb Spill management procedure Storm water drains	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
190	Supply Chain Management	Total	Disposal of mine wide hazardous waste	Disposal of hazardous waste	Disposal of hazardous waste e.g. old oil, oil rags, chemical containers, grease, fluorescent tubes, oil filters, etc.	Waste management procedure TZ-OPR-MW-001 Bunded wall area Shelter Locked Final disposal certificate Separator pit	NA	NA	13	NA	NA	1	NA	NA	NA	NA	13
191	Supply Chain Management	Receiving	Handling and storage of goods including hazardous chemicals during receiving and binning	Spillage of chemicals	Spillage of chemicals during use e.g. paint, cleaning chemicals, thinners, etc.	Spill management procedure	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8
192	Supply Chain Management	Receiving	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	13	NA	NA	14	14	4	NA	13	14
193	Supply Chain Management	Receiving	Removing packaging	Disposal of general waste	Packaging material will be generated for disposal. Currently this is not always	Covered bins Waste management procedure TZ-OPR-	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					recycled but disposed at the municipal landfill site.	MW-001											
194	Supply Chain Management	Total	Storage of diesel Storing and dispatching of repairable items at the reconditioning bay	Spillage of chemicals	Chemicals such as diesel can spill during handling and storage.	Use of zorb Bunded area Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
195	Supply Chain Management	Total	Maintenance of pumps (Checking of pumps and motors for leakage and maintenance of seals, valves etc.)	Spillage of chemicals	Spillage of chemicals during maintenance e.g. oil and grease. Small volumes will spill which is contained inside	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	2	3	NA	NA	NA	5
196	Supply Chain Management	Total	Pumping old oil from oil trolley at work shop	Spillage of chemicals	Old oil can spill when material is pumped from the old oil trolley. The spill will be contained. Immediate cleaning will minimise the potential impact thereof.	Concrete slab Use of zorb Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
197	Supply Chain Management	Total	Spillage of material as a result of equipment failure whilst refuelling trucks with diesel or during maintenance	Spillage of chemicals	Spillage of material during use, loading and off-loading, maintenance and from wear and tear of equipment	Control valve installed in supply pipe near filling station Oil/water separator Cement slab	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
198	Supply Chain Management	Total	Storage of used oil	Spillage of chemicals	During the storage of used oil at Total spillages can occur. This will however be contained inside the bunded	Bunded area Oil/water separator Spill management procedure TZ-OPR-	NA	NA	5	NA	NA	5	3	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
					area. In the event of a spill overflowing the volume will be small and it can be contained.	MW-003											
199	Supply Chain Management	Total	Storing of old grease, oil and used drums with rags and filters	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, grease, oil and diesel filters are stored at Total prior to final disposal.	Oil/water Separator Roof Bunded area Covered drums Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
200	Supply Chain Management	ITP	Cutting of steel into smaller sizes	Generation of emissions to atmosphere	Steel cutting will cause emissions to the atmosphere. This will be minimal considering that the activities do not take place frequently.		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
201	Supply Chain Management	ITP	Cutting of steel into smaller sizes	Disposal of general waste	Scrap metal which is recycled will be generated in the workshop. This will be stored in the scrap metal bin prior to removal by the scrap metal dealer for recycling.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2
202	Mine wide	Mine wide	Use of water	Water use	Water us not use effectively. No identification of savings is in place.	Resource management procedure TZ-OPR-MW-004	NA	NA	NA	NA	NA	9	21	NA	NA	9	21
203	Mining	Blasting	Blasting	Generation of	Dust will be generated when	Blasting procedure	NA	11	NA	NA	11	NA	NA	12	NA	16	16

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				emissions to atmosphere	blasting takes place. This takes place on a regular basis. The dust consists of heavy particles and the dust will settle quickly after the blast has been completed. No complaints of dust generated due to blasting have been received in the last number of years except in Kumba pit. Dust not chemically harmful.												
204	Mining	Blasting	Blasting	Generation of noise	Blasting will generate noise. This is a short sound that does not carry on for long periods. The noise can be a nuisance to the community during blasting and on a longer term in terms of land use	Blasting procedure	NA	NA	NA	NA	1	NA	NA	NA	NA	16	16
205	Mining	Blasting	Blasting	Generation of air blast / vibration	Blasting will result in an air blast that can be felt by some people in and around the mine depending on where the blast takes place. In most cases people are however far away from the blasting area.	Blasting procedure	NA	NA	NA	NA	NA	NA	NA	NA	NA	16	16

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
206	Mining	Blasting	Blasting	Veldt fire	Blasting can result in veldt fires which will emit smoke into the atmosphere. This does not happen often and emergency procedures will commence once such an impact occurs.	Blasting procedure	NA	3	NA	NA	3	NA	NA	3	NA	3	3
207	Mining	Blasting	Destruction of old explosives	Water use	Water is used to dissolve the ammonium nitrate that is used for blasting. The other destruction methods involve blasting and burning of the explosives. These impacts are covered under generating of emission to the atmosphere during blasting.	Blasting procedure Exemption from Chief Air Pollution Control Officer (CAPCO)	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	1
208	Mining	Blasting	Operating loading area	Spillage of chemicals	Spillages of chemicals used for blasting may result in an impact. The volumes that can be spilled are very small and the spill will be confined to a small area. The spilled material will be destroyed during the blasting process	Blasting procedure	NA	NA	1	NA	NA	1	NA	NA	NA	NA	1
209	Mining	Blasting	Loading in rapid reloading area	Spillage of chemicals	Emulsion and nitrate spillage can take place during rapid reloading. Volumes will be very small and confined to	Spill management procedure TZ-OPR-MW-003	NA	NA	7	NA	NA	4	1	NA	NA	NA	7

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					the specific area created for this purpose. There are no plants in this area. Runoff water due to rain can occur.												
210	Mining	Blasting	Refuelling of trucks and vehicles transporting explosives	Spillage of chemicals	Spillage of fuel can take place when vehicles are refuelled. Spillage will however be small due to mechanism (quick coupling) systems.		NA	NA	NA	NA	NA	8	4	NA	NA	NA	8
211	Mining	Blasting	Refuelling of blasting trucks with flueden	Spillage of chemicals	Spillage of fluden can take place when vehicles are refuelled. Spillage will however be small due to mechanism (quick coupling) systems.		NA	NA	NA	NA	NA	8	4	NA	NA	NA	8
212	Mining	Blasting	Storage of fluden	Spillage of chemicals	Emergency situations can occur when the fluden tank ruptures or when a vehicle drives into the tank causing a major tank collapse. The entire fluden tank volume of 23000l can spill.		NA	NA	5	NA	NA	19	NA	NA	NA	NA	19
213	Mining	Blasting	Storage of fluden	Spillage of chemicals	Spillage of fluden during the loading or off-loading can occur. If it happens inside the bund area it will be contained. If it happens		NA	NA	5	NA	NA	5	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures EXISTING CONTROLS	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					outside the bund area a certain volume will end up in the storm water system.												
214	Mining	Blasting	Storage of material e.g. detonators	Disposal of hazardous waste	Waste is generated when detonators are stored e.g. boxes. These volumes are very small and the waste procedure is in place to address this. Disposal of detonators by blasting	Waste management procedure TZ-OPR-MW-001 Blasting procedure?	NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12
215	Mining	Blasting	Storage of material e.g. detonators	Generation of emissions to atmosphere	Emissions can be caused if a fire breaks out where the material is stored. (Emergency)	Operational procedure??	NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12
216	Mining	Blasting	Transporting Ammonium Nitrate and Fluden	Spillage of chemicals	Emergency when large volumes are spilled during an accident.	Emergency procedure on spillages. Spill management procedure TZ-OPR-MW-003 Safety measures : Stop before crossing the bridge	NA	NA	8	NA	NA	15	2	NA	NA	NA	15
217	Mining	Blasting	Using siren during blasting	Generation of noise	The blasting siren will generate noise when warning all that blasting is about to commence. This is a legal requirement and		NA	NA	NA	NA	NA	NA	NA	11	NA	NA	11

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY Significance	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					cannot be ignored.												
218	Mining	Buffelshoek	Drilling of blasting holes	Spillage of chemicals	Spillage of drilling foam can occur during the drilling of holes. This will however be contained and limited to a small area. Small amounts are used of a environmental friendly chemical	Training	NA	NA	5	NA	NA	5	5	NA	NA	NA	5
219	Mining	Buffelshoek	Drilling of blasting holes	Generation of emissions to atmosphere	Generation of dust during the drilling process in the pit. Dust suppression is done by either chemical or mechanical. Dust generation is localised to the pit.	Training	NA	NA	NA	NA	NA	NA	NA	5	NA	5	5
220	Mining	Buffelshoek	Filling of loaders and haulers with diesel and oil	Spillage of chemicals	Emergency situations can occur during accidents, tank collapse, drum rupture etc.	Emergency procedure on spillages. Spill management procedure TZ-OPR-MW-003	NA	NA	13	NA	NA	9	9	NA	NA	NA	13
221	Mining	Buffelshoek	Filling of loaders and haulers with diesel and oil	Spillage of chemicals	Spillage of diesel may occur during the filling of loaders and haulers in the pit. The spillage will be contained in the pit and the emergency procedure will be applied.	Spill management procedure TZ-OPR-MW-003	NA	NA	12	NA	NA	8	8	NA	NA	NA	12
222	Mining	Buffelshoek	Filling of water truck	Water use	Water is used for dust		NA	NA	NA	NA	NA	NA	16	NA	NA	NA	16

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					suppression in the pit. The water truck is filled at the filling point and spillages can occur. This water is mainly clean water.												
223	Mining	Buffelshoek	Hauling of product	Lighting during night shift	Lighting on the mining areas may cause nuisance to neighbours during night work.	Turnign lights down and using only when necessary	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	5
224	Mining	Buffelshoek	Hauling of product	Generation of emissions to atmosphere	Hauling of product can cause the generation of dust. The roads are mainly sprayed with dust-a-side and the roads in the pit are suppressed with dust.	Dust suppression on roads (water and dust-a-side)	NA	NA	NA	NA	NA	NA	NA	5	NA	5	5
225	Mining	Buffelshoek	Hauling of product	Generation of noise	The hauling of product may cause noise generation. This is as a result of the haul trucks activities. The hauling of product at night will cause noise generation. This will have an effect on neighbouring farms and people making use of facilities such as Ben Alberts nature reserve.	Noise monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	8	8
226	Mining	Buffelshoek	Ineffective management of	Erosion	Methods of waste rock	erosion control	NA	16	12	NA	2	8	NA	2	NA	1	16

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			WRD		placement cause erosion on the long side of the WRDs. This may cause soil to wash down the side slopes and this may result in situation of water courses.	procedure											
227	Mining	Buffelshoek	Loading of haul trucks Use of excavator - loading	Generation of emissions to atmosphere	Dust generation will take place during the loading of vehicles. This will however be limited to inside the pit. No impact is envisaged outside the mining area. The nature of the dust allows for quick settling thereof.		NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12
228	Mining	Buffelshoek	Loading of haul trucks Use of excavator - loading	Generation of noise	The loading of haul trucks may cause noise during the process. Noise will be limited to the pit area and should not cause any impact outside the mining area.		NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
229	Mining	Buffelshoek	Mining	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, chemical containers, grease, old batteries, brake pads, thinners, paint, fluorescent tubes, oil filters, sewage and sanitary waste etc. will be generated as part of	Waste management procedure TZ-OPR-MW-001	NA	NA	8	NA	NA	5	9	NA	NA	NA	9

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
							Significance										
					normal pit operations.												
230	Mining	Buffelshoek	Mining	Disposal of general waste	Disposal of general waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder etc.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	1	NA	NA	NA	NA	2
231	Mining	Buffelshoek	Mining - mixing clean and dirty water	Contamination of water	Due to the layout of the mine it is possible that clean and dirty water can mix. GN 704 audit has indicated where all these possibilities lie and action plans have been compiled to resolve this issue	IWULA requirements	NA	NA	2	NA	NA	13	8	NA	NA	NA	13
232	Mining	Buffelshoek	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	21	21	17	17	17	9	9	12	10	8	21
233	Mining	Buffelshoek	Refuelling of excavator	Spillage of chemicals	Spillage of diesel may occur during the refuelling of excavators. This will be limited to the pit and the spill will be contained.	Spill management procedure	NA	NA	12	NA	NA	8	8	NA	NA	NA	12
234	Mining	Buffelshoek	Use of excavator	Spillage of chemicals	Hydraulic pipe bursts may result in spillages of hydraulic fluid. The spill will	Spill management procedure	NA	NA	8	NA	NA	5	9	NA	NA	NA	9

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					be localized and the volume will be small.												
235	Mining	Buffelshoek	Use of roads on contours	Erosion	Roads constructed on contours may cause erosion when they are not maintained. Heavy rains causes erosion and resulting in situation.	Regular road maintenance	NA	12	12	NA	2	8	NA	2	NA	NA	12
236	Mining	Buffelshoek	Using septic tanks	Spillage of chemicals	Sewage spills may occur during the use of septic tanks as a result of overturning the tank or rupturing the tank.	Spill management procedure TZ-OPR-MW-003 Sewage handling procedure	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
237	Mining	Buffelshoek	Maintaining GREEN toilets in the mining areas	Disposal of hazardous waste	These toilets have a whirl to dry the sewage for easy disposal. The toilets are installed on a concrete floor.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	5	NA	NA	NA	NA	5
238	Mining	Construction	Constructing emergency sand stopper	Generation of emissions to atmosphere	Vehicles will generate emissions to the atmosphere during general operations. The emissions are limited due to regular maintenance on vehicles. Dust will be generated to an extent for the duration of the task but is limited to the area of the task.	Regular equipment maintenance Procedure	NA	NA	NA	NA	4	NA	NA	4	NA	1	4
239	Mining	Construction	Constructing emergency sand	Ineffective soil	Use soil from the river bank.	Procedure	NA	NA	13	1	5	13	NA	NA	13	NA	13

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			stopper	management practice													
240	Mining	Construction	Constructing drainage pipes Constructing new roads	Erosion	Erosion may occur if drainage pipes are not correctly placed and outlets are not constructed to limit erosion.	?	NA	9	9	5	9	9	NA	NA	NA	1	9
241	Mining	Construction	Constructing drainage pipes	Generation of emissions to atmosphere	Vehicles will generate emissions to the atmosphere during general operations. The emissions are limited due to regular maintenance on vehicles.	Regular equipment maintenance	NA	NA	NA	NA	4	NA	NA	4	NA	1	4
242	Mining	Construction	Constructing drainage pipes	Spillage of chemicals	Chemicals such as oil, diesel, petrol can spill when construction takes place. The volumes will however be small and contained and happening on the road.	Spill management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	8	8	NA	NA	NA	8
243	Mining	Construction	Constructing new roads	Ineffective soil management practice	Top soil may not be removed in this process and this can result in loss of top soil. New roads are not regularly constructed.	TZ-OPR-MW-010 TZ-OPR-MW018 TZ-OPR-MW-022	NA	NA	13	1	5	13	NA	NA	13	NA	13
244	Mining	Construction	Constructing new roads	Generation of emissions to atmosphere	Dust generation will take place during the construction of new roads. This is however limited.		NA	NA	NA	NA	1	NA	NA	8	NA	NA	8

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
245	Mining	Construction	Constructing new roads	Generation of noise	Noise generation will take place but is limited to the area where the construction takes place. This activity does not happen often.		NA	NA	NA	NA	NA	NA	NA	5	NA	1	5
246	Mining	Construction	Constructing new roads	Spillage of chemicals	During the construction of new roads spillages such as oil, diesel, petrol and grease can take place. The volumes will however be small.	Spill management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	5	5	NA	NA	NA	5
247	Mining	Construction	Maintenance of roads including fixing potholes, re-surfacing areas and application of dust aside	Spillage of chemicals	Spillage of chemicals may occur during the maintenance of roads. In some cases it could be close to water courses and may flow into the storm water system. Emergency situations may occur if large volumes of the material e.g. dust-a-side spills into the water environment.	TZ-OPR-MW-003 TZ-OPR-SPR-009	NA	NA	4	NA	NA	9	6	NA	NA	NA	9
248	Mining	Construction	Maintenance on vehicles used for construction purposes Welding and cutting	Disposal of general waste	Disposal of general waste e.g. scrap metal will be required when vehicle maintenance takes place. Scrap metal is put into the recycling bin for recycling by	TZ-OPR-MW-001 TZ-OPR-MW-002	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					the contractor.												
249	Mining	Construction	Maintenance on vehicles used for construction purposes	Disposal of hazardous waste	Disposal of hazardous waste e.g. old oil, oil rags, grease, old batteries, brake pads, oil filters may take place.	Waste management procedure TZ-OPR-MW-001	NA	NA	8	NA	NA	5	5	NA	NA	NA	8
250	Mining	Construction	Maintenance on vehicles used for construction purposes	Spillage of chemicals	Spillage of material during maintenance. Oil, diesel, petrol, fluden grease. The volumes will however be small.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	8	5	NA	NA	NA	8
251	Mining	Construction	Planning of infrastructure and changes to existing infrastructure	Ineffective soil management practice	Top soil may not be removed in this process and this can result in loss of top soil. New roads are not regularly constructed.		NA	NA	13	1	5	13	NA	NA	13	NA	13
252	Mining	Construction	Scarifying of areas	Spillage of chemicals	During scarifying of areas chemicals can spill such as diesel, petrol, fluden grease. The volumes will however be small and the spill localized.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	5	3	NA	NA	NA	5
253	Mining	Construction	Sweeping roads	Generation of emissions to atmosphere	Dust generation will take place during the sweeping of roads. This is however limited to the area around the sweeper.		NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7
254	Mining	Construction	Washing of equipment	Disposal of contaminated water	When equipment is washed it will be required that contaminated water is	TZ-OPR-MW-009 TZ-OPR-MW-001	NA	NA	8	NA	NA	9	5	NA	NA	NA	9

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					disposed. This is disposed in the dirty water system.												
255	Mining	Construction	Welding and cutting	Generation of emissions to atmosphere	Emissions from cutting and welding. Ad hoc activities		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
256	Mining	Donkerpoort	Accidents - Diesel vehicle	Spillage of chemicals	Emergency situations can occur during accidents, tank collapse, drum rupture etc.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	1	NA	NA	NA	NA	5
257	Mining	Donkerpoort	Blasting - veldt fires	Generation of emissions to atmosphere	Emissions to atmosphere will be generated when veldt fires occur as a result of blasting. The likelihood is low.	Fire procedure Products used for blasting cannot cause a felt fire.	NA	NA	NA	NA	5	NA	NA	5	NA	1	5
258	Mining	Donke poort	Building of high wall, discard dumps and roads	Spillage of chemicals	Spillages from vehicles can occur when leaks take place. The volume would be small and the spill contained.	Spill management procedure	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
259	Mining	Donkerpoort	Cargo haulers	Generation of noise	Noise generation will take place during the hauling of the product.	Regular maintenance	NA	NA	NA	NA	NA	NA	NA	4	NA	2	4
260	Mining	Donkerpoort	Cleaning of crushed rock around crusher	Generation of emissions to atmosphere	Dust will be generated when crushed rock is cleaned. This will be minimal and localized.	Extractor fan and dust tunnel	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
261	Mining	Donkerpoort	Cleaning of radar eye	Generation of emissions to atmosphere	Dust will be generated when radar eye is cleaned. This will be minimal and localized.	Extractor fan and dust tunnel	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
262	Mining	Donkerpoort	Controlling of generated dust	Contamination	As a result of dust being		NA	NA	4	4	8	NA	13	NA	NA	NA	13

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				of water	generated from the operations clean seepage water will be polluted with dust.												
263	Mining	Donkerpoort	Controlling of generated dust - Disposal	Contamination of water	If dust generated during the crushing process is disposed of in an incorrect manner. The storm water can be contaminated with suspended solids.		NA	NA	4	4	8	13	NA	NA	NA	NA	13
264	Mining	Donkerpoort	Drilling of blasting holes Use of drilling liquids	Disposal of hazardous waste	Hazardous waste e.g. drilling mud and blasting fluid will be generated which will require disposal. This will be disposed in line with the Waste management procedure TZ-OPR-MW-001.	Waste management procedure TZ-OPR-MW-001	NA	NA	8	NA	NA	5	5	NA	NA	NA	8
265	Mining	Donkerpoort	Drilling of blasting holes	Spillage of chemicals	Chemicals can spill during drilling of blasting holes. Small volumes are however used.		NA	NA	5	NA	NA	5	5	NA	NA	NA	5
266	Mining	Donkerpoort	Drilling of blasting holes	Generation of emissions to atmosphere	Dust will be generated when blasting takes place. This takes place on a regular basis. The dust consists of heavy particles and the dust will settle quickly after the blast has been completed.		NA	NA	NA	NA	NA	NA	NA	12	NA	1	12

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					No complaints of dust generated due to blasting has been received.												
267	Mining	Donkerpoort	Drilling of blasting holes	Spillage of chemicals	Spillage of material during use, loading and off-loading, maintenance e.g. oil, diesel, petrol, fluden grease etc	Spill management procedure	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
268	Mining	Donkerpoort	Drilling of blasting holes - drilling foam spill	Spillage of chemicals	Spillage of chemicals during use. Small volumes are however used.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	5	NA	NA	NA	5
269	Mining	Donkerpoort	Drilling work	Contamination of water	Drilling into ground water may cause ground water to be polluted is spillage of oil occurs. This is however limited likelihood and volume will be small.		NA	NA	NA	NA	NA	NA	13	NA	NA	NA	13
270	Mining	Donkerpoort	Drilling work	Generation of noise	Noise generation will take place during drilling. This is however limited to the drilling area.		NA	NA	NA	NA	NA	NA	NA	4	NA	1	4
271	Mining	Donkerpoort	Filling of water bowsers	Water use	Water is used for dust suppression in the pit. The water truck is filled at the filling point and spillages can occur. This water is mainly clean water This has been observed.	Resource management procedure	NA	NA	NA	NA	NA	1	8	NA	NA	NA	8
272	Mining	Donkerpoort	Ineffective management of	Erosion	Erosion and situation will		NA	16	12	NA	2	8	NA	2	NA	1	16

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			WRD		occur if waste risk is not disposed and rehabilitated.												
273	Mining	Donkerpoort	Loading	Generation of emissions to atmosphere	Dust will be generated when loading takes place. This is limited to the pit and will not cause impact outside the mining area.		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
274	Mining	Donkerpoort	Loading - Front-end loader	Generation of noise	Noise will be generated in the pit during the loading of product.		NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
275	Mining	Donkerpoort	Loading - Waste disposal	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, chemical containers, grease, old batteries, brake pads, thinners, paint, fluorescent tubes, oil filters, sewage and sanitary waste etc. Can be generated in the pit and would require disposal as per procedure.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	2	NA	NA	NA	5
276	Mining	Donkerpoort	Mining	Spillage of chemicals	Spillage of chemicals during use e.g. battery acid, paint, cleaning chemicals, acids, dust aside etc.		NA	NA	4	NA	NA	9	6	NA	NA	NA	9
277	Mining	Donkerpoort	Mining - mixing clean and dirty water	Contamination of water	The possibility exists to mix rain water with dirty water from the pit.		NA	NA	8	NA	NA	16	5	NA	NA	NA	16
278	Mining	Donkerpoort	Operating of Crusher	Disposal of	General waste e.g. scrap	Waste management	NA	NA	5	NA	NA	2	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				general waste	metal, office waste, paper, plastic, wood, fire extinguisher powder etc. will be stored in the waste skip prior to disposal at the municipal waste site.	procedure TZ-OPR-MW-001											
279	Mining	Donkerpoort	Operating of Crusher	Generation of emissions to atmosphere	During the crusher operation dust can be generated. The crusher is underground but extraction systems will result in dust being extracted outside.	Extractor fan and dust tunnel	NA	NA	NA	NA	NA	NA	NA	7	NA	NA	7
280	Mining	Donkerpoort	Operating of Crusher	Spillage of chemicals	Chemical spillages e.g. grease, oil will occur during the normal operations of the crusher. This will be contained in the area of use.	Preshift inspection Spill management procedure	NA	NA	2	NA	NA	5	3	NA	NA	NA	5
281	Mining	Donkerpoort	Operating of Crusher	Generation of noise	When the crusher is operated noise will be generated underground. This will have no effect on the surrounding area.	Situated underground	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
282	Mining	Donkerpoort	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts	Change management procedure TZ-OPR-MW-010	21	21	17	17	17	9	9	12	10	8	21

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					on the environment.												
283	Mining	Donkerpoort	Pumping of water	Disposal of contaminated water	Water is pumped from the pit and disposed into the surrounding veldt. This is done as per IWULA requirements.		NA	NA	1	NA	NA	4	4	NA	NA	NA	4
284	Mining	Donkerpoort	Stockpiling ore next to national road	Generation of emissions to atmosphere	Dust can be generated during stockpiling of ore. This is limited due to material being large size.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
285	Mining	Donkerpoort	Use of drilling liquids	Spillage of chemicals	Chemicals will spill during use. Small volumes are however used.		NA	NA	7	NA	NA	2	5	NA	NA	NA	7
286	Mining	Donkerpoort	Use of toilets (Long drop & Flush toilets)	Disposal of hazardous waste	Hazardous waste e.g. sewage and sanitary waste will require disposal.	Sewage handling procedure.	NA	NA	5	NA	NA	5	2	NA	NA	NA	5
287	Mining	Donkerpoort	Washing around the crusher	Water use	Washing around the crusher uses a lot of water. This water gets contaminated and will contaminate clean water.	Mostly manual cleaning of spilled material	NA	NA	NA	NA	NA	NA	5	NA	NA	NA	5
288	Mining	Dust-a-side	Filling of dust-a-side vehicle	Spillage of chemicals	Spillage of material during loading and off-loading of dust a side.		NA	NA	5	NA	NA	1	NA	NA	NA	NA	5
289	Mining	Dust-a-side	Storage of dust-a-side	Spillage of chemicals	Emergency when the storage tank ruptures. Large volumes will spill but according to the Material Safety Data Sheet (MSDS)	Bund wall in place. Emergency procedures in place.	NA	NA	5	NA	NA	1	NA	NA	NA	NA	5

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					no impact is envisaged.												
290	Mining	Geology	Constructing prospecting trenches	Erosion, Destruction of vegetation	The construction of trenches will result in a destruction of the natural soil layers resulting in erosion. Trenches are only open for a maximum of two weeks. Destruction of flora as a result of removal of vegetation during prospecting		NA	NA	12	NA	7	2	NA	NA	9	NA	12
291	Mining	Geology	Construction of roads	Erosion	The construction of roads will result in a destruction of the natural soil layers resulting in erosion.		NA	13	12	NA	13	2	NA	NA	9	NA	13
292	Mining	Geology	Cut lines	Destruction of vegetation	Destruction of flora when cutting lines are cut. The disturbance is limited to the narrow area where the line is cut.		NA	NA	NA	NA	8	NA	NA	NA	NA	NA	8
293	Mining	Geology	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	21	21	17	17	17	9	9	12	10	8	21
294	Mining	Geology	Constructing prospecting	Destruction of	Destruction of flora as a		NA	NA	NA	NA	8	NA	NA	NA	NA	NA	8

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			trenches	vegetation	result of removal of vegetation during prospecting												
295	Mining	Geology	Constructing prospecting trenches	Ineffective soil management practice	Top soil may not be removed in this process and this can result in loss of top soil.		NA	2	2	NA	2	NA	NA	NA	NA	NA	2
296	Mining	Geology	Constructing prospecting trenches	Ineffective storm water management	Ineffective storm water control can take place as a result of disruption of the natural soil layers and surface water flow. Trench will be open for a maximum of 2 days. This action didn't take place in the last 5 years.		NA	2	2	NA	NA	2	NA	NA	NA	NA	2
297	Mining	Geology	Construction of roads	Destruction of vegetation	Destruction of flora as a result of removal of vegetation during site preparation and levelling/ compaction	TZ-OPR-MW-010 TZ-OPR-MW-018 TZ-OPR-MW022	NA	NA	NA	NA	8	NA	NA	NA	NA	NA	8
298	Mining	Geology	Construction of roads	Ineffective soil management practice	Top soil may not be removed in this process and this can result in loss of top soil. New roads are not regularly constructed.	TZ-OPR-MW-010 TZ-OPR-MW018 TZ-OPR-MW-022	NA	2	8	2	8	2	NA	2	NA	NA	8
299	Mining	Geology	Construction of roads	Ineffective storm water	Ineffective storm water control can take place as a	TZ-OPR-MW-010 TZ-OPR-MW018	NA	2	8	2	NA	8	NA	NA	NA	NA	8

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				management	result of disruption of the natural soil layers and surface water flow.	TZ-OPR-MW-022											
300	Mining	Geology	Secondary blasting	Generation of emissions to atmosphere	Dust will be generated when blasting takes place		NA	NA	NA	NA	1	NA	NA	5	NA	2	5
301	Mining	Kwaggashoek	Fill equipment / vehicles with diesel.	Spillage of chemicals	Spilling occurs during filling e.g. oil, diesel, petrol, fluden grease. Small volumes may spill and spills will be contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
302	Mining	Kwaggashoek	Filling of secondary equipment e.g. haulers	Spillage of chemicals	Major spillages can occur during accidents. This will be treated as an emergency situation.	TZ-OPR-MW-009 TZ-OPR-MW-003	NA	NA	9	NA	NA	9	6	NA	NA	NA	9
303	Mining	Kwaggashoek	Filling of water truck	Water use	Water is used for dust suppression in the pit. The water truck is filled at the filling point and spillages can occur. Spillage of water does occur which results in water wastage.	Resource management procedure	NA	NA	NA	NA	NA	1	8	NA	NA	NA	8
304	Mining	Kwaggashoek	Hauling of product	Generation of emissions to atmosphere	Dust will be generated when the product is hauled. The roads are covered with dust-a-side and if well maintained it will minimise and prevent the generation of dust due to	Dust a side and wetting of roads takes place.	NA	NA	NA	NA	NA	NA	NA	11	NA	5	11

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					hauling of product.												
305	Mining	Kwaggashoek	Hauling of product	Generation of noise	Noise will be generated when product is hauled. This will happen at night and during the day. This may disturb stakeholders in the area.	Regular maintenance	NA	NA	NA	NA	NA	NA	NA	4	NA	2	4
306	Mining	Kwaggashoek	Hauling of product	Lighting during night shift	Vehicles and mining will cause light (illumination) during the operational hours. The lights on Kwaggashoek can be seen from very far away.		NA	NA	NA	NA	NA	NA	NA	NA	NA	2	2
307	Mining	Kwaggashoek	Ineffective management of WRD	Erosion	Erosion can be caused by ineffective storm water management. Erosion gullies will be generated on the side slopes of the WRDs.		NA	16	12	NA	2	8	NA	2	NA	1	16
308	Mining	Kwaggashoek	Loading of haul trucks Use of excavator loader - loading and transport Use of front-end loader - loading and transport	Generation of emissions to atmosphere	Dust generation will take place during the loading of haul trucks. This will however be limited to inside the pit. No impact is envisaged outside the mining area.	TZ-OPR-MW-016	NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
309	Mining	Kwaggashoek	Loading of haul trucks Use of excavator loader -	Generation of noise	Noise will be generated when trucks are loaded.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4

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			loading and transport Use of front-end loader - loading and transport		This is limited to the pit. Noise will be generated which is confined to the area of use limiting any impact outside the mining area.												
310	Mining	Kwaggashoek	Mining	Disposal of general waste	General waste e.g. scrap metal, office waste, paper, plastic, wood will be generated at the caucus meeting areas. Sufficient waste skips are available to handle the volume prior to disposal at the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2
311	Mining	Kwaggashoek	Mining	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, chemical containers, grease, oil filters, sewage and sanitary waste etc will be generated in the pit and at the caucus area. The containers at the area will be used for temporary storage of the waste prior to disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
312	Mining	Kwaggashoek	Mining	Spillage of chemicals	Chemicals can spill from various sources in the pit during mining. These include battery acid, paint,		NA	NA	4	NA	NA	9	6	NA	NA	NA	9

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					cleaning chemicals, acids, dust aside etc. The volumes will differ but the spills will be contained in the pit.												
313	Mining	Kwaggashoek	Mining - mixing clean and dirty water	Contamination of water	Due to the layout of the mine it is possible that clean and dirty water can mix. GN 704 audit has indicated where all these possibilities lie and action plans have been compiled to resolve this issue	IWULA requirements	NA	NA	2	NA	NA	13	8	NA	NA	NA	13
314	Mining	Kwaggashoek	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	21	21	17	17	17	9	9	12	10	8	21
315	Mining	Kwaggashoek	Storage of bulk diesel in 23000l tank	Spillage of chemicals	Chemicals can spill from the bulk diesel tank. This can happen during loading or off-loading or in the event of an accident (emergency situation).	Bund wall, TZ-OPR-MW-28 Spill management procedure TZ-OPR-MW-003	NA	NA	13	NA	NA	6	6	NA	NA	NA	13
316	Mining	Kwaggashoek	Use of excavator loader - loading and transport	Spillage of chemicals	Material such as oil, diesel, petrol, grease can spill when malfunction occurs on the	Spill management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	5	5	NA	NA	NA	5

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					loader e.g. hydraulic pipe burst.												
317	Mining	Kwaggashoek	Use of front-end loader - loading and transport	Spillage of chemicals	Material such as oil, diesel, petrol, grease can spill when malfunction occurs on the loader e.g. hydraulic pipe burst.	Spill management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	5	5	NA	NA	NA	5
318	Mining	Mining engineering	Placement of waste rock	Destruction of vegetation	Destruction of flora takes place when waste rock is placed. This may mean the destruction of red data species.		NA	NA	NA	NA	18	NA	NA	NA	NA	NA	18
319	Mining	Mining engineering	Planning and placement of WRDs	Ineffective planning	Ineffective placement of WRDs, infrastructure and pit planning In the event of ineffective removal of topsoil waste rock can be placed on top so topsoil that may be used for rehabilitation.	Change management procedure TZ-OPR-MW-010. Pit and WRD design, control and construction TZ-OPR-MW-018.	18	19	17	9	13	17	5	13	8	8	19
320	Mining	Mining engineering	Planning of infrastructure in and around pit area e.g. roads, power lines, water lines, bridges etc. as well as planning of the pit.	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	18	19	17	9	13	17	5	13	8	8	19
321	Mining	Mining	Planning of placement of	Ineffective soil	Ineffective handling and	Change	5	9	13	8	13	5	5	5	9	5	13

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
		engineering	topsoil	management practice	placement of top soil may result in the degradation of topsoil thus rendering it ineffective for use.	management procedure TZ-OPR-MW-010. Pit and WRD design, control and construction TZ-OPR-MW-018. Topsoil management TZ-OPR-MIN-001											
322	Mining	Rosond	Drilling of geological samples	Generation of emissions to atmosphere	Drilling can cause fires in the veldt. This has not happened often in the past but is possible.	TZ-OPR-MW-009	NA	NA	NA	NA	8	4	NA	12	NA	1	12
323	Mining	Rosond	Drilling of geological samples	Destruction of vegetation	Destruction of flora may take place when geological samples are being drilled.		NA	NA	NA	NA	4	NA	NA	NA	NA	NA	4
324	Mining	Rosond	Drilling of geological samples	Generation of emissions to atmosphere	Dust generation will take place during the taking of samples. This is centralized to the area of drilling. No impact outside the mining area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
325	Mining	Rosond	Drilling of geological samples	Generation of noise	Noise will be generated when samples are taking. This noise is limited to the area where it is generated.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
326	Mining	Rosond	Drilling of geological samples	Spillage of	Material can spill during use,	Use of drip trays	NA	NA	5	NA	NA	5	3	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				chemicals	loading and off-loading, maintenance e.g. oil, diesel, petrol, fluden grease etc. This will be localized and small in volume.	Monthly inspection of equipment Spill management procedure											
327	Mining	Rosond	Handling and storage of chemicals	Spillage of chemicals	Chemicals can spill during normal drilling operations and storage. The volumes will be small and the spill localized.	Spill management procedure TZ-OPR-MW-003	NA	NA	4	NA	NA	2	1	NA	NA	NA	4
328	Mining	Rosond	Refuelling of equipment	Spillage of chemicals	Chemicals such as diesel and petrol can spill during the refuelling of equipment. These volumes will differ depending on the type of filling apparatus used. The impact of the spill will depend on where the filling takes place.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
329	Mining	Rosond	Refuelling of equipment	Spillage of chemicals	In the event of an emergency the bowser containing 1000l can capsize and result in a major spillage.	Spill management procedure Emergency procedure	NA	NA	9	NA	NA	6	6	NA	NA	NA	9
330	Mining	Rosond	Storage of used oil	Spillage of chemicals	Used oil can spill or leak from the storage facility. The used oil gets taken to the Total area for final	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					disposal after it has been temporarily stored at the Rosond yard.												
331	Mining	Roux engineering	Draining of oil	Disposal of hazardous waste	Old oil which is recycled is temporarily stored prior to removal to Total for disposal by oil recycling company.	Waste management procedure TZ-OPR-MW-001	NA	NA	13	NA	NA	9	6	NA	NA	NA	13
332	Mining	Roux engineering	Draining of oil	Spillage of chemicals	During the draining of old oil some oil can spill. The volume is limited and the spill will be contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	13	NA	NA	5	3	NA	NA	NA	13
333	Mining	Roux engineering	Generation of old tyres for disposal	Disposal of general waste	Old tyres will require disposal once vehicles tyre are replaced. These tyres are all send back to the supplier. The odd tyre may end up at the equipment used tyre disposal area.	Tyres goes to Trentyre	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
334	Mining	Roux engineering	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	21	21	17	17	17	9	9	12	10	8	21
335	Mining	Roux engineering	Servicing of equipment and vehicles Welding and cutting	Disposal of general waste	When servicing of vehicles takes place general waste will be disposed in bins	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					provided prior to final disposal at the municipal waste site. General waste in the form of scrap metal which is recycled is generated. This is kept in a waste container prior to removal by the metal recycling company.												
336	Mining	Roux engineering	Servicing of equipment and vehicles	Disposal of hazardous waste	Hazardous waste such as old oil, oil rags, grease, old batteries, brake pads, oil filters etc. will be generated during the servicing of the vehicles. The hazardous waste will be disposed at Total prior to final disposal.	Waste management procedure TZ-OPR-MW-001	NA	NA	13	NA	NA	9	6	NA	NA	NA	13
337	Mining	Roux engineering	Servicing of equipment and vehicles	Spillage of chemicals	During the servicing of equipment chemicals such as oil, grease, diesel can spill. These spills will be small and contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	13	NA	NA	9	6	NA	NA	NA	13
338	Mining	Roux engineering	Storage of oil	Spillage of chemicals	During the storage of oil, oil can spill. These spills will be small and contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
339	Mining	Roux engineering	Use of bulk diesel (mobile 10 000L tank)	Spillage of chemicals	During emergency situations e.g. accidents, tank collapse, drum rupture etc. large	Spill management procedure TZ-OPR-MW-003	NA	NA	9	NA	NA	6	6	NA	NA	NA	9

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					volumes of diesel will spill. This will require the emergency procedure to become active and control the spill.	Emergency preparedness and response TZ-SPR-MW-009											
340	Mining	Roux engineering	Use of mine chemical toilets	Disposal of hazardous waste	Hazardous waste e.g. Sewage and sanitary waste will require disposal.	Sewage handling procedure.	NA	NA	2	NA	NA	3	NA	NA	NA	NA	3
341	Mining	Roux engineering	Washing of equipment	Disposal of contaminated water	When equipment is washed it will be required that contaminated water is disposed. This is disposed into the veldt.		NA	NA	20	NA	16	16	20	NA	NA	NA	20
342	Mining	Roux engineering	Washing of equipment	Water use	Water is used for washing of vehicles. The volumes are small but employees must made aware of the prevention of water wastage.	Resource management procedure	NA	NA	NA	NA	NA	NA	5	NA	NA	NA	5
343	Mining	Roux engineering	Welding and cutting	Generation of emissions to atmosphere	Emissions from cutting and welding will take place. This is limited to the area of use.		NA	NA	NA	NA	NA	NA	NA	4	NA	NA	4
344	Mining	SPH	Refuelling of vehicles	Spillage of chemicals	Chemicals e.g. oil and diesel will spill during refuelling. The spills will be contained in the area where it is being refuelled.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
345	Mining	SPH	Screening	Generation of emissions to	Dust generation will take place during the screening	TZ-OPR-MW-016	NA	NA	NA	NA	2	NA	NA	11	NA	NA	11

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
				atmosphere	process. Extensive dust is generated during this process.												
346	Mining	SPH	Screening	Generation of noise	Noise generation will take place due to sifting. No effect outside the mining area is envisaged.		NA	NA	NA	NA	NA	NA	NA	4	NA	2	4
347	Mining	SPH	Screening - refuelling and use of diesel engine	Spillage of chemicals	When the diesel engine is refuelled spillage of diesel can occur. Evidence of such spillage was observed previously. The volumes are however small and will be contained in the area where it has spilled.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
348	Mining	SPH	Screening - use of diesel engine	Generation of emissions to atmosphere	Emissions will be generated from the diesel engine used.	Regular maintenance	NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12
349	Mining	SPH	Stockpiling ore	Generation of emissions to atmosphere	Dust generation will take place during the loading of haul trucks.	TZ-OPR-MW-016	NA	NA	NA	NA	NA	NA	NA	11	NA	NA	11
350	Mining	SPH	Use of front-end loader - loading and transport	Generation of emissions to atmosphere	Dust generation will take place during the loading of haul trucks	Dust a side and wetting of roads takes place.	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
351	Mining	SPH	Use of front-end loader - loading and transport	Generation of noise	Noise generation will take place when loading of the haul trucks take place. This will be limited to the pit not		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
					affecting anyone outside the mining area.												
352	Mining	Survey	Washing vehicles	Disposal of contaminated water	When vehicles are washed dirty water runs into the veldt. Vehicles only washed with water, no soap are used during this activity. The engine is cleaned at the vehicle workshop. If soap has to be used to clean dust-a-side on the vehicle the vehicle will be taken to the vehicle workshop or Donkerpoort washbay.		NA	NA	11	NA	NA	11	NA	NA	NA	NA	11
353	Plant	Canteen	Cleaning Kitchen and canteen	Disposal of hazardous waste	Hazardous waste may be generated e.g. chemical containers. This will be disposed in the hazardous waste skips prior to disposal at Total.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
354	Plant	Canteen	Cleaning Kitchen and canteen Cleaning yard Preparation of food	Disposal of general waste	General waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder etc. will be stored in the waste skip prior to disposal at the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
355	Plant	Canteen	Cleaning Kitchen and canteen	Disposal of	Contaminated wash water	Sewage system	NA	NA	1	NA	NA	1	NA	NA	NA	NA	1

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
				contaminated water	will be generated during the cleaning of kitchens. In most cases this water is emptied into the sewage system.												
356	Plant	Canteen	Storage of detergents	Spillage of chemicals	Spillage of chemicals can take place during the storage and use thereof. The volumes are however very small and the chemicals are household products.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
357	Plant	Conveyor belts	Applying lagging	Disposal of hazardous waste	Hazardous waste will be generated during the lagging process which will be disposed in the hazardous waste bin. Disposal of empty epoxy containers	PTO Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
358	Plant	Conveyor belts	Applying lagging	Spillage of chemicals	Spillage of material during application of lagging can take place. Very small volumes are used and the spill will be contained.	PTO Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
359	Plant	Conveyor belts	Maintenance on conveyors	Disposal of general waste	General waste e.g. conveyor belt cut offs will require disposal. This will be disposed in the general waste skip and removed to the municipality waste site	PTO Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY Significance	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					for final disposal. Rollers disposed in steel bin.												
360	Plant	Conveyor belts	Maintenance on cyclones	Disposal of general waste	General waste e.g. scrap metal which is recycled is generated as part of maintenance on cyclones.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
361	Plant	Conveyor belts	Painting	Disposal of hazardous waste	Hazardous waste e.g. paint tins will be generated during the painting of areas.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
362	Plant	Conveyor belts	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	12	14	10	10	13	9	8	NA	NA	14
363	Plant	Conveyor belts	Replacement of screens, mats/panels as part of maintenance on sieves Replacing cones	Disposal of general waste	General waste e.g. scraps metal and screens will be generated as part of the maintenance process. These materials are recycled as far as possible.	PTO Demarcated bins? TOTAL?? Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
364	Plant	Conveyor belts	Storage and use of paint	Spillage of chemicals	Spillage of paint can take place during the storage and use thereof. Small volumes will spill and they will be contained.	Chemical procedure Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
365	Plant	Conveyor	Storage of conveyor belts	Generation of	Fire may result when	Emergency	NA	NA	NA	NA	NA	NA	NA	5	NA	2	5

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
		belts		emissions to atmosphere	conveyor belts are set alight. This is however a very low likelihood considering where the belts are stored.	procedure											
366	Plant	Conveyor belts	Washing of work shop floors	Disposal of contaminated water	Contaminated water generated due to work shop floor washing will be disposed into the dirty water system.	Water trenches	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
367	Plant	Electric work shop	High voltage and low voltage maintenance work	Disposal of general waste	General waste will be generated during the maintenance work. This is recycled.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
368	Plant	Electric work shop	Loading and off-loading of drums	Spillage of chemicals	Transformer oil spill during loading and off-loading of drums. The volume can be large but will be contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	2	NA	NA	NA	5
369	Plant	Electric work shop	Maintenance of transformers - spillage during maintenance	Spillage of chemicals	Transformer oil can spill during the maintenance of transformers. These spills will be small and contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	2	NA	NA	NA	5
370	Plant	Electric work shop	Maintenance on PLC's	Disposal of general waste	General waste will be generated. This is recycled.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
371	Plant	Electric work shop	Painting	Disposal of hazardous waste	Paint and related items would require disposal in the hazardous waste stream.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2
372	Plant	Electric work	Painting	Spillage of	Small volumes of paint and	Spill management	NA	NA	2	NA	NA	2	NA	NA	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
		shop		chemicals	e.g. thinners can spill but will be contained.	procedure TZ-OPR-MW-003											
373	Plant	Electric work shop	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
374	Plant	Electric work shop	Replacing fluorescent tubes	Disposal of hazardous waste	Disposal in fluorescent bin	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	2	NA	2	NA	NA	2
375	Plant	Electric work shop	Washing of work shop floors	Disposal of contaminated water	Disposal of contaminated water. This water is disposed into the dirty water system.	Water trenches	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
376	Plant	Fraser Alexander	Painting of penstock cage and corner posts used for water level control	Spillage of chemicals	Chemicals such as paint and thinners can spill during the maintenance on the pen stock. Small volumes will spill and it will probably end up in the slimes dam, but if painting is done at work area at Fraser Alexander offices spillage may occur on the soil.	Chemical procedure	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
377	Plant	Fraser Alexander	Painting of penstock cage and corner posts used for water	Disposal of hazardous	Chemical containers generated due to the	Waste management procedure TZ-OPR-	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			level control	waste	painting of the penstock will require disposal in the hazardous waste bin.	MW-001											
378	Plant	Fraser Alexander	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	15	18	18	18	10	13	21	5	NA	NA	21
379	Plant	Fraser Alexander	Refuelling and lubrication of excavator	Spillage of chemicals	Spillage of material such as diesel, grease or oil could take place during refuelling or lubrication of the excavator	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
380	Plant	Fraser Alexander	Replacing pipes as part of slimes dam operations	Disposal of hazardous waste	Material e.g. sewage and slimes can spill when changing pipelines.	Spill management procedure TZ-OPR-MW-003 Waste management procedure TZ-OPR-MW-001 Aanleg procedure??? Planned replacements - cleaning of pipeline with process water	NA	NA	4	NA	NA	NA	4	NA	NA	NA	4
381	Plant	Fraser	Slimes dam operations	Disposal of	Emergency during breaking	Daily inspections	NA	6	6	NA	1	NA	NA	NA	NA	NA	6

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
		Alexander		hazardous waste	of dam wall resulting in spillage of slimes will be treated as an emergency situation.	Quarterly inspection - civil engineer 24hours operation personnel Operation manual - Frazer Alexander											
382	Plant	Fraser Alexander	Slimes dam operations Use of excavator for building dam walls	Generation of emissions to atmosphere	Dust will be generated when using vehicles at the slimes dam.		NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12
383	Plant	Fraser Alexander	Slimes dam operations - ineffective return of water	Water use	Water is used for dust suppression in the pit. The water truck is filled at the filling point and spillages can occur.		NA	NA	NA	NA	NA	13	NA	NA	NA	NA	13
384	Plant	Fraser Alexander	Storage of paint	Spillage of chemicals	Chemicals can spill during storage e.g. paint. Small volumes will spill and the spill will be contained.	Spill management procedure TZ-OPR-MW-003	NA	NA	2	NA	NA	1	NA	NA	NA	NA	2
385	Plant	Fraser Alexander	Use of excavator for building dam walls	Spillage of chemicals	Chemicals can spill form the excavator e.g. oil, diesel, petrol whilst building dam walls. The volume will differ depending on the type of incident. The spill should be contained in the area.	Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
386	Plant	Fraser Alexander	Use of toilet	Disposal of hazardous waste	Sewage and sanitary waste will be generated at the slimes dam facilities. This	Sewage handling procedure.	NA	NA	2	NA	NA	5	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					will require regular removal and disposal has hazardous waste.												
387	Plant	Inner Section	Angle grinding Cutting and welding	Disposal of general waste	Scrap metal will be generated during the maintenance. This is recycled by a scrap metal dealer.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
388	Plant	Inner Section	Angle grinding	Generation of emissions to atmosphere	Emissions from grinding are limited to the workshop area.		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
389	Plant	Inner Section	Cutting and welding: conveyor belt structures screens Zonal and ore bin doors (including replacement) Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes	Generation of emissions to atmosphere	Emissions will be generated from cutting and welding. This will be limited to the workshop.		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
390	Plant	Inner Section	Maintenance: lab screens pumps conveyor belt structure gear boxes ore bin zonal	Disposal of general waste	General waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder etc. will be stored in the waste skip prior to disposal at the municipal waste site.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes Removing packaging and putting parts in storage Repairs on hydraulic systems														
391	Plant	Inner Section	Maintenance: lab gear boxes screens pumps Repairs on hydraulic systems	Disposal of hazardous waste	Hazardous waste e.g. old oil, oil rags, chemical containers, grease, thinners, paint, fluorescent tubes will be generated for disposal during maintenance. This will be stored at Total prior to final disposal.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
392	Plant	Inner Section	Maintenance: pumps hydraulic systems Replacing ore bin doors and gears Transportation, loading and off-loading of drums	Spillage of chemicals	During maintenance e.g. oil and grease can spill. The volumes will however be small and localized.	Use of zorb Spill management procedure	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
393	Plant	Inner Section	Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes	Erosion	Erosion brought about by maintenance on underground pipelines.	Spill management procedure	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
							Significance										
394	Plant	Inner Section	Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes	Spillage of chemicals	Spillage of other material e.g. slimes that could be contained in the pipe that is being repaired, lengthened, shortened, replaced.	Spill management procedure	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
395	Plant	Inner Section	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
396	Plant	Conveyor belts	Replacing cones	Generation of emissions to atmosphere	Emissions to atmosphere during welding.		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
397	Plant	Inner Section	Washing of work shop floors	Disposal of contaminated water	Contaminated water will run into the dirty water system and will be recycled to the plant for use.	Stormwater trenches	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
398	Plant	Inner Section	Washing of work shop floors	Spillage of chemicals	Cleaning chemicals can spill during the washing of floors at the workshop. This spill will however end up in the dirty water system.	Environmental friendly detergents Chemical procedure Spill management procedure TZ-OPR-MW-003	NA	NA	5	NA	NA	5	3	NA	NA	NA	5
399	Plant	Laboratory	Disposal of redundant chemicals	Disposal of hazardous waste	Redundant chemicals will be disposed in accordance with the disposal requirements on	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	5	9	9	1	NA	9	9

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					the MSDS of the specific chemical. Hazardous waste can be disposed incorrectly												
400	Plant	Laboratory	Fire	Generation of emissions to atmosphere	Emissions to atmosphere will occur in the event of a fire.	Emergency procedure	NA	NA	NA	NA	2	NA	NA	8	NA	1	8
401	Plant	Laboratory	Sample preparation - crushing	Generation of emissions to atmosphere	Dust generation will take place during the crushing. Small samples are crushed and dust will be limited to the lab.		NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
402	Plant	Laboratory	Sample preparation - crushing	Generation of noise	Crushing will generate noise which is confined to the lab.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
403	Plant	Laboratory	Sample preparation - milling	Generation of emissions to atmosphere	Dust generation will take place during the milling. Small samples are milled and dust will be limited to the lab.		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1
404	Plant	Laboratory	Sample preparation - screening	Generation of noise	Screening will generate noise which is confined to the lab.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
405	Plant	Laboratory	Sample preparation - use of ovens	Electricity use	Electricity will be used during the preparation of samples. The volumes are small compared to the rest of the plant and mining.	Resource management procedure	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
406	Plant	Laboratory	Storage of gas cylinders	Generation of emissions to	In the event of stored cylinders leaking it may		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				atmosphere	cause emissions to the atmosphere. The main chemicals used will disperse quickly and not have a significant impact on the environment.												
407	Plant	Laboratory	Washing of laboratory floor and pots	Disposal of contaminated water	Water will be polluted with detergents and chemicals whilst washing the laboratory floor and the contaminated water will be disposed of. This water will run into the dirty water system.		NA	NA	2	NA	NA	5	5	NA	NA	NA	5
408	Plant	Maintenance of siding	Application of herbicides and pesticides	Spillage of chemicals	Chemicals can spill during use. Small volumes are used and this happens on an ad-hoc basis.	Chemical procedure Spill management procedure	NA	NA	2	NA	5	NA	NA	NA	NA	NA	5
409	Plant	Maintenance of siding	Application of herbicides and pesticides	Disposal of hazardous waste	The chemical containers of pesticides and herbicides used for the maintenance of the siding will require disposal once the product is finished. This will be disposed as hazardous in line with the MSDS requirement.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
410	Plant	Maintenance of siding	Cutting and welding	Generation of emissions to	Emissions will be generated from cutting and welding		NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures EXISTING CONTROLS	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
				atmosphere													
411	Plant	Maintenance of siding	Lubricating of lines and signals Painting	Spillage of chemicals	Chemical spillages can occur during the maintenance of lines and signals. This will be mainly related to e.g. oil, grease, paint. The spill will be contained and localized and can easily be cleaned.	Spill management procedure	NA	NA	5	NA	NA	8	NA	NA	NA	NA	8
412	Plant	Maintenance of siding	Lubricating of lines and signals Painting Transportation of spares, including paint, oil, grease and material	Disposal of hazardous waste	When the cleaning of spillages are required hazardous waste e.g. oil rags, grease will be generated requiring disposal. This will be removed to Total prior to final disposal by a recognized waste company.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
413	Plant	Maintenance of siding	Repairs to rail line	Disposal of general waste	General waste e.g. scrap metal is generated for reuse and recycling when repairs are made to the rail line.	Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
414	Plant	Outer section	Angle grinding, cutting and welding Maintenance on secondary crusher, screens, pipe maintenance	Generation of emissions to atmosphere	Emissions during grinding are limited to the work shop.		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
			plasma cutting														
415	Plant	Outer section	Causing veldt fires during maintenance	Generation of emissions to atmosphere	Emissions to atmosphere as a result of veldt fires. These fires are caused during the maintenance where welding and cutting is required in the veldt and grass is set alight.	Fire extinguisher Emergency and crisis control procedure TZ-OPR-MW-076	NA	NA	NA	NA	5	NA	NA	8	NA	2	8
416	Plant	Outer section	Disposal of empty drums Maintenance of gear boxes, secondary crusher, conveyor belt structure reclaimed, including replacing sprocket and chain, painting, hydraulic systems	Disposal of hazardous waste	Hazardous waste e.g. Containers will be generated in the outer section workshop. These drums are stored in demarcated areas prior to disposal or send back to supplier. This will be stored at Total prior to final disposal or recycling.	Waste management procedure TZ-OPR-MW-001 Demarcated bins PTO	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
417	Plant	Outer section	Maintenance on conveyor belt, pumps, reclaimed, painting, hydraulic systems. Transport, loading and off-loading of drums	Spillage of chemicals	Chemicals such as glue used for splicing can spill during the maintenance on conveyor belts. This will be contained. During maintenance e.g. oil and grease can spill. The volumes will however be small and localized. Chemicals can spill during use e.g. paint. Small volumes.	PTO Demarcated bins Waste management procedure TZ-OPR-MW-001 Spillage management procedure	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
418	Plant	Outer section	Maintenance on pumps, reclaimed, including replacing sprocket and chain screens Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes Plasma cutting Removing packaging and putting parts in storage cones v-belts bin doors valves hydraulic systems cutting, welding, gauging, angle grinding secondary crusher gear boxes conveyor belt structures	Disposal of general waste	Scrap metal will be generated during the maintenance of the pumps. This is recycled by a scrap metal dealer.	PTO Demarcated bins Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
419	Plant	Outer section	Pipe maintenance, including: Repair, lengthening and shortening, replacing & removing old pipes and installation of new pipes	Erosion	Erosion brought about by maintenance on underground pipelines.	Spill management procedure	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	5
420	Plant	Outer section	Planning of infrastructure and	Ineffective	If environmental aspects and	Change	NA	NA	9	NA	NA	14	14	5	NA	NA	14

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No	**Department**	**Section**	**Activity**	**Aspect**	**What can go wrong**	**Control Measures**	**Significance**										**Final significance (Highest score)**
			changes to existing infrastructure	planning	impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	management procedure TZ-OPR-MW-010											
421	Plant	Outer section	Washing of parts and workshop floors	Disposal of contaminated water	Contaminated water generated when parts are washed will be disposed into the dirty water system.	Stormwater trenches	NA	NA	2	NA	NA	5	NA	NA	NA	NA	5
422	Plant	Planning Office	General office activities	Disposal of general waste	General waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder etc. is generated in the office. This is disposed on the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
423	Plant	Plant operations (Production)	Disposal of general waste	Disposal of general waste	General waste e.g. scrap metal, office waste, paper, plastic, wood, fire extinguisher powder, bulk bags etc. is generated during plant operation activities This is disposed on the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
424	Plant	Plant operations (Production)	Management of plant beneficiation equipment	Disposal of contaminated water	Contaminated water generated when equipment are washed will be disposed	Catchment sumps	NA	NA	12	NA	NA	8	NA	NA	NA	NA	12

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS Control Measures	Significance GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					into the dirty water system. Beneficiation areas have catchment sumps for dirty water.												
425	Plant	Plant operations (Production)	Management of plant beneficiation equipment	Generation of noise	The plant beneficiation equipment generates noise but this is limited to the plant area and does not cause an impact on this surrounding area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
426	Plant	Plant operations (Production)	Management of conveyor belt - fire	Generation of emissions to atmosphere	Air emissions will be generated when a fire starts.	Emergency procedure on fires	NA	NA	NA	NA	NA	5	NA	2	NA	1	5
427	Plant	Plant operations (Production)	Management of plant beneficiation equipment	Generation of emissions to atmosphere	Dust generation will take place from the discard dump. Monitoring has indicated that this is not a concern.	Dust monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
428	Plant	Plant operations (Production)	Management of secondary crusher	Generation of noise	The secondary crusher will generate noise which is limited to the plant area and does not affect anyone outside the area.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
429	Plant	Plant operations (Production)	Management of secondary crusher	Generation of emissions to atmosphere	Dust generated during crushing	Dust monitoring Dust extraction system	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
430	Plant	Plant operations	Opening of slimes (tailings) pipes	Disposal of contaminated	Contaminated water generated when pipes burst	Emergency procedure - Slimes	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
		(Production)		water	or pipes blocked and could be released into the environment depending where the incident occur.	line damage TZ-SPR-EVA-01746 Inspection Defect reporting HDPE pipes replaced with steel pipes											
431	Plant	Plant operations (Production)	Operating of plant mobile machinery	Disposal of contaminated water	During operations small quantities of diesel or oil leaks may occur.	Pre-shift inspection Regular maintenance	NA	NA	8	NA	NA	2	NA	NA	NA	NA	8
432	Plant	Plant operations (Production)	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	12	NA	NA	NA	NA	NA	NA	NA	NA	12
433	Plant	Plant operations (Production)	Pumping and handling of ferrosilicon, flocculant and lime	Spillage of chemicals	Chemicals such as FESI, lime and flocculant can spill at the plant. Considering the nature of the chemicals the impact will be determined (MSDS). Chemicals transported in packaging (e.g. bulk bags)	Cleaning of spillages	NA	NA	5	NA	NA	2	NA	NA	NA	NA	5
434	Plant	Plant operations (Production)	Washing site (Floors, walkways, structures)	Disposal of contaminated water	Contaminated water generated when structures are washed will be disposed	Catchment sumps	NA	NA	12	NA	NA	8	NA	NA	NA	NA	12

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					into the dirty water system. Beneficiation areas have catchment sumps for dirty water.												
435	Plant	Plant operations (Loading)	Emptying waste bins	Disposal of general waste	General waste e.g. scraps metal, office waste, paper, plastic, wood, fire extinguisher powder etc. Is generated in the waste bins and will require final disposal at the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2
436	Plant	Plant operations (Loading)	Handling of product during loading	Generation of emissions to atmosphere	Dust generation will take place during the loading of product. The material is wet from the reclaimed and the dust generated will be limited. No impact is envisaged.	Monitoring	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
437	Plant	Plant operations (Loading)	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	12	14	10	10	13	9	8	NA	NA	14
438	Plant	Plant operations (Loading)	Use of diesel loco	Generation of emissions to atmosphere	Vehicles will generate emissions to the atmosphere during general operations.	Regular maintenance	NA	NA	NA	NA	NA	NA	NA	12	NA	NA	12

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					The emissions are limited due to regular maintenance on locos												
439	Plant	Plant operations (Loading)	Use of loco - filling loco with diesel	Spillage of chemicals	Chemicals can spill during the filling of the loco with diesel. This will be contained but could be a large volume. 2000l	Use of drip trays Spill management procedure TZ-OPR-MW-003	NA	NA	8	NA	NA	8	NA	NA	NA	NA	8
440	Plant	Plant operations (Loading)	Washing of scale floor	Disposal of contaminated water	Contaminated water generated when parts are washed will be disposed into the dirty water system.	Stormwater trenches	NA	NA	4	NA	NA	4	NA	NA	NA	NA	4
441	Plant	Workshop area	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	NA	9	NA	NA	14	14	5	NA	NA	14
442	Plant	Workshop area	Storage of chemicals at workshop	Spillage of chemicals	Chemicals e.g. oil, grease, FESI etc. can spill when handled during storage (loading and offloading). This will take place in the dirty water system and will be contained.	Spill management procedure Demarcated areas Bunded area Under roof	NA	NA	2	NA	NA	5	NA	NA	NA	NA	5
443	Plant	Workshop area	Storage of gas	Generation of emissions to	Emissions to atmosphere in the event of a leak. This	Demarcated areas	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2

						EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
				atmosphere	volume will be very small and the nature of the chemicals stored in gas bottles is not highly toxic.												
444	SHE	Ben Alberts	Abstraction of water from Crocodile river	Water use	Water is abstracted from the crocodile river for use at Ben Alberts. The volumes are small.	Resource management procedure	NA	NA	NA	NA	NA	4	NA	NA	NA	NA	4
445	SHE	Ben Alberts	Bush clearing	Destruction of vegetation	Destruction of vegetation when cleaning next to fence and roads. This is done in line with the Land management plan requirements.	land management plan	NA	NA	NA	NA	9	NA	NA	NA	NA	NA	9
446	SHE	Ben Alberts	Capturing of game	Injury to animals	Animals can be injured during the game capturing exercise. This is not viable because money is lost in this event.	land management plan	NA	NA	NA	NA	8	NA	NA	NA	NA	NA	8
447	SHE	Ben Alberts	Cleaning and maintenance of areas Kitchen activities Maintenance of equipment e.g. pipes, bal valves, fences.	Disposal of general waste	General waste will require disposal when maintenance is done on the farm. Where it can be recycled or reused it is but when disposal is required it is disposed on the municipal waste site.	Waste management procedure TZ-OPR-MW-001	NA	NA	2	NA	NA	5	NA	NA	NA	NA	5
448	SHE	Ben Alberts	Culling and hunting	Hunting / culling of	When culling and hunting is not done in line with the land	land management plan	NA	NA	NA	NA	8	NA	NA	NA	NA	NA	8

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				animals	management plan it can cause over culling.												
449	SHE	Ben Alberts	Culling and hunting	Disposal of general waste	General waste such as carcases and intestines are disposed at the vulture restaurant.	Disposal at Aasvoel restaurant	NA	NA	5	NA	5	NA	NA	2	NA	1	5
450	SHE	Ben Alberts	Disposal of sewage	Disposal of hazardous waste	Sewage is disposed via French drains. The effectiveness can be questioned.	Sewage disposal procedure	NA	NA	13	NA	NA	NA	4	NA	NA	NA	13
451	SHE	Ben Alberts	Eradication of invader plants	Destruction of vegetation	In the event of inappropriate application of herbicides the wrong plants can be affected.	Invader plant control plan	NA	NA	9	NA	9	5	NA	NA	NA	NA	9
452	SHE	Ben Alberts	Filling of vehicles with diesel and oil Pumping water for game to drink	Spillage of chemicals	When vehicles or motors are filled with diesel and oil spillages can occur which will require cleaning. The volumes are however very small.	Spill management procedure	NA	NA	5	NA	NA	5	NA	NA	NA	NA	5
453	SHE	Ben Alberts	Fire breaks and controlled fires	Generation of emissions to atmosphere	Emissions from fires	land management plan Thabazimbi Emergency Response Team	NA	4	4	NA	12	NA	NA	8	NA	2	12
454	SHE	Ben Alberts	General lodge activities	Electricity use	Electricity is used on the farm but the volume is very small compared to the mine	Resource management procedure	NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8

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					and plant.												
455	SHE	Ben Alberts	Leaks from water troughs and dams	Water use	Troughs and dams can leak resulting in ineffective water management. This has happened.	Daily inspections	NA	NA	NA	NA	NA	NA	8	NA	NA	NA	8
456	SHE	Ben Alberts	Managing of biodiversity	Effective biodiversity management	Ensuring good species diversity	land management plan BAP	NA	NA	5	9	9	2	2	NA	NA	5	9
457	SHE	Ben Alberts	Pumping water for game to drink Road maintenance and use of vehicles	Generation of emissions to atmosphere	Emissions from motor Emissions from vehicle	Daily inspections	NA	NA	NA	NA	NA	NA	NA	8	NA	NA	8
458	SHE	Ben Alberts	Road maintenance	Ineffective storm water management	During road maintenance ineffective storm water management can lead to e.g. erosion of the area. This has happened in the past and resulted in additional repairs of roads.		NA	NA	8	2	NA	8	NA	NA	NA	NA	8
459	SHE	Ben Alberts	Storage of diesel	Spillage of chemicals	During the filling of vehicles and drums spillage of diesel can occur. This can be large volume but will be contained in the area of use.	Spill management procedure SABS standard Zorb	NA	NA	8	NA	NA	5	NA	NA	NA	NA	8
460	SHE	Environmental	Abstraction of water from bore holes	Ineffective storm water management	Water is abstracted from bore holes. Ineffective use will result in wastage of resource.	Water use monitoring	NA	NA	NA	NA	NA	NA	9	NA	NA	NA	9

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461	SHE	Environmental	Abstraction of water from pit	Ineffective storm water management	Water is abstracted from the pit. This water is wasted if not used.	Water use monitoring	NA	NA	NA	NA	NA	9	9	NA	NA	NA	9
462	SHE	Environmental	Control of invader plants (empty containers)	Disposal of hazardous waste	Hazardous waste e.g. chemical containers will be generated during the control of invader plants. These containers will be reused where possible or disposed as hazardous waste.	Waste management procedure TZ-OPR-MW-001	NA	NA	5	NA	NA	5	1	NA	NA	NA	5
463	SHE	Environmental	Control of invader plants (incorrect application of herbicides)	Ineffective control of vegetation	Ineffective control of invader plants will result in the spreading of invader plants or the destruction of endemic vegetation.	BAP	NA	NA	8	NA	5	5	NA	NA	NA	NA	8
464	SHE	Environmental	Control of invader plants (spillage of herbicides)	Spillage of chemicals	Chemicals can spill during use e.g. herbicides. This is however small volumes and will be contained.		NA	NA	5	5	9	5	9	NA	NA	NA	9
465	SHE	Environmental	Demolishing of buildings	Disposal of general waste	General waste e.g. scrap metal, building rubble etc. will be generated as part of the rehabilitation process. This will be buried as per approval from DEAT.	Asbestos removed by disposal company	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1
466	SHE	Environmental	Environmental Management	Ineffective rehabilitation	In the event of ineffective rehabilitation erosion can occur as well as the		NA	13	13	13	13	13	NA	NA	NA	NA	13

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					spreading of invader plants and impact on fauna. A rehabilitation plan is followed with annual schedules and maintenance of past rehabilitated areas.												
467	SHE	Environmental	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts on the environment.	Change management procedure TZ-OPR-MW-010	NA	14	9	14	14	9	14	12	15	9	15
468	SHE	Environmental	Providing water to town	Water use	Ground water is supplied to the municipality in town for use by the people in Thabazimbi.		NA	NA	NA	NA	NA	NA	8	NA	NA	1	8
469	SHE	Environmental	Re-shaping of WRDs	Generation of emissions to atmosphere	Dust will be generated during reshaping of dumps. This will be part of the rehabilitation process. The dust will not affect anyone outside the mining area. Dust will be generated when blasting takes place		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	5
470	SHE	Environmental	Storage of chemicals	Spillage of chemicals	Chemical spillages can occur during use e.g. herbicides, paint, cleaning	Access control	NA	NA	5	NA	9	5	1	NA	NA	NA	9

No	Department	Section	Activity	Aspect	What can go wrong	EXISTING CONTROLS	GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	
No	Department	Section	Activity	Aspect	What can go wrong	Control Measures	Significance										Final significance (Highest score)
					chemicals, dust aside etc. This will be small volumes and contained.												
471	SHE	Environmental	Storm water management - erosion	Erosion	Erosion can be caused by ineffective storm water management.		NA	5	5	NA	NA	NA	NA	NA	NA	NA	5
472	SHE	Environmental	Storm water management - general	Ineffective storm water management	Separation of clean and dirty water.	Waste water management	NA	NA	5	NA	NA	5	5	NA	NA	NA	5
473	SHE	Environmental	Waste management yard	Disposal of general waste	The historic waste site has been closed for 10 years but is still monitored to ensure no ground water contamination occurs. Closure has been applied for and feedback is awaited.		NA	NA	1	NA	NA	NA	1	NA	NA	NA	1
474	SHE	Occupational health	Disposal of medical waste through incineration by contractor	Generation of emissions to atmosphere	Emissions to atmosphere from incineration of waste. These needs to be done in line with the permit requirements and regular audit must confirm this. Disposal incinerator wet ash to a landfill site	Licensed site TZ-OPR-OH-001 Handling and disposal of medical waste	NA	NA	5	NA	NA	NA	NA	9	NA	NA	9
475	SHE	Occupational health	Taking of x-rays (Removal of used fixer) developer and fixer	Spillage of chemicals	X-ray chemicals can spill during the use but it is contained inside a room and will not pose a risk outside	Spill management procedure TZ-OPR-MW-003	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	2

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					the clinic.												
476	SHE	Occupational health	Taking of x-rays (Removal of used fixer) developer and fixer	Disposal of hazardous waste	Hazardous waste e.g. chemical containers and x-rays will require disposal through the hazardous waste stream. Developer diluted with water and disposed in sewage system. Fixer are collected in container and removed by Silver recycling contractor.	Waste management procedure TZ-OPR-MW-001	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	2
477	SHE	SHE	Controlled fires	Generation of emissions to atmosphere	Emissions to atmosphere when controlled fires are performed. Limited number is performed in the year.	Conservation plan. Fire plan? Emergency team Done in a designated area	NA	NA	2	NA	NA	1	NA	8	NA	4	8
478	SHE	SHE	Maintenance of fire extinguishers	Generation of emissions to atmosphere	Emissions to atmosphere are limited. No impact envisaged.	In a building	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	2
479	SHE	SHE	Making fire Brakes	Destruction of vegetation	Destruction of flora when fire breaks are made.	Standard?	NA	NA	NA	NA	8	NA	NA	4	NA	NA	8
480	SHE	SHE	Planning of infrastructure and changes to existing infrastructure	Ineffective planning	If environmental aspects and impact of new activities are not identified in advance it may result in ineffective controls over impacts. This will cause additional impacts	Change management procedure TZ-OPR-MW-010	NA	NA	NA	NA	14	9	NA	12	NA	9	14

No	Department	Section	Activity	Aspect	What can go wrong	Control Measures (EXISTING CONTROLS)	Significance: GEOLOGY	TOPOGRAPHY AND VISUAL	SOIL	LANDCAPABILITY AND LAND USE	FLORA AND FAUNA	SURFACE WATER	GROUND WATER	AIR QUALITY	ARCHEAOLOGICAL AND HERITAGE	COMMUNITY	Final significance (Highest score)
					on the environment.												
481	Supply Chain Management	Receiving	Diesel tank	Spillage of chemicals	Empty tank in bunded wall area that needs to be removed to the plant area. Waiting for plant to construct bund wall area and afterwards include it in the Plant's aspect register.	Bunded wall area. Spill management procedure TZ-OPR-MW-003	NA	NA	1	NA	NA	1	1	NA	NA	NA	1
NEW	Engineering	Mc Keep	Washing of complete dipper assembly	Disposal of hazardous waste	Access grease are removed before washing and then wiped, thus there is only small amounts left on the complete dipper assembly. The grease is disposed in a drum which is removed to TOTAL for final disposal. Drums with lids are kept in a bunded area.	Waste management procedure TZ-OPR-MW-001 PTO	NA	NA	8	NA	NA	NA	NA	NA	NA	NA	8

4.2 Risk Sumary

Based on the abovementioned description the environmental impacts related to each one of the operations have been identified in an impacts and aspect register. This register forms part of the ISO 14 001 management systems, which is used on a daily basis to manage the environmental risks identified in the process.

The aspect register is regularly updated to ensure effective management of the actual and potential environmental impacts.

Refer to **Table 38** which indicates the risk matrix as used by Thabazimbi Mine. Refer to **Table 39** for the Likelihood and **Table 40** for the Consequence Level in **Chapter 5**.

The summarized impact related information is presented in the form of **Table 35** for the Impacts / Consequences and **Table 36** for the Aspect / Unwanted Events. Please note that detailed impact assessment tables have been compiled for each department including each action and has been compiled based on the risk assessment approach followed at Thabazimbi Mine. This detail can be seen in **Section 4.2**

Table 35: Impact or Consequence

		HAZARD EFFECT / CONSEQUENCE				
		1 Insignificant	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
Likelihood	**5 Almost Certain**	11 (M)	16 (S)	20(S)	Topography / Visual 23 (H)	25 (H)
	4 Likely	7 (M)	12(M)	Soil 17 (S)	Groundwater Surface water Natural Resources usage (Fossil fuels, electricity) 21 (Ex)	24 (H)
	3 Possible	4 (L)	8 (M)	Air & Climate Community 13(S)	Land capability / use Biodiversity (fauna & flora) 18(S)	Heritage 22 (H)
	2 Unlikely	2 (L)	5 (L)	9 (M)	14 (S)	19 (S)
	1 Rare	1 (L)	3 (L)	6(M)	Natural resource - Geology	15 (S)

		HAZARD EFFECT / CONSEQUENCE				
		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
					10 (M)	

RISK RATING	RISK LEVEL	GUIDELINES FOR RISK MATRIX
21 to 25	(H) – High	Eliminate, avoid, implement specific action plans/procedures to manage & monitor
13 to 20	(S) – Significant	Proactively manage
6 to 12	(M) – Medium	Actively manage
1 to 5	(L) – Low	Monitor & manage as appropriate

Table 36: Aspect or Unwanted Events

		HAZARD EFFECT / CONSEQUENCE				
		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Likelihood	5 Almost Certain	Spillages of chemicals Blasting – emissions & dust Invader plants 11 (M)	Nuisance noise 16 (S)	Veldt fires 20(S)	Landscape alteration 23 (H)	25 (H)
	4 Likely	7 (M)	Waste storage Seepage to groundwater 12(M)	Usage of treated sewage Overgrazing Soil management 17 (S)	Water consumption Storm water management Process water management 21 (Ex)	24 (H)
	3 Possible	Usage of chemicals Electricity consumption General and hazardous waste disposal 4 (L)	Vehicle accident - animal Blasting - vibration 8 (M)	Exceeding licensed footprint Waste separation and recycling Generation of dust	Degradation of rivers / streams Destruction of fauna & flora Soil erosion Siltation of water	Destruction of heritage 22 (H)

		HAZARD EFFECT / CONSEQUENCE				
		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
				Mineral waste disposal Poaching / theft 13(S)	courses 18(S)	
	2 Unlikely	2 (L)	5 (L)	9 (M)	Mine closure 14 (S)	19 (S)
	1 Rare	1 (L)	Light pollution Flood 3 (L)	Draught Animal diseases 6(M)	Rock rolling down slope or waste dump failure Dam failure 10 (M)	15 (S)

RISK RATING	RISK LEVEL	GUIDELINES FOR RISK MATRIX
21 to 25	(H) – High	Eliminate, avoid, implement specific action plans/procedures to manage & monitor
13 to 20	(S) – Significant	Proactively manage
6 to 12	(M) – Medium	Actively manage
1 to 5	(L) – Low	Monitor & manage as appropriate

The mitigation and management measures for each of the above aspects and impacts are discussed in detail in **Chapter 5**. The recommendations and findings of the different specialist studies were taken into consideration in determining the risk rating and identifying the mitigation measures.

4.3 Mine Closure Impacts

4.3.1 Latent Impacts

Latent impacts are defined as impacts that result after closure. These impacts are in other words impacts that were not foreseen prior to closure. The mine has embarked on managing the potential impacts that have been identified as part of the EIA and impact and aspect identification process (ISO 14 001 system). Considering the potential closure date of 2034 no latent impacts have been identified at this early stage. Prior to applying for mine closure a detailed risk assessment will be done to determine the potential residual and latent impacts associated with the closure of the mine. Such a risk assessment will be conducted in detail to quantify and qualify the potential risks.

Attempting to do so know will result in an inaccurate attempt to qualify and quantify the latent impacts.

4.3.2 Residual Impacts

Residual impacts are defined as those environmental impacts that remain subsequent to the issuing of a closure certificate. All management actions are launched to limit the potential for residual environmental impacts. Various actions such as rehabilitation of the areas, assessing appropriate land uses and identifying practical closure objectives all work towards minimizing this risk. The real risk will only be determined once a closure risk assessment had been conducted. In the mean time the actions as stipulated in this EMPr all work towards minimizing the potential environmental impacts after closure.

The potential residual impacts have been identified under each one of the following sections:

4.3.2.1 Geology and the Mineral Resource

Considering the fact that the mining of Iron Ore goes hand in hand with extraction of the ore body the impact on the geology (mineral wise) will be permanent. As part of mine planning, the effects of mining on the geological features have been kept to a minimum to minimize the potential risk to the employees and the environment during mining. The extraction of ore takes place from the various pit areas as described in the mining method. The activities take place in the various pits. The potential Project Phoenix focuses on extracting ore form already disturbed areas.

No residual impact is foreseen with regards to geology because the mining activity ceases and no further destruction of the geology will take place.

4.3.2.2 Topography

The mining activity will have permanent impacts on the topography of the area. This is a result of WRDs that stretch along the slopes of the mountains and a plant discard dump that forms a hill on its own next to the Dwaalboom road. The mining method applied to abstract the ore from the ore body is one of total abstraction of the body and thus it causes complete changes in the existing topography in the area. In normal terms the mountains are lowered in height and a v-shaped intrusion is made into the mountain - pit. In addition to the abovementioned structures slimes dams will also be constructed. The slimes dams have however been constructed in such a way that effective rehabilitation results in no effect on the topography. The only measures that can be taken to minimize the impact on the topography are to ensure that effective rehabilitation is done in accordance with the proposed rehabilitation measures.

The management actions have been discussed in detail under the rehabilitation section. All the actions with regards to the rehabilitation of the structures have been designed to work towards prevention of pollution and to minimize the effect the structures may have on the topography of the area.

The residual impact on the topography will be minimized as far as possible by applying the abovementioned approaches. The impact is however permanent and will continue after mining. Rehabilitation measure can minimize the visual effect and partially the topography effect due to sloping and terracing of areas.

4.3.2.3 Soils

Various activities on the mine could have and can result in soil pollution. These activities include the workshop activities, use of pesticides, storage and handling of chemicals and the storage and disposal of non-mineral waste. All the potential aspects which could cause environmental impacts have been identified through the impact assessment and EMS implementation.

The potential does exist that polluted soil (due to spillages, storage etc.) may be present after closure. It is envisaged that these risks will be kept to a minimum through the implementation of the EMS according to ISO 14 001 standard requirements. The operational controls such as spill handling, disposal of non-mineral waste, and the handling and storage of chemicals have been designed and implemented to keep this effect to a minimum.

A study was conducted in the Donkerpoort area to identify the potential sources of hydrocarbon pollution in the area. Siltation from the WRDs will be minimized as described in the IWWMP.

Prior to the application for closure a survey will be conducted to identify all the polluted areas and appropriate actions will be taken to remediate the effect of the pollution on the surrounding soils.

4.3.2.4 Land Capability, Surrounding Land Use and Landscape Character

The areas that have been sterilized by the mineral waste structures (WRD, slimes dams and plant discard dump) will not be rehabilitated back to the previous land capability. Objectives have been set for mine closure and the current mining area will be rehabilitated to such that it can be re-used for the pre-mining land use namely game and cattle farming.

Considering the closure objectives the impact on the land capability will be limited and the impact on land use will be negligible.

4.3.2.5 Vegetation

Although vegetation was destroyed as part of the mining activities, vegetation was and will be re-introduced to various rehabilitated areas on site as per the rehabilitation plan scheduling and rehabilitation procedure. All areas have been scheduled in accordance with the rehabilitation schedule.

The only residual impact that is foreseen is the ingression of invader plants. To combat this action plans have been developed to identify all the invader plants on site and develop plans to eradicate such invader plants. Alien plant eradication has been done since 2000. The re-vegetation of areas will only be done using indigenous plants.

Considering the effective implementation of the actions the residual impact of vegetation will be negligible.

4.3.2.6 Animal life

The residual impact of the mining activity will be negligible considering the fact that animals roam the mining area. The mining activities have an impact on the animal life in the sense that animals leave the areas due to amongst other things noise and moving machinery. Once mining has ceased the animals will return to the mining area. Currently various animals are found on site and have adapted to the change in the area caused by the mining activity.

The management measures implemented to combat the above-mentioned impacts will result in no residual impact after closure on the animal life in the area.

4.3.2.7 Water Resources

The residual impacts related to water resources will become clearer as the mining activities continue. Based on the current information the following potential residual impacts have been identified:

Siltation of Rooikuilspruit, Crocodile River and Bierspruit from WRDs;

- Storage of clean water in the pit areas; and
- Contamination of ground water due to chemical spillages, hydrocarbon use and spillages, nitrate contamination from blasting, seepage from wash-bay dam etc.

Various mechanisms have been put in place to prevent pollution of clean water on site. Once mining activities have ceased the sources of clean water pollution such as chemicals would have been removed from the site thus preventing pollution of clean water. The only potential clean water pollution that may still occur is the runoff from WRDs and the slimes dam which can add to increases in solids. The rehabilitation measures that have been documented in this EMPr will add to minimizing the residual impact on the natural runoff.

Annual water reports are compiled and submitted to DWA. These reports include the water quality data of surface as well as ground water. The monitoring information will provide an indication of the potential pollution of the ground and surface water. In the case of such a measurement the corrective action system will be used and the incident will be recorded. Appropriate corrective action will be taken. This will add to the exercise of minimizing the potential impact on the environment.

Once mining activities have ceased the mining activities will not require any water. Water abstraction for mining will cease. The possibility exists that the town may require water from the water sources. In this case the existing abstraction equipment may be reused by the town municipality. If the mining infrastructure is to be used by any other party after closure the maintenance of such infrastructure will be the responsibility of this party. Thus no latent impact with regards to depletion of water resources is foreseen due to mine closure activities.

4.3.2.8 Air Quality

Various sources of potential air pollution had been identified as part of the aspect and impact identification process. These potential dust sources include the slimes dams, plant operations, WRDs and plant discard dumps, mining activities, haul roads and conveyor belts. Considering the management measures identified in this EMPr with regards to rehabilitation and closure it is foreseen that the potential impact of these sources on air quality will be negligible.

It is foreseen that some level of post closure maintenance would need to be done on the slimes dams and WRDs to ensure the vegetation cover is acceptable. The financial provision has been calculated in such a way as to consider this post closure cost. The detail with regards to the post closure actions will be developed in due course.

The plant will have no residual impact on the air quality because it will not be operational after closure. The plant and related infrastructure will most probably be demolished.

4.3.2.9 Radiation

No residual impact with regards to radiation is envisaged. Radiation sources will be removed and disposed at the appropriate sites.

4.3.2.10 Noise, Vibration and Shock

No residual impact cause by noise is envisaged after closure. This is due to closure of the plant operations and mining activities which were mainly responsible for the noise generated on the mine. Blasting will also stop thus no vibration and shock will take place. Some structures that have been damaged due to mining activities (blasting and shock) will be identified and appropriate action initiated prior to the mining operations closing.

4.3.2.11 Visual Aspects

The potential impacts associated with the visual issues and change in topography will be addressed as part of the implementation of closure objectives and mitigation measures to minimize the impacts. Visual impacts will be present after closure. These impacts will be minimized as far as practical by means of effective rehabilitation practices.

4.3.2.11 Traffic

It is foreseen that no residual impact on traffic will take place after closure. Traffic will decrease in the area.

4.3.2.12 Existing Infrastructure, Facilities and Services

The impact of mine closure on the current mining infrastructure, facilities and services will be affected by the closure options as identified in this EMPr. Once the specific closure option has been chosen the appropriate actions will be initiated to minimise the residual impact on the mining infrastructure, facilities and services (Municipal).

4.3.2.13 Archaeological, Historical and Cultural Aspects

The heritage assessment identified various archaeological, historical and cultural aspects that need to be managed. These aspects will require maintenance subsequent to mine closure. The impact that mining will have on these aspects identified in the heritage assessment will cease to exist after closure due to no mining activities taking place anymore. To ensure that these aspects are well managed and the impact of mining activities is minimized a Management Plan (hereafter referred to as MP) will be documented by the end of 2006. This plan will identified appropriate management measures that would be required to minimize the potential impacts. These measures will extend after closure where required.

4.3.2.14 Paleontological and Anthropological Aspects

No residual impact is envisaged on Paleontological and anthropological aspects

4.3.2.15 Waste Management

Once all mining activities have ceased no waste will be generated thus resulting in no further impacts due to waste disposal. A non-mineral waste site was operated on the mine area in the past but the site was closed prior to 1998. This site was rehabilitated and a closure application was submitted to DWA in 1999. DWA indicated that additional monitoring would be required on potential ground water pollution. Such monitoring has been done since.

A waste management procedure (TZ-OPR-MW-001) has been developed and implemented on the mine to ensure all types of waste is adequately managed and disposed. Appropriate records of waste disposal are obtained and kept at the responsible areas. No burning of waste takes place, which limits the potential of air pollution. The explosive packaging is burned but this is done under an exemption obtained from CAPCO in 2004.

4.3.2.16 Socio – Economical Impacts

The significant impacts as identified in the Socio economic scan have been documented in the Social and labour plan (hereafter referred to as SLP).

CHAPTER 5: MANAGEMENT OBJECTIVES AND MITIGATION MEASURES

Chapter 5 of the EMPr serves the purpose of providing the reader with information regarding the mitigation measures that are taken to minimize and prevent the negative impacts the mining operation may have on the environment as discussed in **Chapter 4**.

Considering the use of the EMS according to the ISO 14 001 standard, emphasis will be placed on how the objectives and actions, mentioned in this section, will be integrated and managed via the EMS.

To be able to manage the environmental, heritage and socio-economic issues effectively it is necessary to set relevant objectives and targets. The environmental objectives and targets are set based on the significant rating of each of the environmental, heritage and socio-economic issues. This is derived from the environmental, heritage and socio-economic impact assessments.

In order to manage the impacts, Management Plans (hereafter referred to as MP's) are developed and implemented. Mitigation measures are captured in a variety of controls including management or improvement plans (hereafter referred to as IP's) and operational control procedures.

Copies of active as well as completed IP's and MP's will be available at any stage on the mine. The IP's and MP's are reviewed on a monthly basis so they are consistently changing when completed actions are added and time frames are extended.

5.1 Management Systems

5.1.1 Introduction

The ISO 14001 Management System has been integrated with a Health Safety and Social Management System resulting in an integrated S&SD Management System complying with the requirements of ISO 14001 (international standard) and OHSAS 18001.

Thabazimbi Mine has an externally certified integrated SHE Management System in place. The Mine has been certified to ISO 14001 and OHSAS 18001 since 2004.

Thabazimbi Mine makes use of different management strategies and systems to ensure that environmental, socio-economic and heritage impacts related to the mining and related activities are minimised and prevented as far as reasonably possible. This would include impacts that could be experienced outside the boundaries of the operation (e.g. downstream users).

Thabazimbi Mine management has committed themselves, through the S&SD Policy, to the establishment of an EMS. Refer to the Executive Summary for S&SD Policy. EMS contents are summarised in the EMS Roadmap Procedure with procedure number TZ-SPR-MW-014.

The following procedures were used to compile the management measures as set out in **Section 5.1**:

Table 37: System Procedures

PROCEDURE NAME	REFERENCE NUMBER
Legal Compliance	TZ-SPR-MW-002
Audits	TZ-SPR-MW-012
Management of Change	TZ-OPR-MW-010
Communication, Participation and Consultation	TZ-SPR-MW-007
Competence, Training and Awareness	TZ-SPR-MW-006
Document Control and Record Keeping	TZ-SPR-MW-008
Identification of Aspects / Impacts and Hazards / Risks	TZ-SPR-MW-001
SHE Management System Road Map	TZ-SPR-MW-014
MPs	TZ-SPR-MW-004
Management Review	TZ-SPR-MW-013
Non-Conformance and Incident Investigation and Reporting Procedure	TZ-SPR-MW-011
Objectives and Targets	TZ-SPR-MW-003
Resource Management Procedure	TZ-OPR-MW-004
Resources, Roles, Responsibilities, Accountability and Authority	TZ-SPR-MW-005

5.1.2 Environmental Management System

The objective of the SHE Management System Roadmap is to ensure understanding of and support for the SHE Policy and S&SD improvement plan, and involvement of all employees in the SHE Management System. The Roadmap also provides a summary of how the EMS is designed and where each facet is addressed. The SHE Management System Roadmap Procedure is applicable as a framework for the entire SHE Management System applied at Thabazimbi Mine. **Figure 49** below provides a visual representation of the SHE Management System and the interface of all the applicable documents.

5.1.2.1 Responsibilities

The Departmental Managers are responsible:

1. To implement this procedure in their respective departments; and
2. To participate in programmes and activities specified in this procedure, where applicable.

The Management Representative is responsible to:

1. Maintain and distribute this procedure on behalf of the General Manager;

2. Assist management with the implementation of this procedure on departmental level;
3. Ensure that the SHE Management System requirements specified in this procedure are implemented and maintained; and
4. Report to the senior management on the performance of the SHE management system and implement improvement actions.

The current Management structure is as depicted **Figure 50**.

5.1.2.2 General Requirements of the SHE Management System

The SHE Policy and S&SD improvement plan is implemented and maintained through a SHE Management System.

The scope of the SHE Management System has been defined as:

> *"All activities, products and services of Thabazimbi Mine that have or can pose a significant hazard or impacts, to employees or the environment, relating to the mining areas and area over which Thabazimbi Mine has an influence."*

This procedure (TZ-SPR-MW-014) describes the interface between the SHE Policy and any other documentation involved in the management of SHE risks. Other documents, which interface with the management system and forms part of the documentation system, are referred to in the various management system documents and standards.

The scope of application of the SHE Management System can be defined as follows:

> *"Extraction of Iron ore via open cast mining processes and beneficiation of Iron ore through dense media separation processes supported by maintenance, administration, SHE, material management, HR and finance."*

5.1.2.3 Safety, Health and Environmental Policy

To ensure that all employees are familiar with the direction of Thabazimbi Mine, the SHE Policy with reference number TZ-POL-MW-001 is communicated in two levels. Firstly, a detailed policy that is available on SharePoint and secondly, a visual and simplified SHE Policy that is displayed on the notice boards and can also be electronically viewed on SharePoint. This SHE Policy expresses the overall intentions and principles in relation to overall SHE performance and provides a framework for actions as well as for setting objectives and targets.

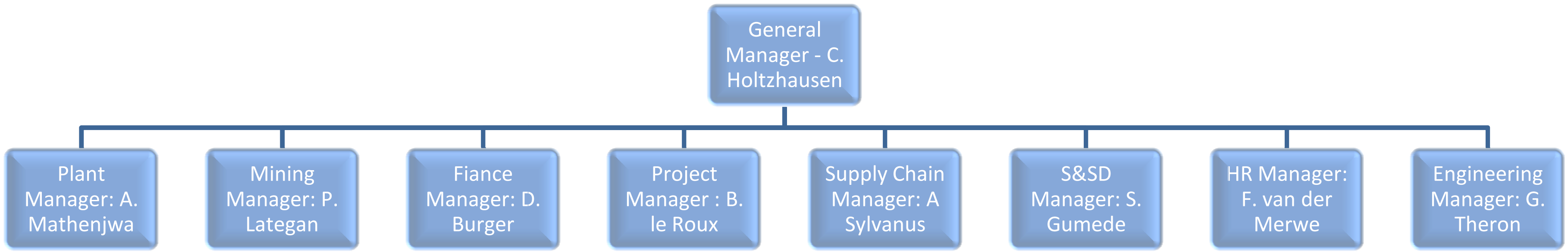

Figure 49: Thabazimbi Mine Management Structure

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Departmental Managers are responsible to ensure that the SHE Policy is understood and supported in their departments through:

1. Participating in the setting of objectives and targets;
2. Deriving departmental objectives and targets from the SHE Policy where appropriate;
3. Involving personnel in programmes to achieve the objectives and targets; and
4. Conducting regular training and awareness sessions.

The policy is available to all on request and has been developed through a process of open and transparent communication with Interested and Affected Parties (hereafter referred to as I&AP's).

5.1.2.4 Planning

The following elements apply to the planning phases of the SHE Management System:

5.1.2.4.1 SHE Hazards / Aspects

Aspects of Thabazimbi Mine's activities, products, processes, services and tasks which pose or can pose a significant risk to employees and non-employees and well as the environment are identified, assessed and recorded in procedure with reference number TZ-SPR-MW-001. Occupational health and safety hazards are identified by using WRAC and Job Safety Analysis (hereafter referred to as JSA) forms and environmental aspects through the environmental aspect and impact process. These are used as inputs for setting objectives and targets.

To determine a risk rating of an unwanted event (aspect) the likelihood that the event will / can occur needs to be established as well as the consequence of the event should happen.

<u>5.1.2.4.1.1 Determine the Likelihood of the Unwanted Event</u>

The Likelihood is a subjective quantification of the possibility that the unwanted event will occur. A description of the Likelihood levels is found in the **<u>Table 38</u>** below, with five rows describing increasing levels of likelihood, from 'rare' through to 'almost certain'. Likelihood can be seen as a combination of the probability of some initiating event/ hazard release to occur (e.g. rock falling in the pit or noise level accidence at a Plant) and the exposure to such hazard release (number and frequency of people present in the area). The combination of these two elements determines the likelihood of the specific unwanted event (rock falling at the pit over work areas or noise exceedance affecting the plant operator). The Likelihood rating shall consider existing controls. For existing operations, the likelihood should be determined with the controls in place at the moment. Other applications, such as new projects, may estimate Likelihood without controls, since they have not been designed or implemented. Controls can reduce the likelihood of the unwanted event by acting on the occurrence of the hazard release and/or on the exposure to such hazard release. When considering controls, there must be recognition of the quality of those controls (position in the hierarchy) and their real status/ application. In other words, if controls are weak by design or application, likelihood is higher.

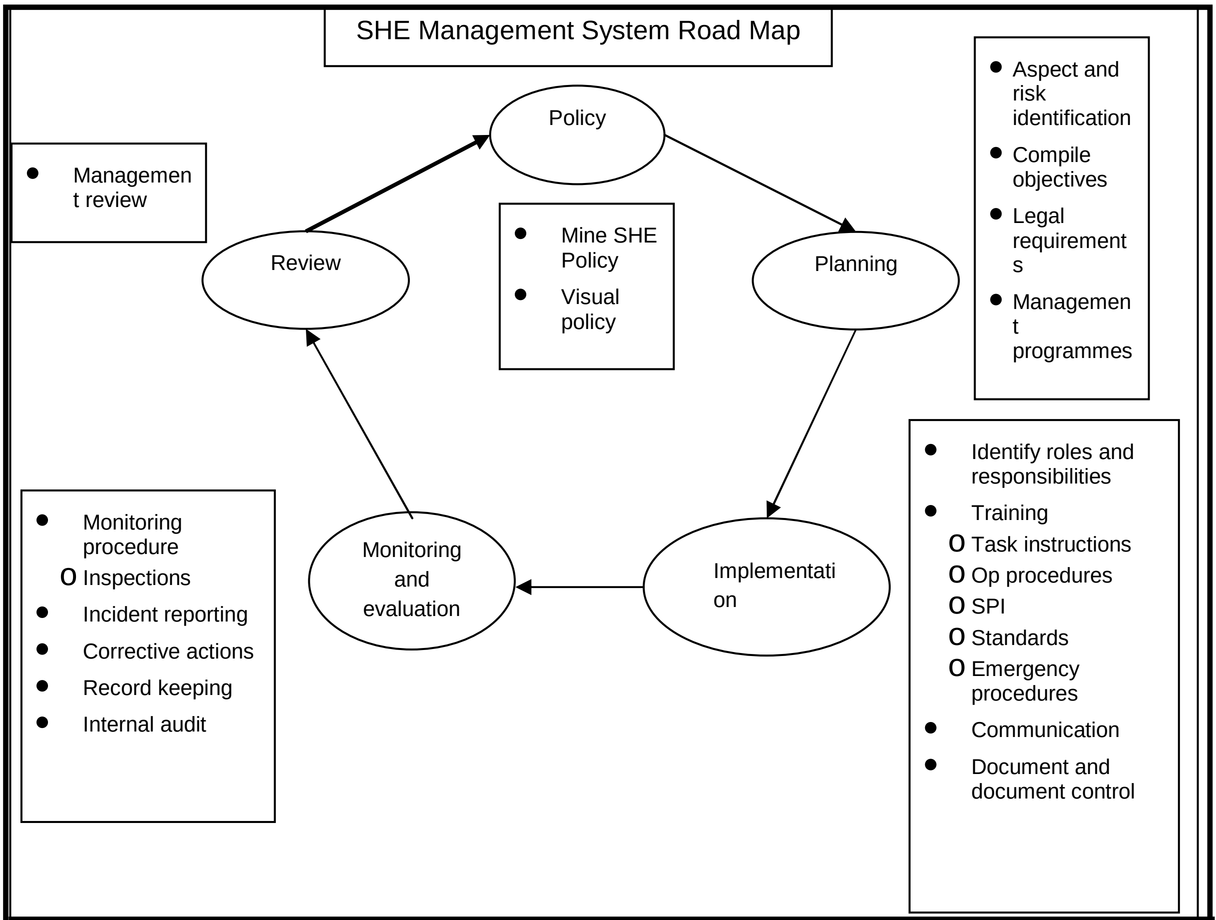


Figure 50: SHE Management System Road Map	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Table 38: Risk Matrix

EVENT RISK RATING/PRIORITY (1)					
Consequence / Likelihood	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Medium 1	Significant 16	Significant 20	High 23	High 25
4 Likely	Medium 7	Medium 12	Significant 17	High 21	High 24
3 Possible	Low 4	Medium 8	Significant 13	Significant 18	High 22
2 Unlikely	Low 2	Low 5	Medium 9	Significant 14	Significant 19
1 Rare	Low 1	Low 3	Medium 6	Medium 10	Significant 15

Table 39: Likelihood Level Descriptions

LIKELIHOOD	DESCRIPTION Considering the presence and magnitude of the hazard and the exposure to that hazard (number of people and frequency of the tasks exposing those people), and also the status of existing controls,
5 Almost Certain	The unwanted event is almost certain to happen within the LoM. In the case of repetitive/ frequent tasks the unwanted event has or will occur in order of one or more times per year. In terms of major events, as also in the case of long term health, environmental or social impacts, it may happen only once in the LoM.
4 Likely	There is a high probability that the unwanted event will occur within the LoM. In the case of repetitive/ frequent tasks the unwanted event has occurred or is likely to occur in order of less than once per year. In terms of major events, as also in the case of long-term health, environmental or social impacts, it might happen once in the LoM.
3 Possible	It is possible that the unwanted event can occur within the LoM. In the case of repetitive/ frequent tasks the unwanted event has occurred or is likely to occur in order of once every 5-10 years. In terms of major events, as also in the case of long-term health, environmental or social impacts, it may possibly happen once in the LoM.
2 Unlikely	There is a low probability for the unwanted event to occur within the LoM. In the case of repetitive/ frequent tasks the unwanted event has occurred sometime or is likely to occur not more than once every 10-20 years. In terms of major events, as also in the case of long term health, environmental or social impacts, there is a low probability for the event to happen in the LoM.
1 Rare	There is a very low probability for the unwanted event to occur within the LoM. In the case of repetitive/ frequent tasks there are no records of the event occurring or it is highly unlikely that it will occur within the next 20 years. In terms of major events, as also in the case of long term health, environmental or social impacts, there is a very low probability for the event to ever happen.

Note that when considering probability of occurrence the team should also consider event history in similar operations and the industry.

5.1.2.4.1.2 Determine the Potential Consequence of the Unwanted Event

The Consequence is an assessment of the outcome(s) that could result if an unwanted event occurs. The maximum reasonable consequence of the unwanted event should be considered. This requires that the hazard or energy be examined to establish what would be the maximum reasonable outcome should the unwanted event materializes. There are seven types of loss or impact categories for an unwanted event, each with 5 levels of consequence ranging from “Minor” to “Major”. These are shown in **Table 40**.

Table 40: Consequence Level Descriptions

	CONSEQUENCE LEVEL (Consider the maximum reasonable potential consequence of the event)				
Impact Type (Additional 'Impact Types' may exist for an event; Identify & rate accordingly)	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
Harm to People – Safety (S)	First aid	Medical treatment	Lost time	Permanent disability or single fatality	Numerous permanent disabilities or multiple fatalities
Harm to People – Occupational Health (H)	Exposure to health hazard resulting in temporary discomfort	Exposure to health hazard resulting in temporary alterations/ limitations (no lost time)	Exposure to health hazards/agents (over the OEL) resulting in reversible impact on health (with lost time)	Exposure to health hazards/agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life or single fatality	Exposure to health hazards/agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life of a numerous group/ population or multiple fatalities
Environmental Impact (E)	Lasting days or less; limited to small area (metres); receptor of low significance / sensitivity (industrial area)	Lasting weeks; reduced area (hundreds of metres); no environmentally sensitive species/ habitat)	Lasting months; impact on an extended area (Km); area with some environmental sensitivity (scarce/ valuable environment).	Lasting years; impact on sub-basin; environmentally sensitive environment/ receptor (endangered species/habitats)	Permanent impact; affects a whole basin or region; highly sensitive environment (endangered species, wetlands, protected habitats)
Social/ Community Impact (C)	Minor disturbance of culture/social structures	Some impacts on local population, mostly repairable. Single Organ of State complaint in reporting	Ongoing social issues. Isolated complaints from community members/ Organs of State	Significant social impacts. Organised community Protests Threatening continuity of operations	Major widespread social impacts. Community reaction affecting business continuity. "Licence to

	CONSEQUENCE LEVEL (Consider the maximum reasonable potential consequence of the event)				
Impact Type (Additional 'Impact Types' may exist for an event; Identify & rate accordingly)	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
		period			operate" under jeopardy
Legal & Regulatory (L&R)	Technical non-compliance; no warning received; no regulatory reporting required	Breach of regulatory requirements; report/involvement of authority. Attracts administrative fine	Minor breach of law; report/investigation by authority. Attracts compensation/ penalties/ enforcement action	Breach of the law; may attract criminal prosecution of Operating Co. and/or of Directors/ Mngrs and penalties/ enforcement action. Individual licence temporarily revoked	Significant breach of the law. Individual or Class action law suits, criminal prosecution of Co., Directors/ Mngrs. Suits against parent Co.; permit to operate substantially modified or withdrawn
Material Losses/ Damage/Business Interruption (M)	< 0.01 % of Annual Revenue/Total Assets	0.01 - 0.1 % of Annual Revenue/ Total Assets	0.1 – 1.0 % of Annual Revenue/ Total Assets	1 - 5 % of Annual Revenue/Total Assets	> 5 % of Annual Revenue/Total Assets
Impact on Reputation (R)	Minor impact; awareness/ concern from specific individuals	Limited impact; concern/ complaints from certain groups/ organisations (e.g. NGOs)	Local impact; public concern/ adverse publicity localised within neighbouring communities	Suspected reputational damage; local/ regional public concern and reactions	Noticeable reputational damage; national/international public attention and repercussions

These categories provide a qualitative description of the consequences resulting from identified unwanted events. They increase in severity from left to right. Evaluate the environmental consequence of the unwanted event considering the Impact Type categories shown in the Risk Matrix as Environmental impact (E). Where an unwanted event could result in more than one 'Impact Type', select the consequence with the highest rating.

5.1.2.4.1.3 Determine the Risk Rating

Assign a Risk Rating by combining the Likelihood level determined and the Consequence level determined. The matrix in **Table 38** provides a Risk Rating for the unwanted event under review where the selected Likelihood row intersects with the selected Consequence column. This resultant rating helps quantify the relative risk level.

The four colored risk levels (low to high) are intended to generally describe the urgency and nature of action to be taken – they do not define acceptable risk. The determination of acceptable or tolerable risk (the achievement of ALARP (as low as reasonable possible) risk as per Anglo American definition) is a desirable outcome of risk analysis. However, it is important to recognize that the Risk Matrix as such, does not provide information that can help the team identify how much Likelihood or Consequences are reduced by additional controls. This will continue to be a judgment call for the team doing the Workplace Risk Assessment and Control (hereafter referred to as WRAC) or the bow tie analysis (hereafter referred to as BTA). As such, the Risk Matrix **must not** be used to 'Re-Rank' or 'Re-Rate' Risk but rather only used to priorities uncontrolled or current risks.

5.1.2.4.2 Legal and Other Requirements

All SHE legal and other requirements pertaining to the Thabazimbi Mine management system are identified and regularly reviewed in procedure referenced TZ-SPR-MW-002. These serve as additional inputs for setting objectives and targets.

5.1.2.4.3 Objectives and Targets

The objectives contained in the SHE Policy are broken down into two levels to ensure that the SHE Policy is implemented in procedure referenced TZ-SPR-MW-003. These relate to the S&SD improvement plan (strategic objectives) and objectives and targets as defined in the MPs (operational objectives).

5.1.2.4.4 Management Plans

MPs are used to document the actions which will be applied to achieve targets and objectives which are implemented and managed through the appropriate forums in the various functional areas in procedure referenced TZ-SPR-MW-004.

5.1.2.4.5 Implementation and Operation

The following elements apply to the implementation and operational phases of the SHE Management System:

5.1.2.4.5.1 Structure and Responsibility

The roles and responsibilities for SHE Management are defined throughout the management system and defined in the Roles and Responsibilities Procedure in procedure referenced TZ-SPR-MW-005 to ensure that it is effectively understood and implemented.

The term "Responsibility" in the context of Thabazimbi Mine's Management System include the assigned responsibility as well as the required authority to exercise the responsibility.

The term "Accountability" in the context of Thabazimbi Mine identifies the person with the overall responsibility for specified actions.

To ensure that objectives and targets are met adequate resources are allocated. Resource availability is considered when the actions to achieve the objectives and targets are planned.

Resources could include the following:

- Human resources;
- Specialized skills;
- Organizational infrastructure;
- Technology; and
- Financial resources.

5.1.2.4.5.2 Training, Awareness and Competence

Environmental training takes place on various levels within the organization at Thabazimbi Iron Ore Mine. The training process is governed by the system procedure on training (TZ-SPR-MW-006). All employees are compelled to go through a process of general environmental awareness training. In support of the environmental awareness training additional competency training is done on a pre determined and scheduled basis. The effectiveness of the training is tested on a regular basis through internal audits, tests and external audits.

1. The importance of the SHE Policy and Management System;
2. Significant SHE risks of their work activities and the benefits of improved personal performance;
3. Their roles and responsibilities in achieving conformance with the requirements of the management system; and
4. The potential consequences of departure from specified operating procedures.

5.1.2.4.5.3 Communication and Consultation

Formal internal communication regarding Thabazimbi Mine's SHE hazards occur through the appropriate forums specified in the procedure in procedure referenced TZ-SPR-MW-007. Informal communication to all employees is conducted through campaigns, posters, memos, etc;

Consultation on policies and procedures occur internally through established processes and forums. The General Manager handles external communication with local authorities and other interested parties. External communication of the significant SHE risks will occur and be driven by the General Manager.

5.1.2.4.5.4 Document Control and Records

SharePoint, an electronic document management system, is used as a mechanism to ensure that the latest version of documentation is available mine wide and to meet the document control requirements. The SHE Policy, procedures in procedure referenced TZ-

SPR-MW-008 and records are distributed, approved and controlled according to the requirements of OHSAS 18001 and ISO 14001.

5.1.2.4.5.5 Operational Control

The following are examples of Operational Control Procedures for Thabazimbi Mine.

Table 41: Operational Control Procedures at Thabazimbi Mine

OPERATIONAL PROCEDURE NO.	DESCRIPTION
TZ-OPR-MW-001	Waste Management Procedure
TZ-OPR-MW-002	Management of Hazardous Chemical Substance
TZ-OPR-MW-003	Spill Management Procedure
TZ-OPR-MW-004	Resource Management Procedure
TZ-OPR-MW-005	Equipment Lock Out Procedure
TZ-OPR-MW-006	Sewage Management
TZ-OPR-MW-008	Receiving , Storage and Disposal of Vehicle Batteries Procedure
TZ-OPR-MW-009	Wastewater Management
TZ-OPR-MW-010	Planning of New Infrastructure
TZ-OPR-MW-013	Procedure for Fires and Fire Fighting Equipment
TZ-OPR-MW-014	Disposal of Old Explosives
TZ-OPR-MW-015	Handling of Fires - Replace with TZ-OPR-MW-013
TZ-OPR-MW-016	Dust Suppression Procedure
TZ-OPR-MW-018	Pit and WRD Design, Control and Construction
TZ-OPR-MW-020	Inspection and Maintenance of Fire Fighting Equipment - Replace with TZ-OPR-MW-013
TZ-OPR-MW-022	Stability Monitoring and Control of Pit Walls and WRDs Procedure
TZ-OPR-MW-076	Off-site Emergencies and Crisis Management

5.1.2.4.5.6 Emergency Preparedness and Response

SHE risks associated with emergency situations are prevented or mitigated through applying the Emergency Preparedness and Response Procedure in procedure referenced TZ-SPR-MW-009. The procedure includes a list of emergencies that occur on site with reference to the appropriate procedure. The procedures are tested on a frequent basis through emergency drills where practicable.

5.1.2.4.6 Checking and corrective action

The effective operation of the management system is maintained through the following measures:

5.1.2.4.6.1 Monitoring and Measurement

Occupational Health monitoring is conducted internally with the aim of identifying areas or activities which could cause ill health or safety incidents / accidents. Corrective steps are taken to rectify any deficiencies identified.

Inspections are performed to provide additional means of verifying effective implementation of actions to minimise SHE risks (TZ-OPR-MW-007).

Periodic environmental legal compliance assessments are performed to determine the level of compliance with regards to environmental legal requirements. During this assessment compliance to other requirements are also assessed.

Environmental monitoring is conducted to identify and monitor the key characteristics of Thabazimbi Mine's activities, which might have an impact on the environment or health of their employees or the community. All monitoring results are recorded and used in the development of MPs to implement corrective actions.

This is done in procedure in procedure referenced TZ-SPR-MW-010.

5.1.2.4.6.1.1 Physical Monitoring

Thabazimbi Iron Ore Mine monitors the significant aspects and impacts on the environment in accordance with a pre-determined frequency. The results obtained from the environmental monitoring exercises feed into the EMS (ISO 14 001). The Monitoring and Measurement Procedure (TZ-SPR-MW-010) describes the basis of the various monitoring programs conducted throughout the mining area.

Monitoring is done on various aspects of the mining activities. The information generated during this exercise is used for the following purposes:

- To assess compliance to legal requirements;
- To assess compliance with internal requirements;
- To identify potential trends;
- To set early warning levels (preventive action);
- To assess the level of achieving existing objectives and targets; and
- To set new objectives and targets.

Monitoring results are thus actively used and not generated for the sake of fulfilling legal requirements. The following key characteristics are monitored.

<u>Water</u>

A water sampling procedure (TZ-OPR-ENV-002) has been compiled identifying the sampling method. The monitoring points have been incorporated in the GIS system.

External laboratories are used to analyze the water samples. A report is produced on the results and is included in the report to the DWA.

As part of surface and ground water monitoring the following parameters are included:

- Organic;
- Inorganic;

- Bacteriological;
- Bio-monitoring on surface water in Crocodile River (six monthly); and
- Ground water levels (monthly).

Surface and ground water quality is measured against South African water quality guidelines for domestic use. If a trend is identified with regards to non-compliance to the standards a non-conformance will be reported and investigated to identify the cause of the problem and take appropriate corrective and preventive action.

To comply with the Mine Health and Safety Act No 29 of 1996, bacteriological analyses of potable and service water samples are carried out by an accredited laboratory.

Quality of storm water will be monitored during rainfall events the rainy season to determine possible pollution. In cases where the standard is exceeded, an investigation is to be initiated and trend analysis to be conducted.

Water usage is monitored and measured daily. The Head Environment documents this information on a spreadsheet to produce the water use report and water balance.

Air

Fall-out dust monitoring is done in accordance with the operational procedure on monitoring of fall-out dust TZ-OPR-ENV-003. The results obtained from this exercise are evaluated by an external party who in turn provides the mine with a report. The operational procedure specifies the methodology used during the monitoring exercise.

In addition to dust fall out the monitoring of vehicle emissions takes place in the form of visual observations. Regular maintenance is conducted on vehicles used on the mine to minimize the potential impact the activities may have on the environment.

Effectiveness of Dust Suppression

The effectiveness of dust suppression will be measured by means of the fall-out dust monitoring to be done. These samples will be used to correlate the effectiveness of the dust suppression measures applied. Dust suppression will be revisited based on the results obtained from the fall-out dust monitoring.

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:

1. 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.
2. 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.

3. 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:

1. 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 D-1739) or any other method which can demonstrated to give equivalent results (SANS, 2004).
2. 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.

Vegetation

The purpose of this monitoring is to assess the effectiveness of the rehabilitation. Photos are used when the effectiveness of rehabilitation is monitored. Comparisons are made between rehabilitated areas from year to year to monitor progress made and determine effectiveness of rehabilitation. The parameters used during the monitoring include:

- Comparison between grass types in rehabilitated and natural areas;
- Tree growth;
- Basal cover; and
- Species diversity.

Erosion

The monitoring of erosion on rehabilitated areas is done during site inspections (visual inspection) and if abnormal erosion is visible a non-conformance will be raised and corrective actions identified to address the problem. Maintenance of rehabilitated areas is included in the annual rehabilitation planning and scheduling. This is done as part of the normal operational budget. Erosion on areas that have not been rehabilitated is only addressed once the area is scheduled for rehabilitation.

Noise

A Baseline noise survey has been conducted to determine the levels of noise generated by the various mining operations. The noise levels will be re-assessed when any operational changes take place that may affect the level of noise generated by the normal day-to-day activities.

Waste

The volumes of general and hazardous waste generated and recycled are monitored and recorded. The types of waste recycled include scrap metal, paper and used oil. A detailed waste assessment has been conducted and the findings of this reports has been incorporated in the existing waste management procedures. Waste is managed in accordance with TZ-OPR-MW-001 – Waste management procedure.

Energy Consumption

Energy consumption is measured in terms of electricity, diesel and petrol used on the mine. The two main sources of energy use are the plant and the mining areas. Energy use is measured on a regular basis.

5.1.2.4.6.1.2 Environmental Management Programme Performance Assessments

Methodology

EMPr PAR will be conducted every two years or as agreed upon by the DMR. The purpose would be to:

- Monitor legal compliance;
- Fulfilment of current environmental objectives as made in the EMPr; and
- Assess the continued adequacy of the EMPr related to current mining activities.

These assessments will be carried out according to the MPRDA, Regulation 55. The assessment report will be submitted to the Minister or relevant authority.

Competent person(s) will be used to conduct the assessment. The methodology followed will be the following:

1. The assessment will be conducted in the form of an audit;
2. A checklist will be compiled of all the environmental commitments (objectives to be achieved) made in the EMPr;
3. This checklist will be in a table format indicating the specific commitment, the level of compliance to the commitment and a recommended action where required;
4. The EMPr will also be assessed for its appropriateness to cover all the mining related activities taking place on site;
5. The assessment will also focus on the description provided in the EMPr related to the mining activities whether these are still appropriate; and
6. The information from this assessment will be used to update the EMPr on a continuous basis.

Format of the Report

Regulation 55(3) states that the format of PAR's should be in the format of the guidelines provided by DMR. At the time of the compilation of this EMPr, no guidelines were available from DMR, but according to regulation 55(3) the report should as a minimum contain the following:

1. Introduction;
2. Methodology, followed for the assessment;
3. Compilation of the assessment audit team;

4. The scope of the assessment and period to which it is applicable;
5. The criteria used to evaluate the EMPr commitments and adequacy;
6. The findings of the assessment (reasons why conformance and non-conformance's where identified); and
7. Recommendation on how the results can be addressed.

The findings recorded in this assessment will be incorporated into MP. The appropriate corrective action will be taken on these non-conformances and the effectiveness of these actions will be regularly reviewed. The focus of the assessment will include previous assessment findings as well as the importance of the areas and commitments assessed.

5.1.2.4.6.2 Non-Conformance and Corrective and Preventive Action (TZ-SPR-MW-011)

Any problem affecting safety, health of employees or the state of the environment is regarded as important is be addressed by reporting, investigating the incidents and initiating corrective and preventive actions to eliminate the direct causes.

5.1.2.4.6.3 Records

Records of SHE activities are maintained to demonstrate conformance to the requirements of the management systems, regulated in procedure referenced TZ-SPR-MW-008.

5.1.2.4.6.4 Management System Audit

The SHE Management System is audited on a regular basis to ensure conformance to SHE legislation, and requirements of the OHSAS 18001 and ISO 14001 standards. The process for scheduling, planning and execution of the internal SHE Management System Audits are defined in procedure referenced TZ-SPR-MW-012.

5.1.2.4.6.7 Management Review

To ensure that the SHE Management System comply and meet internal requirements, the system is regularly reviewed to ensure its continuing suitability, adequacy and effectiveness. This review is performed by top management on an annual basis. This is regulated in procedure referenced TZ-SPR-MW-013.

Table 42: Monitoring

SUBJECT MONITORED	SUB-SECTIONS	SPECIFICATION	RESPONSIBILITY	FREQUENCY	MONITORING EQUIPMENT USED	RECORDS
Surface Water	Organic	See water sampling procedure	Environmental manager	Quarterly	Accredited lab	Environmental manager office
	Inorganic	See water sampling procedure	Environmental manager	Quarterly	Accredited lab	Environmental manager office
	Bacteriological	See water sampling procedure	Occupational hygienist (Harry Barnard)	Monthly	Accredited lab	Environmental manager office
	Bio-monitoring (Crocodile river)	See water sampling procedure	Environmental manager	Six-monthly	Accredited lab	Environmental manager office
Ground water	Organic	See water sampling procedure	Environmental manager	Quarterly	Accredited lab	Environmental manager office
	Inorganic	See water sampling procedure	Environmental manager	Quarterly	Accredited lab	Environmental manager office
	Bacteriological	See water sampling procedure	Occupational hygienist (Harry Barnard)	Monthly	Accredited lab	Environmental manager office
	Ground water levels	See water sampling procedure	Geology	Weekly	Accredited lab	Geology offices
Land	Erosion	Visual	Environmental Manager	Every site visit	N/A	Environmental manager office
Vegetation	Rehabilitation	See internal classification	Environmental Manager	Every site visit	N/A	Environmental manager office
Noise	Occupational noise levels	85db	Occupational hygienist (Harry Barnard)	Monthly		JPJ system
	Environmental noise levels	SABS 0103	Environmental Manager	When required based on level of risk		Environmental manager office

Dust	Fall out dust	Total dust Particle size Total chemical analysis	Occupational hygienist	Monthly		Environmental manager office
Resource use	Electricity use		Financial department	Monthly	ESKOM meters	
	Water use		Environmental manager	Monthly	Water meters	Environmental manager office
Emissions	Vehicle emissions	Visual	Diesel work shops	During scheduled maintenance	N/A	Vehicle maintenance records
Radioactive sources	Source exposure	Physical monitoring	Radiation Protection Officer	At least quarterly	N/A	Plant technician office
Waste	Hazardous waste	Volume	Logistics manager	Monthly		Material management
	Scrap metal	Volume	Logistics manager	Monthly		Material management
	Used oil and filters	Volume	Logistics manager	Monthly		Material management
	Paper	Volume	Logistics manager	Monthly		Material management
	Medical waste	Number of consignments	Occupational nurse	When required		Occupational health
Slope stability		Stability	See TZ-OPR-MW-022	See TZ-OPR-MW-022	See TZ-OPR-MW-022	See TZ-OPR-MW-022

5.2 Environmental Objectives

This section describes the generic mine wide environmental objectives for Thabazimbi Mine. This provides evidence of actions taking place on site to minimize or prevent the potential for environmental pollution.

The following procedures were used to compile the management measures as set out in **Section 5.2** and **Section 5.3**:

Table 43: Operational Procedures

PROCEDURE NAME	REFERENCE NUMBER
Dust Suppression Procedure	TZ-OPR-MW-016
Procedure for the Receiving, Handling, Storage and Disposal of Vehicle Batteries	TZ-OPR-MW-008
Performance Measurement and Monitoring	TZ-SPR-MW-010
Sewage Management	TZ-OPR-MW-006
Spill Management Procedure	TZ-OPR-MW-003
Topsoil Management	TZ-OPR-MIN-001
Waste Management Procedure	TZ-OPR-MW-001
Waste Water Management	TZ-OPR-MW-009
Hazardous Chemical Substance Management	TZ-OPR-MW-002

5.2.1 Geology

Objective: Minimize the disturbance of the local geology through effective prevention measures during blasting and mining activities.

Actions to ensure achieving of objective:

1. Effective blasting in accordance with blasting plan to minimise noise and dust;
2. Effective mining practices; and
3. Effective Planning.

5.2.2 Soil

Objective (1): Minimize the pollution of soil through effective prevention measures.

Actions to ensure achieving of objective:

1. Effective separation and disposal of non-mineral waste;
2. Management of storage and use of fuels, oils & lubricants
3. Management of oil and chemical spillages;
4. Managing, ordering and storage of hazardous substances;
5. Minimizing slimes spillages;
6. Controlling of slimes spillages to prevent siltation of storm water;
7. Vehicle maintenance must take place inside the workshop area. If this is not possible the in pit maintenance must be done in such a way as to prevent contamination of soil due to spillages of chemicals such as grease and oils. This must be done through applying effective spill containment measures such as drip trays and ensuring that spill cleaning equipment is available in the event of a spill; and

8. Effective storm water management controls such as berm on the high-level side and channels to keep the clean water from entering the site. This will also minimize the possibility of erosion occurring on the site.

Objective (2): Ensure effective soil management practices.

Actions to ensure achieving of objective:

1. The Engineering Geology department is responsible to do a survey for the identification of topsoil and the depth thereof, within the mining area with emphasis on existing mining areas where waste rock are to be dumped and in new mining areas during the surveying and planning phase. The person responsible for the identification should be competent and have the relevant experience to identify such material.
2. Identified topsoil and the depth thereof should be clearly indicated as contours of topsoil depth on a surface layout plan and clearly marked by the survey department in the field.
3. The environmental manager should be notified if topsoil were identified in new mining areas and waste rock disposal/storage areas, by the Engineering Geology department.

Stripping and Storage of Topsoil

1. If topsoil is identified, the Pit-supervisor and Mine planning department should be notified and the precise location of the topsoil to be striped should be communicated. Mine Planning department should include the removal and storage areas in their planning program and layout plans.
2. The volumes of the different topsoil heaps must be calculated and added to the surface layout plan. This is done to ensure that when rehabilitation is required the volume required and the volume available can be compared.
3. The topsoil should be stripped to a maximum depth as measured and calculated by the Engineering Geology department.
4. The topsoil should be stockpiled in windrows not higher than 1.5 m and the stockpiles should be marked as topsoil.
5. These stockpiles should not block access roads, be situated away from high pollution risks and should be protected from erosion as far as possible (design, vegetation and physical structures).
6. Topsoil berms may not be used as a storm water control measure. This will result in erosion and loss of topsoil.
7. Adequate storm water control measures must be constructed around topsoil heaps to ensure that storm water flow does not result in erosion and thus loss of topsoil.
8. In the event that top soil heaps are going to be stored for a long period prior to use these heaps must be planted with indigenous vegetation to build the seed bank in the top soil for future use.

5.2.3 Land Capability

Objective: Maximizing land capability of disturbed / affected areas through effective rehabilitation and remediation practices.

Actions to ensure achieving of objective:

1. Implementing effective and sustainable rehabilitation and remediation practices as per the description under rehabilitation; and
2. Align with the mine closure plan objectives related to land use and land capability.

5.2.4 Land Use

Objective: Promote sustainable land use subsequent to rehabilitation.

Actions to ensure achieving of objective:

1. Implementing effective and sustainable rehabilitation and remediation practices; and
2. Align with the mine closure plan objectives related to land use and land capability.

5.2.5 Flora

Objective (1): Minimize the destruction of natural vegetation.

Actions to ensure achieving of objective:

1. Effective planning of mining activities;
2. Consideration of legal requirements; and
3. Conducting EIA's to assess the impacts of new activities and/or compiling EMPr to address such new activities or existing activities.
4. The Tambotiekloof and Meyers Mine area sustain high densities of tall (aged) *Spirostachys africana* (Tamboti) trees. It is recommended that all individuals of *S. africana* be marked prior to the commencement of any mining activities. Where possible, these individuals should be conserved *in situ.*

Objective (2): Promote the establishment of self-sustaining plant communities through effective rehabilitation practices.

Actions to ensure achieving of objective:

1. Implementing effective and sustainable rehabilitation and remediation practices.

Objective (3): Control of invasive plant species.

Actions to ensure achieving of objective:

1. Implement alien and invasive plant eradication / control programme by mechanical removal, chemical application and biological control.

5.2.6 Fauna

Objective: Minimizing the destruction of animal habitat in the mining area.

Actions to ensure achieving of objective:

1. Effective management of undisturbed areas (e.g. game farm); and
2. BAP.

5.2.7 Surface Water

Objective (1): Minimizing the pollution of the surface water resource.

Actions to ensure achieving of objective:

1. Water quality monitoring;
2. Effective separation and disposal of non-mineral waste;
3. Management of storage and use of fuels, oils & lubricants;
4. Management of spillages;
5. Maintenance of oil separators and sumps;
6. Management of oil and silt traps;
7. Managing, ordering and storage of hazardous substances;
8. Disposal of used oils;
9. Managing refuelling in order to prevent spills;
10. Using of drip trays under vehicles;
11. It is the responsibility of every person to report a water leak to the relevant section supervisor. The supervisor should ensure that water leaks are fixed as soon as possible.
12. Water loss during the operation of the plant must be reduced where possible.
13. Water used during the beneficiation process must be recycled or re-used where possible.
14. An annual water use audit must be conducted, which aims to identify any areas where spillage of water occurs from e.g. leaking pipes. The audit must also aim to identify areas where water can be re-used.
15. Pipes, taps and valves supplying water should not leak and regular maintenance ensures effective functioning thereof;
16. Implementing effective storm water control measures;
17. Minimizing slimes spillages;
18. Effective storm water management controls such as berm on the high-level side and channels to keep the clean water from entering the site. This will also minimize the possibility of erosion occurring on the site;
19. Identification of 1:50 year flood line in Buffelshoek east-east and Meyer mine to ensure no activities take place within the flood line; and
20. Roofing of hazardous waste storage area to prevent contamination of rain water.

Use of Water

1. Water should be used in a responsible manner to avoid unnecessary use, spillage and contamination of the water.
2. Washing of vehicles and equipment should be done in a dedicated wash bay located in the following areas:

    - In front of Donkerpoort workshop;
    - Next to tyre workshop;
    - Next to petrol workshop;
    - Survey; and
    - Masingita workshop.

3. Soap and other cleaning chemicals need to be used in accordance with prescribed material specifications to minimise the potential impact the cleaning chemical may have on the environment.
4. Taps and valves should be properly closed when washing activities are not taking place.
5. Water should be used in such a manner to ensure that dirty water is contained in the wash bay and reach the dedicated sump/drain.
6. The sump/drain and silt trap should be inspected and cleaned regularly to ensure the effective functioning there off.

Disposal of Wash Water

1. All wash water should be canalised to the relevant dirty/wash water system to avoid contamination of soil and other clean water systems.
2. The pipes and channels should be inspected and cleaned regularly to avoid blocking and overflowing.
3. Wash water should only be disposed of in dedicated drains and sumps.
4. All wash water should go through an oil separation process.
5. The separated oil and sludge should be treated and disposed of as hazardous waste.
6. The separators should be inspected by the relevant area/workshop foremen on a weekly basis for effectiveness and malfunctions should be reported and corrective actions taken.
7. Water released into the process or storm water system from oil separators should be tested regularly to ensure the oil separators are effective.
8. Monitoring of the surface water quality for oil concentrations is done by the SHE department.
9. Should it be evident that the oil separation equipment is not effective, the release of the water should be avoided and minimised till corrective action has taken place.
10. The water should be disposed in the dedicated facilities (Oil dam, new plant facility).

Siltation Prevention

1. During the design and implementation phase of the Storm Water Management Plan (hereafter referred to as SWMP) the main focus was to prevent any Plant water from entering the Rooikuilspruit. A new silt separation pit had to be constructed where the heavily silted water would be retained long enough to allow the sedimentation of as much as possible silt. The effluent had to be pumped back to the Plant to be re-used. The silt had to be pumped to a suitable silt dam.

2. Discharge from the central workshop area (lubricating fluid) flows into the trench behind the workshop. Runoff from this area, mainly storm water, is routed to the silt / oil separating dam (also referred to as the Kragstasie dam), ultimately discharging into the Rooikuilspruit.

3. Any run-off from the mined area is retained by collecting storm water at the foot of the waste rock heaps and bottom of pit areas. The suspended material is settled out in silt retainment areas, avoiding siltation of down slope drainage lines and watercourses.

<u>Stormwater Control on Roads</u>

1. Where diversion berms are used the berms could be improved by more careful selection of construction material and possibly the use of cement stabilisation or more environmentally friendly stabilisation agents such as “Powercem”.
2. Erosion could be reduced by calculating the required positions of the berms based on the contributing catchments and road gradients.
3. Discharge points should be lined with rip rap, stone pitching or gabions to diffuse the flow and prevent damage / erosion to the edge of the road and the downstream gullies.
4. The use of material stabilisation could be considered as an integral part of the road construction on steeper sections of road or in areas where there will be excessive stormwater run-off on the road surface.
5. A more suitable solution would be the installation of side drains where spatial and topographical constraints allow.

The design of side drains should t\take cognizance of the following points:

- A wider shallower channel, where space permits, will be more resistant to erosion.
- The spacing of discharge points should be an integral part of the channel design.
- Discharge points should be lined with rip rap, stone pitching or gabions to diffuse the flow and minimise erosion as mentioned above.
- In areas where the road gradients are steep consideration should be given to –
    - Lining the channel with Reno mattresses or similar protection measures.
    - Stepping the channel (steps to be protected with gabions) to reduce the channel gradient in relation to the road gradient.
- Channels formed with or lined with selected material in order to achieve appropriate levels of compaction.

<u>Stormwater Control at Pit Excavations</u>

1. The top of the pit perimeter should be surrounded with a berm to prevent stormwater ingress.
    - Each excavation level should have an open perimeter drain which would discharge to a sump (or sumps) from which the stormwater would be pumped to surface as required. As new levels are excavated the above process would be duplicated on each level.
    - The pumped stormwater would be passed through a settlement pond to prevent surface erosion and excessive silt deposition.

2. A more practical recommendation would be to install a sump at the level being mined with the ground level being shaped / graded to direct stormwater to the sump. When a new mining level is reached then this sump would be abandoned and a new sump would be excavated at the new mining level. Stormwater collected in the sumps would

be pumped to surface via a stormwater settlement pond that would reduce excessive silt deposition and erosion.

3. A detailed design of this type of system would be required as part of the planning process for the pit excavation and would need to address the following points
    - Level of protection required in terms of sump volumes and pumping times in relation to different recurrence interval storms.
    - Pumping requirements for different mining depths.
    - Capex and Opex of the stormwater infrastructure in relation to estimated loss of revenue caused by suspended mining operations.

Objective (2): Optimising the use of water.

Actions to ensure achieving of objective:

1. Documenting the water balance of the mine;
2. Re-use of process water;
3. Optimization of water use; and
4. Water saving measures.

5.2.8 Ground Water

Objective (1): Minimizing the pollution of the groundwater aquifer.

Actions to ensure achieving of objective:

1. Effective separation and disposal of non-mineral waste;
2. Management of spillages;
3. Managing, ordering and storage of hazardous substances;
4. Disposal of used oils;
5. Managing refuelling in order to prevent spills;
6. Monitoring groundwater for leachates from slimes dams;
7. Continually monitoring the effect of groundwater withdrawal on the groundwater aquifers;
8. Use of appropriate toilets in most cases where operations are away from sewage connections;
9. Use of French drain and regular maintenance on French drain to ensure that the drain is effective and minimises potential pollution of ground water. Regular inspections on French drains must take place to ensure effectiveness;
10. Storage of fuels, oils and lubricants on site will be done in such a way that spillages are contained and cleaned up in accordance with set procedures; and
11. Designated public toilets at the cultural village, Mollies and education centre which will be connected to the sewage system, if possible.

5.2.9 Sanitation

Objective: Minimizing the water pollution potential from sanitation and sewage.

Actions to ensure achieving of objective:

1. Effective pollution prevention measures;
2. Water quality monitoring;
3. Effective operation of sewage systems;
4. Correct disposal and treatment of sewage; and
5. Management of sewage spillages.
6. Department heads are responsible to ensure that a survey is done to identify the sewage sources and the disposal there of in each department where applicable.

Management of sewage and sewage infrastructure

1. Department heads are responsible to ensure that all identified sewage sources are managed to ensure that impacts to the environment and the potential health hazard to employees are minimised and prevented.
2. Were sewage is temporary stored, the supervisor must ensure that the storage container does not leak or overflow and that the impact to the environment and employees are minimised.
3. The supervisor must ensure that no sewage enters the clean water system.
4. All chemical toilets must be checked regularly (daily if used daily) and treated with chemicals if required.
5. Should long drop toilets be used; the supervisor should avoid the contamination of ground water. All long drops must be closed if not used regularly.
6. Under no circumstances may untreated sewage be disposed of in the environment e.g. pumped underground.

Disposal of sewage

1. Should sewage systems or parts thereof, need to be cleaned, the sludge should be disposed off in the Thabazimbi municipal sewage system.
2. Should any sewage infrastructure need to be disposed of, the supervisor should ensure that it is clean of sewage and/or sewage sludge.

5.2.10 Air Quality

Objective: To effectively control air pollution sources.

Actions to ensure achieving of objective:

Dust:

1. Watering of production roads that are not chemically treated;
2. Water bowsers are responsible to provide sufficient water to suppress the dust on the roads in the pit area.
3. Water bowsers are also used for dust suppressing purposes on haul roads, to and from the pit, prior to the use of Dust-A-Side.
4. Mist sprayers at high dust generation areas;
5. Atmospheric dust monitoring;

6. Effective rehabilitation practices;
7. Speed limit on roads to minimise dust generation;
8. General maintenance of dust suppression equipment;
9. Re-modelling dispersion on a risk based basis;
10. Dust is suppressed during drilling by using water as suppressant as part of the drilling equipment technology. Water sprays are used to suppress drilling dust optimally. Too much water can cause the drill hole to collapse and therefore the amount of water used is based on the technology available, dust generated and danger of the drilling hole collapsing;
11. Regular maintenance of drill equipment ensures optimal use of the water sprays;
12. The only practical mechanism used to minimize the volume of dust generatedduring blasting is to optimize the use of explosives;
13. The blasting contractor continuously investigates mechanisms that can be used to minimize the generation of dust and optimize the use of explosives;
14. The pit supervisor will determine the frequency of dust suppression in the pit;
15. When the dust has an effect on the visibility and cannot be suppressed due to the fact that a water bowser is not available, a mini-HIRA must be completed after which the supervisor will apply the corrective action;
16. This incident must be reported and entered in the logbook;
17. It is the responsibility of Dust-A-side to ensure that dust suppression is done on all haul roads as per contract;
18. The frequency of the application of dust-A-Side will be determined by the quality of the road surface;
19. Regular maintenance of the road surfaces is done in accordance with a predetermined schedule based on area to be covered and quality of road surface;
20. A cost-effective chemical control programme should be developed evaluating the costs and benefits arising from various chemical stabilization practices on site specific roads;
21. The fines and coarse stockpiles are always wet and therefore additional dust suppression measures are not deemed necessary;
22. Measurements will be taken if these conditions change;
23. Water sprays will be used to minimize the dust at the primary stockpiles;
24. These sprays will be regularly maintained to ensure the effective operation thereof, as deemed necessary;
25. Considering the fact that the largest portion of the process in the plant is a wet process the need for dust suppression will only be investigated once the process changes and less water is used;
26. This may require that dust suppression measures be applied on the conveyor systems and crossover points;
27. Dust suppression is done at the secondary crusher; and
28. Dust suppression of crusher in laboratory is done by means of extraction systems. When the dust has an effect on the health and safety of employees a mini-hira must be completed.

<u>Emissions:</u>

1. Regular maintenance of vehicles and equipment;
2. Correct handling and storage of volatile chemicals;

3. Prevention of fires;
4. Maintaining fire breaks to prevent fires from spreading; and
5. Regular inspection on fire fighting equipment.

5.2.11 Radiation

Objective: to ensure safe handling and disposal of radioactive material.

Actions to ensure achieving of objective:

1. No specific actions are taken besides regular maintenance and compliance with permit and license requirements.

5.2.12 Noise

Objective: To effectively control noise sources within the mining area.

Actions to ensure achieving of objective:

1. Ore processing (noise generating) equipment contained in buildings where practical e.g. crusher;
2. Regular maintenance of vehicles and equipment;
3. Noise monitoring when changes take place;
4. Review the dumping of waste on the northern slopes of Vanderbijl pit; and
5. Identify appropriate noise reduction measures to minimise potential noise from the pit.

5.2.13 Visual Aspects

Objective: Minimizing the visual impact of the mine and its related activities.

Actions to ensure achieving of objective:

1. Effective rehabilitation practices which includes concurrent rehabilitation where relevant;
2. Stick to the mine plan;
3. Waste rock is dumped up against the mountain slope in order to match the contour of the dumps with that of the mountain. The dumps are re-vegetated in order to merge them better with the surroundings;
4. The natural grass that establishes itself on the dumps differs from the natural vegetation, but helps to improve the appearance of the dumps and to minimize erosion; and
5. Shaping of the mined areas.

5.2.14 Blasting, Vibration and Shock Management

Objective: To conduct all blasting, vibration and shock related activities according to the Mine Health and Safety Act, 1996 (no.29 of 1996). This is related to the surrounding community.

Actions to ensure achieving of objective:

1. Monitoring of vibration and shock where required; and
2. Research into blasting activities to ensure most effective blast with least impact.

5.2.15 Traffic

Objective: To minimize the effect of increase in traffic on the local area.

Actions to ensure achieving of objective:

1. Reconstruct exit and entrances to stock pile area, workshops and Ben Alberts to ensure that traffic is not affected by the heavy vehicles entering and exiting the area;
2. Mine traffic cross provincial road at controlled crossing or under controlled conditions;
3. During blasting, when traffic can be affected, controlled conditions apply;
4. Accommodate public transport in a laybye (located to west of the R510 and beyond the mine entrance);
5. The construction of the bridge across the R510 must take place according to the South African National Road Agency Limited (hereafter referred to as SANRAL) procedures, which allows for the bridge to be built while keeping the R510 open at all times;
6. The daylight blasting hours should be between 13h00 and 14h00 being the lowest two-way traffic flows during the day where predictable and if traffic is effected;
7. Continue and possibly improve in the future the existing Spoornet transport arrangements;
8. Minimize the usage of road-based (truck) transport arrangements;
9. The new plant access must be off R510 in its current position;
10. Access must be to the satisfaction of SANRAL Road Authority; and
11. Responsible driving, good lighting and visibility, and awareness of drivers will ensure that the impact are minimised.

5.2.16 Archaeological, Historical and Cultural Aspects

Objective: Prevent the destruction of archaeological, historical and cultural sites and artefacts.

Actions to ensure achieving of objective:

1. Identify possible archaeological sites before activity takes place;
2. Surveying and fencing off where practical of archaeological sites;
3. Recommendations from Heritage assessment; and
4. Establish a comprehensive heritage inventory for the purposes of Thabazimbi Mine's heritage preservation strategy for the future.

5.2.27 Sensitive Landscapes

Objective: To avoid or minimise impacts to sensitive landscapes

1. Identify possible sensitive sites before activity takes place; and
2. Surveying and fencing off where practical of sensitive sites.

5.2.18 Socio-Economic Aspects

Objective: Minimise the negative impacts associated during and after closure on the local economy, community and public sector.

1. **Short term:** House construction workers in existing housing structures within the community where possible.

2. **Medium term:** Consider the use of a small-scale construction village in combination with housing within the local community at the peak of construction.
3. **Long term:** Enter negotiations with the TLM regarding a co-operative (or funding) agreement, together with the Development Bank of South Africa (DBSA), regarding sustainable development in terms of housing and the municipal services network.
4. However, due to the limited timeframes of the construction phase of the project, this option falls outside the scope of this phase of the project and is therefore not deemed as a viable option for housing construction workers. It is therefore only recommended as a future or long term option that could potentially complement Thabazimbi Mine's social investment initiatives as outlined in their Thabazimbi Mine's SLP.

5.3 Principles and Management Measures – Mitigation

5.3.1 Rehabilitation Procedure and Standards

5.3.1.1 Overview of Rehabilitation Practices on Site

The rehabilitation of the mining area takes place in line with the actions described in this section. Rehabilitation is scheduled in accordance with the financial provision and rehabilitation budget over the LoM. The progress made with regards to the scheduling is tracked on an annual basis in line with the rehabilitation plan. At present, the WRDs are divided into three categories for the purposes of the EMPr, namely:

1. Old WRDs where activities ceased before 1980 and which need to be made safe and rehabilitated;
2. WRDs where mining activities ceased after 1980 and before 1991; and
3. Present and future WRDs, where specific attention must be devoted to compliance with the legal requirements regarding environmental rehabilitation from the outset.

The workings under each category are as follows:

Category 1 - Old WRDs where activities ceased before 1980

1. Meyer Mine pit;
2. Bobbejaanwater pit; and
3. Eastern pit.

Management actions scheduled in this category comprise only the removal of structures, scrap recovery and the planting of trees on and just below the top of the WRDs and level surfaces in order to mitigate the visual impact. The trees will be attended to until they are self-supporting and the necessary closure certificate has been obtained.

Category 2 – WRDs where activities ceased after 1980 and before 1991

1. Vanderbijl pit; and
2. Donkerpoort pit.

Management actions scheduled in this category with regard to the WRDs and level surfaces comprise the actions described under Category 1 as well as levelling piles of broken rock on the level surfaces.

Category 3 – Present and future WRDs

1. Donkerpoort West pit;
2. Kwaggashoek East pit and Kwaggashoek East underground;
3. Prospecting projects;
4. Donkerpoort Neck;
5. Eastern Mine underground;
6. Wachteenbietjes Draai;
7. Meyer Mine MMD;
8. Vanderbijl pit (future);
9. Bobbejaanwater pit (future); and
10. Buffelshoek pit (future).

Management actions scheduled in this category with regard to the WRDs and level surfaces comprise the actions described under Category 2 as well as slope reduction and moon-scaping of the dumps. Moon-scaping means that a cratered surface is formed with equipment that scrapes out shallow depressions on the sections of the dumps where the slope has been reduced.

5.3.1.4.3 Rehabilitation

1. The stockpiled topsoil should be used as soon as possible for the rehabilitation of the area or other areas. This will ensure that the topsoil retain its characteristics to support vegetation.
2. When top soiling of an area is required a calculation must be done to determine what volume is required for the rehabilitation of the area.
3. Topsoil will be placed not shallower than 150 mm on top of overburden or sub-soils.

5.3.1.4.4 Inspections

1. The environmental manager is to verify that topsoil is striped and stockpiled according to this procedure.
2. The environmental manager is responsible to ensure inspections are done on topsoil management identifying areas where erosion could result in the loss of topsoil.
3. These inspections will take place at least four times per year. The inspections will be scheduled throughout the year to include inspection during the rainy season and during the winter.

5.3.1.5.5 Re-Establishing Vegetation

The Institute for Rehabilitation Ecology of the University of Potchefstroom has assisted with the initial rehabilitation efforts.

A growth medium (fertiliser mixture) that was recommended consisted of the following:

- 400 kg/ha super phosphate;

- 200 kg/ha KCL; and
- 150 kg/ha 2:3:2(22) Zn.

The recommended grass seed mixture that was recommended consisted of the following grasses:

- Quick grass;
- Blue buffalo grass;
- Ganda grass;
- Smuts finger grass; and
- White buffalo grass.

It was also recommended that 50 $kg.ha^{-1}$ of ammonium sulphate is applied in the first growing season (about 6 weeks after germination). The trees that were prescribed by the University for Re-vegetation are as follows:

- Umbrella thorn;
- Scented thorn;
- Knobthorn;
- Buffalo thorn;
- Marula;
- Brack thorn (ankle thorn);
- Blue thorn;
- Karoo thorn;
- Camel thorn;
- African wattle;
- Monkey thorn;
- Hook thorn; and
- Mountain karee.

As time progressed the recommendations were modified by trial and error to the current method. The fertiliser mixture now consists of 50% LAN and 2:3:2 (22) Zn. This mixture is applied after the three or grass is planted to prevent the chemicals from burning the seedlings. Only Rhodesian grass is planted. No growth medium is used as it does not seem necessary.

The tree species list has been adapted and more tree species is being added. The mine cultivates its own trees in a nursery. The current species used is listed below:

- Umbrella thorn;
- Scented thorn;
- Knobthorn;
- Monkey thorn;
- Mountain karee;

- Leadwood;
- Jacket plum;
- Baobab;
- Weeping wattle;
- Transvaal red balloon;
- Karoo thorn;
- Camel thorn;
- Buffalo thorn;
- Brack thorn (ankle thorn);
- Blue thorn;
- Tamboti;
- Red ivory;
- Large –leaved rock fig;
- Common wild pear; and
- White seringia.

The process followed for re-vegetation:

1. Two trees and two tufts of grass are planted in every moonscape on the slope;
2. On a level surface Rhodesian star grass and trees are planted 6 m apart in the furrows created by the bulldozer;
3. After the vegetation is planted on the flat surfaces and in the moonscapes it is watered with 5 l of water for the next 3 weeks or until enough rain has fallen; and
4. The same fertiliser mixture is applied to each plant after a one year period.

This procedure will be applied mainly to level surfaces and WRDs of which the slopes have been reduced. All re-established vegetation will be monitored until it has established itself and shows ecologically dynamic development.

The slimes dams are covered with natural grass, reeds, water plants, bulrushes and trees. The vegetation appears denser here than in the immediate vicinity. The dam walls show little signs of erosion. Currently the slopes of the slimes dams have been rehabilitated to between 20º and 30º. Natural vegetation has been allowed to grow back onto the slimes dams. Due to the nature of the material limited erosion of the side walls take place. Based on historical evidence, natural vegetation settles on the side slopes within a very short period. Due to a lack of topsoil (See soil assessments) no topsoil is available for revegetation of side slopes therefore the side slopes are revegetated making use of natural occurring vegetation.

The flat surfaces of the dumps, the shaped sections on which grasses have been planted and the areas where natural grasses have established, can offer good grazing for animals. As the animal life in the area plays an extremely important role in fertilization, dissemination of seeds and the creation of microhabitats, the presence of this component is essential. Thabazimbi Iron Ore Mine is in the fortunate position of being located in a region where this component is in fact present. Germination tests are done to determine ways to use the seed mixture to get the grass established on the WRDs.

5.3.1.2 Sloping

To assist with the rehabilitation process the initial actions required relate to the sloping of the WRDs. The sloping of the WRDs is done as follows:

Category three (3) WRDs can be classified into two types namely:

1. Type 1 – short slope WRDs are formed with benches between 10 m and 15 m (vertical height); and
2. Type 2 – long slope WRDs are formed when waster rock dumps cannot be tipped with benches of between 10 m and 15 m (vertical height).

The type 1 WRDs are rehabilitated by reducing almost the entire 35° slopes to between 18° and 24° by moving the crest of the WRD back towards the mountain. Moonscapes are then created on these flatter slopes with a bulldozer and vegetated.

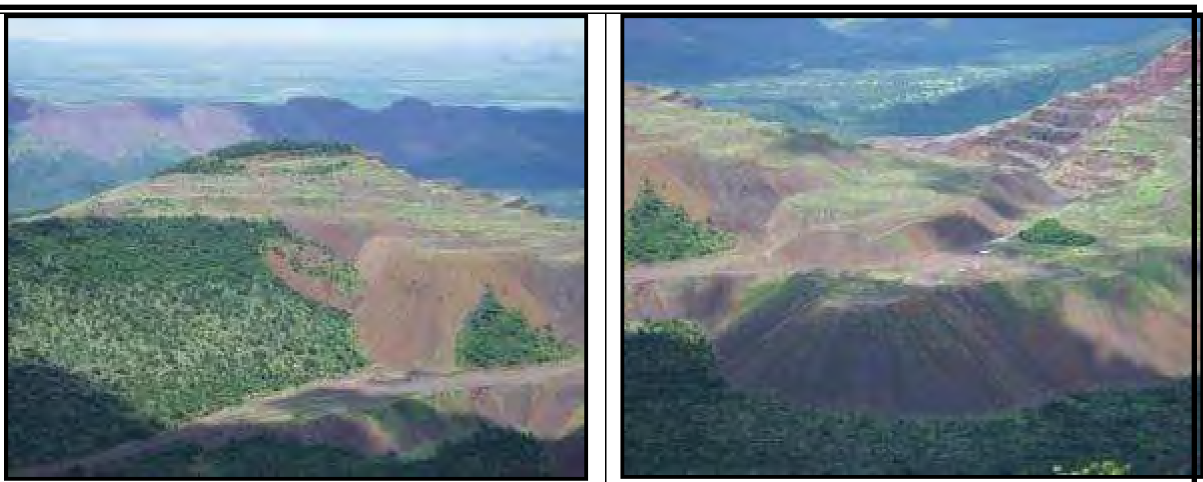
Type 2 WRDs are rehabilitated by reducing the top portion of the WRD slope (slope at 35°) to between 18° and 24° by moving the crest of the W RD back towards the mountain. Moonscapes are then created on these flatter slopes with a bulldozer and vegetated. The lower part of the WRD slope will remain at 35° due to the natural angle of this material. This results in this portion not being re-vegetated. The mine will try to find a practical, safe, cost effective way to re-vegetate these portions of the waste of the WRDs

The moonscapes not only serve the purpose of providing the vegetation with a growth area and collecting runoff rainwater for the plant but also help prevent erosion due to water runoff. Flat surfaces are ripped 30 – 50 cm deep with a bulldozer. The furrows are ± 6 m apart. Furrows are ripped rectangular to the slope to prevent soil erosion. The flat surfaces are vegetated.

Slimes dams will be shaped to prevent surface water ponding therefore natural drainage to occur.

5.3.1.3 Demolition of Structures

As part of concurrent rehabilitation unused and unwanted structures will be demolished prior to closure. As per permission received from LEDET, building rubble can be buried in close proximity to the original structure after all hazardous waste has been removed and appropriately disposed. The disturbed area will then rehabilitated as per current practice for sloped surfaces, i.e. ripping, sloping and planting.



Donkerpoort West re-vegetation

Disturbed areas with established vegetation

Figure 51: Re-Establishing of Vegetation		
Client: Thabzimbi Mine	Date: December 2010	SHANGONI Management Services (Pty) Ltd
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WRDs with long and short slopes

Vegetated moonscapes on reduced slopes

Shorter slopes

Long slope

Slope reduced to a 20º angle

Mechanically reducing angle of slop

Figure 52: Sloping of WRD's

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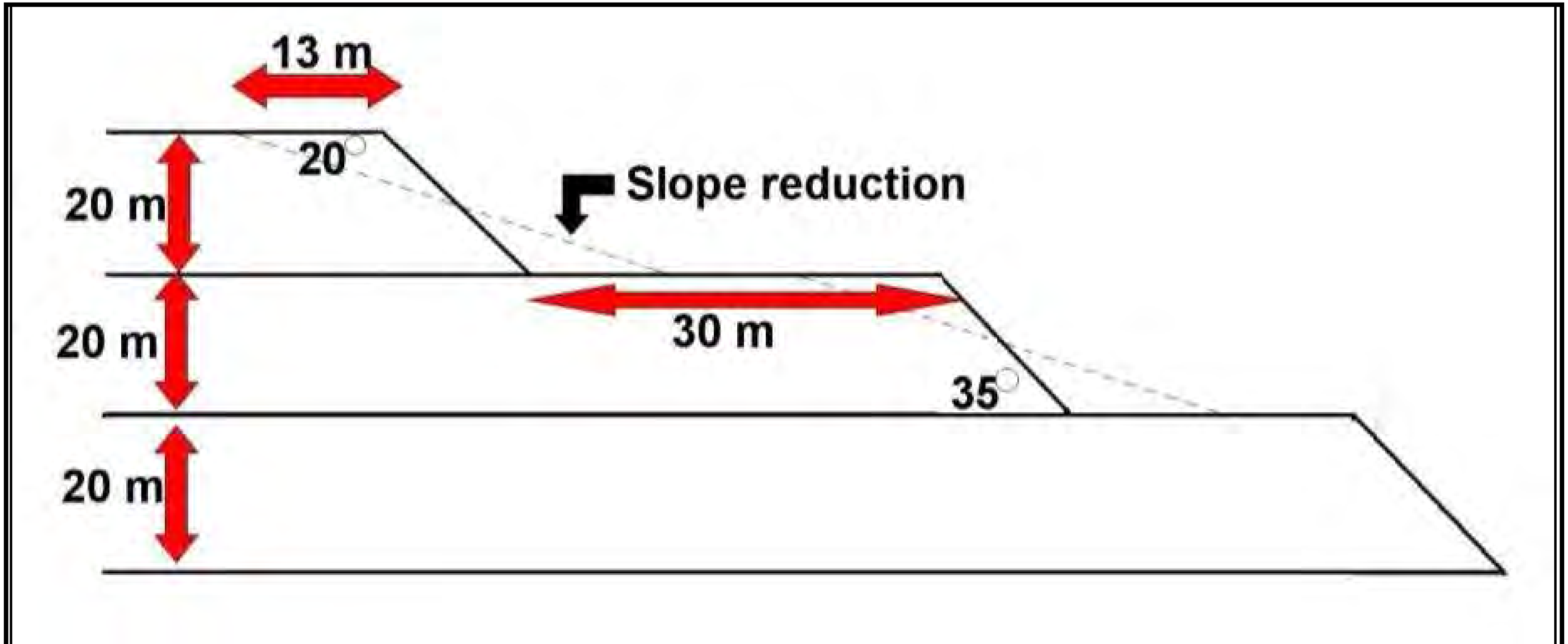

Figure 53: Typical example of a Waste Rock Site (Example 1)		
Client: Thabazimbi Mine	Date: December 2010	
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr	

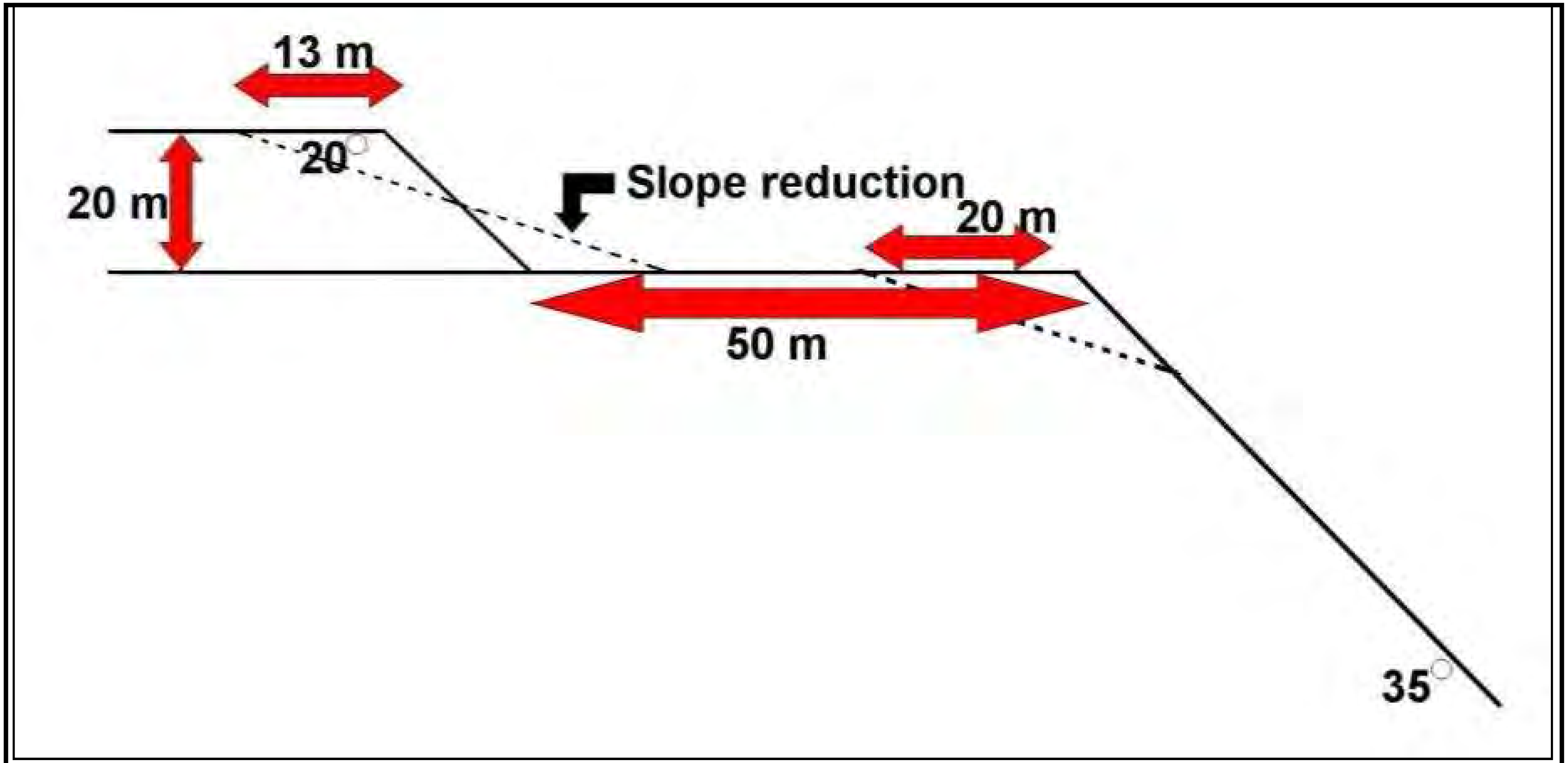

Figure 54: Typical example of a Waste Rock Site (Example 2)

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5.3.2 Operational Procedures and Standards

5.3.2.1 Non-Mineral Waste

Waste on the mine is managed according to the waste management procedure (TZ-PROMW001). The different waste streams and the disposal method are identified in the procedure as well as the requirements of temporary storage areas.

A detailed waste assessment has been conducted whereby all waste streams on site had been identified and the waste management procedure (TZ-OPR-MW-001) was reviewed to reflect the observations made in the waste assessment. The verification of the effective implementation of the waste management procedure takes place during inspections and internal and external audits. The main waste types identified were the following:

5.3.2.1.1 General Waste

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.).

5.3.2.1.2 Hazardous Waste

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.).

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

5.3.2.1.3 <u>Recycling</u>

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. Wastes that must be recycled on the mine are:

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

The procedure will be expanded to provide for the other management principles as defined by DWA. All the findings in the report will be investigated and corrective actions taken where applicable.

5.3.2.1.4 Demarcated area

Demarcated area is the area that has been identified for the storage of waste material. This area is indicated by a sign and has to comply with the relevant legislation for the storage of waste.

Currently all waste is disposed off site. General waste is disposed at the municipal general waste site. Hazardous waste is stored temporarily at the Total area prior to being removed by a recognised waste disposal company and disposed at a licensed waste disposal facility.

Appropriate records of waste disposal are obtained and kept at the responsible areas. No burning of waste takes place, which limits the potential of air pollution. The explosive packaging is burned but this is done under an exemption obtained from CAPCO in 2004.

It is planned to comply with the Polokwane declaration of waste whereby a certain level of waste reduction is envisaged. To ensure that this is achieved changed are being implemented such as designing a central waste separation area to increase the recycling opportunities.

5.3.2.2 Mineral Waste

5.3.2.2.1 Mine Residue Deposits

Part of the mining process produces large volumes of waste rock which is disposed on the slopes of the mountains. This alters the topography of the area. By applying tested rehabilitation practices the sloping of these WRDs minimises the effect the mining activity has on the topography. Additional re-vegetation practices also contribute to minimising the effect on the topography in the area.

5.3.2.3 Hazardous Substances Procedures

5.3.2.3.1 Storage

1. All wastes should be appropriately stored on site in accordance with the waste procedure.
2. Supervisors are responsible for ensuring that materials used on their sites are adequately stored in order to prevent accidental spillage and release.
3. All oils, fuels and chemicals in containers over 205 l (a drum) are to be stored in bunded containment.
4. A MSDS must accompany any chemical supplied. If a MSDS does not accompany the delivery, contact the supplier to obtain one.

5.3.2.3.2 Delivery

1. Supervisors are responsible for ensuring that a member of mine supervises deliveries at all times.
2. Tanks and containers should be labelled with the nature and volume of their contents.

3. Levels should be checked before delivery to prevent overfilling.

5.3.2.3.3 Spillages

1. Any oil, diesel, petrol or hazardous chemical spill, must be reported as an environmental incident (by any employee) to KGB or Donkerpoort control.
2. The person that first noted the spill, and or the person responsible for the spill, must take steps to prevent the spill from spreading if possible.
3. The correct personal protective equipment (hereafter referred to as PPE) must be worn when handling spilled chemicals as required by the MSDS.
4. Once contained, the spill should be cleaned up in a manner appropriate to the substance spilled and the surface on which the spillage occurred.
5. Consult the MSDS to determine the toxicity of the substance.
6. Preventative measures must be taken to prevent the spilled substance from contaminating water sources, e.g. storm water, rivers etc.
7. If harmful substances, like oil, fuel or lubricant, are spilled into water the contaminated water must be contained and pumped to where it can be either rectified or correctly disposed of.
8. All equipment to be used in case of a spill must be available at the area where the substance is stored and regularly used.
9. All areas at Thabazimbi Mine that make use or store acids should have acid spill kits available for attending to acid spills.
10. These acid spill kits should be checked on a monthly basis to ensure that the spill kit is complete.

5.3.2.3.4 Batteries

<u>Receiving and dispensing of batteries</u>

1. The correct PPE must be worn during the loading and offloading of batteries as indicated in the CTI (Critical Task Inventory).
2. Old batteries must be handed in before new batteries may be issued.
3. Monitoring of issuing of new batteries and receiving of batteries will be controlled and recorded by the clerk at Diesel Electric.

<u>Handling of batteries</u>

1. During the handling of batteries the person handling the batteries is responsible to ensure that there are no visible cracks in the battery casing, or any leakage from the batteries.
2. Should there be a crack or any leakage; the battery must be placed in an area where the spillage can be contained.
3. Should a battery fall or break while being transported and causes a spillage, the spill must be retained and managed according to the spill management procedure.
4. The correct PPE must be worn during the handling of new and used batteries

<u>Storage of batteries</u>

1. Batteries must be stored in a demarcated area that is well ventilated and easily accessible.

2. New / old batteries must be stored in plastic containers. These containers must have an effective capacity to contain the spillage and prevent pollution.
3. The maximum amount of batteries that may be placed in a container must not exceed the volume of the batteries to be placed in the container.
4. The demarcated area must be covered with a roof to prevent rainwater from entering the area.
5. The demarcated area must be well ventilated to prevent the possibility of emissions building up and resulting in a potential fire hazard.
6. Areas that can be used for the storage of batteries must clearly have a sign posted to indicate that batteries may be stored there.
7. Temporary storage of batteries must be done in an area where the spillage of battery acid can be contained.
8. The correct PPE must be worn during the handling of new and used batteries.
9. Should spillage of battery acid occur, the spill should be treated in accordance with the spill management procedure.

Disposal of batteries

1. Used or old batteries will be returned to Diesel Electric for final disposal. New batteries are only issued by Diesel Electric once the old battery is returned ensuring optimal recycling of old batteries. Supply Chain Management disposes used/old batteries. Supply Chain Management will file all electronic gate releases for future reference.

5.3.3 Emergency Procedures

Environmental emergencies are managed via an EMS procedure and various operational procedures on the mine. These procedures form part of the integrated SHE management system implemented on the mine. Refer to **Table 44** for the emergency procedures.

Table 44: Emergency Procedures

PROCEDURE NAME	REFERENCE NUMBER
Procedure for emergency preparedness and response	TZ-SPR-MW-009
Fire	TZ-OPR-MW-013
Movement of WRD's	TZ-OPR-MW-022&24
Snake bites	TZ-OPR-MW-041
Radioactive	TZ-OPR-MW-042
Spillages of chemicals	TZ-OPR-MW-003
Off-Site Emergencies and Crisis Management	TZ-OPR-MW-076

Emergency drills are scheduled on a regular basis. Subsequent to drills, post mortem meetings are held to determine whether improvement or the revision of the procedure is required.

The emergency equipment is regularly maintained to ensure the effective functioning of the equipment in the case of an emergency.

CHAPTER 6: AUTHORISATION PROCESS

6.1 Application Timeframe

Considering the fact that this document serves the purpose of updating the current approved EMPr the time frame for approval of the revised document would be expected to be June 2011. The document is submitted in December 2010. Prior to submitting the EMPr ESR's have been submitted for various changes over the last 5 years. Based on the EMPr PAR it has been highlighted that the EMPr must be updated.

6.2 Process Followed

6.2.1 Application

This document is a review of the previous EMPr that was approved in 2005. Since 2005 various activities have changed and based on the last PAR it was decided to review the EMPr. In addition to catching up with some changes the document has also been reviewed to include proposed future developments. These developments have been in various phases over the last few years (conceptual, pre-feasibility and feasibility phase) and would require approval from DMR. Where necessary, National Environmental Management Act, 2002 (No. 28 of 2002), hereafter referred to as NEMA, was followed to obtain approval for listed activities.

6.2.2 Submission of the Scoping Report

In consultation with the Polokwane DMR (Limpopo) dated the 12th March 2010 it was agreed that an ESR and an EMPr for Thabazimbi Mine, and has to be submitted to incorporate the amendments made that were identified in the two ESR's that were submitted to the DMR and to LEDET.

The titles of the ESR's were as follows:

1. Phoenix ESR / EIA, dated April 2008
2. Bioremediation ESR / EIA, dated June 2008
3. ESR for the review and updating of EMPr dated November 2010

As per the letter titled: "Comments with regard to the amendment ESR's submitted by SIOC (Pty) Ltd on the Farm Grootfontein 352 KQ and others, situated in the Magisterial District of Thabazimbi, Limpopo Region" received from the DMR on the 25th March 2010 (LP 30/5/1/3/2/1 (45) EM and (47) EM). The Regional Manager requested that the following information must be adequately captured in the EMPr:

1. A detailed itemization assessment of the total liability of the mine for both existing operation as well as for the proposed development project.
2. Any shortfall must be addressed in the form of bank guarantee or cash deposit

3. A possible impact and mitigation measures on the heritage status of the area must also form part of the amendment EMPr

Therefore, an updated ESR for environmental authorisation under the MPDRA was submitted to the Polokwane DMR (Limpopo) dated the 30th November 2010.

6.2.3 Submission of Environmental Impact Assessment Report and Environmental Management Programme

The final revision Environmental Impact Assessment Report (hereafter referred to as EIAR) and EMPr was submitted to the Polokwane DMR (Limpopo) dated the 24th December 2010.

6.2.4 Submission of the IWULA and IWWMP

The IWULA and IWWMP was submitted to DWA in 2007, additional information was submitted to DWA in 2010 and a License in terms of Chapter 4 of the National Water Act, 1998 (Act No. 38 of 1998), hereafter referred to as NWA, was received on the 1st of October 2010, License No. 26032123.

6.2.5 Submission of Waste License

Draft to LEDET at end January 2011. Final BAR and waste licence application was submitted to LEDET on 10 June 2011. Comments from LEDET have been received and will be dealt with accordingly.

6.3 Public Participation Process

A Public Participation Process (hereafter referred to as PPP) was conducted as part of the Environmental Scoping process (which forms part of the EIA Process), to gather information from the community and organs of state that could ultimately affect the decision-making process concerning the planning, construction and Operational Phases of the proposed new projects on the mine. The communities and public have been identified as I&AP’s. The I&AP’s have been given the opportunity to participate in this process and their comments, whether positive or negative, will influence the decision of the Authorities and the developer’s final actions.

The PPP aims to enlighten the public on the positive and negative aspects that the proposed new projects will have on their immediate surroundings. Negative comments and objections received from I&AP’s prompt the applicant (Thabazimbi Mine) to enact change in their proposed course of action. The applicant is compelled to mitigate to an acceptable status the significant impacts, as well as consider suitable alternatives as identified during the process.

6.3.1 Objectives of the Public Participation Process

The PPP has the following objectives:

1. To inform I&AP’s as well as all organs of state of the proposed development;

2. To provide an opportunity for I&AP's and organs of state to raise environmental issues/concerns and make suggestions;
3. To promote transparency and an understanding of the project and its consequences; and
4. To serve as a structure for liaison and communication with I&AP's and organs of state.

To summarise, the objective of the ongoing PPP is to promote openness and transparency concerning the proposed new projects during the length of the project. The process should by no means be regarded as a vehicle to temper opposition or objections. Any conclusions agreed upon must be socially, financially and technically acceptable and feasible in order to meet the requirements of both the NEMA and the vision of the applicant.

6.3.2 The Guidelines Followed for the Public Participation Process

The PPP for this project was conducted by Shangoni, and undertaken strictly according to the Regulations in Chapter 6 of the NEMA.

6.3.3 Public Participation Process Followed

The following PPP was conducted for the proposed new projects:

- Identification of key I&AP's (including all adjacent landowners);
- Notification of key I&AP's;
- Placement of a press notice in 'Die Kwêvoël' Newspaper, informing the public of the process;
- Placement of On-Site Notices;
- Public Meetings;
- Registering I&AP's;
- Receiving feedback from I&AP's;
- Addressing comments and questions received from I&AP's;
- Identification of key Organs of State (stakeholders);
- Notification of Organs of State;
- Organs of State Meeting;
- Receiving feedback from Organs of State;
- Addressing comments and questions received from Organs of State; and
- Issuing Registered I&AP's and Organs of State with ESR's.

6.3.3.1 Identification of Key Interested and Affected Parties

I&AP's are defined in the MPRDA as a natural or juristic person or association of persons with direct interest in the proposed or existing operation or who may be affected by the proposed or existing operation. This definition is further described by NEMA to include any Organ of State that may have jurisdiction over any aspect of the operation. For this EMPr, I&AP's are divided into Organs of State and all other I&AP's.

The identification of all key I&AP's was done by using the Thabazimbi Mine I&AP database. Refer to **Table 45** for a complete list of all I&AP's identified for the proposed new projects sites. Please note, this list is from 2005 to 2010.

Table 45: Interested and Affected Parties for Proposed Three Scoping Reports

CONTACT PERSON	COMPANY
C. Aspelling	Kumba: Mining
D. Azar	Hoërskool (High School) Frikkie Meyer
T. Benade	NG Church
W. Bezuidenhout	Chairman - Kamer van Koophandel
Dr Blignaut	Docter
A. Boshoff	A.P. church
B. Boshoff	Adjacent Landowner
E. Botha	Ewaldtie
E. Botha	Contractor
M. Brink	Thabazimbi Christian School
B. Bronkhorst	Adjacent Landowner
H. Bruze	Adjacent Landowner
D. Burger	Financial Manager – Kumba
Dr Buys	Docter
J. Coetzee	Adjacent Landowner
M. Coetzee	Adjacent Landowner
W. de Clercq	Adjacent Landowner
Dr de Kock	Docter
J. de Kock	Amandelbult Environmental Coordination
R. De Villiers	Kumba
B. de Wet	Adjacent Landowner
W. Diedericks	Mine Manager – Kumba
Dr Doevendans	Docter
J. du Buys	Adjacent Landowner
A. Du Plessis	Head: MB Ing – Kumba
Dr du Plessis	Docter
S. Enslin	AGS Church
M.S.A. Erasmus	Adjacent Landowner
M. Farren	Anglo Platinum
F. Few	Adjacent Landowner
P. Fuchet	Rhino Andolosiet Mine
N. Funda	Park Head - Marekele
D. Gonsalves	Northam Platinum
B.J. Greeff	Supt - SAPS
G. Greer	Kumba Project Manager
W. Grimes	Adjacent Landowner
J. Grobler	Grootfontein
L Harmse	Kumba Project Phoenix
G. Hattingh	Adjacent Landowner
H. Hattingh	Env Manager - Kumba
P. Human	Adjacent Landowner

CONTACT PERSON	COMPANY
H. Human	Adjacent Landowner
C.C. Holtzhausen	Manager: OBP - Kumba
L. Jacobs	Kwêvoël Newspaper
G.G. Jacobs	Employee - Kumba
P.I. Janse van Rensburg	Adjacent Landowner
H. Jones	Rhino Andalusite Mine
D. Jooste	Adjacent Landowner
C. Klopper	Adjacent Landowner
Kok (Ds)	
D. Lambrecht	Adjacent Landowner
B. Le Roux	Employee - Kumba
G. Lewis	Northam Platinum
Loods (Ds)	Nederduits Hervormde Kerk
L. Makau	Mabogopedi High School
Dr Marais	Docter
T. Maree	Adjacent Landowner
M. Milner	Adjacent Landowner
M. Molekoa	Mabogopedi School
A. Momberg	Adjacent Landowner
J. Mpofu	Employee – Kumba
J. Mpshane	Ysterberg Primary School
L.T. Mpyane	Ysterberg Primary School
H. Mugwabana	Marakele National Park
K. Myburg	Adjacent Landowner
H. Pauw	Die Kwêvoël Newspaper
H. Pelser	Adjacent Landowner
C. Pelser	Adjacent Landowner
P. Pieterse	Phoenix Project Member - Kumba
K. Prinsloo	Head: Management Acc – Kumba
M.F. Reinecke	Adjacent Landowner & Transvaal Agricultural Union
P. Rheeders	Adjacent Landowner
N. Roets	Adjacent Landowner
H. Schutte	Adjacent Landowner
M. Schrenk	Adjacent Landowner
P. Scruton	Council member Manufacturing/commerce
L. Sithole	Rhino Mine
K. Stassen	Adjacent Landowner
F. Steenkamp	Adjacent Landowner
G. Swanepoel	Adjacent Landowner
W. Taylor	RPM Swartklip
J. Trollope	Adjacent Landowner
P. Trollope	Adjacent Landowner
F. Uys	RPM Amandelbult
Dr van Hasselt	Doctor
G. van der Walt	Adjacent Landowner
H.T. van der Linde	NH Church

CONTACT PERSON	COMPANY
F. van der Merwe	Adjacent Landowner
D. vd Merwe	Solidariteit
J.P. vd Merwe	Adjacent Landowner
H.P.M. van Rhyn	G Church
W.J.A. van Schalkwyk (Ds)	AP Kerk
P. van Schalkwyk	Adjacent Landowner
M. van Wyk	Employee - Kumba
H.C.P. van Zyl	Resident
T. van Zyl	Adjacent Landowner
T. Veldsman	Tourism Association
K. Venter	Thabazimbi Primary School
J. Viljoen	Adjacent landowner
	Kgapamadi Primary School
N. Williams	RPM Swartklip

6.3.3.2 Notification of Interested and Affected Parties

Notification of I&AP's took place for all three ESR's followed as mentioned in **Section 6.2** above. These notifications will be dealt with separately for each ESR.

6.3.3.2.1 Project Phoenix

Notifications to I&AP's included Background Information Documents (hereafter referred to as BID) as well as an invitation to attend the public meeting. The BID's and the invitations for the public were distributed to I&AP's in November 2006 and October 2010. Refer to **Figure 55** and **Figure 56** for a copy of the BID and the invitation to the public meeting that were send to the I&AP's in 2006 and **Figure 57** for a copy of the invitation to the public meeting that were send to the I&AP's in 2010.

6.3.3.2.2 Bioremediation

Notifications to I&AP's included an invitation to attend the public meeting. The invitations for the public were distributed to I&AP's in April 2008. Refer to **Figure 58** for a copy and **Figure 59** for proof of the invitation to the public meeting that were send to the I&AP's.

6.3.3.2.3 Review and Updating of Environmental Management Programme

Notifications to I&AP's included BID's. The BID's were distributed to I&AP's in June 2010. Refer to **Figure 60** and **Figure 61** for a copy of the BID that were send to the I&AP's. Note, only one of the BIDs senT is included in this document. Invitations were senT to all I&AP's. Also refer to **Figure 62** for proof of the BID's and invitations sent to I&AP's.

SCOPING PUBLIC NOTIFICATION DOCUMENTATION

THABAZIMBI IRON ORE MINE

PROJECT PHOENIX

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
SCOPING PHASE

BACKGROUND INFORMATION DOCUMENT

NOVEMBER 2006

1. **BACKGROUND AND LEGAL REQUIREMENTS**

In terms of the Mineral and Petroleum Resources Development Act, 28 of 2002 (MRDA), promulgated on 1 May 2004, Thabazimbi Iron Ore Mine ("The Mine") has to submit and EIA and scoping report to the Department of Minerals and Energy in the event of changes to the existing mining operations that could result in detrimental impacts to the environment.

- New activities which include the following
  1. Proposed bridge across the R510
  2. New conveyors replacing the old conveyor system across the R510
  3. New slimes dam to handle the capacity required for the expansion of the current mining operations, and

Thabazimbi Iron Ore Mine is in the process of applying for an Integrated Water Use Licence in terms of Chapter 4 of the National Water Act, 1998 (Act 36 of 1998). A review of the Integrated Water Use Licence Application is being undertaken.

The mine will be undertaking the following processes as part of the proposed Project Phoenix expansion:

- Any persons wishing to register as an interested and affected party must send their name, contact information and interest in the matter to (Shangoni Management Services).
- Any interested and affected parties are welcome to send their queries or complaints to the Department of Water Affairs and Forestry North West Regional Offices at tel: 012- 253 1093 and fax: 012 253 1905 in terms of the Water License Application.

The above processes will partly be informed by:

(1) Environmental Impact Assessments to be conducted;

the results of which will be used to

(2) Amend the mine's Environmental Management Programme, closure plan, rehabilitation plan and financial provision.

(3) Review of the mine's Integrated Water Use License Application

2. **LOCATION OF MINING ACTIVITIES**

The mine is situated in the Waterberg District Municipality of the Limpopo Province, some 220km north-west of Pretoria and approximately 140km south of Lephalale (Ellisras).

3. **BRIEF DESCRIPTION OF EXISTING MINING ACTIVITIES**

Mining authorizations are currently held on five (5) farms, i.e. Donkerpoort 344KQ, Wachteenbietjiesdraai 350KQ, Kwaggashoek 345KQ, Buffelshoek 351KQ and Grootfontein 352KQ. Iron ore is mined from multiple open cast operations by means of drilling and blasting, loading and hauling, various crushing stadia, screening, cyclone and drum beneficiation. Two types of ore are produced, i.e. Lump ore (-32mm +8mm), which constitutes some 54% of total annual production, and Fine ore (-8mm), making up 46% of total annual production of total. Total resources are estimated at about 93Mt of which some 20Mt is defined as reserves. Current annual production is calculated at 2.5Mt. The current work force totals 878 permanent Kumba staff and approximately 400 contractors.

The current Life of Mine (LOM) is stated as Five (5) years and various projects aimed at extending the economic LOM is currently underway.

4. **DESCRIPTION OF PROPOSED EXPANSION (PROJECT PHOENIX)**

It is proposed that the bridge will span the R510, Rooikuilspruit and the railway line and will link the Donkerpoort area with the Van der Bijl area. This is proposed to prevent vehicles crossing the R510.

The new conveyor system will also span the R510 and Rooikuilspruit and will replace the existing conveyor system. The new system will convey larger volumes.

The new slimes dam must be constructed to ensure that adequate capacity is available for the disposal of fines generated from the new Phoenix plant as well as to cope with the current demand from the existing plant.

5. **SCOPE OF EIA**

The Environmental Impact Assessment (EIA) process will be conducted in two phases i.e. a Scoping phase and an update of the current approved EMP. The first phase consists of required public consultation activities, which are undertaken to inform Interested & Affected Parties (I&AP's) of the proposed activities and record their (I&AP's) issues, comments and/or concerns. Key dates for the Scoping Phase Public Consultation process are given below (section 6).

The EIA scope of study includes:

- New activities as described under section 4,
- All areas of study identified by specialist studies; and
- All public consultation activities to be conducted for the EIA, and the Integrated Water Use License Application processes.

6. **KEY DATES FOR SCOPING PHASE PUBLIC CONSULTATION**

- **7 November 2006:** Key Stakeholders Meeting
- **7 November 2006:** Comment Period Commences
- **20 November 2006:** Public Meeting (Cinema Hall/Elsakoop Saal)
- **11 December 2006:** Closing date for public comments

7. **INVITATION TO PARTICIPATE**

Should you wish to raise any comment or concern regarding the proposed project, register as I&AP and/or inform us of any other I&APs and/or stakeholder who should be notified, please contact <u>Jan Nel</u> before the Scoping Phase comment closing date **<u>(11 December 2006)</u>**, at:

Shangoni Management Services (Pty) Ltd
PO Box 12988
Clubview
0014
Tel: (012) 348 0272
Fax: (012) 361 6191
Cellular: (082) 379 5935
E-mail: jan@shangoni.co.za

KUMBA RESOURCES

<u>Figure 55: Copy of the BID for Project Phoenix ESR - 2006</u>

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

THABAZIMBI IRON ORE MINE

ENVIRONMENTAL IMPACT ASSESSMENT

PUBLIC NOTICE

Notice is hereby given of the Environmental Impact Assessment Process in terms of the Mineral and Petroleum Resources Development Act, (Act 28 of 2002), and an Integrated Water Use License Application in terms of Chapter 4 of the National Water Act 1998 (Act 36 of 1998), being conducted at the Thabazimbi Iron Ore Mine.

Interested and Affected Parties (I&AP's) are invited to attend a public meeting at the **Auditorium Thabazimbi** on **Monday 20th of November 2006 at 18:00**.

Applicant: Thabazimbi Iron Ore Mine

Location: The mine is situated in the Waterberg District Municipality of the Limpopo Province, some 220km north-west of Pretoria and approximately 140km south of Lephalale (Ellisras). Mining authorizations are held on five (5) farms, i.e. Donkerpoort 344KQ, Wachteenbietjiesdraai 350KQ, Kwaggashoek 345KQ, Buffelshoek 351KQ and Grootfontein 352KQ.

Environmental Consultants: Shangoni Management Services (Pty) Ltd

Contact Details: PO Box 12988, Clubview, 0014
Tel: (012) 348 0272
Fax: (012) 381 8191
Mobile: (082) 379 5935
E-mail: jan@shangoni.co.za

Date of Notice: 10 November 2006

INVITATION TO PARTICIPATE

Should you wish to raise any comment or concern regarding the proposed project, register as I&AP and/or inform us of any other I&APs and/or stakeholder who should be notified, please contact **Jan Nel** before the Scoping Phase comment closing expires on **11th December 2006**. A Background Information Document is also available from the Consultant.

SHANGONI

THABAZIMBI YSTERERTSMYN

OMGEWINGSIMPAKSTUDIE

KUMBA RESOURCES

PUBLIEKE KENNISGEWING

Kennis word hiermee gegee dat Thabazimbi Ystererstmyn besig is met 'n Omgewings Impak Studie in terme van die Minerale en Petroleum Hulpbronne Ontwikkelingswet, (Wet 28 van 2002) en 'n aansoek vir 'n geïntegreerde water verbruike lisensie in terme van die Nasionale water wet (Wet 36 van 1998).

Alle geïnteresseerde en/of geaffekteerde partye word uitgenooi na 'n openbare vergadering wat gehou sal word in die **Auditorium, Thabazimbi** op **Maandag 20 November 2006 om 18:00**.

Aansoeker: Thabazimbi Ystererstmyn

Ligging: Die myn is geleë in die Waterberg Distriksmunisipaliteit, in die Limpopo Provinsie, sowat 220km noordwes van Pretoria en sowat 140km suid van Lephalale (Ellisras). Mynregte word gehou op vyf (5) plase, nl. Donkerpoort 344KQ, Wachteenbietjiesdraai 350KQ, Kwaggashoek 345KQ, Buffelshoek 351KQ en Grootfontein 352KQ.

Omgewingskonsultant: Shangoni Management Services (Pty) Ltd

Kontakbesonderhede: Posbus 12988, Clubview, 0014
Tel: (012) 348 0272
Fax: (012) 381 8191
Selfoon: (082) 379 5935
E-pos: jan@shangoni.co.za

Kennisgewingdatum: 10 November 2006

PUBLIEKE DEELNAME UITNODIGING

Vir enige kommentaar en/of navrae, of indien u as belanghebbende wil registreer of ons in kennis will stel van ander partye wat 'n belang kan hê, kan u gerus vir **Jan Nel** kontak by bg. kontak besonderhede, vóór die kommentaar periode verstrek op **11 Desember 2006**. Vir meer inligting kan 'n Agtergrondinligting Dokument van die Konsultant aangevra word.

SHANGONI

Figure 56: Copy of Invitation to Public Meeting for Project Phoenix ESR - 2006

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

INVITATION TO PUBLIC PARTICIPATION MEETING

DATE: **20 November 2006**

TIME: **18:00**

VENUE: **Thabazimbi Iron Ore Mine Auditorium**

To: J.P. vd Merwe

Fax. 014 777 1160

In terms of the Mineral and Petroleum Resources Development Act, 28 of 2002 (MRDA), promulgated on 1 May 2004, Thabazimbi Iron Ore Mine has to conduct an EIA with regards to proposed expansions which form part of the proposed Project Phoenix.

The mine will be undertaking the following processes as part of the proposed Project Phoenix expansion:

- New activities which include the following
    - Proposed bridge across the R510
    - New conveyors replacing the old conveyor system across the R510
    - New slimes dam to handle the capacity required for the expansion of the current mining operations,
- Thabazimbi Iron Ore Mine is in the process of applying for an Integrated Water Use License in terms of Chapter 4 of the National Water Act, 1998 (Act 36 of 1998)
- Any persons wishing to register as an interested and affected party must send their name, contact information and interest in the matter to (Shangoni Management Services).
- Any interested and affected parties are welcome to send their queries or complaints to the Department of Water Affairs and Forestry: North West Regional Offices at tel: 012- 253 1093 and fax: 012 253 1905.

The above processes will be partly informed by *(1) an Environmental Impact Assessment to be conducted for the proposed Project Phoenix*, the results of which will be used to *(2) amend the mine's Environmental Management Programme, closure plan, rehabilitation plan and financial provision*. Integral to the EIA is a public consultation process which serves to inform key stakeholders and Interested and Affected Parties of proposed activities and register their issues, comments and/or concerns.

We invite all identified key stakeholders to attend a meeting to inform them of the intended processes and have their issues, comments and/or concerns registered regarding the process. The meeting will be held at the Thabazimbi Iron Ore Mine Auditorium on the 20th of November 2006 at 18:00.

Yours faithfully,

Shangoni Management Services (Pty) Ltd

Jan Nel

Figure 57: Copy of Invitation to Public Meeting for Project Phoenix-2010

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

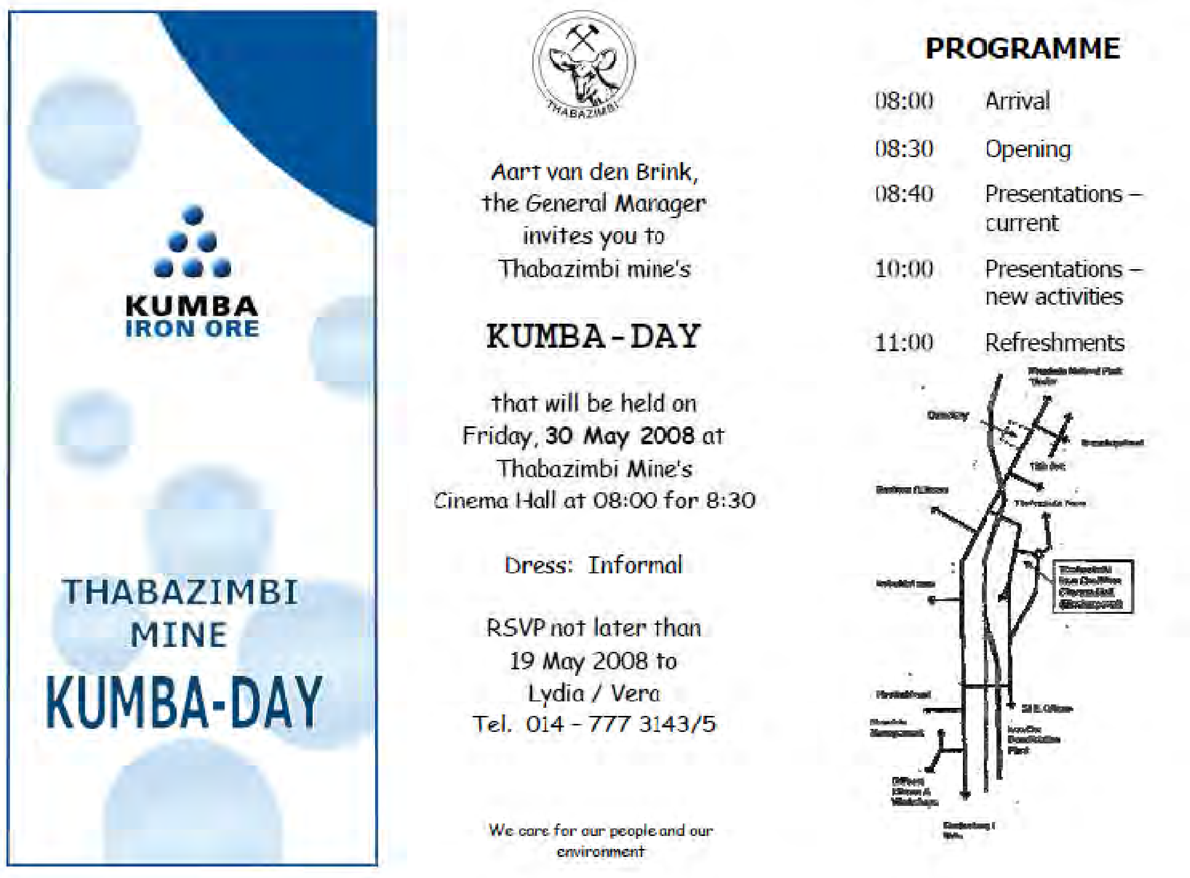


Figure 58: Copy of Invitation to Public Meeting for Bioremediation ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

6.3.3.3 Placement of the Press Advertisement

The placement of press advertisements took place for all three ESR's. These placements will be dealt with separately for each ESR.

6.3.3.3.1 Project Phoenix

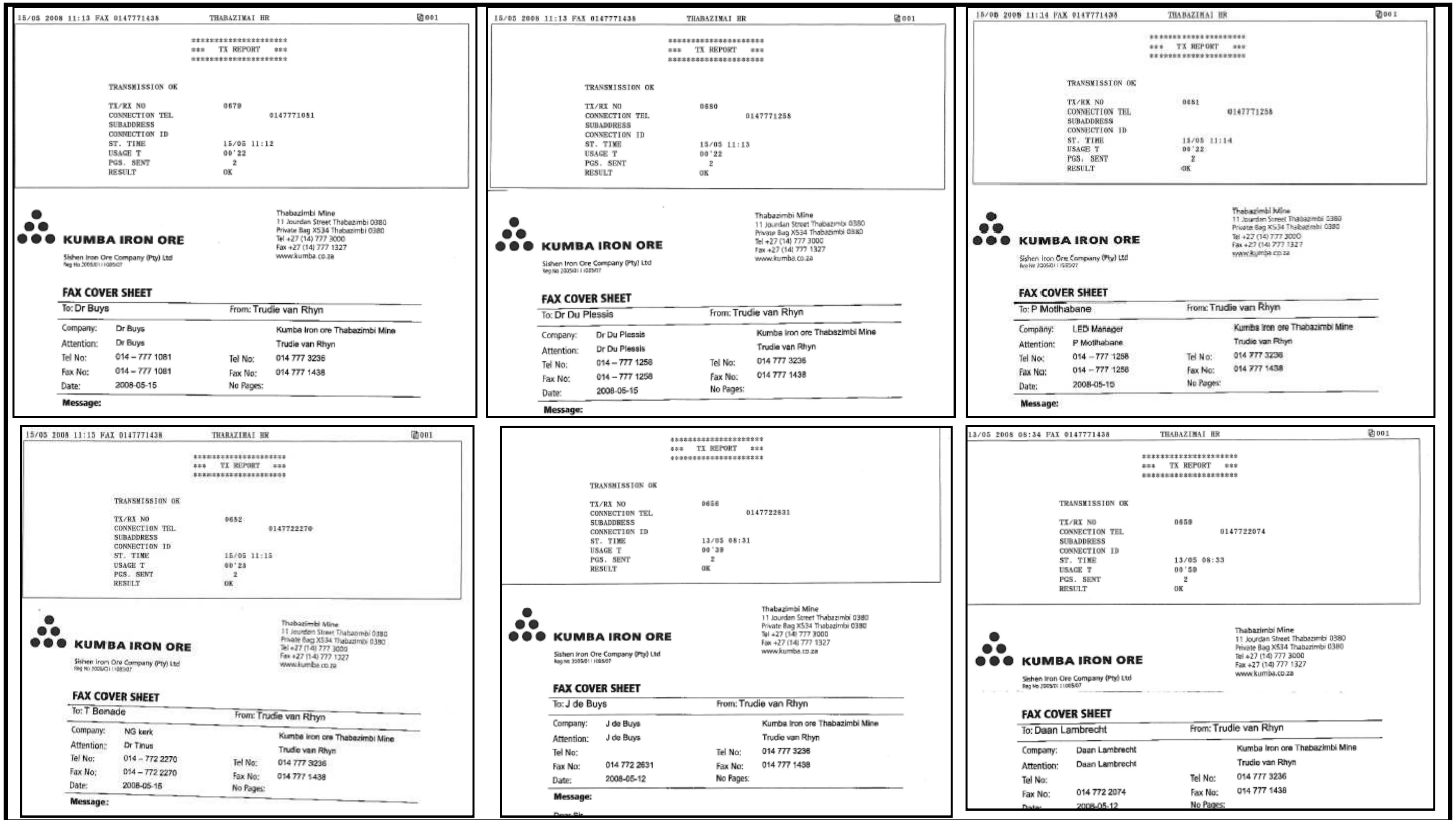
An advertisement was placed in the local newspaper named "Die Kwêvoël" on 15th of October 2010. Refer to **Figure 63** for proof of the placement of the newspaper advertisement.

6.3.3.3.2 Bioremediation

An advertisement was placed in the local newspaper named "Die Kwêvoël" on 16th May 2008. Refer to **Figure 64** for proof of the placement of the newspaper advertisement.

6.3.3.3.3 Review and Updating of Environmental Management Programme

An advertisement was placed in the local newspaper named "Die Kwêvoël" on 4th June 2010. Refer to **Figure 65** for proof of the placement of the newspaper advertisement placed.


15/05 2008 11:13 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0679
CONNECTION TEL 0147771081
SUBADDRESS
CONNECTION ID
ST. TIME 15/05 11:12
USAGE T 00'22
PGS. SENT 2
RESULT OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Dr Buys		From: Trudie van Rhyn	
Company:	Dr Buys		Kumba Iron ore Thabazimbi Mine
Attention:	Dr Buys		Trudie van Rhyn
Tel No:	014 – 777 1081	Tel No:	014 777 3236
Fax No:	014 – 777 1081	Fax No:	014 777 1438
Date:	2008-05-15	No Pages:	

Message:

15/05 2008 11:13 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0680
CONNECTION TEL 0147771258
SUBADDRESS
CONNECTION ID
ST. TIME 15/05 11:13
USAGE T 00'22
PGS. SENT 2
RESULT OK

FAX COVER SHEET

To: Dr Du Plessis		From: Trudie van Rhyn	
Company:	Dr Du Plessis		Kumba Iron ore Thabazimbi Mine
Attention:	Dr Du Plessis		Trudie van Rhyn
Tel No:	014 – 777 1258	Tel No:	014 777 3236
Fax No:	014 – 777 1258	Fax No:	014 777 1438
Date:	2008-05-15	No Pages:	

Message:

15/05 2008 11:14 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0681
CONNECTION TEL 0147771258
SUBADDRESS
CONNECTION ID
ST. TIME 15/05 11:14
USAGE T 00'22
PGS. SENT 2
RESULT OK

FAX COVER SHEET

To: P Motlhabane		From: Trudie van Rhyn	
Company:	LED Manager		Kumba Iron ore Thabazimbi Mine
Attention:	P Motlhabane		Trudie van Rhyn
Tel No:	014 – 777 1258	Tel No:	014 777 3236
Fax No:	014 – 777 1258	Fax No:	014 777 1438
Date:	2008-05-15	No Pages:	

Message:

15/05 2008 11:15 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0682
CONNECTION TEL 0147722270
SUBADDRESS
CONNECTION ID
ST. TIME 15/05 11:15
USAGE T 00'23
PGS. SENT 2
RESULT OK

FAX COVER SHEET

To: T Benade		From: Trudie van Rhyn	
Company:	NG kerk		Kumba Iron ore Thabazimbi Mine
Attention:	Dr Tinus		Trudie van Rhyn
Tel No:	014 – 772 2270	Tel No:	014 777 3236
Fax No:	014 – 772 2270	Fax No:	014 777 1438
Date:	2008-05-15	No Pages:	

Message:

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0656
CONNECTION TEL 0147722631
SUBADDRESS
CONNECTION ID
ST. TIME 13/05 08:31
USAGE T 00'39
PGS. SENT 2
RESULT OK

FAX COVER SHEET

To: J de Buys		From: Trudie van Rhyn	
Company:	J de Buys		Kumba Iron ore Thabazimbi Mine
Attention:	J de Buys		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 772 2631	Fax No:	014 777 1438
Date:	2008-05-12	No Pages:	

Message:

13/05 2008 08:34 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO 0659
CONNECTION TEL 0147722074
SUBADDRESS
CONNECTION ID
ST. TIME 13/05 08:33
USAGE T 00'59
PGS. SENT 2
RESULT OK

FAX COVER SHEET

To: Daan Lambrecht		From: Trudie van Rhyn	
Company:	Daan Lambrecht		Kumba Iron ore Thabazimbi Mine
Attention:	Daan Lambrecht		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 772 2074	Fax No:	014 777 1438
Date:	2008-05-12	No Pages:	

Figure 59: Proof of Invitation to Public Meeting for Bioremediation ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

13/05 2008 08:36 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0660
CONNECTION TEL	0147771829
SUBADDRESS	
CONNECTION ID	BOSVELD MIDAS
ST. TIME	13/05 08:35
USAGE T	01'00
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Paul Scruton — From: Trudie van Rhyn

Company:	Paul		Kumba Iron ore Thabazimbi Mine
Attention:	Paul		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 777 1829	Fax No:	014 777 1438
Date:	2008-05-12	No Pages:	

Message:

13/05 2008 08:39 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0662
CONNECTION TEL	0147723455
SUBADDRESS	
CONNECTION ID	
ST. TIME	13/05 08:38
USAGE T	00'59
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Gys van der Walt — From: Trudie van Rhyn

Company:	Gys		Kumba Iron ore Thabazimbi Mine
Attention:	Gys		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 7723455	Fax No:	014 777 1438
Date:	2008-05-12	No Pages:	

Message:

13/05 2008 08:41 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0664
CONNECTION TEL	0147860467
SUBADDRESS	
CONNECTION ID	
ST. TIME	13/05 08:41
USAGE T	00'26
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: William Taylor — From: Trudie van Rhyn

Company:	William		Kumba Iron ore Thabazimbi Mine
Attention:	William		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 7860467	Fax No:	014 777 1438
Date:	2008-05-12	No Pages:	

Message:

13/05 2008 10:03 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0668
CONNECTION TEL	0147771703
SUBADDRESS	
CONNECTION ID	
ST. TIME	13/05 10:02
USAGE T	00'24
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Morris Mataboge — From: Trudie van Rhyn

Company:	Morris		Kumba Iron ore Thabazimbi Mine
Attention:	Morris		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 777 1703	Fax No:	014 777 1438
Date:	2008-05-13	No Pages:	

Message:

13/05 2008 09:59 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0665
CONNECTION TEL	0147771234
SUBADDRESS	
CONNECTION ID	LS THABAZIMBI
ST. TIME	13/05 09:58
USAGE T	01'15
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Koos Venter — From: Trudie van Rhyn

Company:	Laerskool Thabazimbi		Kumba Iron ore Thabazimbi Mine
Attention:	Koos Venter		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 777 1234	Fax No:	014 777 1438
Date:	2008-05-13	No Pages:	

Message:

13/05 2008 10:01 FAX 0147771438 THABAZIMAI HR 001

*** TX REPORT ***

TRANSMISSION OK

TX/RX NO	0666
CONNECTION TEL	0147771037
SUBADDRESS	
CONNECTION ID	
ST. TIME	13/05 10:00
USAGE T	01'07
PGS. SENT	2
RESULT	OK

KUMBA IRON ORE
Sishen Iron Ore Company (Pty) Ltd

Thabazimbi Mine
11 Jourdan Street Thabazimbi 0380
Private Bag X534 Thabazimbi 0380
Tel +27 (14) 777 3000
Fax +27 (14) 777 1327
www.kumba.co.za

FAX COVER SHEET

To: Dr de Kock / Dr Marais — From: Trudie van Rhyn

Company:	Dr de Kock / Dr Marais		Kumba Iron ore Thabazimbi Mine
Attention:	Pieter		Trudie van Rhyn
Tel No:		Tel No:	014 777 3236
Fax No:	014 777 1037	Fax No:	014 777 1438
Date:	2008-05-13	No Pages:	

Message:

Proof of Invitation to Public Meeting for Bioremediation ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

KUMBA IRON ORE

PUBLIC NOTICE OF APPLICATION FOR A BASIC ASSESSMENT 12/9/11/L285/5

INTRODUCTION:

In terms of the act and Government notice R385 of the regulations in terms of chapter 5 of the National Environmental Management Act 1998, published in Government Gazette 28753 of 21 April 2006, the interested and affected parties are herewith notified of the intent to carry out the following activity:

The following activities will be dealt with under the Waste Act (Act No. 59 of 2008):

CATEGORY AS PER WASTE ACT	ENVIRONMENTAL PROCESS AS PER NEMA	TITLE	LOCALITY	ACTIVITY NUMBER	LISTED ACTIVITY
Category A	Basic Assessment	Storage of waste	Wagteenbietjesdraai 350 portion 1	2	The storage including the temporary storage of hazardous waste at the facility that has the capacity to store in excess of $35m^3$ of hazardous waste at any one time excluding the storage of hazardous waste in lagoons.
Category A	Basic Assessment	Storage of Waste	Donkerpoort 344 portion 10	4	The storage of waste tyre in storage area exceeding $500m^2$
Category A	Basic Assessment	Treatment of waste	Donkerpoort 344 portion 10	12	The remediation of contaminated land

Applicant: Sishen Ore Mine Company

Locations: Tyre storage area & Bioremediation is on the farm Donkerpoort 344 Portion 10. Hazardous waste storage area is on the farm Wagteenbietjesdraai 350 portion 1, Magisterial District Thabazimbi, Limpopo Province

SHANGONI

Figure 60: Copy of the BID for Review and Update of EMPr ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

SHANGONI Management Services (Pty) Ltd

PO Box 74726, Lynnwood Ridge, Pretoria, 0040
42 Ida Street, Lynnwood Glen, 0081, Pretoria, South Africa
Tel: +27 (0) 12 348 0272
Fax: + 27 (0) 12 361 6191
www.shangoni.co.za
info@shangoni.co.za

Registration no: 2002/000002/07

4 June 2010

P.O. Box 5
Thabazimbi
0380

Attention: Boshoff Bossie

Dear Sir,

PUBLIC NOTICE OF APPLICATION FOR AN ENVIRONMENTAL BASIC ASSESSMENTS REFERENCE NUMBER 12/9/11/L285/5

In terms of the act and Government notice R385 of the regulations in terms of chapter 5 of the National Environmental Management Act 1998, published in Government Gazette 28753 of 21 April 2006, the interested and affected parties are herewith notified of the intent to carry out the following activity:

Applicant: Sishen Iron Ore Company

Locations: Tyre storage area & Bioremediation is on the farm Donkerpoort 344 Portion 10. Hazardous waste storage area is on the farm Wagteenbietjesdraai 350 portion 1, Magisterial District Thabazimbi, Limpopo Province

Directors: Jan Nel, Corrie Potgieter, Jacs van Rooy, Brian Hayes

The following activities will be dealt with under the Waste Act (Act No. 59 of 2008):

CATEGORY AS PER WASTE ACT	ENVIRONMENTAL PROCESS AS PER NEMA	TITLE	LOCALITY	ACTIVITY NUMBER	LISTED ACTIVITY
Category A	Basic Assessment	Storage of waste	Wagteenbietjesdraai 350 portion 1	2	The storage including the temporary storage of hazardous waste at the facility that has the capacity to store in excess of 35m³ of hazardous waste at any one time excluding the storage of hazardous waste in lagoons.
Category A	Basic Assessment	Storage of Waste	Donkerpoort 344 portion 10	4	The storage of waste tyre in storage area exceeding 500m²
Category A	Basic Assessment	Treatment of waste	Donkerpoort 344 portion 10	12	The remediation of contaminated land

Environmental Consultants: Shangoni Management Services (Pty) Ltd

Contact Details:

PO Box 74726
Lynnwood Ridge
Pretoria
0040
Tel :(012) 348 0272
Fax: (086) 639 7956
E-mail:leeanne@shangoni.co.za

INVITATION TO PARTCIPATE

Should you wish to raise any comment or concerns regarding the proposed project, register as I&AP and/or inform us of any other I&APs and/or stakeholders, who should be notified, please contact **Lee-Anne Meiring** before the expiry date on **4 July 2010.** A Background Information Document is also available from the Consultant.

Regards

Lee-Anne Meiring
Environmental Consultant

Figure 61: Copy of the BID for Review and Update of EMPr ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

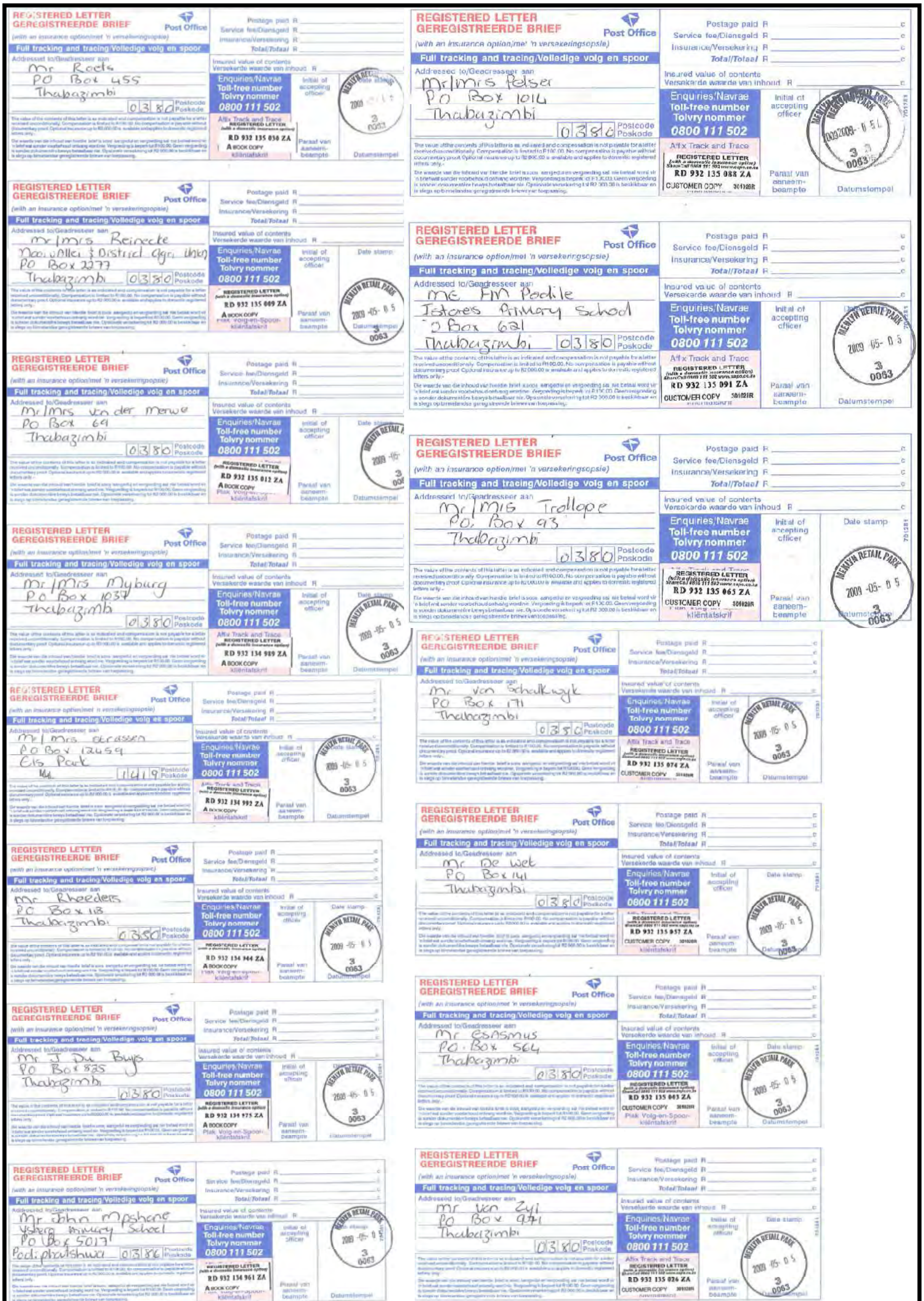


Figure 62: Proof of the BID for Review and Update of EMPr ESR	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Friday 15 October 2010 — Die Kwêvoël — Page 9

Die inhoud van 'n testament

'n Testament moet eerstens verkieslik gebruik word om net jou boedelbates aan enige persoon of instansie van jou keuse te bemaak. Tweedens is dit belangrik om 'n eksekuteur, en indien van toepassing ook 'n trustee, van jou keuse te benoem.

Tambotie Versorgingsentrum Jaarvergadering vir 2010

THABAZIMBI – Die gemeenskap word daaraan herinner dat die vierde Jaarvergadering van die Tambotie Versorgingsentrum volgende Donderdag, 21 Oktober, plaasvind.

Verwoestende brande vernietig ook privaat eiendom

THABAZIMBI – 'n Geskatte oppervlakte van 10 000 hektaar in die Waterberggomgewing, wat nie die Marakele Nasionale Park insluit nie, is sedert Sondag 10 Oktober in die verwoestende brande vernietig nadat weerlig verlede week die veld in die Marakele Nasionale Park op drie plekke aan die brand gesteek het.

Adverteer op: Die Kwêvoël se Eiendommeblad
Kontak die Kwêvoël vir verdere navrae

Die Kwêvoël BERIGTE
ADVERTENSIES THABAZIMBI 014 777 1621
014 777 1621 k/u
NORTHAM-area: Michell 083 741 0116
KROMDRAAI: Rita Marais 014 735 0002

VAKATURE
VOLDAG ADMIN POS
TEL: 014 777-1055
Aansoeke sluit: 22 Oktober 2010

ANGLO AMERICAN — IRON ORE KUMBA IRON ORE LTD — SHANGONI

ANGLO AMERICAN IRON ORE KUMBA IRON ORE LTD
NOTICE OF PLANNED ACTIVITIES WITHIN A MINING RIGHT - PUBLIC NOTICE

In terms of the Act and Government Notice R543 of the Regulations in terms of Chapter 6 of the National Environmental Management Act 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations, published in Government Gazette No. 33306 of 2 August 2010, the Interested and Affected Parties are herewith notified of the intent to carry out the following activities

Due to the changes in the mining process on the mine the following activities amongst others will be dealt with under the Minerals and Petroleum Resources Development Act, Act 28 of 2008:

- Meyermyn Iron.
- Ore Stockpile area.
- New Parking areas at the Plant and Donkerpoort.
- Jood se Dam.
- Power line Jik Plant.

The process involves a Scoping Report and Updating of the Environmental Management Plan of the Mine.

Applicant: Sishen Iron Ore Company

Locations: The proposed activities will be on the farms Wachteenbietjesdraai 350 KQ, Donkerpoort 344 KQ, Buffelshoek 351 KQ, and Kwaggashoek 345 KQ, Magisterial District Thabazimbi, Limpopo Province

INVITATION TO PARTCIPATE
Should you wish to raise any comment or concerns regarding the proposed project, register as I&AP and/or inform us of any other I&AP's and/or stakeholders, who should be notified, please contact **Lee-Anne Meiring** before the expiry date on **15 November 2010**. A Background Information Document is also available from the Consultant. Environmental Consultants: **Shangoni Management Services (Pty) Ltd**
Contact details P.O. Box 74726, Lynnwood Ridge, Pretoria, Tel (012) 348 0272 Fax: (086) 639 7955 Mobile: (082) 456 32 E-mail: leeanne@shangoni.co.za

You are invited to attend our Public Meeting: Date: 21 October 2010 Time: 18:00 Venue: Cinema Hall in Thabazimbi

ANGLO AMERICAN — IRON ORE KUMBA IRON ORE LTD — SHANGONI

ANGLO AMERICAN IRON ORE KUMBA IRON ORE LTD
PUBLIEKE KENNISGEWING AANSOEK VIR 'N OPDATERING VAN DIE OMWEGINGSBESTUURSPLAN

In terme van die Wet en Staatskennisgewing R543 van die Regulasies in terme van Hoofstuk 6 van die Nasionale Omgewingsbestuurswet, 1998, (Wet No 107 van 1998) Omgewingsimpak Regulasies gepubliseer in die Staatskoerant No. 33306 van 2 Augustus 2010, word geïnteresseerde en geaffekteerde partye hiermee in kennis gestel van die volgende voorgenome aktiwiteite:

As gevolg van veranderinge in mynbou prosesse sal die volgende aktiwiteit hanteer word in terme van die Minerale en Petroleum Bronne Ontwikkelings Wet, Wet 28 of 2008

- Mayermyn Ystererts Voorraad
- Nuwe Parkeerareas by die Aanleg en Donkerpoort
- Jood se Dam
- Kraglyn
- Jik Aanleg

Die Proses behels 'n Scoping verslag en Opdatering van die Omgewingsbestuursplan

Applikant: Sishen Iron Ore Company

Ligging: Die volgende aktiwiteite sal plaasvind op die plase Wachteenbietjesdraai 350 KQ, Donkerpoort 344 KQ restante gedeelte van gedeelte 10, Buffelshoek 351 KQ en Kwaggashoek, in die Magistrale Distrik van Thabazimbi, Limpopo Provinsie.

UITNODIGING VIR DEELNAME
Sou U enige bydraes of kommentaar rakende die bogenoemde aktiwiteite wou lewer, as Geïnteresseerde en / of Geaffekteerde Party wou registreer of ons wou inlig oor enige ander Geïnteresseerde en / of Geaffekteerde Partye wat in kennis gestel moet word, kan U vir **Lee-Anne Meiring** kontak voor **15 November 2010**. 'n Inligtingstuk is ook beskikbaar vanaf die betrokke konsultant. **Omgewingskonsultante:** Shangoni Management Services (Pty) Ltd. **Kontakbesonderhede:** Posbus 74726, Lynnwood Ridge, Pretoria, Tel: (012) 348 0272 Faks: (086) 639 7955 Selfoon: (082) 456 3208 E-pos: leeanne@shangoni.co.za

U word hiermee uitgenooi na 'n Publieke Deelname vergadering op die 21[ste] Oktober 2010 Om 18:00 by die Cinema Hall in Thabazimbi

Figure 63: Proof of Advert Placement – Project Phoenix ESR	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Diere soek huis

Suksesvolle wildveiling van Pride of Africa

Noodnommers vir SAP

BOK- & SKAAPVEILING

Vrydag 23 Mei om 11:00

Voorlopige inskrywing:
SKAPE: 100 Dorper-tipe,
BOKKE: 30 Kalahari Reds,
200 Boerbok-tipes

NOG INSKRYWINGS WORD VERWAG !!

MOTORLAND

WARMBAD / BELA-BELA

014 736 3688 014 736 2086

!WINSKOPE / BARGAINS!

Praat met ons oor - "DEPOSITO"

Talk to us about - "DEPOSIT"

VAKANTE POS

Ondervinding van krediteure en voorraadbeheer IN HARDEWARE NOODSAAKLIK!

Sluitingsdatum: 24 Mei 2008

GAME RANGER

WARMBAD DISTRICT

ENVIRONMENTAL IMPACT ASSESSMENT PUBLIC NOTICE

OMGEWINGSIMPAKSTUDIE PUBLIEKE KENNISGEWING

Figure 64: Proof of Advert Placement – Bioremediation ESR	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Figure 65: Proof of Advert Placement –Update and Review of EMPr ESR	
Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

6.3.3.4 Placement of On-Site Notices

6.3.3.4.1 Project Phoenix

A2, laminated site notices were placed at site on the notice board at the following places:

- Shoprite;
- Donkerpoort entrance looking onto Road R510;
- Library;
- Pick & Pay;
- Post Office;
- Donkerpoort gate;
- TLM;
- Total site;
- Tyre site;
- Spar; and
- TLM.

Refer to **Figure 66** for proof of the site notice placements.

6.3.3.4.2 Bioremediation

An A2, laminated site notice was placed at site on the notice board at the Donkerpoort entrance looking onto Road R510. Refer to **Figure 67** for proof of most of the site notice placement.

6.3.3.4.3 Review and Updating of Environmental Management Programme

A3, laminated site notices were placed at site on the notice board at the following places:

- Shoprite;
- Donkerpoort entrance looking onto Road R510;
- Pick & Pay;
- Post Office;
- Spar; and
- TLM.

Refer to **Figure 68** for proof of the site notice placements.

Bioremediation

Checkers

Donkerpoort gate

Library

Pick n Pay

Post office

Spar

Thabazimbi Municipality

Total site

Tyres site

Figure 66: Proof of Site Notice Placements – Project Phoenix ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

Figure 67: Proof of Site Notice Placements – Bioremediation ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

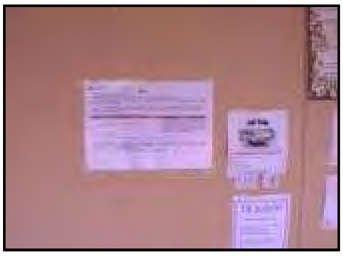
Site notice at Pick & Pay	Site notice at the Post Office	Site notice at the TLM
		
Site notice at Checkers		Site notice at Spar
		

Figure 68: Proof of Site Notice Placements–Review and Update of EMPr		
Client: Thabzimbi Mine	Date: December 2010	SHANGONI Management Services (Pty) Ltd
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr	

6.3.3.5 Public Meetings

6.3.3.5.1 Project Phoenix

A public meeting was held on the 26th October 2006 in Thabazimbi. A presentation was made to all involved and is included as **Figure 69**. Minutes of the meeting were taken and have been included as **Table 46**. Refer to **Figure 70** for proof of the attendance register.

A second public meeting was held on the 21th of November 2010 in Thabazimbi Mine Auditorium. The public meeting also involved an open house session where visual displays were presented to the participants on the proposed developments. A presentation was made to all involved and is included as **Figure 71**. Minutes of the meeting were taken and have been included as **Table 47**. Refer to **Figure 72** for proof of the attendance register. The main concerns raised during the public meetings related to the following:

- The visual impact from extending Pit 1 (Phoenix Pit) as well as the construction of the new plant may affect tourism in the area.
- Potential impact from waste rock on the Thabazimbi town as well as Mooivallei farmers.
- Monitoring the impact of shock and vibrations from blasting operations at Phoenix Pit.
- Traffic disturbances and the safety of travellers during the construction of the bridge and conveyor system.
- Sufficient water supply for the expanding Thabazimbi town.

No additional environmental concerns were raised during the public meetings held in Thabazimbi.

Table 46: Minutes of Meeting taken for Project Phoenix - November 2006

MINUTES OF PUBLIC MEETING HELD ON THE 26TH OF NOVEMBER 2006 HELD AT THE THABAZIMBI MINE AUDITORIUM – THABAZIMBI 18:00 – PROJECT PHOENIX	
Opening and welcome	Mr. Jan Nel (JN) introduced the Mine Manager (MM) whom in turn welcomed all those present and reiterated the importance of obtaining inputs from the public regarding the potential environmental impacts of the proposed expansion project. JN introduced the project team form a Kumba perspective and explained the role of each person. He furthermore introduced the main speakers for the evening.
Introduction and background	JN provided some background and an introduction with regards to the process followed to date as well as the progress made with regards to the proposed expansion of the current mining activities. JN explained the reasoning behind the expansion.
Mining	The project manager Gareth Greer (GG) provided an overview of the proposed expansions with regards to the extension of Vanderbijl pit and Kumba pit. GG further explained that no waste rock disposal will take place towards the northern side of Vanderbijl pit and the waste rock from Kumba will be used to backfill the Donkerpoort west pit. GG also provided an explanation with regards to the construction of a new haul road to replace Kwaggashoek East road.
Plant	GG presented a detailed slide show on the positioning and layout of the new plant. He mentioned that the current waste from the plant will continue to be disposed on the existing WRD. Emphasis was placed on the positioning of a contractor camp towards the west of the new plant. GG explained the new crossing of a conveyor system close to the current conveyor crossing. This would be required due to the increase in volumes. The construction of the conveyor structures will be done to withstand the water generated during a flood in town. GG mentioned that the highest structure would be 45 m in height. GG stated that the plant was initially constructed in the 1:100 year flood line but has not been moved outside the flood line.
Tailings facility	GG explained the reasoning behind the site selected for the placement of the tailings facility. He explained the evaluation of the 7 proposed sites and provided information on the final decision.
Bridge and railway siding	Viktoria Janse Gotchev (VJG) provided information regarding the proposed construction of a bridge linking Donkerpoort and Vanderbijl pit. She provided information on the positioning and the construction of the bridge as well as the design with regards to storm water management. She mentioned that the culverts have been designed to handle 400 m^3 of water per second. VJG explained that the process of obtaining authorization from SANRAL and all parties that may be affected by the construction in the “poort” has commenced and these parties are all involved in the process.

MINUTES OF PUBLIC MEETING HELD ON THE 26TH OF NOVEMBER 2006 HELD AT THE THABAZIMBI MINE AUDITORIUM – THABAZIMBI 18:00 – PROJECT PHOENIX	
	VJG explained the need for expanding the railway siding and mentioned that this will have no effect on the surrounding environment.
Air quality	JN mentioned that a detailed air quality assessment has been conducted where modelling of the dust as well as possible noise impacts have been done. He presented the findings of the studies which indicated that the levels of dust and noise will be within acceptable limits. JN mentioned that further assessment has been proposed to assess the short burst of dust generation e.g. blasting and the possible effect on the surrounding environment.
IWULA	JN presented the process followed to date with regards to the IWULA. He explained that the license was submitted but requires review due to the new activities.
Water related issues	Anna van Vuuren (AV) presented detailed slides on the water related issues on site. She explained the new plant process water requirements and indicated that no additional water will be required for the new plant. The current water supply used will be sufficient to support the proposed new plants requirements. KS presented slides on the dewatering of the pits and the potential impact on the surrounding ground water volumes. He mentioned that no impact is expected from the Kumba or the Phoenix pits with regards to decreasing ground water levels in the surrounding environment.
Traffic	JN mentioned that the traffic study is in the process of being completed. All the relevant aspects will be address from this study.
Process	JN explained the process to date and provided information on the road ahead. He mentioned that the ESR will be submitted to DMR once the specialist studies have been completed. He also mentioned that the feedback would be expected from the DMR by February and that the EMPr will then be revised to include the necessary information and resubmitted for final approval.
Closure	JN once again thanked all those that participated in the meeting and closed it at 20h30

Table 47: Minutes of Meeting taken for Project Phoenix - October 2010

THABZIMBI MINE - PUBLIC MEETING MINUTES CINEMA HALL - 21 OCTOBER 2010 10:00	
Welcome:	Cornelia Holtzhausen welcomed the attendees to the public meeting and introduced Mr. Jan Nel from Shangoni who is assisting the mine with their Environmental Authorisations.
Purpose of the meeting:	Present the updates / amendments of the EMPr to the I&APs; Inform public, adjacent landowners, organs of state of changes; Opportunity to give input on issues discussed.
Presentation:	Mr. Jan Nel went through the presentation and discussed all the developments and changes that are proposed on the mine.
Issues Raised	
Marius Schrenk Asked how the storm water will be managed on Slimes dam no 5.	**Jan Nel** Responded that the storm water runoff will be diverted around Slimes dam no 5 to follow its normal course.

THABZIMBI MINE - PUBLIC MEETING MINUTES CINEMA HALL - 21 OCTOBER 2010 10:00	
What pollution can be expected from the Slimes dam no 5?	**Heilett Hattingh** Responded that specialist studies are in process such as geo-hydrological and hydrological to confirm that there is no pollution. .The mine further tests their boreholes on the mine quarterly to monitor for pollution. Monitoring indicates that there are no signs of pollution.
Marius Schrenk Asked will there be an increase of water for Project Phoenix?	**Heilett Hattingh** Responded that the mine uses ground water from boreholes on the mine property and are within their IWULA requirements. With regards to Project Phoenix the mine will stay within their current quantities. **Cornelia Holtzhausen** There is a decrease in water usage and the mine uses treated sewerage water and recycles water from the plant for re-use. The Pilot plant will process 40 t / h and there is not large consumption of water required. The mine is only conducting test work and this is not a continual process. **Jan Nel** The mine will stay within their current limits.
M. F. Makananisi Enquired if any trees will have to be removed for the power line? Will the waste sites pollute the nearby rivers? Requested more information on the waste sites. The Department received complaints from Citrus and tomato farmers with regards to dust and black frost.	**Sabelo Gumede** A narrow strip of trees will be removed. **Lee-Anne Meiring** A fauna and flora study was done in the area which indicated that there were no species of concern. The mine uses its BAP as a guideline to protect species on the mine. **Sabelo Gumede** The likelihood is small as the mine used the designs and specifications given by the specialists for the waste sites. The areas are also bunded and ground water is also monitored quarterly. **Lee-Anne Meiring** A copy of the Waste application and Basic Assessment Report (hereafter referred to as BAR) will be sent to her for comments. **Jan Nel** The mine conducted a climate study in the past. This study indicated no foreseen problems. The mine received complaints from the Mooivallei farmers and the mine has commissioned a regional climate study for the area.

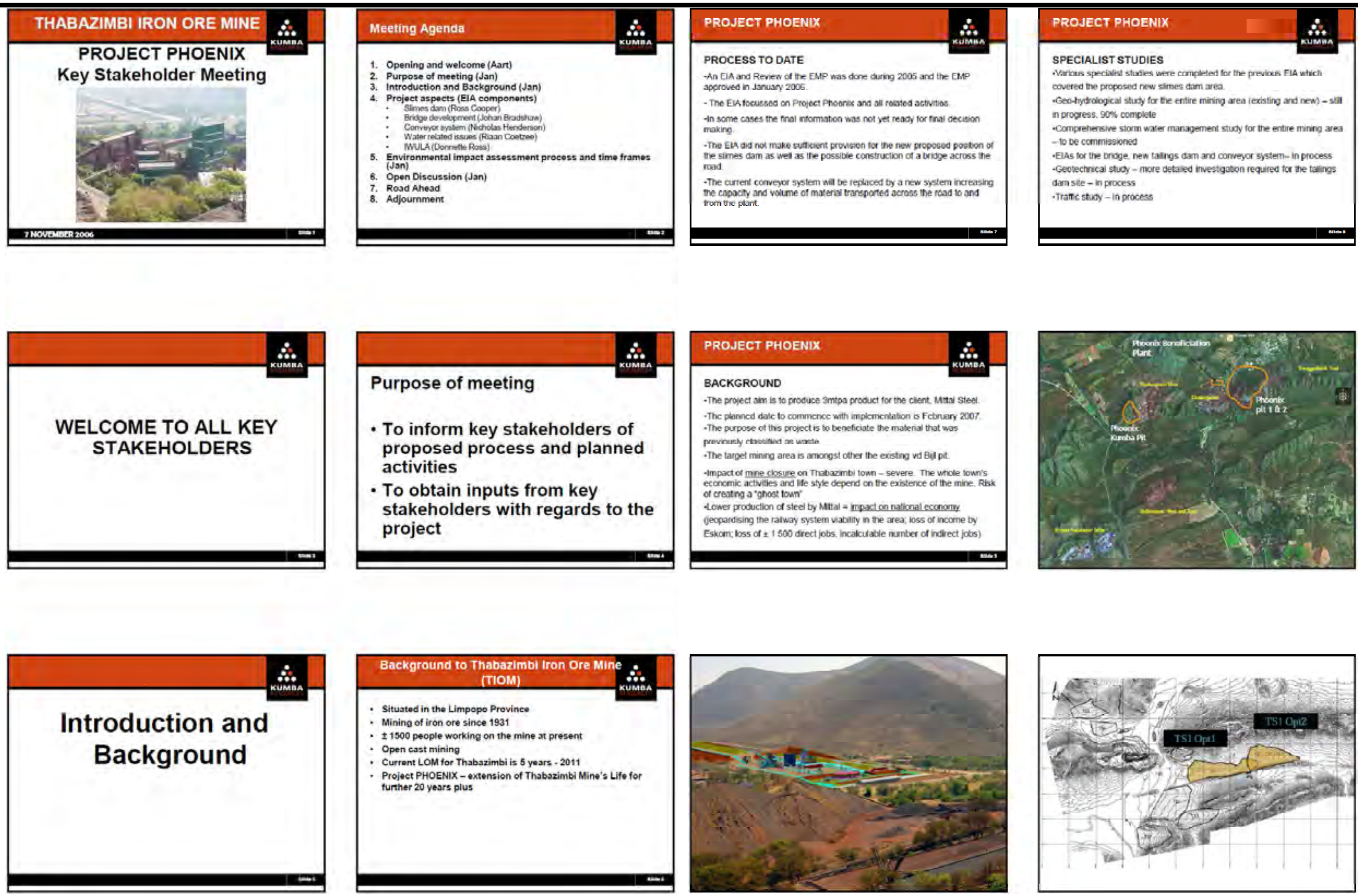


Figure 69: Presentation of Public Meeting for Project Phoenix ESR - 2006	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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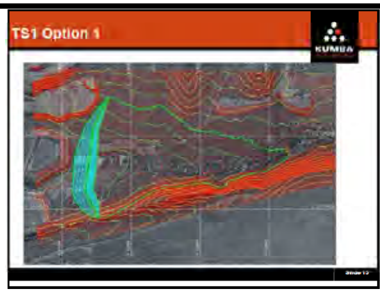

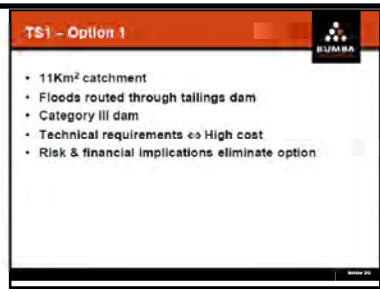

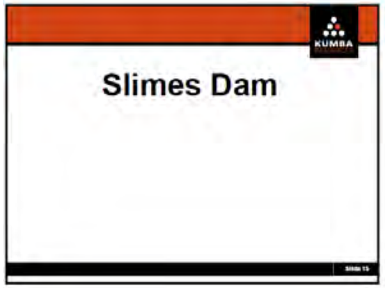

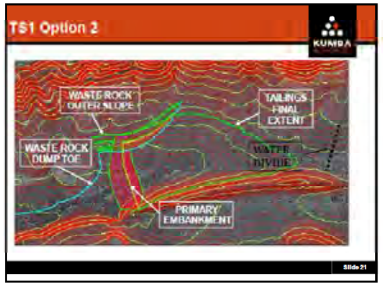

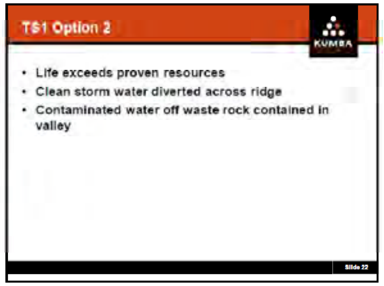

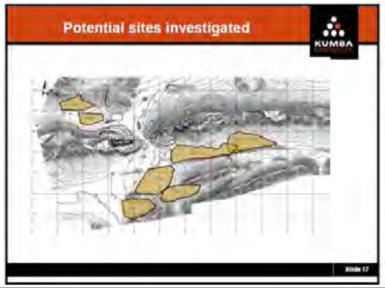

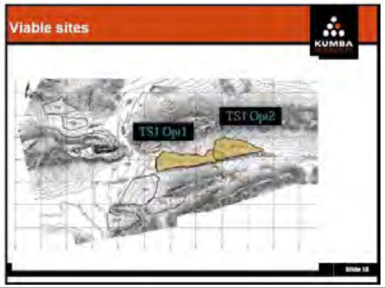

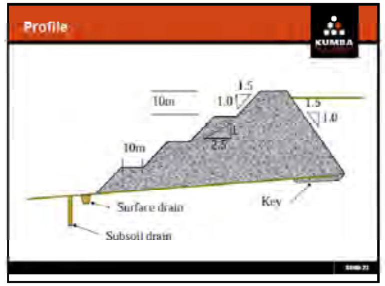

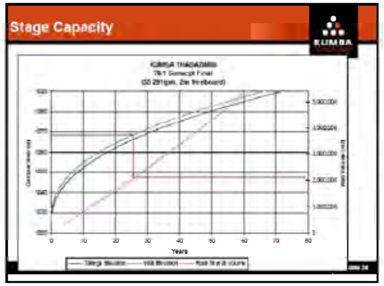

Presentation of Public Meeting for Project Phoenix ESR - 2006		SHANGONI Management Services (Pty) Ltd
Client: Thabazimbi Mine	Date: December 2010	
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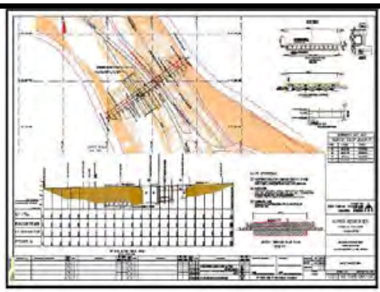

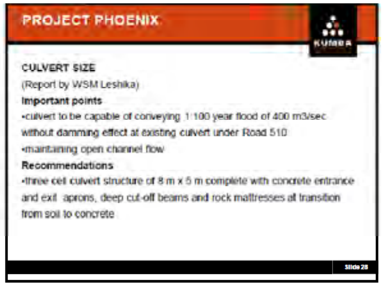

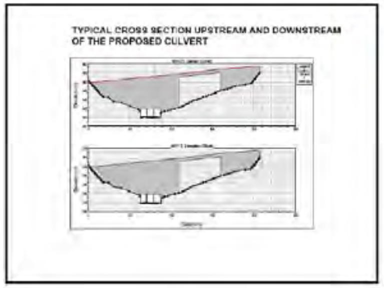

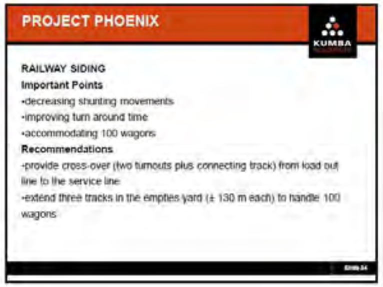

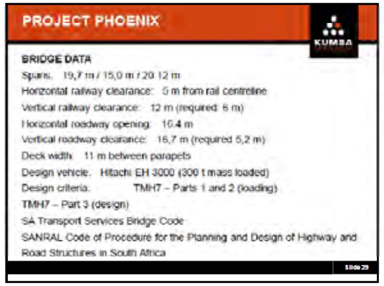

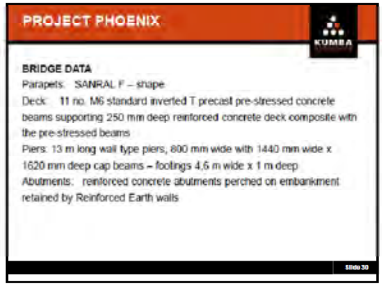

Presentation of Public Meeting for Project Phoenix ESR - 2006

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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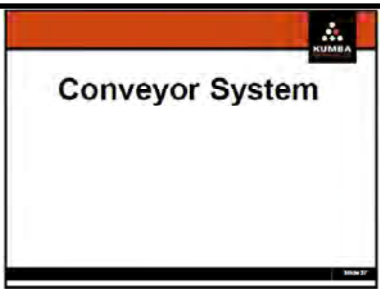

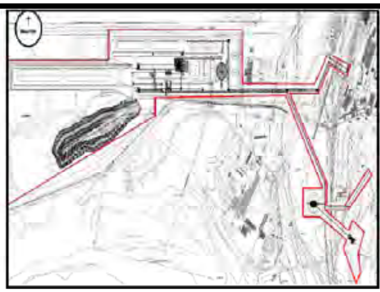

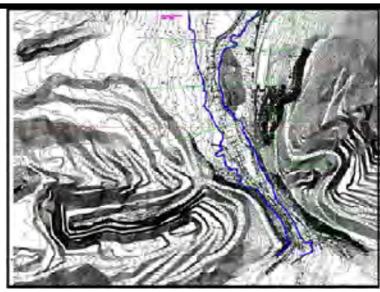

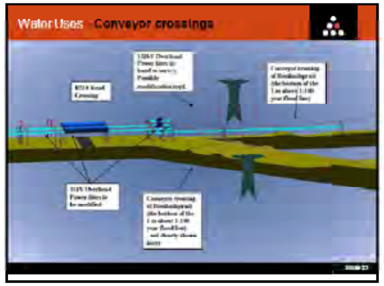

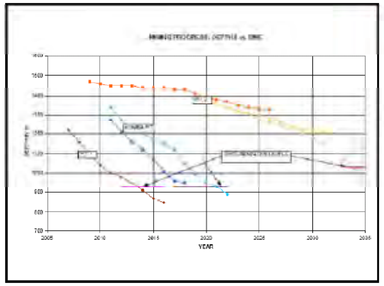

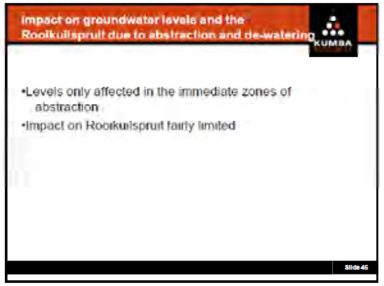

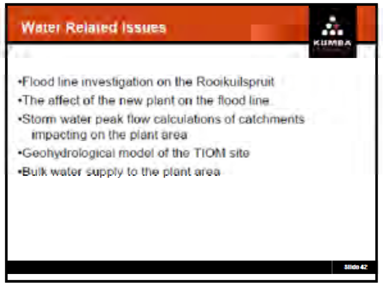

Presentation of Public Meeting for Project Phoenix ESR - 2006

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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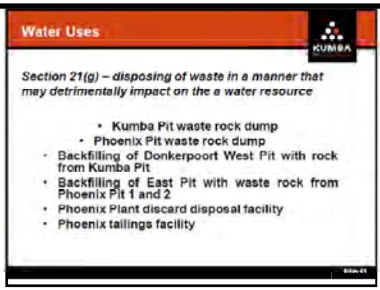
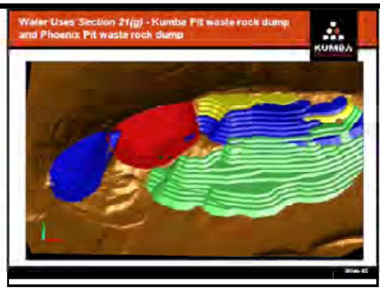
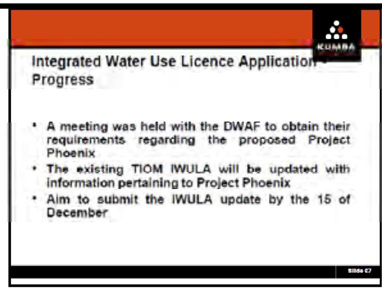
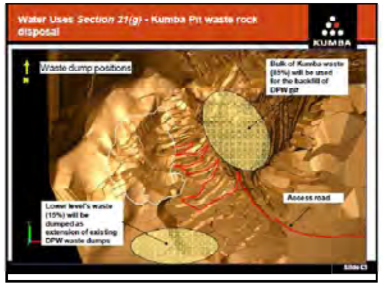
Presentation of Public Meeting for Project Phoenix ESR - 2006

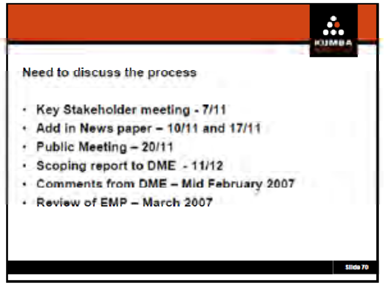
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

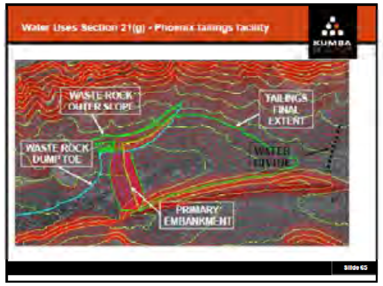


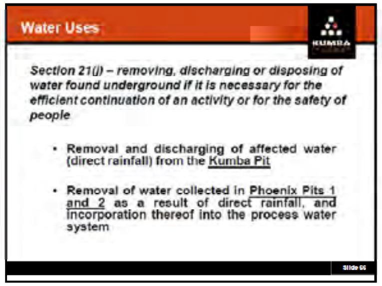












Presentation of Public Meeting for Project Phoenix ESR - 2006	
Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

ATTENDANCE REGISTER

Project Phoenix: 26 October 2006

NAME	COMPANY / DEPARTMENT	TEL	CELL	FAX	EMAIL
Donnette Roos	Clean Stream	(012)349-1429	0834895199	(012)349-1428	donnette@cleanstream.co.za
SOLO MASIKE	DWAF: HARTBEESPOORT	(012)2531026	0828059523	012 2532761	masikes@dwaf.gov.za
Sally Tsheko	DWAF: HO	012 336 8659	082 802 4898		TSHEKOS@DWAF.GOV.ZA
Blanché Roosma	Clean Stream	012 349 1429	082 340 4140	012 349 1428	blanche@cleanstream.co.za
Ross Cooper	Jones & Wagener	(011) 519-0200	082 496 4214	011 5190201	cooper@jaws.co.za
Gareth Greer	Kumba Resources	(012) 307-7077	083 609 1165		Gareth.Greer@kumbaresources.com
Aart v/d Brink	Thabazimbi Mine	014-7773001	082-4546182	014-7773258	aart.vandenbrink@kumbaresources.com
CONRAD BEZUIDENHOUT	KUMBA RESOURCES	(012) 307-8680	0836091521	012 3078629	CONRAD.BEZ@KUMBARESOURCES.COM
Donovan Brink	HATCH	(012) 302-9682	0829411236	0	dbrink@hatch.co.za
Lee-Anne Neising	SHANGONI	012-3480272	082 4563208	012-3616191	lee anne@shangoni.co.za
SEAN KENNEDY	HATCH	(011) 239 5300	082 557 3852	-	skennedy@hatch.co.za
Nicholas Henderson	Hatch	(011) 239 5300	076 789 8515		nhenderson@hatch.co.za
ALAN THOMPSON	HATCH	(011) 2395300	0761085642		AThompson@hatch.co.za.
EWALD BOTHA	THABAZIMBI MINE	014 777 3137	0828781275	014 777 1651	EWALD.BOTHA@KUMBARESOURCES.COM
HENRY HATTINGH	THABAZIMBI MINE	014 777 3137	082 5575987	014 777 1651	HENRY.HATTINGH@KUMBARESOURCES.COM
Anna van Vuuren	WSM Leshika	012-3488595	083-641-9744	0123488598	avanvuuren@wsmleshika.co.za
KOBAMSAMI	WSM Leshika	012 3488595	0864934724	012 348598	wsmks@mweb.co.za
Viktoria Jansen-Jotcher	Kumba	012-307-8641	083-414 7966	012 307 8629	Viktoria.Jansen-Jotcher@kumbaresources.com
Danilla BREEDT	Clean Stream	(012) 349 1429	0845173311	(012) 349 1428	danilla@cleanstream.co.za

Thabazimbi Iron Ore Mine: Project Phoenix

Figure 70: Attendance Register of Public Meeting for Project Phoenix ESR - 2006

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

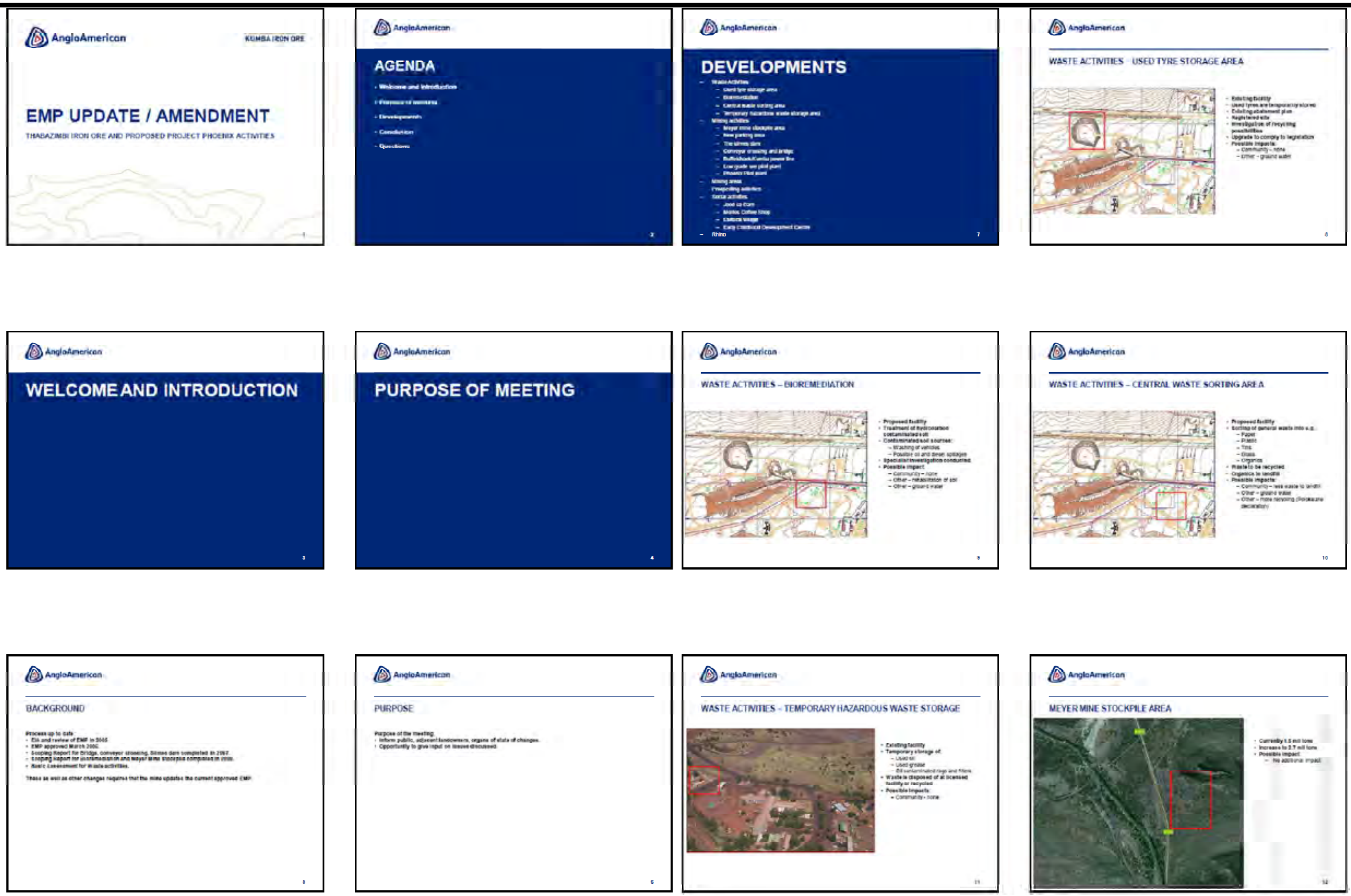
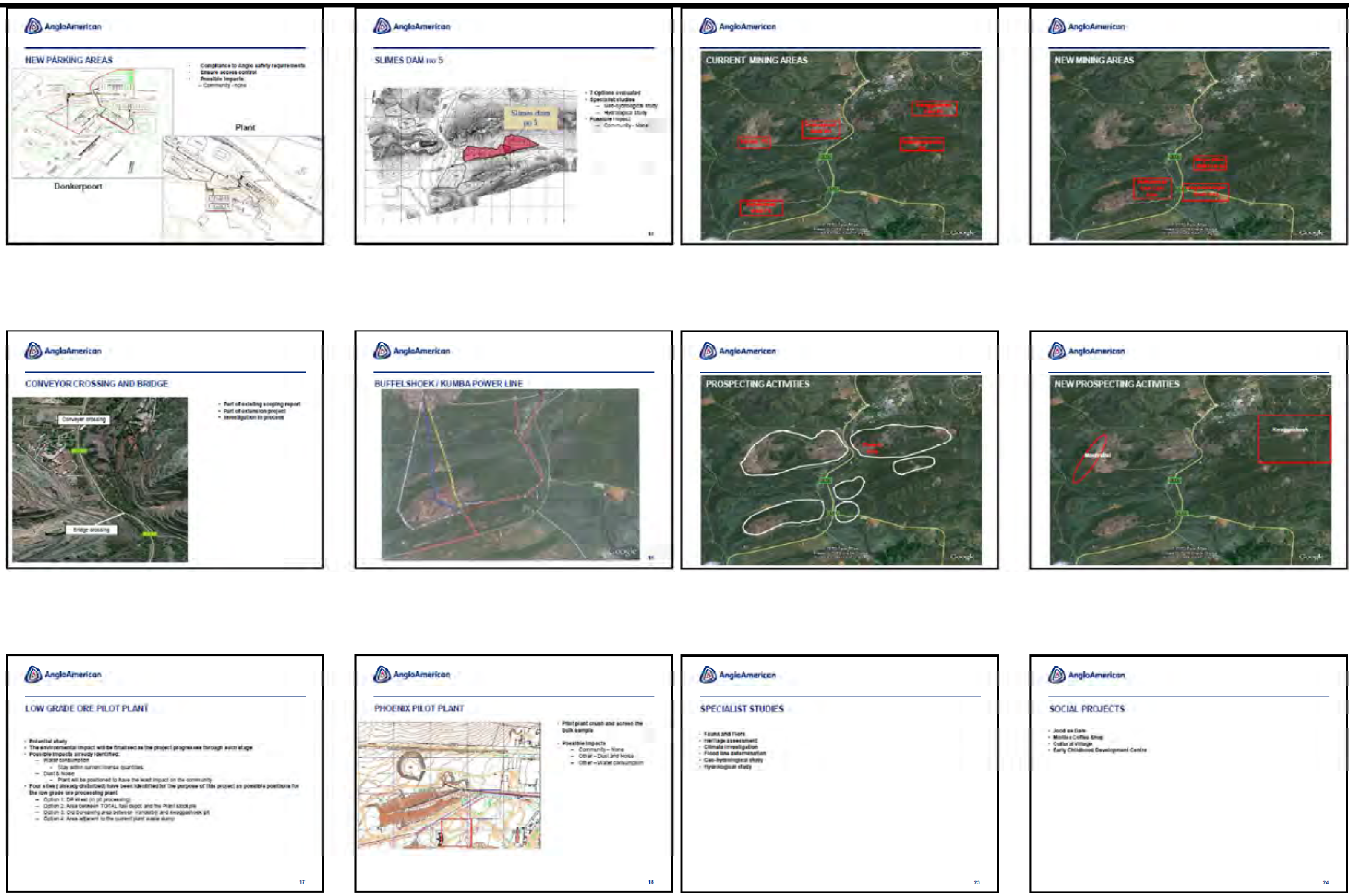


Figure 71: Presentation of Public Meeting for Project Phoenix ESR - 2010		SHANGONI Management Services (Pty) Ltd
Client: Thabazimbi Mine	Date: December 2010	
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr	



Presentation of Public Meeting for Project Phoenix ESR - 2010

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

SHANGONI
Management Services (Pty) Ltd

ATTENDANCE REGISTER – PUBLIC MEETING 21 October 2010

Name	Designation	Company	Telephone Number	Email address
Jan Nel	Consultant	Shangoni	0823795935	jan@shangoni.co.za
Viktoria Jansen-Gotcher	Kumba	Kumba	083 414 7966	viktoria.jansen-gotcher@kioltd.com
Lee-Anne Meiring	Consultant	Shangoni	082 456 3208	lee-anne@shangoni.co.za
CC Holtzhausen	Acting GM	Kumba	(083) 417-2107	cornelia.holtzhausen@kioltd.com
H Hattingh	Kumba	Kumba	083703 2318	hetel.hattingh@kioltd.com
S. Gumede	Manager SQSD Kumba Iron Ore	Kumba Iron Ore	0834172246	sabelo.gumede@kioltd.com
M Schrenk	Burman	Self	0827082495	msc.brenk@yahoo.connect.co.za
Albert du Plessis	KIO TBZ	CMF	0833045703	albert.duplessis@kioltd.com
AR Ramodale	CCCR	TBZ Municipality	0829769779	0147771531
Makanamisi FM	Agriculture (TBZ)	TBZ Agriculture	0734344094	MakanamisiFM@agric.limpopo.gov.za
Mothapo MJ	Agriculture	Dpt Agriculture	0763216225	MothapoMJ@agric.limpopo.gov.za

Figure 72: Attendance Register of Public Meeting for Project Phoenix ESR – 2010

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

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6.3.3.5.2 Bioremediation

On the 30th May 2008 Thabazimbi Mine held a public meeting / open day for all I&AP's as well as stakeholders. Different aspects concerning the mine were discussed, including the proposed bioremediation process. Refer to **Figure 73** for the attendance register and **Table 48** for the minutes of the meeting held.

During the public meeting, questions were raised regarding the mining activities. However, none of these questions were regarding the proposed bioremediation ESR.

	LIST OF KEY STAKEHOLDERS AND INTERESTED AND AFFECTED PARTIES								Attendance Register	
No	Surname	Name	Capacity	Organisation	Tel	Fax	Cell	E-mail	Postal adress	Signature
1	Azer	Orion	Head master High School	Hoërskool Frikkie Meyer	014-777 1583	014-777 1583	014-777 1483		Posbus 5 TBZ 0380	
2	Blignaut	Andre	Mine safety: inspector of Mines	DME	014-588 0617	014-583 8424	082 460 4046	Andre.blignaut@dme.gov.za		
3	Blignaut (Dr)	Jaco	Dr	Kumba	014 777 3000	014 772 2080	083 458 4688	jaco.blignaut@kiolltd.com	Posbus 184 TBZ 0380	
4	Boshoff	Boesie	Adjacent Landowner	Klipgat	014-777 3224		078 640 7808		Posbus 8 TBZ 0380	
5	Boshoff	Albert		AP Kerk	014-777 1666	014-777 1666		albert.boshoff@aplr.co.za	Posbus 817 TBZ 0380	
6	Botha	Ewald	Environmental Management	Exxaro	014-777 2137	014-777 1031	082 874 1278	ewald.botha@kioltd.com	Posbus 595 TBZ 0380	
7	Brand	Gerhard	Manager Mining	Kumba	014-777 3084			gerhard.brand@kioltd.com		
8	Brink	Magda		Thabazimbi Christian school	014-777 3084	014-777 3084	083 817 7780	thabazimbi.cs@lantic.net		
9	Bronkhorst	Boikie	Adjacent Landowner	Mooivallei	014-772 1343	014-772 1340	082 438 9947		Posbus 92 TBZ 0380	
10	Bruns	Henk	Adjacent Landowner	Wachteenbietjiesdraai	011-807 4197				Marlenestraat 29 Bronkhorstspruit 1400	
11	Burger	Dries	Financial Manager	Kumba	014-777 3099	014-777 3258	083 300 4674	dries.burger@kioltd.com		
12	Buys (Dr)				014-777 1081	014-777 1081			Posbus 1026 TBZ 0380	
13	Coetzee	Johan	Adjacent Landowner	Haakdoringdrift	014-772 2035		083 258 4783		Posbus 611 TBZ 0380	
14	de Clercq	Wessie	Adjacent Landowner	Mooivallei	014-772 3970	014-777 1531	082 385 4067	wessaldec@gmail.com	Posbus 098 TBZ 0380	
15	De Kock	Jurie		Amandelbult Env Coordination	014-784 1245		083 075 8170	juried@amplats.co.za		
16	de Kock (Dr)			Dokters	014-777 1036				Posbus 1077 TBZ 0380	
17	de Wet	Boet	Adjacent Landowner	Klipgat					Posbus 141 TBZ 0380	
18	Doevendans (Dr)			Dokters	014-777 1569				Privaatsak 79 TBZ 0380	
19	du Buys	J	Adjacent Landowner	Haakdoringdrift	014-772 2631	014-772 2631	083 830 8097		Posbus 525 TBZ 0380	
20	du Plessis	Albert	Acting manager mining	~~Exxaro~~ Kumba	014 777 3228		083 304 9703	albert.du.plessis@kioltd.com		
21	du Plessis (Dr)		Dokter	Dokters	014-777 1258	014 777 1258	836573631		Posbus 302 TBZ 0380	
22	Erasmus (Pas)	S	AGS Pastor	AGS Kerk	014-772 1765			agstbz@lantic.net	Posbus 167 TBZ 0380	
23	Erasmus	MSA	Adjacent Landowner	Klipgat	014-772 2893		084 817 5828		Posbus 504 TBZ 0380	
24	Farren	Mark	Manager	Anglo Platinum	014-784 1030	014-784 1250		markf@amplats.co.za		
25	Fenn	Fred	Adjacent Landowner	Mooivallei	014-777 1593		083 940 3199		Posbus 383 TBZ 0380	
26	Gonsalves	Danny	Manager	Northam Platinum	014-7843086			danny.gonsalves@norplats.co.za	Posbus 441 TBZ 0380	
27	Grimes	Willie	Adjacent Landowner	Wachteenbietjiesdraai	014-772 2760				Posbus 80 TBZ 0380	
28	Gumede	Sabelo	Manager SHE	Kumba	014-777 3148	014-777 1681	082 812 3649	sabelo.gumede@kioltd.com		
29	Hattingh	George	Adjacent Landowner	Spitskop		011-886 9934	082 651 7741	georgeh@gmhcpp.com		
30	Hattingh	Hellet	Environmental Management	Kumba Resources	014-777 3127	014-777 1031	082 657 6657	hellet.hattingh@kioltd.com		
31	Holtzhausen	CC	Plant Manager	Kumba			082 654 7262	cornelia.holtzhausen@kioltd.com		
32	Human	Piet	Adjacent Landowner	Langpan (0380)	014-772 1681		083 452 5015	piet.human@kioltd.com		
33	Human	Hans	Adjacent Landowner	Klipgat	014-777 1663		082 324 7565		Posbus 394 TBZ 0380	
34	Janse v Rensburg	R	Adjacent Landowner	Hanover	014-772 1164		083 381 0786	tollo@iafrica.com		
35	Jones	Hendrik	Rhino Andalusite Mine	Grootfontein	014-784 0688	014-784 0688		hendrik.jones@samrec.com	P/S X329 TBZ 0380	
36	Joosté	Dave	Adjacent Landowner	Spitskop		014-777 1500	082 579 0218			
37	Klopper	Dafs	Adjacent Landowner	Klipgat	014-772 1578		083 239 2882		Posbus 345 TBZ 0380	
38	Kruger	Gerrie	DME Engineering	DME	018 452 0630	018 452 0630	082 838 3960	Gerrie.kruger@dme.gov.za		
39	Lambrecht	Daan	Adjacent Landowner	Wachteenbietjiesdraai	014-772 2074	014-772 2074	083 476 0889			
42	Maja	Lilly		DEO Environment provincial government	0			majal@finptb.norprov.gov.za		
43	Makau	Louis	Mabogopedi high School	PO Box 5018 Pudiphatshwa 0366		014 772 2825				
44	Malao	David	Mine safety: Snr inspector of Mines	DME	018-464 103405	018-462 9039	082 828 3301	David.malao@dme.gov.za		
45	Maradu	Lydia		Dept of Agriculture	014-777 1558	014-777 1873		Maraducl@agric.limpopo.gov.za		
46	Marais (Dr)				014 777 1036				Posbus 1077 TBZ 0380	

Figure 73 Attendance Register of Public Meeting for Bioremediation ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

LIST OF KEY STAKEHOLDERS AND INTERESTED AND AFFECTED PARTIES									Attendance Register	
No	Surname	Name	Capacity	Organisation	Tel	Fax	Cell	E-mail	Postal adress	Signature
47	Maree	Thys	Adjacent Landowner	Klipgat		012-321 3281	082 385 6037	mareemj@intekom.co.za		
48	Matabogo	Morris		Government - Health and welfare	014-777 1399	014-777 1703				
49	Matabogo	Lesego		H R Kumba	014-777 3008		0834033410	lesego.matabogo@kioltd.com		
50	Matjila	Joe	Head Office	Kumba				joe.matjila@kioltd.com		
51	Matlou	N L	Mayor	Thabazimbi Municipality	014-777 1525	014-777 1531	082 822 9048	tbzmun2@lantic.net		
52	Matlou	Lucas	Councillor	Waterberg District Municipality	014 717 1344	014-717 3889	082 822 9048	matlou@postnet.co.za		
53	Matlou	Marcus	Mine equipment safety: Inspector of Mines	DME	014-585 8417	014-585 8434	082 495 4345	Marcus.matlou@dme.gov.za		
54	Mboranda	Xolile	Principal Inspector	DME	018-462 7480	018 462 8039	082 787 3360	kennedy.moagi@.dme.gov.za		
55	Milner	N	Adjacent Landowner	Doornhoek	014-772 2888		082 508 0580	wol@lantic.net		
58	Mathabane	P	LE Manager	Thabazimbi Municipality	014 777 1282	014-777 1531	072 831 3081			
59	Mthombeni	Gibson	Dme							
61	Mpyana	LT		Ysterberg Primary School	014-777 1315	014-777 1315			Posbus 5017 TBZ 0380	
62	Mr PSR Mchunu	PSR	Municipality Thabazimbi	Thabazimbi Municipality, PO Box 90, Thabazimbi, 0380	014-777 1525 (082) 414 7732	014-777 1531		tbzmun2@lantic.net		
63	Mugwabana	Hendrick	Park Manager	Marakele	014-777 1745	014-777 1866		hendrickm@sanparks.org		
64	Myburg	Koos	Adjacent Landowner	Spitskop	014-772 2821		083 481 2052		Posbus 1037 TBZ 0380	
65	Nemade	Z	Act Manager: Corporate Services	Thabazimbi Municipality	014-777 1281	014-777 1531	072 495 2877	tbzmun1@lantic.net		
66	Nel	Annatjie		DME- Polokwane (Environment)	015-287 4700	015 287 4729	082 828 3827	anna.nel@dme.gov.za		
67	Noko	Doreen	Occupational Medicine: Inspector of mines	DME	018-464 1831		082 828 3353	doreen.noko@dme.gov.za		
68	Pauw	Henriëtte	Newspaper	Kwevoel	014-777 1831	014-777 1482	083 284 0781	kwevoel@kwevoel.co.za		✓
69	Pelser	Hans	Adjacent Landowner	Klipgat	014-777 1947				Posbus 841 TBZ 0380	
70	Pelser	Coert	Adjacent Landowner	Spitskop	014-777 1600		082 534 7562		Posbus 1014 TBZ 0380	
71			Kgaparnadi Primary school							
73	Reinecke	WF	Adjacent Landowner	Moolvallei & District Agri Union	014-772 1148		082 418 7277		PO Box 2277, Thabazimbi 0380	✓
75	Rheeders	Peet	Adjacent Landowner	Klipgat	014-772 1831	014-777 1297			Posbus 55 TBZ 0380	
76	Rheeders	P	Adjacent Landowner	Sroodfontein	012-254 0831	012-254 0831	083 804 5242	peetr@telkomsa.net		
77	Richter	Gerhard		District Agr Union Koedoeskop				gerhard@explpro.co.za		
78	Roets	Nolte	Adjacent Landowner	Moolvallei	014-777 1668		082 881 4421		Posbus 455 TBZ 0380	
79	Scruton	Paul		Council member Manufacturing/commerce	014 777 1769	014-777 1829	083 278 0214	bosauto@lantic.net		
80	Schutte	Hans	Adjacent Landowner				083 525 2475	quatcon@lantic.net		
80	Schrenk	Markus	Adjacent Landowner	Brakvlei	014-772 2475	014-772 2478	082 788 2405	machrenk@goggaconnect.co.za		
81	Sibiya	JT	Manager: Social Services	Thabazimbi Municipality	014-777 1934	014-777 1531	073 319 2326			
82	Stassen	Kallie	Adjacent Landowner	Wachteenbietjiesdraai					Posbus 12458 Elspark 1418	
83	Steenkamp	Flip	Adjacent Landowner	Klipgat	014-772 2481				Posbus 116 TBZ 0380	
84	Storm	Henk	Manager Materials Management	Kumba	014-777 33193		083 380 4888	henk.storm@kioltd.com		
85	Swanepoel	Gert	Adjacent Landowner	Moolvallei	014-772 2111	014-772 2111	082 828 2827	tbzcvo@lantic.net		
86	Taylor	William		RPM Swartklip	014-788 1855	014-7885487			P/S x551 Swartklip 0371	
87	Theunissen	Gustav	Junior Manager	Spoornet	014-590 2082	014-590 2079		gustav.theunissen@transnet.co.za		
88	Tlhapi	Os	Occupational Health, Snr Inspector of mines	DME	014-586 8417	014-586 8424	082 8283995	Oupa.Tlhapi@dme.gov.za		
89	Trollope	John	Adjacent Landowner	Vaalwater	014-777 1880			admin@tmsgroup.co.za	Posbus 50 TBZ 0380	
90	Trollope	Peter	Adjacent Landowner	Vaalwater	014-777 1880		082 443 6416	admin@tmsgroup.co.za	Posbus 50 TBZ 0380	
91	Tsheko	Solomon		DWAF	012-253 1093	012-253 1895		tshekos@dwaf.gov.za		
92	Tshivhandekano	Olney	Deputy Dir Environment	DME - Polokwane (Environment)	015-287 4700	015-287 4729				
93	Tsopo	Sipho	Dme	Dme	014 585 81417	014 585 8424	082 459 3773	Sipho.Tsopo@dme.gov.z.a		
94	Van den Brink	Aart	Mine Manager	Kumba	014-777 3001	014-777 3258	082 654 0182	aart.vandenbrink@kioltd.com		✓

LIST OF KEY STAKEHOLDERS AND INTERESTED AND AFFECTED PARTIES									Attendance Register	
No	Surname	Name	Capacity	Organisation	Tel	Fax	Cell	E-mail	Postal adress	Signature
95	Van der Linde(Ds)	H T		Nederduits Hervormde Kerk(Dinkie)	014-772 1137	014-772 1137	083 507 0333	nhkyflege@lantic.net(henrievdlinde@xinet.co.za)	Posbus 14 TBZ 0380	
96	van der Walt	Gys	Adjacent Landowner	Klipgat	014-772 1007	014-772 3466	083 252 0588		Posbus 1308 TBZ 0380	
98	Van Rhyn (Ds)	HPM		Gereformeerde Kerk(Kitty)	014-772 1 868	014-772 1868		mvanrhyn@telkomsa.net(gerefthaba@absamail.co.za)	Posbus 8 TBZ 0380	
99	van Schalkwyk	Pieter	Adjacent Landowner	Rooseauspoort			082 849 1720		Posbus 171 TBZ 0380	
100	van Zyl	Trevor	Adjacent Landowner	Klipgat			083 887 8307		Posbus 871 TBZ 0380	
101	vd Merwe	Francois	Adjacent Landowner	Roodedam (Doctor)	014 7722788	014 772 2788			Posbus 88 TBZ 0380	
102	Venter	Petrus		DWAF	012-253 1093	012-253 1895		venterp@dwaf.gov.za(lamprechtg@dwaf.gov.za)		
103	Venter	Koos		Laerskool Thabazimbi	014-777 1234	014-777 1234		lstbz@ceg.co.za		
104	Viljoen	Jax C		District Agriculture union			083 325 9057	jcviljoen@worldonline.co.za		
105			Area Manager	Spoornet	014-590 2082	014-590 2079				
106				Eskom		014-772 3131				
107	Senadla	Dr Thinus	N.G.Kerk Thabazimbi	NG Kerk	014-772 2270	014-772 2270	083 236 8438	ntsenade@lantic.net(ngktbz@telkomsa.net)	Posbus 40 TBZ 0380	

MOLEKOA K.I MABOGOPEDI MABOGOPEDI SCH 0147723412 0825234924 molekoa@... Box 2521, TBZ

108. MATHEKGA TH ENVIRONMENTAL OFFICER DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM 0795278334 mathekgath@ledet.gov.za

LUCKY SITHOLE HR-CO-ORDINATOR RHINO MINE - 0147840080 083 3085121 lucky.sithole@samrec.com

MULANDZI A ASD ENVIRON DME 0728547798 mavhungu.si-mulandzi@dme.gov.za

TENZA SIBUSISO Kumba 014777 3255.

Attendance Register of Public Meeting for Bioremediation ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

Table 48: Questions raised at Kumba Day Meeting held on the 30th of May 2008 at the Cinema Hall in Thabazimbi for Bioremediaiton ESR

PERSON RAISING QUESTION	QUESTION	PERSON RESPONDING	RESPONSE
George Hattingh	He enquired about the use of local labour on the mine and raised the issues of different ways of rehabilitation e.g. Hydro-seeding.		
Alie de Buys	Mr. Buys remarked that the fences between Kumba and his property are not in a good state and that it does not stop certain animals from entering or leaving the area.	Me. Hattingh - (environmental coordinator)	She remarked that they are busy with it at the moment. The issue will be investigated further.
Harm Schutte	He remarked whether the fire breaks have been made between the mine and the farms surrounding the mine.	Me. Hattingh - (environmental coordinator)	She remarked that they are busy with it at the moment.
Fred Few	He enquired whether the mine will make fire break roads around the municipal waste site.	Me. Hattingh - (environmental coordinator)	She remarked that they are busy with it at the moment.
	Mr. Few remarked that he has purchased a chipper machine and that he would like to tender for the removal of plastic material from the mine.	Me. Hattingh - (environmental coordinator)	She remarked that they will go on a tender and then he can tender for the work.
Jan Viljoen	Mr. Viljoen congratulated the mine on the very good safety performance.		
Ds van Rhyn	He enquired whether Kumba will support a religious organization if they approach Kumba for assistance.	Mr. Sibusiso Tenza - Sustainable Development and communication Manager	He remarked that Kumba will not provide finances for building a church for instance but they will evaluate community projects that religious groups are involved in and if they find the cause worthy they will support it.
Gert Swanepoel	Mr. Gert Swanepoel enquired why the bottom slopes of the WRDs are so long and	Me. Hattingh - (environmental coordinator)	She responded that you need space towards the mountain the take the slope back and this space does not exist. In addition to this she

PERSON RAISING QUESTION	QUESTION	PERSON RESPONDING	RESPONSE
	cannot be sloped more or made shorter.		mentioned that working on the sides is unsafe and vehicles and people are at risk when working on the steep slopes.
Faan Erasmus	Mr. Erasmus enquired how the mine and the surrounding farmers are going to ensure that other companies that prospect on adjacent farms can be rehabilitated.	Mr. Aart van den Brink - General Manager	Replied that for them to have received the permit to prospect they would have had to go through an EMPr approval phase which addresses the rehabilitation of the site once prospecting is finished. They need to comply with their requirements.
	Mr. Erasmus also remarked on the progress with fire breaks.	Me. Hattingh - (environmental coordinator)	She remarked that they are busy with it at the moment.
	Mr. Erasmus asked whether the mine is doing something with regards to the sewage problems in town.	Mr. Aart van den Brink General Manager	He remarked that the mine is providing technical advice to the municipality in this regard.
Ds Malan	He enquired whether Kumba will also be providing recycling opportunities for the public when erecting their recycling area.	Mr. Jan Nel – Shangoni management Services	He replied that making the recycling site a community project has been discussed and that Mr. Sibusiso Tenza will be investigating this further. He furthermore said that the location of the site has not been finalised yet and once this has been done the final approach will be decided on. This may result in a community project to optimise recycling.

6.3.3.6 Registering Interested and Affected Parties

All I&AP's that replied to the PPP as well as all I&AP's that attended the meeting are registered I&AP's.

6.3.3.7 Feedback from the Interested and Affected Parties

6.3.3.7.1 Project Phoenix

As advised by LEDET, I&AP's could register comments and/or concerns up to the 11th of December 2006 before the Scoping comment Phase expires. The comment period was extended to ensure that all parties have received ample time to comment and raise their specific concerns. As part of the approach of Thabazimbi Mine the open door policy is applied whereby any person having any concern can raise it at any time in the future and Thabazimbi Mine will attend to such issues. Such concerns can be raised by phoning the mine manager who in turn will request appropriate information from the relevant employees to address the concerns raised. Up to date, no comments or any other feedback has been received from any I&AP regarding the proposed ESR.

6.3.3.7.2 Bioremediation

I&AP's could register comments and/or concerns up to the 29th of May 2008 before the Scoping comment Phase expires. As part of the approach of Thabazimbi Mine the open door policy is applied whereby any person having any concern can raise it at any time in the future and Thabazimbi Mine will attend to such issues. Such concerns can be raised by phoning the mine manager who in turn will request appropriate information from the relevant employees to address the concerns raised. Up to date, no comments or any other feedback has been received from any I&AP regarding the proposed ESR.

6.3.3.7.3 Review and Updating of Environmental Management Programme

I&AP's could register comments and/or concerns up to the 4th of July 2010 before the Scoping comment Phase expires. As part of the approach of Thabazimbi Mine the open door policy is applied whereby any person having any concern can raise it at any time in the future and Thabazimbi Mine will attend to such issues. Such concerns can be raised by phoning the mine manager who in turn will request appropriate information from the relevant employees to address the concerns raised. **Table 49** below contains all the comments received up to date on the review and updating of the EMPr.

Table 49: Comments received from Interested and Affected Parties for Update of EMPr

PERSON	COMMENTS RECEIVED
George Hattingh	Is an adjacent landowner and requested to be kept informed on any developments.
Marius Schrenk	Is an adjacent landowner and informed the mine that he is planning an Eco-estate downstream of the proposed slimes dam on Kwaggashoek 345 KQ on the farm Brakvallei 347 KQ. He is concerned about possible pollution from the slimes dam from storm water and groundwater as they will be using groundwater for human consumption.
Erika Lamprecht - Lekota	Enquired as to which portion of Wachteenbietjesdraai are the mine going to mine? They reside on portion 30 of Wachteenbietjesdraai.

An e-mail was received from Rhino Minerals replying they have no comments regarding the new activities. Refer to **Figure 75** for this e-mail.

6.3.3.8 Addressing Comments and Questions Received from the Interested and Affected Parties

6.3.3.8.1 Project Phoenix

As no comments have been received up to date, this is not applicable at present.

6.3.3.8.2 Bioremediation

As no comments have been received up to date, this is not applicable at present.

6.3.3.8.3 Review and Updating of Environmental Management Programme

These comments will be addressed accordingly.

6.3.3.9 Identifying Organs of State

As mentioned in **Section 6.3.3.1** Organs of State are I&AP's that may have jurisdiction over any aspect of the operation. The identification of all Organs of State was done by using the Thabazimbi Mine stakeholder database. Refer to **Table 50** for a complete list of all Organs of State identified for the proposed 3 ESR's. Please note, this list is from 2005 to 2010.

RHINO MINERALS (PTY) LTD

Rhino Andalusite Mine
Private Bag X329
THABAZIMBI, RSA
0380
Telephone +27(0)14 784-0660
Telefax +27(0)14 784-0669

Shangoni Management Services
PO Box 74726
Lynnwood Ridge
Pretoria
0040

Att: Salome Venter

KUMBA EMPR CONSULTATION

This is to confirm that Rhino Andalusite Mine was consulted on the upgrade of KUMBA's EMPR and that we have no comments to make.

Yours Faithfully,

21/7/11
H Jones
Mine Manager

Figure 74: Response from Rhino Minerals for Update of EMPr ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

Table 50: Organ of States for Proposed Three Scoping Reports

CONTACT PERSON	DEPARTMENT
M. Bornman	Limpopo Department of Agriculture – hereafter DA
M.J. Mphela	Limpopo DA (Lephalale District)
M.F. Makananisi	Limpopo DA (Thabazimbi District)
M. J. Mothapo	Limpopo DA Thabazimbi District)
H. Grobler	Deptartment of Agriculture
L. Maradu	DA
J.C. Viljoen	District Agricultural Union

CONTACT PERSON	DEPARTMENT
B. Eckard	District Agricultural Union
S. Pretorius	District Agricultural Union
G. Richter	District Agricultural Union Koedoeskop
M.F. Reinecke	Mooivallei & District Agricultural Union
K. Thivhulawi	Limpopo DMR
A. Nel	Limpopo DMR
A. Blignaut	Limpopo DMR
G. Kruger	Limpopo DMR
D. Malao	Limpopo DMR
M. Matlou	Limpopo DMR
X. Mbonanbi	Limpopo DMR
G. Mthombeni	Limpopo DMR
D. Noko	Limpopo DMR
O. Tihapi	Limpopo DMR
O. Tshivandekano	Limpopo DMR
S. Tsopo	Limpopo DMR
A. Mulaudzi	Limpopo DMR
K. Makgakga	Limpopo DMR
L. Makgoba	Limpopo DMR
E. Zietsman	Limpopo DMR
S. Nkopane	Limpopo DMR
Regional Manager	DWA (Hartebeespoort Regional Offices)
S. Tsheko	DWA
P. Venter	DWA
L. Wiles	DWA
T.H. Mathekga	LEDET
S. Mokgehle	EDET
D. Mapholo	EDET
S. Rabashaba	Department of Environmental Affairs and Tourism, hereafter DEAT (WDM)
M. Livhuwani	DEAT
M. Maebana	TLM
P. Motlhabawe	TLM
N.L. Matlou	TLM
P. Mathlabane	TLM
P.S.R. Nkhumisi	TLM
Z. Namate	TLM
P. Scruton	TLM
J.T. Sibiya	TLM
S. Moselane	TLM
D. Stoltz	TLM
M.E. Lefawane	TLM
L. Lepheana	TLM
J. Madela	TLM
D. Mafa	WDM

CONTACT PERSON	DEPARTMENT
R.J. Lategan	WDM
T. Tshabalala	WDM
L. Matlou	WDM
M. Mataboge	Government – Health and Welfare
L. Maja	CEO Environment Provincial Government
R. Leshiba	Department of Education
R. Mahoa	NUM
S. Klopper	Eskom
B. Engelbrecht	Eskom
Regional Manager	The South African Heritage Resources Agency
Gustav Theunissen	Spoornet
J. Augustyn	Spoornet
P. Erasmus	Spoornet

6.3.3.10 Notification of Organ of States

6.3.3.10.1 Project Phoenix

Notifications to Organs of State included an invitation to attend the public meeting. The invitations for the public were distributed to Organs of State in November 2006 and October 2010.

6.3.3.10.2 Bioremediation

Notifications to Organs of State included an invitation to attend the public meeting. The invitations for the public were distributed to Organs of State in April 2008.

6.3.3.10.3 Review and Updating of Environmental Management Programme

Notifications to Organs of State included BID'ss. The BID's were distributed to Organs of State in June 2010.

6.3.3.11 Organ of State Meetings

6.3.3.11.1 Project Phoenix

An Organ of State meeting was held on the 7th November 2006 in Thabazimbi. A presentation was made to all involved and is included as **Figure 69** – **Section 6.3.3.4.1**. Refer to **Figure 76** for the attendance register. **Table 51** is included which contains the minutes of the meeting.

Table 51: Minutes of Meeting taken for Project Phoenix on 7th November 2006

THABAZIMBI MINE - PROJECT PHOENIX KEYSTAKEHOLDERS MEETING - 7 NOVEMBER 2006, 14:00	
Opening & Welcome	Jan Nel from Shangoni welcomed everyone present at the meeting. Aart van der Brink from Kumba Thabazimbi Mine opened the key stakeholders meeting. He thanked everyone for attending and their inputs.
Purpose of the Meeting	Jan Nel discussed the purpose of the meeting and extended an invitation to the stakeholders to raise their concerns so that

<table>
<tr><th colspan="2">THABAZIMBI MINE - PROJECT PHOENIX
KEYSTAKEHOLDERS MEETING - 7 NOVEMBER 2006, 14:00</th></tr>
<tr><td></td><td>these can be addressed.

It was agreed with DMR that the mine revises the current EMPr once the scoping phase has been completed. DMR would prefer the whole document and not an amendment to the document. A total of 7 copies will be submitted to DMR by the 11 December 2006.</td></tr>
<tr><td>Introduction and Background</td><td>Jan Nel presented information on the background of the mine as well as background on the proposed Project Phoenix activities and the activities covered by this EIA process. The activities include; proposed bridge across the R510, new conveyors replacing the old conveyor system across the R510, and a new slimes dam to handle the capacity required for the expansion of the current mining operation.</td></tr>
<tr><td>Specialist Presentations</td><td>Each specialist did a presentation. The presentations were as follows:
Ross Cooper from Jones and Wagner spoke on the placement of the slimes dams.
John Bradshaw from Hatch spoke on the construction of the bridge.
Rian Coetzee from WSM Leskhika spoke on the hydrology of the project
Donnette Ross from Cleanstream spoke on the IWULA process.
Jan Nel from Shangoni spoke on the conveyor belts.
Jan Nel from Shangoni spoke on the EIA process. The following dates are important to note.

20 November: Public meeting
11 December: Revised EMPr submitted to DMR

That Jan Nel has reached an agreement with LEDET to consider ESR and EMPr only, whilst omitting the need for a full EIA report, and

Jan Nel has received a commitment from DMR for a letter allowing Shangoni to assist with delivery / distribution of copies of the application documentation to other government departments and key stakeholders in order to fast-track the approval process.

The opportunity was given to all participants to raise their concerns subsequent to each presentation.</td></tr>
<tr><th colspan="2">Issues Raised</th></tr>
<tr><th colspan="2">Pits & WRDs</th></tr>
</table>

THABAZIMBI MINE - PROJECT PHOENIX KEYSTAKEHOLDERS MEETING - 7 NOVEMBER 2006, 14:00	
Abrie Tshivhandek and - DMR asked if any new pits will be opened in the process.	**Aart van den Brink - Thabazimbi Mine** Responded that no new pits will be mined. Phoenix pit 1 & 2 will be expanded to existing banded iron ore along the Kumba pit. WRDs can possibly be mined in future but this still needs to be investigated.
Abrie Tshivhandekand - DMR asked if WRDs will be rehabilitated or if they will be mined at a later stage?	**Aart van den Brink - Thabazimbi Mine** The WRDs with a Fe of 45% could be mined. The rehabilitation process as approved in the EMPr will continue.
Bridge	
Abrie Tshivhandekand - DMR asked about the servitudes and whether all the servitudes have been identified and what will happen to them.	**Viktoria Jansen-Gotchev – Thabazimbi Mine** responded that Thabazimbi Mine are in Negotiations with Eskom to move the power line. The costs anticipated are not fixed yet but estimates are available. No other infrastructure will have to be moved. The servitudes will be defined in detail and the impact on these will be addressed.
Johan Augustyn – SPOORNET asked if the bridge was going to affect the traffic flow?	**Viktoria Jansen-Gotchev – Thabazimbi Mine responded** that the traffic will have to be diverted during the construction phase. Thabazimbi Mine has a meeting with SANRAL on the 8 November 2006. A traffic impact assessment has been commissioned.
Johan Augustyn – SPOORNET asked if there was an action plan for the traffic flow?	**Viktoria Jansen-Gotchev – Thabazimbi Mine** responded that they are busy with a traffic study, and contingency plans will be developed for the construction phase
Conveyor Belt	
Philip Makgoka - LEDET asked if the current conveyor belt will be demolished?	**Conrad Bezuidenhout – Thabazimbi Mine** responded that the current conveyor belt will remain until the new plant has been constructed. Once the new plant is operational the existing conveyor may be demolished.
Slimes Dam	
Abrie Tshivhandek and - DMR noted that the proposed slime dam has rock material deposited in the vicinity. Will the material be moved?	**Ross Cooper – J&W**, responded positively that there is material but it will not be removed as the WRDs are stable. Waste rock will be used to construct the wall of the slimes dam.
Philip Makgoka – LEDET enquired whether DWA has been involved in the process.	**Donnette Ross – Cleanstream**, responded that DWA has been involved. The current IWULA document will be amended to include the new water uses as per Project Phoenix.
EIA Process	
Jan Nel Enquired from DMR and LEDET whether they accept the process proposed for the EIA.	**BOTH parties indicated** that they were in agreement with the proposed process of completing the ESR, submitting it for comments within 30 days and then revising the current EMPr

Key Stakeholder Meeting held on 7th of November 2006 at Thabazimbi Iron Ore Mine.

Name	Representing	Address	Tel Number	Cell Number	E-mail or fax number
LEE-ANNE MEIRING	SHANGONI	41 IDA STREET LYNNWOOD	012 - 348 [illegible]	082 456 5268	lee anne @ shangoni.co.za
JAN NEL	"	"	012 - 346 0274	082 [illegible]	jan @ shangoni.co.za
Richard [illegible]	Eskom	83 [illegible] street	014 565 [illegible]	0860037566	[illegible] @ eskom.co.za
AUBREY TSHIVHANDEKANO	DME	101 DORP STREET POLOKWANE	015 287 [illegible] / 082 471 [illegible]	082 [illegible]	aubrey.tshivhandekano @ dme.gov.za
Dina Kobe	DEDET	corner Geyser & Thabo Mbeki, Mokopane	015 491 2010	073 839 5422	015 491 [illegible]
Matjoka M.P	DEDET	"	"	082 888 4923	"
GABEBE M.F	DEDET	Corner Geyser & Thabo Mbeki, Mokopane	015 491 3010	0836356274	Francy [illegible] @ [illegible].co.za
Ross Cooper	J&W	[illegible]	083 496 [illegible]	011 [illegible]	cooper @ jaws.co.za
JOHN GRAOSHAM	R & H	76 MAIN ST [illegible]	011 066 [illegible]	082 [illegible]	johnbg@ robhitch.co.za
Boekes Le Roux	R & H	✓	0145970626	0836044255	boekeslr@robhitch.co.za
I. Uockermann	Spoornet	222 Smit street Braamfontein	011 773 [illegible]	083 [illegible]	[illegible]@ spoornet.co.za
Johan Augustyn	Spoornet	P/bag x [illegible] [illegible]	014 390 [illegible]	083 [illegible]	johannesa @ spoornet.co.za
ALBERT JACOBS	KUMBA	MCC BUILDING, PTA WEST.	012 307 8676	084 6038963	albert.jacobs@kumbaresources.com
Conrad [illegible]	KUMBA		012 307 8680	083 609 1521	Conrad.[illegible]@ kumbaresources.com
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rian Coetzee	USAL	Argentum Building, [illegible]	012 [illegible]	0827792313	rcoetzee @ [illegible].co.za
Viktoria Jansen-Jotcher	Kumba	MCC Bld., PTA West	012 307 8641	083 [illegible] 7966	Viktoria.Jansen-Jotcher@kumbaresources.com
Donnette Roos	Clean Stream	Building 11B, CSIR Campus, Meiring Naude Rd, Brummeria	(012) 349-1629	083 [illegible]	donnette@cleanstream.co.za
Ewald Botha	Kumba	P/bag x [illegible] Thabazimbi	014 777 [illegible]	082 [illegible]	[illegible]@kumbaresources.com
[illegible]	Kumba	P/bag x [illegible] Thabazimbi	014 777 [illegible]	[illegible]	[illegible]
Alort vd Brink	KUMBA-TIOM	"	014 777 [illegible]	083 [illegible]	[illegible]

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Figure 75: Attendance Register of Organ of State for Project Phoenix ESR - 2006

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

6.3.3.11.2 Bioremediation

On the 19 March 2008 Thabazimbi Mine held a key Organs of State meeting. Different aspects concerning the mine were discussed, including the proposed bioremediation process. Refer to **Figure 76** for the presentation, **Figure 77** for the attendance register and **Table 52** for the minutes of the meeting held.

Table 52: Minutes of Meeting taken for Bioremediation ESR on 19th March 2008

<table>
<tr><th colspan="3">THABAZIMBI MINE
STAKEHOLDERS MEETING - 19 MARCH 2008</th></tr>
<tr><td>Introduction</td><td colspan="2">A stakeholder meeting was held on the 19th March 2008 at the “Koedoe” boardroom of the Thabazimbi Mine to discuss the various proposed processes and planned activities at the Thabazimbi Mine.

Thabazimbi Mine has been successfully mining since 1931. Furthermore, the authorization of the EMPr took place in 2006.

• The various activities discussed with the key stakeholders are as follows:
• A central facility for bioremediation of hydrocarbon contaminated soil;
• The burying of building rubble after removal of all re-usable and hazardous material;
• The storage of old tyres in old provincial administration borrow pit situated on the mine;
• Temporary storage of waste to be recycled and re-used;
• Closure of old general waste site; and
• Extension of mining activities to the Buffelshoek east-east, Donkerpoort west-west and Kumba pit areas.</td></tr>
<tr><td>Opening</td><td colspan="2">Mr. Aart van den Brink, mine manager of Thabazimbi Mine, opened the stakeholders meeting, and welcomed all present. Mr. Jan Nel facilitated the meeting. Mr. Nel explained the agenda, introduced all parties involved in the process and explained the purpose of the meeting. The comments and concerns raised during this issue will be addressed during the process of the above activities.</td></tr>
<tr><th colspan="3">Comments from Stakeholders at Meeting</th></tr>
<tr><th colspan="3">Bioremediation site:</th></tr>
<tr><td colspan="3">The potential environmental concerns (as identified by Shangoni and Thabazimbi Mine) include:
Storm water run-off;
Disposal of contaminated material;
Transport of material;
Hydrocarbon smell; and
Replacement of soil.
Jan Nel proposed that a BA should be done for this activity.</td></tr>
<tr><td>Suzan Rabashaba</td><td>Will this activity use the municipal waste disposal site?</td><td>Jan Nel stated that the municipality waste disposal site would not be used.</td></tr>
<tr><td></td><td>Is this the old landfill site?</td><td>Jan Nel stated this is not the old landfill site, only the site for Bioremediation, therefore a new proposed site.</td></tr>
</table>

<table>
<tr><th colspan="3">THABAZIMBI MINE
STAKEHOLDERS MEETING - 19 MARCH 2008</th></tr>
<tr><td></td><td>Is the proposed BA for the landfill site as well?</td><td>Jan Nel stated that the BA would only apply to the Bioremediation site and not for the landfill site.</td></tr>
<tr><td>Jan Nel</td><td>Asked Luke Wiles if the mine can apply for exemption for the “waste site” as indicated in Section 21 as it is only a temporary storage are for the soil.</td><td>Luke Wiles wants to first clarify this issue with DWA before giving an answer.
Further, Luke also wants to see the site first before giving an answer.
Luke stated, depending on the amount of water used, a general authorisation might be needed.
Lastly the IWULA as well as the EMPr should be updated to include this activity.</td></tr>
<tr><td>Jan Nel</td><td>Asked Susan Mokgehle whether it is correct to do a BA for the proposed activity.</td><td>Susan Mokgehle stated she must first inquire at the Waste Department as well as the EIADepartment before she can give an answer.</td></tr>
<tr><td></td><td>Asked if it is a possibility to only improve the EMPR instead of doing a BA.</td><td>Susan Mokgehle must first inquire at the EIA Department before giving an answer. She will stay in contact regarding this issue.</td></tr>
<tr><td colspan="3">Building rubble
The potential environmental concerns (as identified by Shangoni and Thabazimbi Mine) include:
Hazardous waste removal (Asbestos); and
Jan Nel proposed that an application for exemption should be done for this activity.</td></tr>
<tr><td>Luke Wiles</td><td>Where will the building rubble be buried?</td><td>Heilet Hattingh stated that the building rubble would be buried closest as to where the building is demolished. This will ensure that no other area is disturbed.
Furthermore, she stated that the site where the building rubble is buried, re-vegetation takes place, if not naturally, by replanting. If looking at old rubble burying sites, it would not be noticed, due to the re-vegetation.</td></tr>
<tr><td colspan="3">Storage of old tyres
The storage of old tyres is a current practice. Old tyres are stored in an old provincial administration borrow pit situated in the mine area.
Currently, there is no other use for the tyres as it is too strong to be cut and used by farmers for e.g. feeding holders.
The potential environmental concerns (as identified by Shangoni and Thabazimbi Mine include:
Groundwater contamination due to hydrocarbons;
Fire hazard (however, the site is far away from any ignition material except for vegetation); and
Potential air pollution if a fire occurs.
There are alternatives for the use of tyres. This includes handing over the tyres to PPC to be used in their ignition processes. However, PPC has not yet received authorization for this activity. The second alternative includes the rethreading of the tyres. It is, however, up to date, not yet possible to rethread the tyres.
Thabazimbi Mine and Shangoni spoke to DWA last year regarding this issue. DWA stated that to remove the tyres, the mine must apply for exemption. Further, if the mine does not remove the tyres, the mine should also apply for an exemption.</td></tr>
<tr><td>Mahlatse Maebana</td><td>The mine should contact the suppliers to hear from them about taking back the old</td><td>Jan Nel responded that he will look into this matter and will contact the suppliers (Tren Tyres) regarding this issue. This however does not solve the problem</td></tr>
</table>

<table>
<tr><th colspan="3">THABAZIMBI MINE
STAKEHOLDERS MEETING - 19 MARCH 2008</th></tr>
<tr><td></td><td>tyres.</td><td>regarding the disposal of the tyres.
Jan Nel further stated due to the fact that the tyres are very expensive; the mine has put MPs into place to increase the lifespan of the tyres. This MP includes the dust a side of roads. Therefore, far less tyres are disposed.</td></tr>
<tr><td>Heilet Hattingh</td><td></td><td>Stated that the tyres are physically too large to obtain any solution regarding the disposal of these tyres. This is not only a local, but also a worldwide problem.</td></tr>
<tr><td>Jan Nel</td><td></td><td>Stated, the smaller tyre can be collected and recycled by companies such as Waste Tech.
Not enough of the large tyres are disposed of, for these types of companies to come and collect for recycling.</td></tr>
<tr><td>Heilet Hattingh</td><td></td><td>The small tyres at the disposal area (borrow pit) are all old tyres from many years back. New small, worn-out tyres are returned to Tren Tyres for recycling.</td></tr>
<tr><td colspan="3">Temporary storage of waste
The temporary storage of waste is done in a pro-active means to recycle and re-use as much waste possible.
The potential environmental concerns (as identified by Shangoni and Thabazimbi Mine) include:
Soil pollution;
Water pollution;
Increase in recycling and re-use of waste; and
Alignment of the Polokwane Declaration.
The process, Thabazimbi mine wants to follow, is the application for exemption for a license of a “Waste site” as stated in Section 21. Furthermore, the Jan Nel proposes that the mine should do a BA. Part of this Assessment will include a well-designed waste storage area for all waste including the hazardous waste.</td></tr>
<tr><td>Susan Mokgehle</td><td>Where is the hazardous waste presently being stored and disposed of?</td><td>Jan Nel stated there is a Total depot on site, which stores the old diesel and fuel as well as oil rages, etc. Waste Tech removes the hazardous waste weekly. Fluorescent tubes and other hazardous wastes are sorted in bins in a well-controlled area. This will be seen during the site visit.</td></tr>
<tr><td>Suzan Rabashaba</td><td>Does the mine want to apply for exemption from recycling?</td><td>Jan Nel stated the exemption the mine wants to apply for, is from the temporary storage of the waste.</td></tr>
<tr><td></td><td>Will the application for exemption include the hazardous waste?</td><td>Jan Nel confirmed yes, it would include the hazardous waste.</td></tr>
<tr><td></td><td>Wants to visit the old hazardous site.</td><td>Jan Nel confirmed that this site will be visited.</td></tr>
<tr><td>Dolly Mafa</td><td>The municipality might like to take some of the material.</td><td></td></tr>
<tr><td>Mahlatse Maebana</td><td>Confirmed above. However, the municipality would first want to know what material would be available.</td><td>Jan Nel confirmed the municipality is welcome to take some of the material. A letter will be send to the municipality regarding this matter.</td></tr>
</table>

THABAZIMBI MINE STAKEHOLDERS MEETING - 19 MARCH 2008		
Old general waste site The old general waste site has not been used since 1998, when the mine started using the municipal waste disposal site. DWA stated that continued maintenance and monitoring must be done on the old general waste site. This has been done up to present date. Closure of the general waste site is requested. The potential environmental concerns (as identified by Shangoni and Thabazimbi Mine) include: Groundwater pollution; and Erosion.		
Luke Wiles	How often does monitoring take place?	Heilet Hattingh stated monitoring takes place quarterly.
	Is this how it is required by DWA?	Heilet Hattingh confirmed yes. Each quarter, the samples are sent through to DWA. So far, there were no objections from DWA.
Suzan Rabashaba		Stated that it looks as if the site is rehabilitated. Therefore she has no problem if closure of the site takes place.
Extension towards Buffelshoek east-east, Donkerpoort west-west and Kumba pit areas Jan Nel mentioned that the appeared EMPr includes extension to the areas and that this was only to inform parties that this extension is now going ahead. When the annual review of the financial provision is done the quantum will be recalculated to include the extensions if it has not already been included.		
Comments from stakeholders on site visit		
Bioremediation site		
Luke Wiles	Are there any other slime dams?	Jan Nel confirmed there are other slime dams to be used.
Susan Mokgehle	Is the groundwater impacted in any way? Also, are there any boreholes nearby the slime dams and are the boreholes monitored?	Jan Nel stated, the bioremediation site will be filled up with a cement slab and bunded. There will also be an oil separator. There will be no run-off from the site to contaminate the ground-water. Furthermore, the bore-holes are monitored for any groundwater pollution.
Peter Motlhabawe	Where is the soil taken at present?	Heilet Hattingh stated the soil is temporarily stored until bioremediation can take place.
Jan Nel		A contractor has determined the depth and pollution content of the slime dam. According to the contactors findings, all polluted soil is taken out of the slime dam to be remediated.
Heilet Hattingh		Contractors must clean up the soil to a certain standard before they get paid. Therefore, all soil replaced will meet this standard.
Luke Wiles	Does remediation of polluted soil take place at present?	Jan Nel confirmed yes, soil remediation takes place at present.
Dineo Mapholo	Is the remediated soil used afterwards?	Jan Nel confirmed the soil will be used afterwards.
Susan	Is DWA informed of the slime	Jan Nel stated it is not needed according to the law

THABAZIMBI MINE STAKEHOLDERS MEETING - 19 MARCH 2008		
Mokgehle	dams?	to inform DWA. Luke Wiles confirmed Jan Nel's statement. He also stated the official of the area should be contacted in the case of any contamination during monitoring of the borehole.
Dolly Mafa	The bioremediation site is not acceptable. Do you have any other sites proposed for the bioremediation?	Jan Nel confirmed there is another site for the bioremediation. However, it should be noted the site proposed at present is an already disturbed site. Using another site will lead to the disturbance of another natural site.
Old hazardous waste site		
Dolly Mafa	How long is the hazardous waste on site?	Heilet Hattingh responded the waste is not for very long periods of time on the site. Jan Nel also stated only fluorescent tubes are present on site for a long time. The reason being. The tubes are stored in bins. Only after a certain amount of tubes have accumulated does Waste Tech remove the tubes.
Susan Mokgehle	Do you need a permit for hazardous waste in the case of a temporary storage site?	Jan Nel stated the application of a permit would form part of the BA process.

KUMBA IRON ORE

Key Stakeholder Meeting
Kumba Iron Ore – Thabazimbi Mine
19 March 2008

AGENDA OF MEETING

- Opening and Welcome
- Attendees
- Purpose of meeting
- Proposed operations
- Potential environmental concerns
- Way forward
- Lunch
- Site visit

PROPOSED OPERATIONS - BIOREMEDIATION

- Central facility for bioremediation of hydrocarbon contaminated soil
- Sources of this soil
  - Silt traps at oil separators
  - Hydrocarbon spillages from vehicles
  - Water storage dams
  - Workshop contaminated material
- Procedure established for management of such facility
- Kumba responsible person
- Developed in line with approved engineering designs
- Engineered to prevent contamination from facility

POTENTIAL ENVIRONMENTAL CONCERNS - BIOREMEDIATION

- Storm water run-off
- Disposal of contaminated material
- Transport of material
- Hydrocarbon smell
- Replacement of soil

OPENING AND WELCOME

- Welcome to all parties present
- Thank you for your attendance
- Very important to us to ensure we have your inputs and support from the start
- Attendance register
- Introductions – All attendees
- Questions (Please ensure you state who you are and whom you are representing)

ATTENDEES

- Parties invited
  - DME
  - DWAF
  - DEDET
  - Greater Waterberg Municipality
  - Thabazimbi Municipality

WAY FORWARD

- Propose a Basic assessment
- Apply for an exemption for the "waste site" Section 21 application
- Part of consultation

PROPOSED OPERATIONS – BUILDING RUBBLE

- Old buildings and concrete slab areas requiring rehabilitation
- Current practice on the mine
  - Removal of all re-usable material prior to disposal
  - Bury building rubble
- Part of the concurrent rehabilitation process

MINE LAYOUT

PURPOSE OF MEETING

- To inform key stakeholders of proposed process and planned activities
- To obtain inputs from key stakeholders with regards to the project process and potential concerns
- Inputs to determine which activities would require a BA
- Use this forum to discuss
  - Bioremediation site
  - Licensing of waste area (building rubble, tyres, temporary storage of waste)
  - Closure of old general waste site
  - Updating of EMP (DP wes-wes, BH Oos-oos, Kumba)

POTENTIAL ENVIRONMENTAL CONCERNS – BUILDING RUBBLE

- Hazardous waste removal (Asbestos)
- Filling up the existing general waste disposal site in town

WAY FORWARD

- Apply for an exemption to burry the building rubble in stead of disposing it on general waste disposal sites.
- No hazardous waste will be disposed in this process

Figure 76: Presentation of Organ of State Meeting for Bioremediation ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

PROPOSED OPERATIONS - TYRES

- Current practice - storage of tyres in old provincial administration borrow pit situated on the mine area
- This site was never rehabilitated
- Currently no other uses for the tyres

POTENTIAL ENVIRONMENTAL CONCERNS - TYRES

- Ground water contamination
- Fire hazard
- Potential air pollution when fire occurs

WAY FORWARD

- Apply for an exemption/license for waste site in accordance with section 21
- Propose a basic assessment
- Design waste storage area to prevent pollution
- Limit volumes of hazardous waste and storage time

PROPOSED OPERATIONS – OLD GENERAL WASTE SITE

- Domestic waste site not used since 1998
- New licensed site under the control of the municipality since 1999.
- Started closure process in 1999
- Last communication from DWAF stated that continued maintenance and monitoring was required. This has been done over the past ten years.

WAY FORWARD

- Apply for an exemption for waste site in accordance with section 21 in stead of disposing it on general waste disposal sites.
- An alternative for the use of the tyres are being sought

POTENTIAL ENVIRONMENTAL CONCERNS – OLD GENERAL WASTE SITE

- Ground water – monitoring done since 1998, no pollution occurring from this site.
- Erosion – Erosion control is done
- Site has been re-vegetated

PROPOSED OPERATIONS – TEMPARY STORAGE OF WASTE

- Prior to final disposal a waste separation facility (Central facility) will be constructed
- This site will be used for increasing current recycling and re-use abilities
- General and hazardous waste
- An appropriate site will be identified for this purpose

POTENTIAL ENVIRONMENTAL CONCERNS – TEMPARARY STORAGE OF WASTE

- Soil pollution
- Water pollution
- Increase in recycling and re-use of waste
- Alignment with Polokwane Declaration

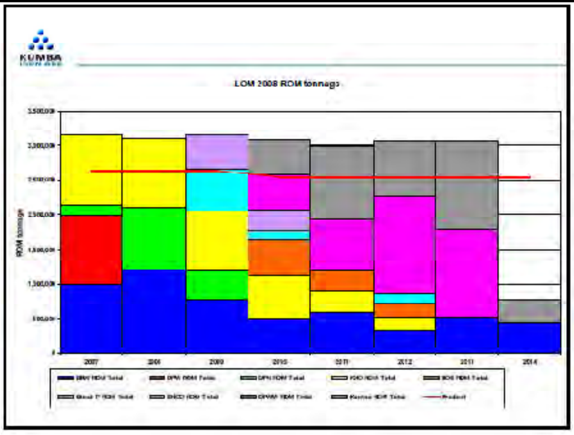
WAY FORWARD

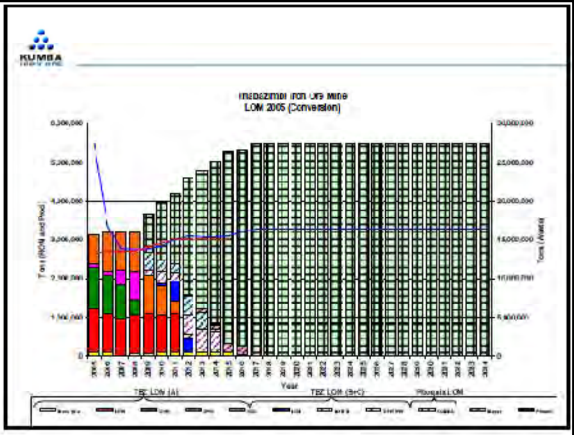
- Compile a report to reflect what has happened to date.
- Include a section in this report on the monitoring that has been done
- Apply for closure (DEAT).

PROPOSED OPERATIONS – MINING ACTIVITIES

- Current life of mine is 2014
- EMP was approved in 2006 reflecting the proposed LOM
- Buffelshoek east-east
- Donkerpoort west-west
- Kumba pit

<table>
<tr><td colspan="2"><u>Presentation of Organ of State Meeting for Bioremediation ESR</u></td><td rowspan="3">SHANGONI
Management Services (Pty) Ltd</td></tr>
<tr><td>Client: Thabazimbi Mine</td><td>Date: December 2010</td></tr>
<tr><td>Project: EMPr Update and Review</td><td>Ref: LP30/5/1/3/2/1 (45)(47) EMPr</td></tr>
</table>





POTENTIAL ENVIRONMENTAL CONCERNS – MINING ACTIVITIES

- Ground water draw down
- Ground water contamination – nitrates (Blasting)
- Noise Nuisance
- Dust
- Lighting at night
- Strom water run off
- Erosion
- Visual - Waste rock disposal
- The above has been identified and addressed in the approved EMP

WAY FORWARD

- Basic assessment –
  - Bioremediation
  - Waste transfer site
- Section 21 exemption applications –
  - Tyre storage area
  - Bioremediation site
  - Waste transfer site
- Application for exemption for building rubble disposal
- Closure application of waste site
- Kumba Day meeting Scheduled for 22 May 2008
- Specific communication to adjacent land owners
- Add in news paper week of 9th May 2008
- Scoping report available for comments from 2nd June 2008 (bioremediation)
- EMP amended together with other changes

SITE VISIT

- Lunch
- Follow Heilet
- Questions and comments on site
- Need to document all the comments and questions / answers

Presentation of Organ of State Meeting for Bioremediation ESR

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

Key Stakeholder Meeting held on 19th of March 2008 at Kumba Iron Ore Thabazimbi Mine.

Name	Representing	Address	Tel Number	Cell Number	E-mail or fax number
Jan Nel	Shangoni	Ida street at Lynnwoodglen	012 3480872	0832791935	jan@shangoni.co.za
[illegible]	DME	Private Bag [illegible] Polokwane	015 2874700	082 [illegible] 3337	[illegible]@dme.gov.za
Luke Wiles	DWAF	P/Bag X352 Hartbeespoort 0216	012 2531036	072 179 6702	wilesl@dwaf.gov.za
Dolly Mafa	Waterberg District Municipality	P/Bag X1018 Modimolle 0510	014 717 1366	082 822 9045	dmafa@waterberg.gov.za
Rabothata Susan	DEAT Waterberg	P/Bag X1018 Modimolle 0510	014 718 3309	076 372 3666	srabothata@deat.gov.za
[illegible]	Thabazimbi Municipality	P O Box 90 TBZ 0380	014 777 1525	083 [illegible]	[illegible]@webmail.co.za
Hele Hallings	Thabazimbi (Kumba)		014 777 3137	083 [illegible]	hele.hallings@kioreltd.com
Pieter Kruger	Thabazimbi (Kumba)		014 777 3144	082 4515541	
Sibusiso Tenza	Kumba Iron Ore		014 7773255	0836091486	
Mahlako Mashana	Thabazimbi Local M	P.O. Box ~~443~~ 90 TBZ	014 777 1014	073 324 0492	mashana18@yahoo.com
Ewald Botha	Kumba		014 777 3137 ~~082 878~~	082878 1275	ewald.botha@kioreltd.com
Sabelo Gumede	Kumba Iron Ore		014-777 3145	0834172246	sabelo.gumede@kioreltd.com
Tebogo Tshabalala	Waterberg District Municipality	P/Bag X1018 Modimolle 0510	014 777 1711/2	082 578 2641	[illegible]@yahoo.com
Peter Motlhabane	Thabazimbi Municipality	P.O. Box 90 TBZ	014 7771525	0728813081	motlhabane@thabazimbi.gov.za
Maphoto Dineo	Dept Economic Development Environment & Tourism	P/Bag X 9484 Polokwane 0700	015-291 3837	0795098666	maphotod@ledet.gov.za
Mokgehle Suzan	"	"	"	0834435748	Mokgehles@ledet.gov.za
S Venter	Shangoni	Ida Street 42, Lynnwoodglen	012 3480872	0766 [illegible]	salome@shangoni.co.za

SHANGONI

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Figure 77: Attendance Register of Public Meeting for Bioremediation ESR

Client: Thabazimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

6.3.3.12 Feedback from the Organs of State

6.3.3.12.1 Project Phoenix

Up to date, no comments or any other feedback has been received from any Organ of State regarding the proposed ESR.

6.3.3.12.2 Bioremediation

Up to date, no comments or any other feedback has been received from any Organ of State regarding the proposed ESR.

6.3.3.12.3 Review and Updating of Environmental Management Programme

Only one comment has been received from DA. Refer to **Table 53** below for this comment.

Table 53: Comments Received from Organs of State for Update of EMPr

ORGANISTION	COMMENTS RECEIVED
DA	Any development on high potential land is not allowed. High potential soil must be preserved for agricultural purposes.

6.3.3.13 Addressing Comments and Questions from the Organs of State

6.3.3.13.1 Project Phoenix

As no comments have been received up to date, this is not applicable at present.

6.3.3.13.2 Bioremediation

As no comments have been received up to date, this is not applicable at present.

6.3.3.13.3 Review and Updating of Environmental Management Programme

Comments will be addressed accordingly.

6.3.3.14 Issuing Registered Interested and Affected Parties and Organs of State with Scoping Report

6.3.3.14.1 Project Phoenix

This draft ESR was made available to all registered I&AP's as well as all Organs of State.

6.3.3.14.2 Bioremediation

This draft ESR was made available to all registered I&AP's as well as all Organs of State.

6.3.3.14.3 Review and Updating of Environmental Management Programme

All I&AP's will have a 45 day comment period to review the ESR in the Thabazimbi Local Library. Organs of State will be sent a copy of the ESR and will have a 45 day comment period.

6.4 Environmental Scoping Reports

6.4.1 Phoenix Scoping Report

6.4.1.1 Background and Motivation

The current LoM at Thabazimbi Mine is estimated at 2016. The economic activities and way of life of Thabazimbi town are depended on the existence of the mine. In light of this the impact of mine closure on Thabazimbi town is expected to be severe. Various projects are currently underway to extent the economic LoM of the mine, such as Project Phoenix. Project Phoenix is in effect a continuation of mining operations in the current Vanderbijl – and east mine pits using improved technology to beneficiate material previously classified as waste and not a new prospecting area.

Furthermore, a lower production rate by AMSA impacts on the national economy. These impacts include the jeopardizing of the railway system viability in the area, loss of income by Eskom, loss of approximately 1500 direct jobs and loss of incalculable indirect jobs. The life of Project Phoenix is estimated to be twenty years plus and aims to produce 3 Mt per annum (mtpa) for the client AMSA. Project Phoenix will extent the current LoM of the Thabazimbi Mine estimated at 2014, to 2036.

The proposed activities are infrastructure that was identified and added to the Phoenix Project subsequent to the completion of the previous EIA conducted in 2005-2006.

6.4.1.2 Projects Description

6.4.1.2.1 Bridge

It is proposed that a bridge will be constructed across the R510 and the Rooikuilspruit as well as infrastructure situated within the pass including water supply, power lines, railway line, etc. The main purpose of the bridge is for the transport of vehicles for servicing and secondly for the transportation of iron ore from the Phoenix Pits 1 and 2 to the Phoenix Plant. Ore transportation via the proposed bridge will be restricted to extreme cases such as power failure or related interruptions causing disruption of transport via the conveyor system. It is proposed that the bridge will span the R510, the mine haul road, Rooikuilspruit and the railway line and will link the Donkerpoort area with the Vanderbijl area. The bridge is proposed for safety reasons to minimize vehicles crossing the R510. The bridge is planned for a span of 20.1 m with a clearance of 5 m.

The R510 is classified as a Class B road in terms of the South African National Roads Agency Limited definition and the bridge design recurrence interval should therefore be the 1 in 100 year flood event.

6.4.1.2.2 Conveyor System

The old conveyor system will be replaced with a new system to transport larger volumes of material to and from the plant. The new conveyor system will also span the R510 and Rooikuilspruit and will be supported by means of pylons that will be located within the 1 in 100 year floodline of the spruit.

6.4.1.2.3 Slimes Dam

A new slimes dam will be constructed to handle fines generated from the new Phoenix Plant. The ore reserve has a life of thirty years with a potential of being increased to 50 plus years in the future.

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. This decision was based on optimal life of the slimes dam; environmental considerations; safety considerations etc.

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. The final elevation of the wall has been set at 1090masl. The life of the slimes dam amounts to 70 years, thus the full life of Project Phoenix and longer. The design is enough to cater for Project Phoenix and beyond.

An access road to the slimes dam will be provided along the pipe and power line route. A haul road for the construction of the slimes dam wall will be provided from the WRD to the outer wall of the slimes dam. The access road may need to be periodically relocated to suit the development of the WRD although the majority of the road should remain on the WRD.

Supernatant and stormwater will be pumped off the dam by means of a pump on a barge. The stormwater capacity for the proposed slimes dam was determined, with assumption that the minimum practical vertical free board would be 3.0 m. The analysis indicated that the dam would have sufficient capacity after 984 mamsl, considering the initial starter wall (971 mamsl), mid height (984 mamsl) and on closure (999 mamsl). The dam would overtop prior to this during the 1 in 100 year storm event and hence a spillway (40 m wide with capacity of 63 m^3 / s) would need to be provided and extended with the growth of the embankment. The capacity of the spillway would be at maximum once the minimum freeboard had been reached for the initial wall.

It is proposed that storm- and supernatant water are stored on the slimes dam prior to pumping back to the plant rather than making use of a separate return water facility. The embankment is considered adequate to store water on the dam even though seepage will occur through the wall, in addition, the pool will move further from the wall with development of the basin. This however means that the depth of water on the dam could at times require a slightly higher vertical freeboard, particularly during the early stages.

Dirty water from the slimes dam will be pumped back to the plant in a closed reticulation system. The minimum pumping rate required to return storm and process water back to the plant to prevent an accumulation of water in the dam was calculated to be 110 m^3 / h.

6.4.2 Bioremediation Scoping Report

Thabazimbi Mine has proposed to construct a bioremediation site for the treatment of contaminated soil. The material to be bioremediated, on Thabazimbi Mine site, consisted of contaminated soil collected from various locations on site. The contamination of soil is due to various activities taking place on the mining site.

Contamination of soil remediated by the temporary bioremediation site occurred due to accumulation of contaminants, ranging in consistency from gasoline to used motor oil and solvent based degreasing solutions, over a period of time. Contamination of soil to be remediated by the permanent bioremediation site will mostly be due to hydrocarbon spills.

6.4.2.1 Project Description

6.4.2.1.1 Temporary Bioremediation Site

A temporary bioremediation site was utilised for the treatment of the contaminated materials.

Differently from the permanent site the majority of the contaminated material was excavated from an old contaminated water storage facility .The contaminated soils form part of the historically contaminated material on the site. The site was lined with plastic sheeting to avoid contamination of the area in which the bioremediation process was to be carried out. The two areas used measured 60 m by 60 m and 100 m by 50 m respectively. The bioremediation product used allows windrows of soil to be stacked to a height of 1.5 m to 2.0 m and therefore reduces the footprint of the temporary site when compared to other products that only allow for a soil bed of ± 30 cm in depth. The product allows for a bioremediation time frame of 3 to 4 months after initial setup.

6.4.2.1.2 Permanent Bioremediation Site

The permanent site will be managed similar as to that of the temporary bioremediation site. The specifications of the site are as follow:

- The permanent site will differ from the temporary site in the sense that a concrete layer will cover the surface of the site.
- Also different from the temporary site, walls with a height of 300 mm will the surround the site.
- This wall will extend to divide the site into two areas. Each area will be approximately 10X20 m.
- Each area will include filters and sumps.
- The site will be approximately 20X20 m and 300 mm high.

Trucks will bring all the contaminated soil from the various locations to the site. The soil will then by seeded with the bioremediation product Water will be used to wet onto soil to help the product with the process.

1. Soil is remediated in the one area (area # 1);
2. Newly transported polluted soil is stored on the other area (area # 2);
3. As the remediation finishes, this soil is then removed from area # 1;

4. The stored soil from area # 2 is then being bioremediated;
5. During this time newly transported polluted soil is stored in area # 2.

This process will be repeated. Bioremediation of one area takes approximately 3 months to convert the soil to re-usable uncontaminated soil.

6.4.2.1.3 Motivation

The contaminated material in question is to be bioremediated to naturally occurring TPH - Infrared Analysis (EPA 418.1) levels, as determined from both clean soil samples and clean soil samples treated in the same manner as the contaminated material in question.

Thabazimbi Mine has based their decision to establish a bioremediation site on the following three reasons:

- Thabazimbi Mine must comply with the standards of the ISO 14001;
- The bioremediation of soil will reduce the amount of waste produced due to mining activities; and
- Through the bioremediation of soil, a very important resource is put back into the environment.

The following benefits have been listed by Maila & Cloete (2004) for the bioremediation of soil:

- Very low capital input required;
- Technology is simple to design and implement;
- Large soil volumes can be treated;
- Can be applied ex-situ;
- Has small environmental impact; and
- Energy efficient.

6.4.2.1.4 Location

The site is located on Portion 10 of the Farm Donkerpoort 344 KQ. Portion 10 of the Farm Donkerpoort forms part of the mining area of Thabazimbi Mine. The area is located on the western side of the national road R510, south of Thabazimbi Town. Portion 10 of the Farm Donkerpoort is on both sides of the R510.

The site itself is located just south of the old conveyor band, approximately 2.3 km from the national road R510.

6.4.3 Scoping Report for Review and Update of Environmental Management Programme

The purpose of this ESR was to broadly and collaboratively identify all the possible issues and impacts from activities associated with the proposed new activities. This ESR therefore contained all the information that is necessary for an adequate understanding of the nature of issues identified during the scoping phase of this project.

6.4.3.1 Project Description

Refer to **Section 3.4** for all new projects forming part of this ESR.

6.5 Specialist Studies

The following is the specialist studies that were done since 2005 and thus not included in the previous approved EMPr.

6.5.1 Climate Assessment

A Climate Assessment was done by Robert Maisha from the Department of Geography; Geoinformatics and Meteorology of the University of Pretoria, completed on 18 October 2010.

This study was done due to complaints received from neighbouring tomato farmers regarding the occurrence of black frost and to verify the mine's impact on the weather if any. The following was found:

1. From the observations minimum temperatures and winds using SAWS climatic station data; for June and July 2009; it was found that minimum temperatures dropped to below freezing point; which supports the formation of frost;
2. The application of NCEP re-analysis data is to check for the spatial distribution of the minimum temperatures. Results shows that, minimum temperatures and frost occurred over a larger area of Limpopo province; stretching towards Botswana and Gauteng area;
3. The weakness of using one weather station data is that one can assume that in this case the occurrence of frost in Thabazimbi area was an isolated case;
4. A further analysis using NCEP re-analysis data was therefore necessary to determine whether such frost occurrence where isolated or not;
5. From this analysis no conclusion can be drawn until winds data (speed and direction) are obtained and analyzed over the province. Likewise the WRF model will be nested over Thabazimbi area and the forecast will then be analyzed in order to draw a conclusion.

6.5.2 Fauna and Flora Survey

A follow-up survey was done on the 2005 survey to cover additional areas to the areas covered in 2005. The Fauna and Flora Survey was compiled by Shangoni Management Services (Pty) Ltd and Pachnoda Consulting cc in July 2010. This survey was done to update the current "Fauna & Flora Survey" report compiled during 20 – 24 June 2005 for the Thabazimbi Mine. The study area is situated south of the town of Thabazimbi, and consists of 6 sites located along a series of parallel running hills and ridges of the Waterberg Mountain range. The respective names of these sites are:

- Kwaggashoek East;
- Bobbejaanswater;

- Tambotiekloof;
- Kumba Pit;
- Meyers Mine; and
- Wagteenbietjiesdraai.

The following recommendations were made:

- The Tambotiekloof and Meyers Mine area sustain high densities of tall (aged) *Spirostachys africana* (Tamboti) trees. It is recommended that all individuals of *S. africana* be marked prior to the commencement of any mining activities. Where possible, these individuals should be conserved *in situ.*
- The felling of large (tall) trees which could be utilised by the Red-billed Oxpecker (*Buphagus erythrorhynchus*) for breeding and roosting purposes should be prohibited. Suitable nesting or roosting trees should be identified prior to any mining activities and should frequently be inspected for breeding/roosting individuals. Confirmed roosting/breeding trees should be marked and conserved *in situ.*
- Mining of the Meyers Mine area will impact on the vulture restaurant. It is suggested that the current restaurant operation relocate to the nearby Ben Alberts Nature Reserve. The spatial position of the restaurant should be selected in consultation with an ornithologists, and due consideration should be given to the position of current transmission and distributions lines on the property to prevent unnecessary ‘bird-power line’ interactions.

It is also recommended that the mine should consider doing the following detailed studies as follow-ups. This would include, but not necessarily be limited to:

- A detailed floristic survey of the entire study area (including the Ben Alberts Nature Reserve) with emphasis on the demarcation of physiognomic vegetation units based on information obtained during a plot-based sampling protocol. The data obtained during plot-based sampling will provide insight into the distribution (spatial position of vegetation communities) and abundance (relative density of species) of plant taxa and their social hierarchy, as well as the ecological condition (successional stage) of the predetermined physiognomic units. The aforementioned studies are compulsory and a prerequisite for the formulation of game stocking strategies, the determination of local carrying capacity and the compilation and implementation of fire management plans.
- An additional survey of the study sites for “Red List” and endemic plant taxa during the early wet season (when most geophyte species produce inflorescence).

- Very little information is available on the distribution and abundance of the small mammal population (pertaining to taxa of the Macroscelididae [elephant-shrews], Soricidae [shrews], Rodentia [all rodents] and meso-carnivores (e.g. mongoose, genets and small felines) on the study area. A small mammal trapping session should be considered imperative for each of the proposed study sites.
- A dung beetle study is recommended – such a study is necessary to evaluate the dung beetle assemblage structure on the study sites. The study will focus on (1) an inventory of dung beetle fauna on different food types and (2) determines to what extent the assemblage structure is influenced by local vegetation and the proposed exploitation of dung. Results from the study will assess the predicted processing of dung pads originating from introduced game and the long-term effects these dung pads have on the palatability of the surrounding grass.
- Information regarding the herpetofaunal diversity on the study sites is lacking or nonexistent. A herpetological study should form part of a follow-up survey during the wet season.

6.5.3 Air Quality Management Plan

An AQMP for Current and Proposed Mining Operations at Thabazimbi Mine, Limpopo was done by Airshed Planning Professionals in September 2009.

Based on the components required for the development of an AQMP for Thabazimbi Mine operations, an emissions inventory was undertaken, atmospheric dispersion modelling conducted and predicted air pollutant concentrations evaluated. The methodology followed for each of these is described below:

A baseline air quality characterisation

The baseline assessment served to give a detailed description of the state of the environment and existing levels of pollution within the region.

An air quality impact study

The release of emissions represents the environmental impact of concern during the proposed operational phases at Thabazimbi Mine. It is assumed that all mining activities and processing operations will have ceased by the closure phase of the mining operations. The potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure and on features which will remain, such as the tailings dam and the WRDs.

Air Quality Management Plan for the mine

Air Quality Management measures will ensure that the current and proposed operations at Thabazimbi Mine will have the lowest possible impacts on the surrounding environment. This can be achieved through a combination of mitigation measures and ambient monitoring. Mitigation measures are usually implemented at the main sources of pollution with the monitoring network designed as such to track the effectiveness of the mitigation measures. To identify the most significant sources, these need to be ranked according to sources strengths (emissions) and impacts. Once the main sources have been identified, target control efficiencies for each source can be defined to ensure acceptable cumulative ground level concentrations.

The main conclusion is that the proposed operations will result in an increase in ground level PM10 concentrations and dust fallout levels at the various sensitive receptors. Although it proposed that open pit mining operations at Bobbejaan Water and Buffelshoek East East will commence when the current Buffelshoek West operations cease, it is unlikely that these operations will lead to an increase in ground level concentrations at the sensitive receptors. This is due to the close proximity of these proposed mining operations to the Buffelshoek West operations and the fact that all these operations are located further away from the sensitive receptors compared to the other open pits (current and proposed). The modelling did however follow a conservative approach to ensure that the worst-case scenarios were reflected in the assessment, especially for the proposed Phoenix project.

For the closure phase, it is likely that the predicted impacts will be much lower when mining activities cease due to extensive rehabilitation that is currently carried out in the mine. It is also possible that by the closure phase, the control efficiencies for the various wind erosion sources could be much higher than those used during the dispersion modelling, resulting in lower impacts at the sensitive receptor sites. It is expected that natural crusting of some of the stockpiled material will also occur once these sources are not disturbed.

Reference data on the impacts of particulates on plants and animals are scarce and therefore the impacts of the current and proposed operations at Thabazimbi Mine on vegetation and animals could not be quantified. Given that the area around the mine has some relatively dense natural vegetation, it is expected that this vegetation will have a tolerance for dust impacts. This however will have to be confirmed through monitoring certain species in the area.

The following recommendations were made:

Target controls for the Main Sources

Current and Future operational phase

1. Vehicle entrainment on unpaved haul roads – 90% control efficiency through the application of chemical surfactants or surface paving.
2. Vehicle entrainment on in-pit haul roads – these roads change depending on the area to be mined and hence it is not practical to apply chemicals. It is recommended that a minimum of 75% control efficiency is achieved through affective water sprays.
3. Materials handling operations- The control efficiency of pure water suppression provides an effective control mechanism achieving on average 62% efficiency by doubling the moisture content.
4. Crushing and screening operations- enclosure of crushing operations is very effective in reducing dust. The Australian NPi indicates that a telescopic chute with water sprays would ensure 75% control efficiency and enclosure of storage piles where tipping occur would reduce the emissions by 99%.In addition, chemical suppressants

or water sprays on the primary crusher and dry dust extraction units with wet scrubbers on the secondary and tertiary crushers and screens will assist in the reduction of the cumulative dust impacts.

Closure Phase

It is highly likely that the predicted impacts will be much lower when mining activities cease due to extensive rehabilitation that is currently carried out in the mine. It is also possible that by the closure phase, the control efficiencies for the various wind erosion sources could be much higher than those used during the dispersion modelling resulting in lower impacts at the sensitive receptor sites. It is also expected that the natural crusting of stockpiled material will occur once these sources are not disturbed.

Suitable Mitigation Measures

Unpaved haul roads

Since Thabazimbi Mine already has extensive mitigation measures in place (chemical suppression and water suppression for the main haul roads and in pit roads), it is recommended that the mine continues with these mitigation measures and that the same mitigation measures be applied to the proposed operations unpaved haul roads when these operations commence. One of the main benefits of chemical stabilisation in conjunction with wet suppression is the management of water resources. A cost-effective chemical control programme should be developed evaluating the costs and benefits arising from various chemical stabilization practices on site specific roads.

Material handling operations

The control efficiency of pure water suppression provide an effective control mechanism achieving on average 62% efficiency by doubling the moisture content. Again, the combination of water and chemicals provides the most feasible mitigation option.

Monitoring Requirements

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:

4. 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.
5. 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.
6. 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:

3. 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 D-1739) or any other method which can demonstrated to give equivalent results (SANS, 2004).

4. 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.

Record-keeping and Environmental Reporting

It is recommended that site inspections and progress reporting be undertaken at regular intervals (at least quarterly) during operations, with annual environmental audits being conducted. Annual environmental audits should form part of the overall EMS at Thabazimbi Mine. A budget should be drawn to provide a clear indication of the capital and annual maintenance costs associated with dust control measures and dust monitoring plans.

6.5.4 Noise Impact Assessment

A Noise Impact Assessment was compiled by F van Niekerk from OH & AP Consulting Services in September 2006. The object of the study was to quantify and to assess the noise impact in surrounding areas expected from mining operations associated with the proposed Project Phoenix mining activities.

The strategy employed in the investigation is being summarised as follows:

- Determine the existing noise levels (residual noise levels) in the area surrounding the proposed Thabazimbi mining zone.
- Identify possible noise sensitive environments
- Determine and assess the current environmental noise levels as a result of current mining activities.
- Quantify the acoustic emission levels of all machines, equipment and processes to be employed in the proposed mining operation.
- Develop a computer model to simulate the emission of sound from the mining operation, as well as the propagation and dispersion of sound into the surrounding environment.
- Use the simulation model to compute contours of the expected increase in ambient noise level in the external environment as a result of future mining activities.
- Employ criteria from National Noise Regulations and from SANS codes of practice to assess the expected impact of noise from the mining operation on the external environment.

Although propagated sound levels at none of the identified critical receptor areas increased the residual noise level with more than 7 dBA, it should be noted that in some instances the

SANS 10103:2004 standard limits are exceeded. Merely based on residual noise levels, these limits are exceeded in most instances.

Taking into consideration that the SANS standard limits are exceeded, mining and plant acoustic emissions should controlled as low as reasonable practicable.

6.5.5 First Phase Heritage Impact Assessment

A First Phase Heritage Impact Assessment was compiled by S. Miller of African Heritage Consultants CC in July 2010.

All relevant maps and documents on the site were studied. The 2005 Heritage Impact report, on the 'Phoenix' project, prepared by the present author, was revisited, as well as the original Prinsloo report. Areas identified are:

1. Disturbed Early Iron Age - Ploughed field;
2. Disturbed Later Iron Age site - No walling;
3. Later Iron Age site (?) - No walling;
4. Later Iron Age site - Walls on hillside, grinding stones present, Slag and bloom iron present.
5. Later Iron Age site - Smelting site, Several smelting ovens, Very small walled site, Prinsloo excavation of two females;
6. Later Iron Age site - Disturbed smelting sites in road.
7. Later Iron Age site - Walled site, Smelting ovens, Grinding stones present;
8. Second non walled site - Smelting ovens, Grinding stones present, Two sites may overlap from different periods in time, Limited MSA material;
9. Later Iron Age site - Smelting ovens;
10. Later Iron Age site - Walled site, Grinding stones present, Animal enclosures (?) present
11. Later Iron Age site - Smelting site;
12. Early Modern - Exploration shaft/hole (?);
13. Early Modern - Du Randt homestead; and
14. Early Modern - First prospector's licensed area.

During discussions with Thabazimbi Mine management the importance of both the old, as well as the new and in-tact sites that were revealed during the site 2010 investigation was pointed out. It was suggested that Thabazimbi Mine will make funds available so that that the newly identified sites, that are well defined, can be mapped in the near future, so that their limits can be defined as a first stage of further investigation. This mapping of the sites will then be collated into the 2005 report of Thabazimbi Mine's heritage estate. So doing a comprehensive heritage inventory will be established for the purposes of Thabazimbi Mine's heritage preservation strategy for the future.

If further scientific studies are deemed feasible by academic or other institutions, then such studies will have to be negotiated between such institutions and Thabazimbi Mine management.

6.5.6 Socio-Economic Impact Assessment and a Plan to Address the Socio-Economic Aspects of Mine Closure at Thabazimbi Mine

A Socio-Economic Impact Assessment and a Plan to Address the Socio-Economic Aspects of Mine Closure at Thabazimbi Mine was compiled by the Mineral Corporation.

Kumba Iron Ore appointed the Consultant to undertake a study on the current impact of Thabazimbi Mine on the affected environment and the future anticipated impact upon mine closure, and to submit a report on the Socio-economic Aspects of Mine Closure that will report on the outcome of the study. The terms of reference of the study included the following:

- SEBS;
- Socio-economic Impact Assessment (SEIA);
- Mine Closure Plan (MCP) - socio-economics; and
- Assessment of Socio-economic related Closure Costs.

It is recommended, as per the SEAT requirement, that stakeholder feedback sessions should be held to discuss the findings of the stakeholder engagement process conducted during this study. It is further recommended that once the Mine Closure Plan is completed, the Company hold stakeholder workshops to test and solidify the robustness of proposed interventions.

Current LED projects managed by Thabazimbi Mine should be scrutinised in the view of possible mine closure to determine the viability and sustainability of these interventions. Proposed LED interventions and SMME opportunities in this document should be investigated further to determine their applicability and feasibility in the case of mine closure.

It is important that a Detailed Closure Plan to be developed in 2010 to confirm the validity and applicability of information gathered in this document as well as to commence with an integrated closure planning process with key stakeholders and employees.

The final aspect of a Mine Closure Plan is performance monitoring, which should be designed to demonstrate that the completion criteria have been met. This period should also plan for remedial action where monitoring demonstrates completion criteria are unlikely to be met. It is therefore important that the Detailed Mine Closure Plan should identify the types of monitoring programs that may have to be instituted to allow verification that the closure planning process is meeting pre-selected goals.

6.5.7 Biodiversity Action Plan

A BAP was compiled by L. Meiring of Shangoni Management Services in August 2009.

The purpose of this document is to capture current actions with regards to biodiversity on the Thabazimbi mine property, and to further investigate actions according to the Anglo American Way guidelines (Coombes 2004) with regards to biodiversity management on the Thabazimbi mine.

In conclusion to the study, biodiversity conservation is undoubtedly a challenge, and this guideline has been produced to clarify biodiversity and provide a practical means to assess, manage and monitor biodiversity with the aim of enabling, where appropriate, Anglo American companies to take on a biodiversity stewardship role. The key elements of such a role are:

- Impacts on biodiversity should be avoided wherever possible, minimized where they cannot be avoided, and mitigated where there are residual impacts.
- During the development phase of a project, there should be a rigorous assessment of all options, including the 'no-go' option.
- Offsets may be useful in mitigating residual impacts; preference should be given to in- situ offsets that are aligned with local, regional, national and international conservation strategies, with the aim of bringing a net positive benefit for biodiversity conservation.

6.5.8 Traffic Impact Assessment Report

A Traffic Impact Assessment Report was done by PD Naidoo and Associates Consulting Engineers in May 2007.

This study was done to assess the traffic impact of:

1. Construction of a new Plant area on the corner of the R510 National road and Dwaalboom Road, west of its current position and with access from the same position off the R510 at the truck workshop access;
2. The impacts of the new bridge over R510 some 500 m south of Dwaalboom Road.

The following findings were made during the assessment:

1. According to SANRAL no future road changes are envisaged in the area;
2. The existing peak traffic hours occur between 06h00 and 06h59 in the morning and between 16h00 and 16h59 in the afternoon;
3. The existing high speed occurrences through the 60kph zone is a critical risk as the risk of fatal and severe traffic accidents occurring increases exponentially with increasing speed;
4. With the assumption that Spoornet will continue to transport ore beyond Thabazimbi by rail in a manner similar to that present and the workforce compliment remains as at present, the change in staff and truck transport is likely to be similar to the existing situation, thus no future impact;
5. The overall intersection capacities are operating extremely satisfactory in the existing situation 2006 and will not require any road upgrading;
6. The additional traffic flow resulting from the growing traffic is not expected to be significant;

7. In future years however, the plant operations and / or area may increase and then the traffic impact could be material, depending on the plant growth; and
8. Since the construction traffic will mostly be confined to the site area, little impact on the passing Dwaalboom traffic is expected.

The following recommendations are proposed:

1. Use rumble strips or noise strips to reduce speeds to a safe level;
2. Accommodate public transport in a laybye (located to west of the R510 and beyond the mine entrance);
3. The construction of the bridge across the R510 must take place according to the SANRAL procedures, which allows for the bridge to be built while keeping the R510 open at all times;
4. The daylight blasting hours should be between 13h00 and 14h00 being the lowest two-way traffic flows during the day;
5. Continue and possibly improve in the future the existing Spoornet transport arrangements;
6. Minimize the usage of road-based (truck) transport arrangements;
7. The new plant access must be off R510 in its current position; and
8. Access must be to the satisfaction of SANRAL Road Authority.

6.5.9 Revised Draft Report Comparative Social Impact Assessment

A Revised Draft Report Comparative Social Impact Assessment for the Housing Options for Construction Workers was compiled by N. Byker and A. Bron of MasterQ Research in February 2007.

This report was compiled to enable Thabazimbi Mine to make an informed decision regarding the better socially and financially feasible housing option for construction workers, during the construction of Project Phoenix. The main objective of such the CSIA was to determine not only the potential social impacts of the two alternatives, but also to compare and assess the associated social impacts between the two options and determining which option would be preferable in terms of economic feasible and social desirability and acceptability by the receiving community.

The following findings were made during the assessment:

1. Based on the assessment of the various impacts and taking cognisance of the financial implications of these impacts, the most viable housing option available to Thabazimbi Mine is to house construction workers in existing housing structures within the community;
2. However, a brief capacity assessment of the available options in terms of existing housing structures revealed that the community would be able to house approximately 700 persons over the lifespan of the project; and

3. Including the estimated 300 local construction workers, a total of approximately 1 000 people can be housed within the community, resulting in the fact that approximately 750 people are still in need of accommodation.

The following recommendations are proposed:

1. **Short term:** House construction workers in existing housing structures within the community where possible.
2. **Medium term:** Consider the use of a small-scale construction village in combination with housing within the local community at the peak of construction.
3. **Long term:** Enter negotiations with the TLM regarding a co-operative (or funding) agreement, together with the Development Bank of South Africa (DBSA), regarding sustainable development in terms of housing and the municipal services network.
4. However, due to the limited timeframes of the construction phase of the project, this option falls outside the scope of this phase of the project and is therefore not deemed as a viable option for housing construction workers. It is therefore only recommended as a future or long term option that could potentially complement Thabazimbi Mine's social investment initiatives as outlined in their Thabazimbi Mine SLP.

6.5.10 Groundwater Model for the Dewatering of the Thabazimbi Mine Area

The Groundwater Model for the Dewatering of the Thabazimbi Mine Area was compiled by WSM Leshika Consulting in April 2007 to develop a numerical groundwater model for Thabazimbi Mine.

The following conclusions can be drawn from the study:

1. No impact on water levels can be observed outside the Thabazimbi mine area, hence mining will not impact on water levels in adjacent farms
2. Current abstraction results in net infiltration losses of 51 m^3 / h from the Rooikuilspruit. These significantly depletes discharges from the Thabazimbi WWTW, and introduces microbial contamination into the breccia basin aquifer
3. With dewatering of Pit 1 losses from the spruit may exceed 80 m^3/h if discharges from the treatment works continue
4. Average dewatering rates will increase from 315 m^3/d to over 2 200 m^3/d from 2012 until 2023.
5. Depending on the rate of mining, maximum dewater capacities of up to 6 000 m^3/d may be required by 2023.
6. Decant levels are above the natural groundwater level, hence no decant is expected
7. In the post mining scenario, since no decant will occur, water levels are expected to rebound to original levels.

6.5.11 Baseline Aquatic Biomonitoring Survey and Toxicity Testing of Selected Sites Associated with Mining Activities in Thabazimbi, Limpopo South Africa

A Baseline Aquatic Biomonitoring Survey and Toxicity Testing of Selected Sites Associated with Mining Activities in Thabazimbi, Limpopo South Africa was conducted by W. Malherbe and M. Ferreira from Econ@uj in September 2010. This was done to determine the ecological integrity of both Rooikuil River and the Bierspruit systems.

The results indicate that most of the physical chemical variables are within the TWQR apart from oxygen saturation, Chromium, Copper, Manganese, Selenium, and Nitrates. Copper, Chromium along with Vanadium was also found in high concentrations in the sediment samples at some of the sampling sites. Although some of these elements are toxic at high levels the possibility exists that despite their presence in the environment, these metals may not be bioavailable. Results of the habitat integrity assessment also indicated that changes in habitat integrity have occurred in the Bierspruit and the Rooikuil River since the high flow assessment. These changes were, however, brought about by lower flow conditions and not by the mining activities. Results also indicate that the habitat integrity within the Crocodile River is in a largely natural to modified state. Although the Crocodile River at this point is a naturally alluvial system there is concern that additional sediment input that is occurring in the system. This is as a direct result of poor catchment management, flow alteration and abstraction of water for irrigation purposes.

The ecological integrity of the macro invertebrate communities within the Bierspruit and Rooikuil River were lower when compared to the high flow survey. This is as a direct result of a change in habitat integrity. This change, brought about by lower flow conditions was easily observed in the community structure with tolerant, air breathing taxa dominating at most of the sites on the Bierspruit and Rooikuil River. Results also indicate that the SASS score was lower at CR 2 and CR 4 when compared to the previous low flow survey. The ASPT was higher at CR 1 and CR 2 and similar at CR 4 when compared to the previous survey. The fish community remained similar between the high and low flow survey in both the Bierspruit and the Rooikuil River. The trends in the fish community within the Crocodile River seems to indicate that the ecological category have increased slightly since the 2009 surveys. This can be attributed to good flow conditions present during 2010 while previous surveys indicated times of decreased flow. A majority of species expected to occur in the Crocodile River needs flow as part of their habitat preferences. Fish results from previous reports also indicate that the average fish community index results for the last eight years averages between 40% and 60%.

Screening toxicity tests were conducted using water from localities T1 to T7. Drastic mortality results for both the guppies and water fleas exposed to water from T3 within the first 24 hours, prompted the implementation of definitive toxicity tests. These tests were conducted to verify whether further dilution of the original water sample may present any detrimental mortality results for the exposed organisms. Screening tests were continued for the rest of the localities.

The following recommendations can be made based on the survey completed in September 2010:

1. The ecological integrity of the biotic communities and water quality within the Rooikuil River can be improved if the spoil heap that has been placed within the active channel of the river at RK1 is to be removed.
2. Overflow from the wastewater dam that is currently flowing into the Rooikuil River should be stopped as this has an influence on the water quality, and may potentially pollute the Crocodile River downstream of the confluence.
3. The sources of metals within the sediment at CR4 should be further investigated. The possibility exists that activities within the catchment of the Bierspruit may be responsible for the higher metal concentrations observed at this site.
4. The bioavailability of certain elements (especially Selenium) must be determined. This could be achieved through active biomonitoring studies.

6.5.12 Regional Geohydrological Model

A Regional Geohydrological Model was compiled by Groundwater Consulting Services (Pty) Ltd in March 2011 to construct and calibrate a regional geohydrological model for the Thabazimbi Mine.

It is concluded that:

1. An extensive hydrocensus was undertaken as part of this investigation. . During the hydrocensus one hundred and eighty four (184) boreholes were visited of which 164 boreholes were existing boreholes and 20 were newly drilled.
2. Newly drilled monitoring boreholes were site using geophysical methods with the objective of targeting Diabase intrusions, to quantify the impact of the proposed Phoenix Tailings Storage Facility and to estimate the extent of hydrocarbon contamination in the Donkerpoort Breccia Basin.
3. The newly drilled monitoring boreholes fully penetrate the aquifers into which they were drilled, with the exception of the boreholes drilled for the hydrocarbon study. The aquifers probably extend to depths of 80 – 100 m, based on available information. The shallower hydrocarbon monitoring boreholes are however considered to be sufficient to monitor the surface sources of contamination in the Breccia Aquifer.
4. There is currently insufficient information available on the depth and construction of the existing monitoring boreholes to determine whether or not they fully penetrate the aquifers into which they were drilled.
5. The newly drilled boreholes were pump tested to obtain aquifer parameters for the aquifers and geological structures into which they were drilled.
6. Chemical analysis of the groundwater from the hydrocensus boreholes indicate that the groundwater is generally of good quality and is calcium-magnesium-bicarbonate dominant. This is testament to the impact of the dolomites on groundwater quality.

7. Monitoring database information indicates that groundwater levels are not declining in the production and monitoring boreholes. This suggests that the aquifers are not over-exploited.
8. Available information was used to construct a conceptual model for the sub-catchment in which the project is situated. Seven aquifer units were identified and quantified. The two main aquifers from which groundwater are abstracted is the Crocodile River Primary Aquifer and the Donkerpoort Breccia Basin Aquifer.
9. A numerical groundwater flow model was constructed and calibrated with available information. The calibrated model was used to simulate the impact of groundwater abstraction by Thabazimbi Mine on the surrounding aquifers and private groundwater users.
10. That water from the Rooikuilspruit seeps into the Breccia Aquifer and is pumped from the production boreholes into the drinking water circuit. It is estimated that approximately 20% of the total volume of groundwater abstracted from the Breccia Basin, originates from the spruit.
11. The simulated cone of abstraction during the operational phase of the project indicates that groundwater may be lowered by 3 – 4 m in the Breccia Basin Aquifer and by up to 7m in the dewatering boreholes around the Donkerpoort West Pit. Groundwater levels in the boreholes drilled into the Alluvial Aquifer will probably not be lowered by more than 1 m.
12. If long-term abstraction is considered, the cone of abstraction expands within the Dolomitic Aquifer, but the drawdown in groundwater levels are not expected to increase significantly. This is due to the high transmissivities of the aquifers abstracted.
13. The impact of prolonged drought is expected to cause a regional lowering in groundwater levels. Drawdown in production boreholes of up to 8m may occur. As the available drawdown in production boreholes is on average >30m, the expected drawdown during drought is not expected to result in borehole loss.
14. The long-term safe yield for the Breccia Basin aquifer is estimated to be just under 2 million m^3/a. The current volume of groundwater abstracted is approximately 80% of the safe yield.
15. The long-term safe yield of the Alluvial Aquifer is approximately 1 million m^3 / a and current abstraction by Thabazimbi Mine from this aquifer is approximately 53% of the safe yield.
16. A detailed monitoring and validation programme was developed, based on the existing monitoring information and the conditions of the IWULA issued by DWA.

It is recommended that:

1. The model must be verified with a dataset that was not used during calibration. It is recommended that this is achieved with information from the 2010/2011 monitoring databases.
2. The model confirms that water from the Rooikuilspruit seeps into the Breccia Aquifer and is pumped into the potable water circuit. Thabazimbi Mine must therefore continue to chlorinate the drinking water, as the discharge from the Municipal WWTW is contaminated with bacteria and pathogens. Thabazimbi Mine must furthermore

continue to work with the Municipality to improve the quality of discharge to the spruit to safeguard the drinking water supply to the Mine as well as to the town against contamination.

3. An attempt is made to calculate the hydraulic conductivity (K) of the Rooikuilspruit riverbed material. If this is not possible, the volume of seepage from the spruit to the underlying aquifer can be estimated and in turn used to calibrate the K for the riverbed material.
4. The results of the pump testing of production boreholes that are currently underway are used to update the predicted operational and long-term drawdown cones presented in this report. The maximum and recommended long-term abstraction rates can be evaluated when this information is available.
5. The abstraction rates and groundwater level fluctuations of production boreholes must be monitored closely during drought conditions to ensure that over abstraction and loss of boreholes do not occur. It is also recommended that the depth and pump position of the existing production boreholes are recorded for future planning and management purposes.
6. The construction and pump depths of hydrocensus boreholes that may be affected by groundwater abstraction by Thabazimbi Mine must be recorded to determine whether or not the lowering in groundwater levels simulated in this report will affect private borehole performance or not.
7. The cumulative impact of in- and out of pit mine dewatering must be assessed with the calibrated and verified geohydrological model. This can be undertaken once the mine planning and geological modelling of the pits have been completed by Thabazimbi Mine.
8. It is recommended that the results of the GCS hydrocarbon study are integrated with this report to ensure that the impact of hydrocarbon contamination in the Donkerpoort Basin Breccia Aquifer is quantified and correctly managed.
9. All boreholes that are included in the IWULA and that is used for groundwater abstraction, must be metered and included in the abstraction database. This information must be used to update the safe yield estimation presented in this report.

CHAPTER 7: COSTING OF MANAGEMENT MEASURES AND CLOSURE OBJECTIVES

7.1 General

The Financial provision has been recalculated for 2010 and provides for the LoM of 2040. The calculation is based on actual figures obtained from quantity surveyors for demolition of structures. The mine has been divided into different areas and each area has been assessed to ensure that all structures and activities taking place in that area is included in the calculation of the provision and adheres to the identified closure objective.

It is important to note that the calculation includes projects, which are still in a feasibility phase. These projects have been added to the provision to provide an indication of the LoM and final closure cost if these projects should go ahead.

Currently the mine needs to make provision for an immediate closure cost of R 130 951 753-00. An amount of R 124 582 389-00 has been provided in the current trust fund. The shortfall of R6 369 363-00 will be provided for. In the past shortfalls were addressed via cash deposits into the trust fund.

Addendum 2 provides more detailed information related to the calculations done for the financial provision.

7.2 Closure objectives

The current LoM excluding the approval of the proposed expansion project (Project Phoenix) is 2016. The MPRDA requires various actions prior to applying for closure. These actions will be taken prior to the application for a closure certificate.

The overall mines closure objectives relate to the following:

- Rehabilitate disturbed mining area to such an extent that the mining area can be fully utilized as part of a game farming unit; and
- Lease or sell all infrastructures that cannot be included in the game farming activity in a meaningful way but can be used in a cost effective way otherwise.

The mine area has been divided into 16 smaller areas which where subdivided further where required to facilitate the determination of the financial provision for the entire area as well as the overall closure objectives. A visual representation of the subdivision of the total mine areas into the smaller areas can be seen in **Figure 78**. More maps for these areas can be seen in **Addendum 2**. The following table (**Table 54**) provides for closure objectives for each one of the smaller identified areas.

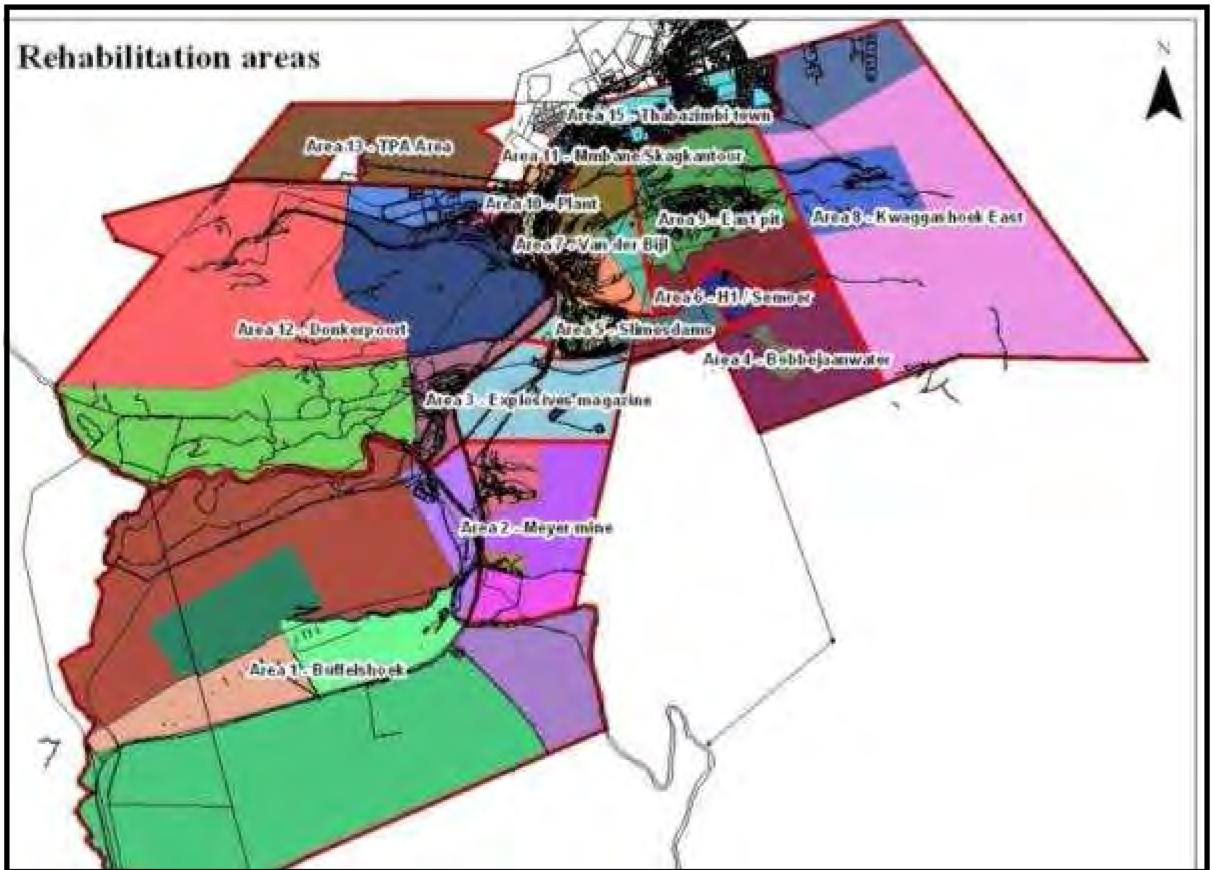

Figure 78: Total Mine Areas

Client: Thabzimbi Mine	Date: December 2010
Project: EMPr Update and Review	Ref: LP30/5/1/3/2/1 (45)(47) EMPr

SHANGONI Management Services (Pty) Ltd

Table 54: Area specific to Closure Objectives

AREA NO	AREA NAME	OBJECTIVE
1.00	**Buffelshoek**	
1.10	Melkplaas	To be incorporated into the game farm
1.20	Group 12	To be rehabilitated for incorporation into the game farm, Water supply to the Municipality
1.30	Iscor farm houses	Part of Andalusite mineral area.
1.40	Buffelshoek pit	To be rehabilitated for incorporation into the game farm
1.50	Group 5 en Kwai bridge	To be rehabilitated for incorporation into the game farm
1.60	Andalusite area	Part of Andalusite mineral area.
1.70	Buffelshoek - natural area	To be rehabilitated for incorporation into the game farm
1.80	Buffelshoek road	To be rehabilitated for incorporation into the game farm
2.00	**Meyer mine**	
2.10	Meyer mine pit	To be rehabilitated for incorporation into the game farm
2.20	Meyer mine underground	To be rehabilitated for incorporation into the game farm
2.30	Sand reclaiming area	To be rehabilitated for incorporation into the game farm
2.40	Meyer mine natural area	To be rehabilitated for incorporation into the game farm

AREA NO	AREA NAME	OBJECTIVE
3.00	**Explosives magazine area**	
3.10	Magazine	To be rehabilitated for incorporation into the game farm
3.20	Magazine - natural area	To be rehabilitated for incorporation into the game farm
4.00	**Bobbejaanwater**	
4.10	Bobbejaanwater pit	To be rehabilitated for incorporation into the game farm
4.20	Bobbejaanwater road to pit	To be rehabilitated for incorporation into the game farm
4.30	Bobbejaanwater - natural area	To be rehabilitated for incorporation into the game farm
5.00	**Slimes dams area**	
5.10	Jood se dam	To be incorporated into the game farm
5.20	Slimes dams	To be rehabilitated for incorporation into the game farm
5.30	Slimes dams - natural area	To be rehabilitated for incorporation into the game farm
6.00	**H1/Semoer area**	To be rehabilitated for incorporation into the game farm
7.00	**Van der Bijl**	
7.10	Van der Bijl pit and WRDs	To be rehabilitated for incorporation into the game farm
7.20	Van der Bijl workshop area	To be rehabilitated for incorporation into the game farm
7.30	East mine WRDs	To be rehabilitated for incorporation into the game farm
7.40	Van der Bijl - natural area	To be rehabilitated for incorporation into the game farm
8.00	**Kwaggashoek east**	
8.10	Kwaggashoek east - natural area	To be rehabilitated for incorporation into the game farm
8.20	Kwaggashoek east pit and WRDs	To be rehabilitated for incorporation into the game farm
8.30	Commando	To be sold or leased or rehabilitated for incorporation into the game farm
9.00	**East pit area**	
9.10	East pit and WRDs	To be rehabilitated for incorporation into the game farm
9.20	East pit - natural area	To be rehabilitated for incorporation into the game farm
10.00	**Plant area**	
10.10	Plant	Demolish structures and rehabilitate the area, incorporate into game farm
10.20	Central workshop	Declare area an industrial area and sell or lease buildings or rehabilitated for incorporation into the game farm
10.30	SHE	Declare area an industrial area and sell or lease buildings or rehabilitated for incorporation into the game farm
10.40	Other owners area	To be rehabilitated where applicable
10.50	Fine ore bed area	Demolish structures and rehabilitate the area, incorporate into game farm
11.00	**Mmebane / skagkantoor**	
11.10	Mmebane	To be sold or leased
11.20	Skagkantoor	To be sold or leased
12.00	**Donkerpoort**	
12.10	Ben Alberts	Retain as a Lodge for the private game farm
12.20	Golf course	Retain as a Golf course for the private game farm

AREA NO	AREA NAME	OBJECTIVE
12.30	Donkerpoort pit	To be rehabilitated for incorporation into the game farm
12.40	Donkerpoort west / mooivallei portion 12	To be rehabilitated for incorporation into the game farm
12.50	Donkerpoort workshop area	Declare area an industrial area and sell or lease buildings or rehabilitated for incorporation into the game farm
12.60	Material management	Declare area an industrial area and sell or lease buildings or rehabilitated for incorporation into the game farm
12.70	Plant discard dump area	To be rehabilitated for incorporation into the game farm
13.00	**TPA area**	To be sold
14.00	**Adits**	
14.10	Buffleshoek adits	To be sealed in accordance to the agreed upon procedure
14.20	Kwaggashoek adits	To be sealed in accordance to the agreed upon procedure
14.30	Meyer mine pump station adits	To be sealed in accordance to the agreed upon procedure
14.40	Meyer mine pit adits	To be sealed in accordance to the agreed upon procedure
14.50	East mine adits	To be sealed in accordance to the agreed upon procedure
15.00	**Thabazimbi town**	
15.10	Main office block	To be sold or leased
15.20	Hospital	To be sold or leased
15.30	Town - mine property	To be sold or leased
15.40	Ipelegeng	To be sold or leased
15.50	Helshoogte	To be used as part of game farm
15.60	Town	To be sold or leased
16.00	**Phoenix**	
16.10	Pit and WRDs	New Project
16.20	Plant	New Project
16.30	New slimes dams	New Project
16.40	Plant discard dump	New Project
16.50	Workshop	New Project
16.60	Dewatering	New Project
16.70	Services	New Project
		New Project

7.3 Definitions

The following table (**Table 55**) contains the definitions used in the compilation of the closure cost estimate.

Table 55: Definition to Compile Closure Cost Estimate

TERM	DEFINITION
Decommissioning cost	Costs associated with dismantling of assets i.e. those closure costs that have an underlying asset such as a beneficiation plant or slimes dam that has a capital value (indicated on the asset register whether written off or not)
Rehabilitation cost	All other costs (those not included in the above definition such as backfilling and surface rehabilitation)
Scenario - Best	Best rehabilitation option from the mine's point of view
Scenario - Probable	Most probable rehabilitation option from the mine's point of view
Scenario - Worst	Worst rehabilitation option from the mine's point of view
Budget - Immediate	Budget for current environmental liabilities if they should close prematurely
Budget - LOM	The sum of the budget for ongoing and final rehabilitation
Budget - APEX	Budget for ongoing rehabilitation
Budget - Final closure	Budget for final rehabilitation
Ongoing Rehabilitation	All rehabilitation activities that are technically possible to execute and complete as an integral part of the day to day operations during the active life of such operation, life of the mine or life of the project
Final Rehabilitation	Only those rehabilitation activities that are technically impossible to execute and complete as part of the day to day operations during the active life of such operation, life of the mine or life of the project and which can only take place after such operations have ceased
Scope change	Change in quantity and quality
Inflation change	Change in unit cost

The worst case scenario was used to determine the immediate and final closure costs.

7.4 Rehabilitation / Decommissioning tariffs

The mine received closure tariffs for the demolishing of structures from Venn & Milford Quality surveyors in 2004. Since then the mine update these tariffs on an annual basis taking into consideration the CPI rate and the change in diesel cost.

The mine calculates the tariff for the rehabilitation (levelling, ripping and planting) of the WRDs on an annual basis from actual cost incurred during the year.

The assumptions that were made to update the tariffs on an annual basis since 2004 is summarised below.

2004 to 2005 - 31-Dec-05 - 2006 budget:

- 20% Diesel
- 5% for the rest (CPI)
- 60% for metal from 2000 to 2005

2005 to 2006 - 31-Dec-06 - 2007 budget:

- 28.7% Diesel
- 6% for the rest (CPI)

2007 to 2008 - 31-Dec-07 - 2008 budget:

- 23% Diesel
- 4.5% for the rest (CPI)

2008 to 2009 - 31-Dec-08 - 2009 budget:

- 7.08% for the rest (CPI)
- Diesel 2007 R 7.35
  - 2009 R9.00 (budget price)
  - % 0.22

Assumption: 33 % of cost is due to Diesel
Assumption: Diesel's highest prices for the year as per your book, except 2009.
Assumption: Diesel for 2009 is the budget price as was fixed by HQ in the 2009 operational budget.

2009 to 2010 - 31-Dec-09 - 2010 budget:

- 6.1% for the rest (CPI)
- Diesel 2009 R 7.50
  - 2010 R 7.88 (budget price)
  - % 0.05

Assumption: 25 % of cost is due to Diesel
Assumption: Diesel's highest price for the year (2009) as per your book
Assumption: Diesel for 2010 is the budget price as was fixed by HQ in the 2010 operational budget.

2010 to 2011 - 31-Dec-10 - 2011 budget:

- 3.2% for the rest (CPI)
- 3.2% Diesel

Assumption: 30% of cost is due to Diesel
Assumption: Diesel escalation is what was used for the 2011 operational budget
Assumption: there is a 25% difference between the contract and non-contract R/h prices
You calculate 2010 tariffs and escalate to 2011 for the 2011 budget

The tariffs used for the calculation of the closure cost can be seen in **Table 56**, **Table 57** and **Table 58** below in the column Tariff 2011.

Table 56: Demolishing of Structures

Year							2008	2009	2010	2011
Budget				Dec-05	Dec-06		Dec-07	Dec-08	Dec-09	Dec-10
			Res	0.05	0.06	0.04	0.045	0.071	0.061	0.032

% Inflation			Diesel	0.2	0.287	0.23	0.23	0.22	0.05	0.032
Items	**Unit**	**Category**	**Tariff 2004**	**Tariff 2005**	**Tariff 2006**	**Tariff 2007**	**Tariff 2008**	**Tariff 2009**	**Tariff 2010**	**Tariff 2011**
Construction materials										
800 mm reinforced in situ concrete structures	m^3	A	150.00	180.00	231.66	284.94	350.48	245.14	230.72	230.72
400 mm reinforced concrete	m^3	B	142.80	171.36	220.54	271.26	333.66	233.37	221.78	221.78
250 mm reinforced concrete	m^3	C	140.00	168.00	216.22	265.95	327.11	228.79	217.43	217.43
340mm concrete slabs	m^2	D	142.80	171.36	220.54	271.26	333.66	233.37	221.78	221.78
220 mm thick brick wall buildings (single storey)	m^2	E	193.80	232.56	299.30	368.14	452.82	316.72	300.99	300.99
Multi level brick & concrete buildings (multi storey)	m^2	F	240.00	288.00	370.66	455.91	560.77	392.22	372.74	372.74
Excavating foundations	m^2	G	52.00	62.40	80.31	98.78	121.50	84.98	80.76	80.76
Light steel construction cladded with corrugated iron (car ports etc.)	m^2	H	20.81	21.85	23.16	24.09	25.17	26.95	28.60	28.60
Medium Steel Construction buildings (corrugated iron cladded workshops and sheds with concrete floors)	m^2	I	142.80	171.36	220.54	271.26	333.66	233.37	221.78	221.78
Large steel structures (Plants) with 300mm diameter H steel bars positioned 6m apart.	m^3	J	6.96	7.31	7.75	8.06	8.42	90.15	95.65	95.65
Infrastructure										
Railway lines	m	K	90.00	94.50	100.17	104.18	108.86	116.57	123.68	123.68
Different diameter pipelines	m	L	19.24	20.20	21.41	22.27	23.27	24.92	26.44	26.44
Powerlines	m	M	75.00	78.75	83.48	86.81	90.72	97.14	103.07	103.07
Electrical Sub-stations	cost	N	6,500.00	6,825.00	7,234.50	7,523.88	7,862.45	8,419.12	8,932.68	8,932.68
Fuel pumps and tanks remove	m^3	O	76.00	79.80	84.59	87.97	91.93	98.44	104.44	104.44
Items	**Unit**	**Category**	**Tariff 2004**	**Tariff 2005**	**Tariff 2006**	**Tariff 2007**	**Tariff 2008**	**Tariff 2009**	**Tariff 2010**	**Tariff 2011**
Workshop cranes	cost	P	7,500.00	7,875.00	8,347.50	8,681.40	9,072.06	9,714.37	10,306.94	10,306.94
Toilets	m^2	Q	80.00	84.00	89.04	92.60	96.77	103.62	109.94	109.94
Water tanks		R	10,000.00	10,500.00	11,130.00	11,575.20	12,096.08	12,952.49	13,742.59	13,742.59
Underground Fuel Tanks	m^3	S	57.12	6,854.00	88.22	108.51	133.46	93.35	88.71	88.71
Conveyer belts	m	T	99.54	104.52	110.79	115.22	120.40	128.93	136.79	136.79
Earth dams	m^2	U	7.50	9.00	11.58	14.25	17.52	12.26	11.65	11.65
Decommissioning of Borehole	Cost	V	3,039.20	3,191.16	3,382.63	3,517.93	3,676.24	3,936.52	4,176.65	4,176.65
Warning signs	Cost	W	1,000.00	1,050.00	1,113.00	1,157.52	1,209.61	1,295.25	1,374.26	1,374.26
Tarred surface areas	m^2	Z	8.80	10.56	13.59	16.72	20.56	14.38	13.67	13.67
In situ cast concrete Weigh Bridges	m^2	AA	142.80	171.36	220.54	271.26	333.66	233.37	221.78	221.78
Pumps & pump rooms	m^2	AB	193.80	232.56	299.30	368.14	452.82	316.72	300.99	300.99
Sealing of boreholes with 1 m^3 cap	Cost	AC	1,500.00	1,575.00	1,669.50	1,736.28	1,814.41	1,942.87	2,061.39	2,061.39
Rehabilitation of return water dams	m^2	AD	18.00	21.60	27.80	34.19	42.06	29.42	27.96	27.96
Rehabilitation of fresh water earth dams	m^2	AE	7.50	9.00	11.58	14.25	17.52	12.26	11.65	11.65

Table 57: Site / Land Rehabilitation

			Res	0.05	0.06	0.04	0.045	0.071	0.061	0.061
% Inflation			Diesel	0.2	0.287	0.23	0.23	0.22	0.05	0.05
Item	**Unit**	**Category**	**Tariff 2004**	**Tariff 2005**	**Tariff 2006**	**Tariff 2007**	**Tariff 2008**	**Tariff 2009**	**Tariff 2010**	**Tariff 2011**
Category 1 dumps - Planting of trees	m^2	BA	1.76	1.85	1.96	2.04	2.13	2.57	2.57	2.57
Category 2 dumps - Shaping of dumps with bulldozer	m^2	BB	5.80	6.96	8.96	11.02	13.55	9.81	8.92	8.92
Category 2 dumps - Planting of trees	m^2	BC	1.81	1.90	2.02	2.10	2.19	3.12	3.12	3.12
Category 3 dumps - Leveling off of dumps with bulldozer	m^2	BD	8.71	10.45	13.45	16.55	20.35	14.73	13.40	13.40
Category 3 dumps - Planting of trees	m^2	BE	2.72	2.86	3.03	3.15	3.29	4.68	4.68	4.68
Category 3 dumps - Planned waste in future	m^2	BF	11.43	13.31	16.48	19.69	23.64	19.41	18.08	18.08
Planting of a flat area	m^2	BG	1.76	1.85	1.96	2.04	2.13	2.57	2.57	2.57
Ripping of a flat area	m^2	BH	0.52	0.62	0.80	0.99	1.21	0.76	0.80	0.80

			Res	0.05	0.06	0.04	0.045	0.071	0.061	0.061
% Inflation			Diesel	0.2	0.287	0.23	0.23	0.22	0.05	0.05
Item	**Unit**	**Category**	**Tariff 2004**	**Tariff 2005**	**Tariff 2006**	**Tariff 2007**	**Tariff 2008**	**Tariff 2009**	**Tariff 2010**	**Tariff 2011**
Rehabilitation of long slopes	m^2	BI						14.73	13.40	13.40

Table 58: Closure of Adits to Underground Workings

			Res	0.6	0.06	0.04	0.045	0.071	0.061	0.061
% Inflation			Diesel	0.2	0.287	0.23	0.23	0.22	0.05	0.05
Item	**Unit**	**Category**	**Tariff 2000**	**Tariff 2005**	**Tariff 2006**	**Tariff 2007**	**Tariff 2008**	**Tariff 2009**	**Tariff 2010**	**Tariff 2011**
Gate	m^2	BJ	1,276.00	2,041.60	2,164.10	2,250.66	2,351.94	2,530.51	2,530.51	2,530.51
Trellis	m^2	BK	775.44	1,240.70	1,315.15	1,367.75	1,429.30	1,537.82	1,537.82	1,537.82
Roof Wire	m^2	BL	134.75	215.60	228.54	237.68	248.37	267.23	267.23	267.23
Concrete wall	m^2	BM						2,000.00	2,000.00	2,000.00

7.5 Closure budget and schedule

The closure budget of the mine is based on the LoM plan as discussed in **Section 1.7**. All infrastructure and disturbed areas was identified for each of the 16 areas that the mine is divided into. A list of these infrastructure (e.g. plant, workshops, crunchers, office buildings etc.) and disturbed areas (e.g. WRDs, workshop areas, etc.) can be seen in the detail budget for the disturbed areas and structures in **Addendum 2**.

This information was used to compile a detailed closure budget and schedule which reflects the immediate closure cost, the LoM closure cost, the budgets for each year for concurrent rehabilitation and the budget required for final closure (Trust fund). The detailed budgets and summary of these budgets and schedules can be seen in **Addendum 2**. The tables below show the closure cost estimate and the closure cost provision for each mining right.

Table 59: Closure Cost Estimate

	AREA		IMMEDIATE CLOSURE	LOM CLOSURE	CONCURRENT 2011 - 2040	CLOSURE
1	Buffelshoek	Disturbed areas	4,927,950.69	9,043,529.13	8,935,935.05	107,594.08
	Buffelshoek	Structures	2,581,394.16	2,593,937.34	1,165,169.30	1,428,768.04
2	Meyer Mine	Disturbed areas	354,293.34	1,611,462.13	860,174.55	751,287.58
	Meyer Mine	Structures	191,551.85	191,550.75	191,550.75	0.00
3	Explosive magazine	Disturbed areas	218,365.75	225,934.87	7,558.87	218,376.00
	Explosive magazine	Structures	62,233.60	62,233.96	0.00	62,233.96
4	Bobbejaanwater	Disturbed areas	874,231.05	1,695,761.58	1,695,761.58	0.00
	Bobbejaanwater	Structures	55,876.27	55,876.26	55,876.26	0.00

	AREA		IMMEDIATE CLOSURE	LOM CLOSURE	CONCURRENT 2011 - 2040	CLOSURE
5	Slimes dams area	Disturbed areas	4,125,161.81	4,125,763.33	4,096,042.62	29,720.70
	Slimes dams area	Structures	1,154,933.92	1,445,565.78	654,710.78	790,855.00
6	H1/Semoer	Disturbed areas	0.00	301,045.47	0.00	301,045.47
	H1/Semoer	Structures	0.00	0.00	0.00	0.00
7	Van der Bijl	Disturbed areas	5,685,945.78	5,949,232.24	5,949,232.24	0.00
	Van der Bijl	Structures	369,273.75	624,804.16	332,420.71	292,383.45
8	Kwaggashoek east	Disturbed areas	2,551,144.34	3,221,243.28	2,231,247.28	989,996.00
	Kwaggashoek east	Structures	1,364,716.68	1,512,702.84	890,733.40	621,969.43
9	East pit area	Disturbed areas	260,767.86	339,746.07	260,803.82	78,942.25
	East pit area	Structures	367,542.08	367,541.61	367,487.25	54.36
10	Plant area	Disturbed areas	884,845.76	1,168,644.51	1,128,226.08	40,418.43
	Plant area	Structures	17,312,339.73	17,355,406.49	15,412,426.90	1,942,979.58
11	Mmebane / Skagkantoor	Disturbed areas	0.00	0.00	0.00	0.00
	Mmebane / Skagkantoor	Structures	5,921,629.55	5,921,661.94	1,434,652.53	4,487,009.41
12	Donkerpoort	Disturbed areas	25,741,293.50	38,627,094.78	36,527,023.27	2,100,071.51
	Donkerpoort	Structures	8,629,200.53	12,362,013.40	4,353,887.36	8,008,126.04
13	TPA Area	Disturbed areas	0.00	0.00	0.00	0.00
	TPA Area	Structures	0.00	0.00	0.00	0.00
14	Adits	Disturbed areas	1,699,840.00	1,699,840.00	1,699,840.00	0.00
	Adits	Structures	0.00	0.00	0.00	0.00
15	Thabazimbi Town	Disturbed areas	0.00	926,129.92	0.00	926,129.92
	Thabazimbi Town	Structures	6,873,059.41	14,522,033.99	0.00	14,522,033.99
16	Phoenix	Disturbed areas	0.00	54,566,658.22	46,488,959.51	8,077,698.71
	Phoenix	Structures	0.00	10,755,925.64	0.00	10,755,925.64
17	Closure actions		15,129,910.93	42,094,735.32	11,958,981.99	30,135,753.33

	AREA		IMMEDIATE CLOSURE	LOM CLOSURE	CONCURRENT 2011 - 2040	CLOSURE
	Sub Total Environmental		107,337,502.35	233,368,075.00	146,698,702.12	86,669,372.88
	Contingency	10%	10,733,750.23	23,336,807.50	14,669,870.21	8,666,937.29
	Consultants Fees	7%	7,513,625.16	16,335,765.25	10,268,909.15	6,066,856.10
	Maintenance	5%	5,366,875.12	11,668,403.75	7,334,935.11	4,333,468.64
	Total Environmental		130,951,752.86	284,709,051.50	178,972,416.58	105,736,634.91

Table 60: Closure Cost Provision for Each Mining Right

	PREMATURE CLOSURE COST	LOM CLOSURE COST	
Mining right LP/45/MR	129,419,533.52	104,977,274.91	Rest
Mining right P/47/MR	1,532,219.34	759,360.00	Kwaggashoek
Total	**130,951,752.86**	**105,736,634.91**	

CHAPTER 8: STATUTORY REQUIREMENTS

Documented in the subsequent sections is a list of the current South African environmental legislation, which is considered to be pertinent to the operation of Thabazimbi Mine. This list is not intended as an exhaustive analysis of the pertinent environmental legislation but provides a guideline to the relevant aspects of each of the acts.

1. Constitution of South Africa, 1996 (Act No 108 of 1996);
2. MPRDA;
3. The Mine Health and Safety Act, 1996 (Act No 29 of 1996);
4. NEMA;
5. Environment Conservation Act, 1989 (Act No 73 of 1989);
6. NWA;
7. WA;
8. National Environmental Management: Waste Act, 2008 (Act No 59 of 2008);
9. The White Paper on Integrated Pollution and Waste Management for South Africa;
10. Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983);
11. National Environmental Management: Biodiversity Act, 2004;
12. National Environment Management: Air Quality Act, 2004 (Act No 39 of 2004);
13. The Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965);
14. The Hazardous Substances Act, 1973 (Act No 15 of 1973);
15. The National Heritage Resources Act, 1999 (Act 25 of 1999); and
16. Principles of Integrated Environmental Management of 1992.

Thabazimbi Mine has a Legal Compliance procedure (TZ-SPR-MW-002). This procedure is as follows:

Legal Appointments

All legal appointments are done as per the legislation, depending on the level of that particular appointment. All legal appointment letters must be initialled on each page. All appointments must be done on an official template which is on SharePoint (Mine Wide).

Legal library / registers

The legal library / register were developed based on all the activities on the mine. The legal library / registers are based on the description of Thabazimbi Mine and mining impacts contained in the aspects and impact register and HIRA documents and the EMPr required by the MPRDA.

An external consultant will be appointed to update and maintain the legal library / register on a continuous basis as new or amended legislation is promulgated.

To ensure compliance to the requirements of OHSAS 18001:2007 and ISO 14001:2004 standards, two mechanisms are used namely a legal library and legal registers.

Thabazimbi Mine shall ensure that these applicable legal requirements and other requirements to which the mine subscribes are taken into account in establishing, implementing and maintaining its SHE Management System.

Thabazimbi Mine shall keep this information up-to-date through regular updates from the external consultant and the SHE department.

Thabazimbi Mine shall communicate relevant information on legal and other requirements to persons working under the control of the mine, and other relevant I&AP's.

The SHE legal library contains the following:

- National legislation;
- Provincial legislation;
- Local by-laws;
- Regulations; and
- Non-regulatory guidelines.

The registers extrapolate the specific legal requirements (section or regulation) that are applicable to different activities on the mine from the library. These can be seen in the discussion pages.

The environmental legal register is linked to the environmental aspects of the operations on site by adding a reference column to the register. Through implementing this action Thabazimbi Mine determined how the legal requirements apply to its environmental aspects. The legal register is not linked to the HIRA's of the operations on site. The legal requirements are taken into account by implementing the occupational health & safety management system (i.e. inspections, checklists, incident reporting and investigation, etc.)

Where no local standard or legal requirement is applicable, international standards will apply if applicable.

Audits

During legal compliance audits the following will be assessed:

- Completeness of the legal library / register information;
- Compliance to the requirements identified in the legal registers; and
- Level of performance regarding the execution of control measures.

Findings from the audits can result in:

- Corrections to the information in the legal library / registers;
- Corrections to operational documentation;
- Implementation of additional control measures; or

- Compilation of MPs to implement actions to ensure compliance where non-compliance to legislation or control measures is identified.

SHE Legal Compliance Audit will be done on an annual basis, based on the information in the legal registers. The legal compliance audit can be done by using an external party. Occupational Health and Safety compliance is assessed on a continuous basis by the supervisors. The areas of non-compliance can be addressed in incident/non-conformity reporting and/ or MPs.

Communication and training

When legislation changes the management representative (SHE Manager) receives the SHE legal updates from the external consultant.

The changes to legislation are then communicated to management who in turn assesses the level of applicability in their sections and identifies the required changes to e.g. operational control procedures. These are discussed during Mine Health and Safety Committee and Thabazimbi Environmental Committee meetings.

Training needs related to legal requirements must be identified in accordance with the requirements as specified in the training procedure (TZ-SPR-MW-006). Ad hoc training can be scheduled as the need may arise. Changes to legal requirements may result in the use of workshops to communicate the changes to all relevant employees.

Permits, licences, exemptions or concessions

Should applications for exemptions, concessions, instructions, licenses or permits be required the responsible process owner will draft the application to the relevant Government Department for signature by the General Manager. The process owner is responsible to ensure that a new permit, licence, exemption or concession is obtained prior to the expiry of the current document.

Permits, licences, exemptions and concessions register with expiry dates are documented in the SharePoint register. All communication must be handled in accordance with TZ-SPR-MW-007.

Upon receiving permits and licenses these documents must be forwarded to the System Administrator at SHE for handling in accordance with TZ-SPR-MW-008.

Other requirements

Where other requirements e.g. corporate SHE requirements have been identified these requirements are included as a separate section in the legal library / registers and or SharePoint. Compliance to other requirements will be assessed as part of the legal compliance assessment and non-compliance to other requirements will be addressed in a similar way.

CHAPTER 9: UNDERTAKING BY APPLICANT

I ....undertake to adhere to the requirements and conditions as set out in the EMPr when approved by ....

Signed at Thabazimbi on this.......day of .

Signature of applicant ....

Approved in terms of Section 39(4) of the Mineral and Petroleum Resources Development Act, 2002 (Act 29 of 2002)

Signed at .... on this........................day................................20........

CHAPTER 10: REFERENCES AND SUPPORTING DOCUMENTATION

1. Airshed Planning Professionals, 2009. Air Quality Management Plan for Current and Proposed Mining Operations at Thabazimbi Mine, Limpopo.
2. Byker, N. and Bron, A, MasterQ Research, 2007. Revised Draft Report Comparative Social Impact Assessment for the Housing Options for Construction Workers was compiled in February 2007.
3. Comprehensive Atlas, Agricultural Geo-Referenced Information System, www.agis.agric.za/agisweb/agis.html.
4. Environmental Potential atlas, Department of Environment and Tourism, www.environment.gov.za/Maps/EnvAtlas/Maps_EnvAtlas_contents.htm.
5. Groundwater Consulting Services (Pty) Ltd, 2011. Regional Geohydrological Model.
6. Hunt, I., 2005. Regional Groundwater Model for Thabazimbi Mine Area.
7. Maisha, R., Department of Geography; Geoinformatics and Meteorology of the University of Pretoria, 2010. Climate Assessment.
8. Malherbe, W and Ferreira, M., Econ@uj, 2010 A Baseline Aquatic Biomonitoring Survey and Toxicity Testing of Selected Sites Associated with Mining Activities in Thabazimbi, Limpopo South Africa.
9. McCarthy, T. & Rubidge, B., 2005: The Story of Earth and Life; KUMBA Resources, Struik Publishers, Cape Town.
10. Miller, S. M., 2005. Kumba Resources Thabazimbi Iron Ore Mine, Heritage Assessment for the EIA of the proposed Phoenix Project.
11. Miller, S. M., 2010. First Phase Heritage Impact Assessment.
12. Mineral Corporation, 2009. Socio-Economic Impact Assessment and a Plan to Address the Socio-Economic Aspects of Mine Closure at Thabazimbi Mine.
13. Maila, P.M. & Cloete, T.E., 2004. Bioremediation of petroleum hydrocarbons through landfarming: Are simplicity and cost-effectiveness the only advantages?
14. Mucina, L & Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
15. Municipal Demarcation Board, 2007: South Africa, www.demarcation.org.za.
16. OH & AP Consulting Services, 2005. Thabazimbi Iron Ore Mine (Project Phoenix Noise Impact Assessment).
17. OH & AP Consulting Services, 2006. Noise Impact Assessment.
18. PD Naidoo & Associates, 2006. Stormwater Management Plan.
19. PD Naidoo & Associates, 2007. Traffic Impact Assessment Report.
20. PSI Risk Consultants, 2005. Thabazimbi Iron Ore Mine Air Quality Impact of Mining Activities.
21. Shangoni Management Services (PTY) Ltd., 2005. Fauna and Flora Survey for Kumba Resources Thabazimbi Iron Ore Mine.
22. Shangoni Management Services (PTY) Ltd., 2005. Waste Management: An Evaluation Report for Thabazimbi Iron Ore Mine.
23. Shangoni Management Services (PTY) Ltd., 2005. Kumba Resources Thabazimbi Iron Ore Mine GN 704 Compliance Audit.

24. Shangoni Management Services (PTY) Ltd., 2005: Fauna and Flora Survey.
25. Shangoni Management Services (PTY) Ltd., 2009. Land Management Plan.
26. Shangoni Management Services (PTY) Ltd., 2009. Biodiversity Action Plan.
27. Shangoni Management Services (PTY) Ltd., 2009. Closure Plan.
28. Shangoni Management Services (PTY) Ltd., & Pachnoda Consulting cc, 2010. Fauna and Flora Survey.
29. Shangoni Management Services (PTY) Ltd., 2009. State of the Environment Report
30. South African Weather Services – Climate Analysis of the proposed Mine at Thabazimbi.www.weathersa.co.za, 2005.
31. Viljoen & Associates, 2005. Kumba Resources Report on: Kumba Thabazimbi Iron Ore Mine Soil Survey.
32. Vuya, Impact Assessments, 2005. Social Scan Thabazimbi Iron Ore Mine.
33. Van der Watt, H.V.H. & van Rooyen, T.H., 1995: A Glossary of Soil Science; The Soil Science Society of South Africa, Pretoria.
34. Water Institute of Southern Africa (WISA), 2008: South Africa, www.ewisa.co.za/sitemap.aspx
35. WSM Leshika Consulting, 2007. Groundwater Model for the Dewatering of the Thabazimbi Mine Area.