

mineral resources

Department: Mineral Resources REPUBLIC OF SOUTH AFRICA

Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province

FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT AND/OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

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This document has been prepared by Digby Wells Environmental.

Report Type:	Final Scoping Report
Project Name:	Proposed Open Pit Magnetite Mine and Concentrator Plant, Mokopane, Limpopo Province
Project Code:	VMC3049

Name	Responsibility	Signature	Date
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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act,1998 (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of Section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of Section 17 (1) (c) the Competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE SCOPING PROCESS

- 1) The objective of the scoping process is to, through a consultative process: -
- a) identify the relevant policies and legislation relevant to the activity;
- b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
- d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- e) identify the key issues to be addressed in the assessment phase;
- f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
- g) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.



NON TECHNICAL SUMMARY

Background Information

Pamish Investments No. 39 (Pty) Ltd (Pamish) is proposing the development and operation of a new Magnetite Open Pit Mine and associated infrastructure, including mineral processing at a site located 45 km northwest of Mokopane in Limpopo Province (hereafter referred to as "the project"). The property details are presented in Table 1.

Table 1: Property Details

	The proposed licence area is located on a group of five adjacent farms namely:					
• R		RE of Farm Vogelstruisfontein 765LR				
	• RE	of Farm Vliegekraal 783LR				
Farm Name:	• RE	of Farm Vriesland 781LR				
	• RE	of Farm Schoonoord 786LR				
	• RE	and Portions 1,2,3,4,5 and 6 of Farm	n Bellevue 808LR			
	The la	nd-use zoning is Agriculture for all fa	rm portions.			
Application Area (Ha):	10 109	Ha (Combined area of the five farm	s)			
Magisterial District:	Mokopane District, Mogalakwena Local Municipality within the Waterberg District Municipality					
Distance and direction from nearest town:	45 km north-northwest of Mokopane and 65 km west of Polokwane					
		Farm	21 digit SG code			
		RE of Farm Vogelstruisfontein 765LR	T0LR0000000076500000			
21 digit Surveyor		RE of Farm Vliegekraal 783LR	T0LR0000000078300000			
General Code for		RE of Farm Vriesland 781LR	T0LR00000000078100000			
each fann portion.		RE of Farm Schoonoord 786LR	T0LR0000000078600000			
		RE of Portion 1 of Farm Bellevue 808LR	T0LR0000000080800001			
		RE of Portion 2 of Farm Bellevue	T0LR0000000080800002			



	808LR						
	Portion 808LR	3	of	Farm	Bellevue	T0LR0000000080800003	
	Portion 808LR	4	of	Farm	Bellevue	T0LR0000000080800004	
	Portion 808LR	5	of	Farm	Bellevue	T0LR0000000080800005	
	Portion 808LR	6	of	Farm	Bellevue	T0LR0000000080800006	

Regulatory Process

In terms of the requirements of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), as amended, a Mining Right Application (MRA) must be submitted to the Department of Mineral Resources (DMR) for the project. In support of the MRA, an Environmental Impact Assessment (EIA) process must be undertaken in accordance with the new EIA Regulations (GN R. 982, 983, 984 and 985), December 2014 promulgated in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA). The project also requires the following environmental approvals, which will be applied for as part of the EIA process:

- Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA); and
- Water Use Licence (WUL) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

Digby Wells and Associates (South Africa) (Pty) Ltd has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process and supporting applications for the project. The details of the EAP are provided in Table 2.

Name of the Practitioner:	Mr. Mellerson Pillay
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Table 2: Contact Details of the EAP



This Scoping Report aims to provide a description of the overall project and activities, the environmental and social environments within which the project is being proposed and the potential impacts that the project may have on these environments.

Project Activities/Components

The following aspects of the project will be assessed as part of the EIA:

- Site clearance and vegetation removal;
- Change of land-use from agriculture to mining;
- Topsoil removal and stockpiling;
- Development of access and haul roads;
- Surface infrastructure development such as channels, bridges, dams, offices and workshops.
- Water abstraction and use;
- Development of two open pits by blasting and truck and shovel methods (approximately 129 ha and 69 ha footprints);
- Development of one waste rock dump (approximately 160 ha footprint);
- Concentrator plant (approximately 236 ha footprint) including crushing, grinding and screening;
- Conveyor belts at crushing and grinding sections and for concentrate product and tailings;
- Tailings Storage Facility (TSF) (approximately 124 ha footprint);
- Pollution control dam, water storage dam and associated pipelines;
- Stormwater diversion berms and channels;
- Storage of fuels, process concentrate, maintenance/workshop oils, and explosive storage facilities;
- Waste generation, storage and disposal (hazardous and general);
- Product storage (magnetite concentrate);
- Transport of materials and product via road;
- Sewerage treatment plant;
- Employment and capital expenditure; and
- Rehabilitation of project site.



Project Alternatives

For mining, the nature of the ore body or deposit determines the mining activities and processes. Furthermore, the location of the resource determines the location of the mining operation, however associated infrastructure can be shifted based on technical, environmental and financial viability. These two factors reduce the identification of possible location and/or activity alternatives. The following alternatives were identified:

- Site infrastructure layout alternatives;
- Technology/Process alternatives;
- No-go option.

The site layout alternatives were identified based on a site sensitivity analysis. The original site layout has been revised to generate a new site layout based on various biophysical and social sensitivities, including the occurrence of rocky ridges, wetlands, proximity to roads, settlements and cultural heritage sites.

There are two technology/process alternatives under consideration relating to the disposal of tailings material. The applicant is considering the use of paste thickeners which will result in the thickening of the tailings which will have several benefits when compared to conventional tailings thickening, these include a reduction in water consumption, reduction of the footprint and possibly height of the tailings dam, reduction in potential seepage reduces seepage and energy requirements. The technical viability of this option is being assessed.

The no-go or do nothing option means that the status quo would be maintained. All potential impacts will be assessed against the current biophysical and socio-economic baseline; therefore all identified alternatives will be assessed against the no-go option. The no-go impact will not be explicitly assessed.

Specialist Consideration

Based on the nature and extent of the proposed magnetite mining operations as well mineral processing through a concentrator plant the following specialist studies were deemed appropriate for the EIA process. The specialist studies have also been identified based on the existing environment of the proposed project site. Refer to Table 3 below.

Biological Assessments	Physical Assessments	Social Assessments
Fauna and Flora	Soils and Land Capability	Social
(including avi-fauna)		
Aquatics	Wetlands	Stakeholder Engagement
	Hydrology	Visual

Table 3: Specialist Studies



Biological Assessments	Physical Assessments	Social Assessments
	Hydrogeology	Heritage
	Air Quality	Health
	Traffic and Safety	Macro-Economic Assessment
	Noise	
	Blasting and Vibration	
	Greenhouse Gas Assessment	
	Rehabilitation Plan	
	Closure Cost Assessment	

Specialists have undertaken a baseline assessment which involved desktop based research on the project area as well as an initial site survey to gain an understanding of the surrounding environment. Furthermore, the baseline provides a description of the respective environmental or social resource/receptors, identifies sensitive features and identifies the potential impacts that may occur as a result of the project activities. These potential impacts and risks have been presented in this Scoping Report.

The impact assessment phase will involve the undertaking of detailed site investigations, sampling and modelling to determine the potential impacts of the project and the identification of mitigation/management measures to minimise these potential impacts.

Stakeholder Consideration

A Public Participation Process (PPP) has been initiated, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by the project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. Comments made by all stakeholders will be included in the Comment and Response Report (CRR) and used to refine the scope of specialist studies that will be commissioned as part of the EIA. Table 4 below presents a summary of the PPP activities undertaken during the scoping phase of the project.



Table 4: Summary of PPP Activities during Scoping Phase

Activity	Details	Reference in Report			
Scoping Phase					
Identification of stakeholders	Stakeholder database which, also includes Interested and Affected Parties (I&Aps), from various sectors of society including directly affected and adjacent landowners in and around the project area.	Appendix 7(1) Stakeholder Database			
Land Claims Commissioner	A letter was sent on the 28 January 2015 to Mr Mapasha of the Limpopo Department of Rural Development and Land Reform: Land Claims Commission. Details on the land claimants were received.	Appendix 7(2) Land Claims Commissioner Letter and Response			
Distribution of proposed project announcement materials	Background Information Document (BID), announcement letter with comment and registration sheet was emailed and posted to stakeholders on <i>Thursday, 12 March 2015.</i> The Background Information Document was available on <u>www.digbywells.com</u> , <i>on Thursday,</i> <i>12 March 2015.</i>	Appendix 7 (3) BID, letter with registration and comment sheet Proof of emails sent			
Placing of adverts	An advert was placed in the Daily Sun on Friday, 13 March 2015.	Appendix 7 (4) Advert			
Placing of site notices	Site notices (20) were put up at various places within proposed project site, including at all the affected villages, the Mogalakwena public library and the Bakenberg Community local library and on <i>Monday, 16 March 2015.</i>	Appendix 7 (5) Site notice report			
Placement of Scoping Report	The Scoping Report was placed at the Mogalakwena Public Library and Bakenberg Community Library and on the Digby Wells website from Friday, <i>13 March 2015 until Thursday 16</i> <i>April 2015</i>				
Announcement of the Scoping Report	A letter was emailed and posted to the full database to announce the availability of the scoping report on <i>Thursday, 12 March 2015.</i> An SMS was also sent to the database on the same day.	Appendix 7(6) Announcement Letter			
Stakeholder Meetings	A series of meetings were held between Monday , 23 March and Tuesday , 31 March 2015 . These included meetings with villages, traditional council, commercial farmers, key stakeholders and the	Appendix 7(7) Comment and Response Report			

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Activity	Details	Reference in Report
	general public. All comments received at these meetings are captured in the Comment and Response Report.	
Placement of updated Scoping Report	The updated Scoping Report will be placed at the Mogalakwena Public Library and at the Bakenberg Community Library and on the Digby Wells website.	
Announcement of the updated Scoping Report	A letter will be emailed and posted to the full database to announce availability of the updated Scoping Report for I&AP to confirm that their comments have been captured and addressed.	Appendix 7 (8) Announcement Letter



ACRONYMS AND ABBREVIATIONS

µg/m ³	Micro grams per cubic meter
ABA	Acid Base Accounting
AMD	Acid Mine Drainage
Bgl	Below Ground Level
BID	Background Information Document
CEC	Cation Exchange Capacity
CRR	Comments and Response Report
CV	Curriculum Vitae
dBA	Decibels
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
SR	Scoping Report
DWS	Department of Water and Sanitation (previously Department of Water Affairs)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GN R.	Government Notice Regulation
На	Hectare
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
kV	Kilovolt
LDV	Light Duty Vehicle
LED	Local Economic Development
LHD	Load-Haul-Dump



LoM	Life of Mine
m ³	Cubic Metres
mS/m	Millisiemens per Metre
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
MAP	Mean Annual Precipitation
Mg/I	Milligrams per litre
Mm	Millimetres
Mm/a	Millimetres Per Annum
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Application
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act,2008 (Act No. 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NGO	Non-Governmental Organisation
NID	Notice of Intent to Develop
PCD	Pollution Control Dam
PES	Present Ecological Status
PM	Particulate Matter
PoS	Plan of Study
PPP	Public Participation Process
PR	Prospecting Right
RoM	Run of Mine
SAHRA	South African Heritage Resources Agency
SANS	South African National Standards
SLP	Social and Labour Plan
SSC	Species of Special Concern



TOR	Terms of Reference
Tph	Tonnes Per Hour
Tpm	Tonnes Per Month
WML	Waste Management Licence



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1 Introduction

Pamish Investments No. 39 (Pty) Ltd (Pamish) is proposing the development and operation of a new Magnetite Open Pit Mine and associated infrastructure at a site located 45 km northwest of Mokopane in Limpopo Province (hereafter referred to as the project).

Pamish currently holds a Prospecting Right (PR) (LP 95 PR) for an area including the following farm portions: RE of Farm Vogelstruisfontein 765LR, RE of Farm Vliegekraal 783LR, RE of Farm Vriesland 781LR, RE of Farm Schoonoord 786LR, RE and Portions 1,2,3,4,5 and 6 of Farm Bellevue 808LR (project site). The PR allows for the prospecting of iron ore, vanadium, titanium and other minerals. The combined area of the PR area is 10 109 hectares.

Pamish now wish to mine magnetite resources at the project site. In terms of the requirements of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), (MPRDA) as amended, a Mining Right Application (MRA) must be submitted to the Department of Mineral Resources (DMR) for the project. In support of the MRA, an Environmental Impact Assessment (EIA) process must be undertaken in accordance with the new EIA Regulations (GN R. 982), December 2014 promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998). Environmental authorisation is in addition required for certain listed activities ancillary to the mining operation as contained in Listing Notices (GN R983, 984 and 985).

The project also requires the following environmental approvals, which will be applied for as part of the EIA process:

- Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008); and
- Water Use Licence (WUL) in terms of the National Water Act, 1998 (Act No. 36 of 1998).

The purpose of the EIA process is to ensure that potential environmental and social impacts associated with construction, operation and closure of a project are identified, assessed and appropriately managed. There are two primary phases of an EIA process, namely the scoping phase and the impact assessment phase. Identification of potential impacts occurs during the scoping phase, whilst the assessment and mitigation of those impacts occurs during the impact assessment phase.

This Scoping Report presents the findings of the scoping phase of the EIA process. The report aims to provide a description of the overall project and activities, the biophysical and social environments within which the project is being proposed and the potential impacts that the project may have on these environments.



2 Content of the Scoping Report

2.1 Item 2(a)(i): Details of EAP

Digby Wells and Associates South Africa (Pty) Ltd has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process and supporting applications for the project. The details of the EAP are provided in Table 2-1.

Name of the Practitioner:	Mr. Mellerson Pillay
Tel No:	+27 11 789 9495
Fax No:	+27 11 789 9498
Email Address:	Mel.Pillay@digbywells.com

Table 2-1: Contact Details of the EAP

2.2 Item 2(a)(ii): Expertise of the EAP

2.2.1 The Qualifications of the EAP

Mellerson holds a Bachelor of Arts (BA) undergraduate degree in Environmental Studies and Political Science which was obtained at the University of Natal in 2003. In 2004, Mellerson obtained a Bachelor of Social Science Honors Degree in Geography and Environmental Management at the University of Natal. Proof of these qualifications is appended as Appendix 1.

2.2.2 Summary of the EAP's Past Experience

Mellerson currently holds the position of Environmental and Legal Services Departmental Manager at Digby Wells Environmental. He has been with Digby Wells for a period of 1 year and has been managing integrated environmental regulatory processes as a Senior Project Manager. Prior to Digby Wells, Mellerson spent 2 years at Environmental Resources Management Southern Africa (Pty) Ltd (ERM) as a Senior Project Manager and 5 years at Aurecon's Environmental and Advisory Services Department as a Project Manager.

Mellerson has almost 9 years of professional experience in environmental assessment and planning and project management. Mel has been involved in a number of Environmental Impact Assessments (EIA) within the mining, energy and oil and gas industries. Of particular relevance, Mellerson managed the EIAs for the proposed Gamsberg Zinc Mine in the Northern Cape and the proposed Khanyisa Coal-Fired Power Station in Mpumalanga amongst others.



Mellerson has considerable experience across a range of developmental and environmental sciences and has worked in South Africa, Namibia and Angola. Please find Mellerson's CV attached as Appendix 2.



3 Item 2(b): Description of the Property

The property details as required are presented in Table 3-1.

Table 3-1: Property Details

-								
	The proposed licence area is located on a group of five adjacent farms namely:							
	RE of Farm Vogelstruisfontein 765LR							
	RE of Farm Vliegekraal 783LR							
Farm Name:	RE of Farm Vriesland 781LR							
	• RE	of Farm Schoonoord 786LR						
	• RE	and Portions 1,2,3,4,5 and 6 of Farm	n Bellevue 808LR					
	The la	nd-use zoning is Agriculture for all fa	rm portions.					
Application Area (Ha):	10 109	Ha (Combined area of the five farm	s)					
Magisterial District:	Mokop Distric	ane District, Mogalakwena Local Mu t Municipality	nicipality within the Waterberg					
Distance and direction from nearest town:	45 km north-northwest of Mokopane and 65 km west of Polokwane							
		Farm	21 digit SG code					
		RE of Farm Vogelstruisfontein 765LR	T0LR0000000076500000					
		RE of Farm Vliegekraal 783LR	T0LR0000000078300000					
		RE of Farm Vriesland 781LR	T0LR0000000078100000					
21 digit Sumayor								
21 digit Surveyor		RE of Farm Schoonoord 786LR	T0LR0000000078600000					
General Code for each farm portion:		RE of Farm Schoonoord 786LR RE of Portion 1 of Farm Bellevue 808LR	T0LR0000000078600000 T0LR0000000080800001					
General Code for each farm portion:		RE of Farm Schoonoord 786LR RE of Portion 1 of Farm Bellevue 808LR RE of Portion 2 of Farm Bellevue 808LR	T0LR0000000078600000 T0LR0000000080800001 T0LR0000000080800002					
General Code for each farm portion:		RE of Farm Schoonoord 786LR RE of Portion 1 of Farm Bellevue 808LR RE of Portion 2 of Farm Bellevue 808LR Portion 3 of Farm Bellevue 808LR	T0LR0000000078600000 T0LR0000000080800001 T0LR0000000080800002 T0LR0000000080800003					



	808LR							
		Portion 808LR	5	of	Farm	Bellevue	T0LR0000000080800005	
		Portion 808LR	6	of	Farm	Bellevue	T0LR0000000080800006	



4 Item 2(c): Locality Map

A regional plan and locality plan has been attached as Plan 1 and 2 respectively within Appendix 3. The nearest town is Mokopane and can be seen on the regional map.



5 Item 2(d): Description of the Scope of the Proposed Overall Activity

5.1 Item 2(d)(i): Listed and Specified Activities

A 1: 10 000 plan of the project site and proposed infrastructure layout of the key project components has been attached as Plan 3 of Appendix 4. The project's activities and aerial extent are listed in Table 5-1. The table also provides an indication of those activities listed in terms of the EIA Regulations (2014) and those which are not listed.

Name of Activity	Aerial extent of the activity (Ha or m ²)	Listed Activity Mark with an X where applicable or affected	Applicable Listing Notice(GNR 983, GNR 984 or GNR 985) / NOT LISTED			
Site clearance and vegetation removal	Approximately 885 ha	X – Activity 30 Activity 15	GNR 983 GNR 984			
Change of land-use	10 109 ha	X – Activity 28 (ii)	GNR 983			
Topsoil removal and stockpiling	Approximately 885 ha	N/A	NOT LISTED			
Development and use	13 km long and 25 m in	X – Activity 24 (ii)	GNR 983			
of access roads	width	Activity 4	GNR 985			
Water abstraction and use	Pipeline/s with a combined length of 11 km and a capacity of 46m ³ /h.	X – Activity 9	GNR 983			
Channels, bridges,	To be confirmed during	X – Activity 12	GNR 983			
system, office,		Activity 19 (i)				
workshop and		Activity 14	GNR 983			
concentrator plant buildings		(i,ii,iii,iv,vi,x,xii)				
Development of two open pits	192 ha	X – Activity 17	GNR 984			
Development of waste rock dump	Approximately 160ha	X- Activity 6	GN R 984			
Mine development and operation	10 109 ha	X – Activity 17	GNR 984			

Table 5-1: Project Activities



Name of Activity	Aerial extent of the activity (Ha or m ²)	Listed Activity Mark with an X where applicable or affected	Applicable Listing Notice(GNR 983, GNR 984 or GNR 985) / NOT LISTED		
Concentrator plant	236 ha	X – Activity 21 Activity 28	GNR 984		
Tailings dam	124 ha The tailings pipeline will be approximately 3 km in length	X - Activity 6 Activity 16	GNR 984 GNR 984		
Pollution control dam, water storage dam and associated pipelines	To be confirmed during the EIA process The process water pipelines will be approximately 2 km in length.	X – Activity 10 Activity 13 Activity 6 Activity 16 Activity 2	GNR 983 GNR 983 GNR 984 GNR 984 GNR 985		
Storage of fuels, process concentrate, maintenance/workshop oils	To be confirmed during the EIA process	X – Activity 4	GNR 984		
Waste generation, storage and disposal (hazardous and general)	To be confirmed during the EIA process	N/A	NOT LISTED		
Product storage (magnetite concentrate)	To be confirmed during the EIA process	N/A	NOT LISTED		
Sewerage treatment plant	To be confirmed during the EIA process	X – Activity 25	GNR 983		
Employment of construction and operational mine workers	mployment of onstruction and perational mine150 people during operationsorkers500 people during construction (permanent and contractor employees)		NOT LISTED		
Rehabilitation of project area	Approximately 885 ha	N/A	NOT LISTED		



5.2 Item 2(d)(ii): Description of the Activities to be Undertaken

5.2.1 Mineral Resource

The applicant has undertaken a scoping study in June 2014 to determine the viability of the project. The discussion on the mineral resource presented below is based on the findings of this study.

The Project is located on the Bushveld Igneous Complex (BIC). The BIC consists of a lower sequence of layered mafic and ultramafic rocks known as the Rustenburg Layer Suite (RLS) and an overlying unit of granites known as the Lebowa Granite Suite. These layered rocks occur in four areas known as the Western, Northern, Eastern, and Bethal limbs. The project is located in the Northern Limb and in the Upper Zone of the RLS.

Within the project site, two titano- magnetite zones have been identified, namely the vanadium-rich Main Magnetite Layer (MML) and the iron and titanium-rich P-Q zone. The MML consists of two massive titano-magnetite layers separated by a parting consisting of lower concentrations of titano-magnetite.

The target mineral for the proposed mine is vanadiferous titano-magnetite of the MML, which will be processed to produce magnetite concentrate which will eventually be used for vanadium production. Other minerals which may be found in association and which are included in the mining right application are: Vanadium, Titanium, Iron Ore, Phosphate, Platinum Group Metals, Gold, Cobalt, Copper, Nickel, Chrome and all minerals found in association with these elements. A second orebody, the so-called P-Q Zone, also has indicated and inferred resources and may be mined at a later stage.

The reef outcrops and dips to the west and has been intersected at depths exceeding 400 m below surface, and a resource has been calculated on the MML to a depth of 120 m. The P-Q Zone also outcrops, and dips to the west and has resources calculated to depths of 400 m.

The following indicated mineral resources are declared for the MML from surface down to a vertical depth of 120 m (Table 5-2) These mineral resources have been prepared in accordance with the guidelines of the 2012 Edition of the JORC Code. The resource estimate was classified in the indicated and inferred resource categories. The combined thickness of this mineral resource is 8.18 m with an indicated 51.81 million tonnes of ore.



Layer Name	Thickness (m)	Million Tonnes	SG t/m³	Fe%	Fe Metal Tonnes million	TiO₂	V ₂ O ₅	SiO₂	Al ₂ O ₃	P₂O₅	S
MAG4	4.36	27.50	4.08	45.5	12.51	10	1.5	10.6	7.8	0.01	0.12
MAG3	3.82	24.31	4.00	43.9	10.66	9.3	1.46	11.8	8.9	0.01	0.24
TOTAL	8.18	51.81	4.04	44.7	23.17	9.7	1.48	11.2	8.3	0.01	0.18

Table 5-2: Combined MML Indicated Mineral Resources

Source: VMIC, February 2014

No geological losses were applied for the P-Q Zone as the wide spacing of the drillholes means that the position of dykes, faults and other disruptive geological features within the P-Q Zone are not well defined. Table 5-3 and Table 5-4 provide the indicated and inferred mineral resource for the P-Q Zone.

Fe Tonnes SG Layer Fe Fe₂O₃ TiO₂ $V_2 0_5$ SiO₂ P_2O_5 S AI_2O_3 Metal q/cm³ % % % Name million % % Mt % % % Q3 157.15 3.62 31.50 45.00 49.44 9.50 0.11 26.70 10.00 0.07 0.60 Q2 89.19 4.07 42.10 60.20 37.52 15.30 0.27 12.80 6.80 0.02 0.54 Q1 24.87 3.68 33.20 47.50 8.26 11.50 0.29 21.30 9.90 0.03 0.51 PMAG 40.14 3.66 32.00 45.80 12.85 10.30 0.28 22.00 10.90 0.04 0.94 PFWDISS 65.72 3.42 27.30 39.00 17.92 7.60 0.22 29.70 12.90 0.03 0.47 OMAG 1.86 4.04 37.50 53.70 0.70 11.40 0.49 17.90 7.60 0.01 0.12 NMAG 4.72 69.00 2.28 6.80 4.41 48.30 16.10 0.55 5.30 0.02 0.12

Table 5-3: Indicated Mineral Resources for the P-Q Zone

Source: VMIC, March 2014

Table 5-4: Inferred Mineral Resources for the P-Q Zone

Layer	Tonnes	SG	Fe %	Fe ₂ O ₃	Fe Metal Mt	TiO₂ ⁰⁄	V ₂ 0 ₅	SiO ₂	Al ₂ O ₃	P ₂ O ₅	S %
Name	minon	g/cm	/0	/0	IVIL	/0	/0	/0	/0	/0	/0
Q3	143.84	3.57	30.20	43.30	43.49	8.80	0.09	28.30	10.30	0.13	0.62
Q2	94.76	3.99	40.30	57.60	38.14	14.10	0.24	15.30	7.60	0.02	0.61
Q1	23.70	3.67	33.20	47.50	7.87	11.30	0.27	21.60	10.50	0.02	0.52
PMAG	38.41	3.58	30.50	43.60	11.71	9.90	0.27	23.40	11.50	0.04	0.83



PFWDISS	73.88	3.37	26.80	38.30	19.78	6.90	0.21	30.20	12.80	0.03	0.43
OMAG	2.04	3.80	32.90	47.10	0.67	9.70	0.40	22.50	10.10	0.02	0.11
NMAG	7.22	4.32	46.20	66.10	3.34	15.60	0.49	8.30	5.90	0.02	0.14

5.2.2 Mining Method

Open pit mining is considered the optimal mining method based on the thickness and positioning of the mineral resource. The MML is covered by 2 m of soil which will be stripped to expose the outcrop. Open pit mining is proposed to be undertaken outwards from the middle of the strike length advancing north and south to an initial depth of 20 m below the surface then to 40 m and thereafter to 60 m, and 80 m. A bench height of 10 m will be used to allow for the separate loading of the two ore layers and the parting. The parting ore will either be stockpiled as a low grade ore or be sent to the waste rock dump, depending on its grade.

There are two open pits planned, which are separated by the D4380 Provincial Road, the approximate footprint of the north and south open pits are 129 ha and 66 ha respectively. Please refer to Appendix 4 for the project infrastructure layout map. It is likely that the north pit (129 ha) will be mined first for approximately 10 years, thereafter the south pit (66 ha) will be mined at the same time, therefore both pits would be mined for the last 20 years of the LoM.

The Life of Mine (LoM) is approximately 30 years with a Run of Mine (RoM) of up to one million tonnes per annum (tpa).

5.2.3 Mineral Processing

Ore will be transported from the open pit to the plant by trucks. A concentrator plant will be constructed for initial processing. Ore processing will commence with crushing which is undertaken in three stages and produces material with a size of 44 millimetres (mm). Based on typical industry performance, the plant is assumed to perform for 5 500 operational hours per annum (i.e. 358 operating days per annum, with an 80% utilisation of 80% availability).

Material from the crushed material stockpile will then be reclaimed and processed through a conventional rodmill-ballmill combination to produce a product of 53 micrometres (μ m). Following grinding, magnetite will be recovered through a three-stage low intensity magnetic separation circuit. The magnetic separation product will be dried by a filter press and stockpiled for further processing, while the non-magnetic waste will be thickened and disposed of at the proposed tailings dam. Refer to Figure 5-1.







Figure 5-1: Process Flow Diagram of the Concentrator Plant

5.2.4 Waste Rock Dump

The waste rock dump (WRD) will be created during the development of the open pit. Waste rock material will be transported to the WRD using Load Haul Dump (LHD) vehicles. An overall slope angle of 50 degrees is proposed for the WRD. The WRD is proposed to have a footprint of 243 ha.

5.2.5 Tailings Dam

There are currently two alternatives under consideration for the development of the tailings dam. The tailings generated from the concentrator plant is proposed to be thickened by either conventional thickening or paste thickening. In terms of past thickening, the underflow can contain up to 75-85 % of solids. There are several benefits to paste thickening, these include:

- Reduction of water sent to the tailings dam by 50%, resulting in a significant overall reduction in water consumption;
- Reduction of the footprint area required for a tailings dam, due to the high solids content;
- Reduced seepage from the tailings dam as a result of less free water in the tailings material;
- Energy savings due to the reduction in slurry volume being deposited through pumping; and
- Once deposited, the paste dries out similarly to conventional thickener underflow.

Paste thickening requires careful design of the entire deposition system, with displacement pumps typically required to move the material. It must be physically possible to produce



paste tailings and also the financial feasibility needs to be assessed. Further information on the preferential tailings disposal technology and proposed design of the tailings dam will be provided during the EIA phase.

The tailings dam to be constructed will have a footprint of approximately 124 ha, which may be reduced depending on the final design of the dam.

5.2.6 Water Management

5.2.6.1 Water Supply

Water is required for use in ore processing as well as for potable use. It is therefore planned for water to be abstracted from existing water abstraction networks. The Bakenburg Rural Water Scheme (RWS) and the Hout River gneiss of the Aganang Local Municipality have been identified as potential sources due to its higher water yielding potential. Based on desktop studies undertaken, the Hout River and RWS yielded 1 and 3 Million Cubic Metres (Mm3) of water per annum, respectively that could potentially be available for the project.

These networks as well as possible groundwater resources will be investigated further through an in-depth hydrogeological investigation to be undertaken during the EIA process. Approximately 2 Megalitres of water will be required per day.

The Olifants River Water Resources Development Project plans to build a pipeline from Flag Boshielo Dam to Mokopane to meet the domestic and industrial needs of the area. This pipeline is currently being constructed, however it is anticipated to be completed by the end of 2017. Pamish will need to liaise with the Lebalelo Water User Association to register its water requirements.

5.2.6.2 Storm water Management

Storm water will be managed as per GN R.704, regulations on use of water for mining and related activities aimed at the protection of water resources (GG 20119 of 4 June 1999). Clean storm water will be directed away from the mining operations using berms and dirty water will be captured within the dirty area and directed towards a pollution control dam for settling and evaporation. The pollution control dams will be sized such that it will be able to contain the run-off from a 1:50 year storm event. Mining will occur outside the 100 year floodline.

5.2.6.3 Pollution Control Facilities

Process water will be returned to the concentrator plant for re-use. Furthermore, the required clean and dirty water separation systems will form part of the mine design as well as the required PCDs.



5.2.7 Waste Management

Both general and hazardous waste will be generated on the project site. These wastes will need to be handled, separated, stored and disposed of according to their classification. The following waste facilities are anticipated to be constructed as part of the project:

- Oil trap at vehicle washbay and workshop areas;
- Settling ponds as part of the concentrator process;
- PCDs;
- Sewerage treatment plant; and
- General waste temporary storage facilities.

5.2.8 Power Requirements

The project site is located 20-30 kilometres (km) from a planned 400 to 132 kiloVolt (kV) substation along a new 400 kV powerline. A separate EIA process will be undertaken for the new powerline and associated infrastructure. The required infrastructure to connect to this power source will be considered as part of a separate EIA process.

The project would therefore be able to draw its power from this substation. It is estimated that approximately 10 Megawatts of power would be required for the operation of the proposed mine and associated infrastructure.

Generators may be required for the construction phase, although sufficient power may be available from Eskom's existing transmission lines in the project area.

5.2.9 Road Infrastructure

The project site is divided by the D4380 Provincial Road. The northern section of the project site can be accessed via the D3534. The southern section of the project site can be accessed via the D3507. Both roads are secondary roads off the D4380 Provincial Road. These municipal roads are double-lane tarred roads which are at present, in good condition.

The material from the proposed mine will either be transported via road, then onto rail in Mokopane and onwards to the nearest port; or via road, directly to Durban/Richards Bay for export. The scope of this EIA is limited to the potential impacts associated with the use of roads only and excludes the potential impacts associated with the rail and port.

Haul roads will be constructed along hanging wall and footwall of both open pits. The haul roads will be constructed between the open pits, WRD, tailings dam and to the concentrator plant. It is planned that there will be one haul road crossing over the D4380 Provincial Road to access the open pit to the south.

The width of the haul road is expected to approximately 25 m in width and a combined length of 13 km. The haul roads will be developed using crushed waste rock, which will be compacted and treated with dust-a-side (dust suppressant).



5.2.10 Other Support Infrastructure

Additional mine infrastructure that is anticipated to be constructed includes the following:

5.2.10.1 <u>Sewerage Treatment Plant</u>

It is anticipated that this plant will be used to process waste generated on the mine only.

5.2.10.2 <u>Conveyors</u>

A 600 m conveyor is required for the crushing and grinding components within the plant area and a further two 100 m conveyor systems are required for the concentrate product and tailings. These conveyors will have a width of 45-60 cm. The conveyors will be closed top conveyors. These specifications will be confirmed during the detailed mine design.

5.2.10.3 <u>Pipelines</u>

Clean water, assuming that it will be piped from the existing water abstraction networks, will have a pipeline/s with a combined length of 11 km and a capacity of $46m^3/h$. The process water pipelines which will be located within the plant area will be approximately 2 km in length. The tailings pipeline will be approximately 3 km in length (distance between the concentrator plant and the tailings dam), with a throughput capacity of $53m^3/h$.

All pipeline diameters are estimated to be approximately 5-20cm.

5.2.10.4 Hazardous Material Storage

Various hazardous substances will be stored on site, including fuels, lubricants, gas, oils, and explosives. There will be emulsion type explosives that would be mixed on site in emulsion tanks with the detonators stored in an explosive magazine (building). These materials will be to be stored in secured buildings or with the necessary bunds (110% of volume of materials). The specifications for hazardous material storage will be confirmed during the detailed mine design.

5.2.10.5 Contractor Camp

All maintenance activities will be undertaken within a workshop area which will include offices, storage and a wash bay.

5.2.10.6 <u>Security</u>

Security will be positioned at the main entrances to the mine to control access into the mining areas. The main entrance to the project site will be via the D4380 Provincial Road.

5.2.11 Staffing Requirements

According to the Social and Labour Plan (SLP), the expected workforce for the mine when fully operational will be approximately 150 people (permanent employees and contractors).


During the construction phase the mine will employ 500 permanent and contractor employees.

5.2.12 Project Schedule

The planned project schedule is as follows and is dependent on receipt of all regulatory approvals:

- Construction : March 2016 March 2018 (2 years)
- Topsoil and Pre-stripping : 2018 2019 (1 year)
- Production: 2019 2049 (30 years)



6 Item 2(e): Policy and Legislative Context

This section aims to provide a description of the policy and legislative context within which the project is being proposed. This section has been divided into national, provincial and local legislation and policies, plans, guidelines and development planning frameworks and tools.



Table 6-1: Relevant National Legislation

Applicable legislation and guidelines used to compile the report	Reference where applied
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Under Section 24 of the Constitution of the Republic of South Africa, it is clearly stated that: Everyone has the right to (a) an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that - (i) Prevent pollution and ecological degradation; (ii) Promote conservation; and (iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. 	An EIA process is being undertaken to determine the impacts associated with the project. As part of the EIA process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and EIA Regulations (December 2014)The National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA), as amended was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.The Environmental Impact Assessment (EIA) RegulationsGovernment Notice Regulation (GN)	The EIA process will be undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA Regulations, promulgated in terms of NEMA. These Listed Notices have been reviewed against the project activities to determine the likely triggers. The listed activities which are potentially triggered under the Listing Notices are provided in Table 5-1. Based on the activities listed, it has been identified that a full EIA process is required for the project. An application for the listed activities has been submitted to the DMR who is the relevant Competent Authority in terms of this application for Environmental



Applicable legislation and guidelines used to compile the report	Reference where applied
R982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R 983 (Listing Notice No. 1), GN 984 (Listing Notice No. 2) and GN R 985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended.	Authorisation.
GN R. 982 National Environmental Management Act, 1998 (Act No. 107 of 1998):Environmental Impact Assessment Regulations, 2014These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes:	
 Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact approaches. 	Please see Table 5-1 for listed activities that will be potentially triggered by the project.
 Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed. 	
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) Waste management activities in respect of which a Waste Management Licence (WML) is required are to be undertaken in accordance with Section 20 (b) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA).	The application for authorisation to the DMR also includes waste management activities in terms of GN R. 921. In particular, Activities 1, 2 and 11 of Category A will be applied for. A waste classification process will be undertaken for



Applicable legislation and guidelines used to compile the report	Reference where applied
On 29 November 2013 the Minister of Water and Sanitation repealed the list of waste management activities published under GN R718 of 3 July 2009 (GN R718) and replaced it with a new list of waste management activities under GN R921 of 29 November 2013. Included in the new list of waste activities are activities listed under Category A, B and C. These activities include inter alia the following:	residue materials generated. General and hazardous waste storage facilities will be managed in accordance with the Norms and Standards for Storage of Waste, 2013.
 Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA regulations supporting an application for a waste management licence; 	
 Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA regulations supporting a waste management licence application; and 	
 Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m³ and storage of hazardous waste in excess of 80 m³. 	
The Waste Classification and Management Regulations (GN R 634) of November 2013 requires that all wastes be classified according to SANS10234 and managed according to its classification.	
National Water Act, 1998 (Act No. 36 of 1998) (NWA)	An Integrated Water Use Licence Application (IWULA)
The National Water Act (Act No. 36 of 1998) (NWA) provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable	and an associated Integrated Water and Waste Management Plan (IWWMP) are required in terms of Section 21 of the National Water Act for the project.



Applicable legislation and guidelines used to compile the report	Reference where applied
 allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. <u>GN R704 National Water Act, 1998 (Act No. 36 of 1998)</u> Regulations 4 and 5 of the regulation on use of water for mining and related activities aimed at the protection of water resources, Government Notice Regulation 704 (GN R No. 704) published in June 1999, states the following: Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution. Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, while Regulation 7 details the requirements necessary for the protection of water resources. 	 The IWULA and IWWMP will be compiled and submitted to the Department of Water and Sanitation (DWS) as the decision making authority. The water uses which may be triggered under Section 21 of the NWA in relation to the project are listed below: S21(a) – Taking water from a water resource; S21(b) – Storing water; S21(c) – Impeding or diverting the flow of water in a watercourse; S21(g) – Disposing of waste in a manner which may detrimentally impact on a water resource; S21(i) – Altering the bed, banks, course or characteristics of a watercourse; and S21(j) – Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of material.
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) (MPRDA) A Mining Right Application submitted to the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Act, 2002 (Act No.28 of 2002) (MPRDA) must be succeeded by various documents including a Scoping Report, EIA Report and an EMP.	An EIA process is being undertaken to meet the requirements of the MPRDA. Furthermore, in support of the MRA, a SLP and MWP has been submitted to the DMR with the MRA.
The MPRDA requires that mining companies assess the socio-economic impacts of their activities	



Applicable legislation and guidelines used to compile the report	Reference where applied
from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)	
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance:	As part of this project, a flora, fauna, wetlands and aquatic assessment will be undertaken to determine the current status of the environment and to determine any potential ecological sensitivities to be avoided and/or mitigated.
 Alien and Invasive Species Lists, 2014 published (GN R599 in GG 37886 of 1 August 2014); National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; 	There are currently no applications submitted in terms of NEM:BA for the project. This will be confirmed during the detailed specialist investigations.
 National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN 1002, 9 December 2011). 	
National Forests Act,1998 (Act No. 84 of 1998). Species that are nationally protected have been listed under this act. A permit is required for the removal of tree species, as listed in the act.	Three plant Species of Special Concern (SSC) were recorded on the project site, a permit for the translocation of these species may be required.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) According to the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) the Department of Environmental Affairs (DEA), the provincial environmental	For the purpose of this project, an Air Quality Assessment will be carried out to determine the baseline conditions of the air prior to the implementation



Applicable legislation and guidelines used to compile the report	Reference where applied
departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	of the proposed mining activities. The projects' activities will set out to abide by the NEM: AQA and standards set out in the National Ambient Air Quality Standards. The required measures will be included in the EMPr.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case the South African Heritage Resources Agency (SAHRA) and Limpopo Provincial Heritage Resources Authority (LIHRA), be notified as early as possible of any developments that may exceed certain minimum thresholds. This act is enforced through the National Heritage Regulations GN R 548 (2000).	A Notice of Intent to Develop (NID) will be submitted, as part of this report, to the Limpopo Provincial Heritage Resources Authority and the South African Heritage Resources. Furthermore, a Heritage Impact Assessment (HIA) will be undertaken.
The National Road Traffic Act, (Act No. 93 of 1996) The National Road Traffic Act, 1996 (Act No. 93 of 1996) sets out to provide for matters relating to traffic control and standards relating to road design. The National Road Traffic Act Regulations, GN R. 225 of 2002 relates to the transportation of hazardous materials, where the following standards apply: SANS 10228; SANS 10231;SANS 10232-1; SANS 10229:2005; and SANS10233.	A Traffic Impact Assessment (TIA) will be undertaken to determine the impact of additional mine traffic on the surrounding road network.
Explosives Act, 1956 (Act No. 26 of 1956) This Act makes provision for, amongst others, storage, transport and the use of explosives. Section 6 of the Act makes provision for storage of explosives in licensed premises and Section 9 makes provision for use of blasting material without a permit. The Explosives Regulations GN	A Vibration and Blast Impact Assessment will be undertaken as part of the EIA process. The applicant will ensure that the external contractors are in possession of the relevant license regarding storage and handling of explosives on site.



Applicable legislation and guidelines used to compile the report	Reference where applied
R1604 (GG3648 of 8 September 1972 provides safety distances from explosive storage areas.	
Environmental Conservation Act, 1989 (ECA), (Act No. 73 of 1989) - National Noise Control Regulations, GN R.154 (10 January 1992)	
These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication.	A Noise Impact Assessment will be undertaken as part of the EIA process to understand the impact of the proposed mine activities on the ambient noise environment.
The National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004) also provides for noise control.	
Traditional Leadership and Governance Framework Amendment (Act of 2003) and Council of Traditional Leaders (Act of 1997)These two acts provide for the recognition and establishment of traditional communities and councils, and provide a framework for traditional leadership and the roles and responsibilities of this leadership.	Since the project is located on tribal land, the role of the tribal authorities will be particularly important during the stakeholder engagement process that will be undertaken as part of the EIA process.
Restitution of Land Rights Act, 1994 (Act No. 22 of 1994) This act provides for the restitution of rights in land to people or communities dispossessed of such rights after June 1913 as result of past racially discriminatory laws or practices.	It will be confirmed during the consultations with traditional authorities and land owners whether there are any land occupiers who need to be consulted. Digby Wells has also enquired if there are any land claims on the various properties and a letter has been submitted to Mr Mphasha of the Limpopo Department of Rural Development and Land Reform, Land Claims Commission, on the 28 January 2015. A letter was



Applicable legislation and guidelines used to compile the report	Reference where applied
	received on the 9 of February 2015 from the land claims commission and the results of the land claims enquiry are reflected in Section 11.1.5.



Table 6-2: Relevant Provincial Legislation

Applicable legislation and guidelines used to compile the report	Reference where applied
Limpopo Environmental Management Act, (Act No. 7 of 2003) (LEMA) The Limpopo Environmental Management Act, 7 of 2003, is aimed at managing and protecting the environment in the Limpopo Province as well as securing ecologically sustainable development and responsible use of natural resources in the Province.	This report will be compiled in accordance with the National Environmental Management Act and its regulations thereof and relevant Specific Environmental Management Act(s) (SEMAs) where applicable. In addition, the report will, as far as possible, meet the requirements of the LEMA where required.
Limpopo Heritage Regulations GN R103 The Limpopo Heritage Authority (LHA) has been established and is responsible for the management of heritage resources in the Province.	A Heritage Impact Assessment will be undertaken in line with these regulations.



Table 6-3: Local By-Laws

Applicable legislation and guidelines used to compile the report	Reference where applied
Waste (July 2004)	
Chapter 2 of the by-laws attend to Local Waste Plan. The objectives of the local waste plan, as set out in the by-laws, include:	
 a) establishing a means of ensuring that waste is collected, re-used, recycled or disposed of without causing harm to human health or damage to the environment and, in particular, without:- (i) risk to water, air, soil, plants or animals; (ii) causing nuisance through noise or odours; or (iii) adversely affecting rural or urban areas or areas of special interest; c) encouraging the minimisation or reduction of waste; Sections 22 of the Waste by-law outline the laws governing the storage, collection, transportation and disposal of Special Industrial, Hazardous or Health Care Risk Waste. 	The application for environmental authorisation submitted to the DMR includes waste management activities in terms of GN R. 921. Activities 1, 2 and 11 of Category A have been applied for.
Water and Sanitation (2005)	
Chapter 2 of the Water and Sanitation by-law outlines the laws governing the application for water services. The main impression is that no one shall gain access to water services from the water supply system, sewage disposal system or through any other sanitation services unless they have applied for such services to the authorised agent.	The applicant will apply to the local council for the project's water requirements.
<u>Waterberg-Bojanala Priority Area (WBPA) in terms of GN R 495 on 15 June 2012</u> The WBPA comprises the Waterberg District in Limpopo Province and the Bojanala Platinum District in the North West. The overall aim of establishing the WBPA is to regulate and to ensure future sustainable development in the area and maintain the NAAQS. It became critical that a	An Air Quality Impact Assessment and Management Plan will be developed as part of the project.



Applicable legislation and guidelines used to compile the report	Reference where applied
Priority Air Quality Management Plan for the area be developed. A Priority Air Quality Management Plan includes the establishment of emissions reduction strategies and intervention. The implication	
of this is that all current and future contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following years.	



Table 6-4: Project Specific Policies and Guidelines

Applicable legislation and guidelines used to compile the report	Reference where applied
National Development Plan (NDP)	
Development in South Africa is guided by the NDP, which presents a shared long-term strategic framework within which more detailed development planning can take place to advance the long-term goals adopted in the NDP (National Planning Commission, 2011). The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and the reduction of inequality. The NDP 2030 sets a target of creating approximately 11 million new jobs and achieving an annual average economic growth rate of 5.4% by 2030.	The project will create approximately 150 jobs during the operational phase of the project and 500 permanent and contractor jobs during the construction phase. A SLP will be developed and submitted to the DMR.
Accelerated and Shared Growth Initiative for South Africa (AsgiSA)	
The Initiative was launched in 2003 with the vision to halve poverty and unemployment among the country's population by 2015. The initiative is considered one of the key vehicles driving South Africa's economic policy and subsequent development plans. One of the primary aim of AsgiSA is to target specific sector strategies and initiatives (including mining) to further stimulate economic growth and job creation.	The project will create approximately 150 jobs during the operational phase of the project and 500 permanent and contractor jobs during the construction phase. A SLP will be developed and submitted to the DMR.
National Infrastructure Plan	
 The South African Government adopted a National Infrastructure Plan in 2012. The primary objective of the Plan is to transform the country's economic landscape, while simultaneously creating significant numbers of new jobs, strengthen the delivery of basic services, and promoting integration with other African economies. In the context of the VMC Project the following SIPs bear relevance to the Limpopo Province: SIP 1: Unlocking of the northern mineral belt, with Waterberg as the catalyst in Limpopo entails investment in rail, water pipelines, energy generation and transmission to tap Limpopo's rich 	The project will result in the development of support infrastructure such as roads, powerlines, pipelines. Even though these facilities will be developed for the purposes of the mine, the local authorities and communities would be able to easily access these services for their use.



Applicable legislation and guidelines used to compile the report	Reference where applied
mineral reserves, and will be co-ordinated by Eskom.	
Department of Water and Sanitation's (DWS) Best Practice Guideline – G2: Water Salt Balances	
water management tools available to the mines. This guideline presents the practical procedure to develop water balances and defines what should be considered in the balances as well as the level of detail.	A salt and water balance will be compiled for the project.
Department of Water and Sanitation's (DWS) Best Practice Guideline – G4: Impact Prediction The impacts of mine activities on the groundwater environment must be assessed as part of the mining right application, as well as for the Integrated Water Use Licence Application (IWULA). The baseline conditions must be assessed to define the current aquifer systems, groundwater use and groundwater conditions before mine commencement and to determine the extent of possible future impacts on the groundwater resources.	An Integrated Water Use Licence Application (IWULA) and an associated Integrated Water and Waste Management Plan (IWWMP) are required in terms of Section 21 of the National Water Act. The IWULA and IWWMP will be compiled and submitted to the Department of Water and Sanitation (DWS) as the decision making authority.
 Department of Water and Sanitation's (DWS) Best Practice Guideline – G1: Storm Water Management Plan (SWMP) These are guidelines provided for the development of a SWMP by DWS. The following will be undertaken to develop the conceptual SWMP: Delineate the clean and dirty area contributing to runoff (based on the final layout plans) and site specific hydrological assessments to determine volumes that require to be handled. The 	A Storm Water Management Plan (SMWP) will be compiled in line with these guidelines.



Applicable legislation and guidelines used to compile the report	Reference where applied
SWMP developed should conform to the guidelines of the EHSG: Mining. It should ensure that temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year/24-hour event, while permanent drainage installations should be designed for a 100-year/24-hour recurrence period.	
 Site specific assessments to establish the appropriate mitigation measures and surface water monitoring programme. 	
Department of Water and Sanitation's (DWS) Best Practice Guideline – H3: Water Reuse and Reclamation	
Given the growing demand for water and the scarcity of this natural resource, it is important for any mining operation to prove that water utilisation is optimized by reuse and reclamation of contaminated water. The guideline presents processes that should be applied by a mine when developing a mine water reuse and reclamation plan.	An Integrated Water and Waste Management Plan (IWWMP) will be compiled and will consider the reuse and reclamation of water.
Limpopo Development Plan (2014)	
The purpose of the LDP is to serve as a single reference point for policy-makers in government, private sector, civil society and donors with regard to developmental priorities for Limpopo, bearing in mind that development is about people. One of the key focus area of LDP is to create sustainable economic development, reduce unemployment and eradicate poverty. The LDP is the overarching strategy for Limpopo Province for the next five years, from 2014/2015 - 2019/2020 financial years. It is the overarching operational medium-term strategy for the province.	Due to the specific nature of this project, that it is mining and labour intensive, the project will endeavour to meet the objectives as outlined in the Limpopo Development Plan.
Waterberg Environmental Management Plan (EMP)	An EIA process, in terms of the EIA regulations 2014, is



Applicable legislation and guidelines used to compile the report	Reference where applied
An EMP is a plan or programme for protection of the environment that seeks to achieve a required	being undertaken as part of this process. As required
end state and describes how activities that have, or could have, an adverse impact on the	by the regulations, an EMPr will be submitted as part of
environment, will be mitigated, controlled, and monitored. An EMP addresses the environmental	the EIA report. As part of the EMPr, mitigation
impacts during design, implementation and operational phases of a project. It is also aimed at	measures will be identified. Furthermore, a closure and
ensuring that the developer maintains adequate control over the project.	rehabilitation plan will be compiled.
Waterberg Environmental Management Framework (EMF)	A site sensitivity analysis has been undertaken to
The EMF is an initiative of the national Department of Environmental Affairs in partnership with the	identify the sensitive biophysical and socioeconomic
Limpopo Department of Economic Development, Environment and Tourism (LEDET) and the	features of the project site. The sensitive areas as
Waterberg District Municipality (WDM). The EMF is set out to support decision-making in the	identified in the Waterberg EMF have been
WDM area to facilitate appropriate and sustainable development. One of the objectives of the	incorporated into the specialist studies (including critical
WDM EMF is to develop a decision support system for development in the area to ensure that	biodiversity areas, National Freshwater Ecosystem
environmental attributes, issues and priorities are taken into account.	Priority Areas (NFEPA) and Important Bird Areas (IBA))
Local Economic Development Plan (LED) Waterberg: The Waterberg LED recognises mining as a key sector in the district municipality followed by agriculture. A mining development strategy focusing on the improvement of the mining value chain has been established in support of the local mining industry. The LED focuses on clusters which have been formed to facilitate the specialisation of certain resources. With the assistance of the public sector, the cluster development aims to maximise the benefits of mineral resources through upstream and downstream activity in the local area. Mogalakwena: According to the Mogalakwena LED Plan (2011-2016) mining is the largest economic component	Due to the specific nature of this project, that it is mining and labour intensive, the project can be considered as meeting the objectives both at a regional and local level.



Applicable legislation and guidelines used to compile the report	Reference where applied	
of the municipality and it is acknowledged that it is the main driving force to achieve growth and development in the area.		
Waterberg District Integrated Transport Plan (2011) An Integrated Transport Planning (ITP) approach is required to ensure that several parts and elements of the transport system complement each other so that its total output can benefit the end user. Each Municipality (Planning Authority) prepares an ITP. Each type of ITP must inform the relevant authority's Integrated Development Plan (IDP).	As part of the project, a Traffic Impact Assessment will be undertaken to assess the impact of the proposed development to the existing road network.	
Limpopo Green Economy Plan (2013) The goals of the Limpopo Green Economy plan are: Generate Jobs Improve Environmental Quality Create Enabling Conditions for Green Growth Change Behavioural and Production Patterns Build a New Economic/Environmental Paradigm for Limpopo There are many initiatives such as water management and sustainable production and consumption.	The initiatives as outlined in this plan will be considered as part of the GHG Study undertaken for the project, particularly relating to the climate change response.	
GHG Protocol: Corporate Accounting and Reporting Standard, 2004 The estimated Green House Gas footprint for the project will be developed in accordance with the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). Even though the standard is intended to provide guidance on accounting for and reporting on GHG emissions at the organisational level, the standard can be applied to individual projects.	A GHG assessment is being undertaken for the project to quantify the possible emissions and to identify technically feasible mitigations.	
International Finance Corporation (IFC)	This project will consider the guiding principles set out	



Applicable legislation and guidelines used to compile the report	Reference where applied	
The IFC, a subsidiary of the World Bank, has published a set of Performance Standards (PS) describing its commitments, roles, and responsibilities relating to environmental and social sustainability, in line with its strategic commitment to sustainable development, and as an integral part of its approach to risk management. The IFC applies the PSs to manage Project related to social and environmental risks and impacts, and enhance development opportunities in its private sector financing. The IFC PSs are widely regarded as international best practice with regard to the management of impacts associated with large project developments.	and Mining Guidelines.	
Department of Mineral Resources Consultation Guidelines The Guidelines were compiled for use by applicants for prospecting and mining rights. It provides that Interested and Affected Parties include, amongst others, host (or receiving) communities, land owners, traditional authorities, land claimants, lawful occupiers, any other person whose socio- economic conditions may be directly affected by proposed prospecting or mining activities.	A Public Participation Process (PPP) will be undertaken as part of the EIA process and will consider these guidelines.	



7 Item 2(f): Need and Desirability of the Proposed Activities

The magnetite concentrate will be further processed as part of a separate project to produce vanadium. Therefore the need for the magnetite concentrate is driven by the demand for vanadium. Vanadium is a high value metal, for which demand is growing due to the increased use of vanadium in steel manufacturing. Approximately 85-90% of global vanadium resources are used in the steel industry with the remaining proportion used in titanium alloys and chemical and battery applications.

In 2012, approximately 76 000 tonnes of vanadium was produced, with South Africa contributing approximately 26 % to the market. South Africa is the second largest producer of vanadium after China, which contributes approximately 52% to the vanadium market. The growth in demand for vanadium has been increasing at a compound annual growth rate of 4.3% between the years 2005 and 2013. The Chinese construction market and the global automotive steel market are the largest consumers of vanadium and are responsible for driving the demand for vanadium (Figure 7-1). It is expected that vanadium demand worldwide will increase by 8.1% per year generating consumption levels above 90 000 tonnes of vanadium by 2016.



Vanadium Consumption Growth (2005 - 2016)

Figure 7-1: Growth in Vanadium Demand

Source: Bushveld Vanadium Scoping Study, July 2014

The project's magnetite deposit underlying the proposed mining right area is considered to have a higher grade/ tonnage ratio when compared to several other similar mine projects globally. Figure 7-2 illustrates that the project has a higher in situ grade compared to other global resources. Mining magnetite resources within the proposed project site is thus considered more favourable from a technical, economic and sustainable viewpoint.



Figure 7-2: Growth in Vanadium Demand

Source: Bushveld Vanadium Scoping Study, July 2014

The project will result in several benefits both at the local and national levels. The estimated cost over the first 5 years for Local Economic Development (LED) programmes is R 2.5 million and R 4.5 million for socio-economic investment initiatives. LED programmes will include entrepreneurial skills development, the Bakenberg Home Center and other general socioeconomic initiatives.

Further to this, the national economy is also expected to benefit through the export of the final vanadium product resulting in foreign revenue. Other annual regulatory costs to be incurred by the proposed project include the payment of royalties (roughly 3% of profits), rates and taxes.

The local economy will also be boosted by the creation of job opportunities. The planned labour complement, once the mine is fully operational, is expected to be 150 permanent employees (excluding contractor employees). In the first 5 years of the project, approximately R 6.3 million will be spent on Human Resource Development (HRD).

Pamish have also developed a Skills Development Plan as part of the Social and Labour Plan (SLP) which will aim to address the proposed mine's operational requirements and also cater to employees' future employment aspirations. This will be done through a series of programmes which will help improve the skills of the community such as Adult Basic Education and Training (ABET), portable skills development initiatives, learnership programmes, mentorship plans and bursaries.



8 Item 2(g): Period for which the Environmental Authorisation is Required

Table 8-1 outlines the project's anticipated timeframe should environmental authorisation be granted. Environmental authorisation is required for the period of the LoM, which is 30 years.

Table 8-1: Project Timeframe

Activity	Date	Time Period
Construction	16 November 2017	1.5 years
Commence Production	24 May 2019	30 years

Source: Bushveld Project Schedule, December 2014



9 Item 2(h): Description of the Process followed to reach the Proposed Preferred Site

A proposed site layout plan has been compiled which outlines areas for the open pits, waste rock dump and process plant (Plan 4 in Appendix 4). Based on this original site layout plan, a site sensitivity analysis was undertaken to identify the biophysical and social sensitivities of the project site and to identify those project components that may potentially have an impact on sensitive resources and/or receptors. The environmental and social aspects considered during the site sensitivity analysis included: terrestrial ecology, aquatic ecology, water resources, air quality, land capability, land-use, traffic, cultural heritage and social and health.

Site sensitivities were identified through the following process:

- Desktop review of available literature (i.e. existing specialist studies of the project area, guideline documents including Environmental Management Frameworks (EMFs);
- Review of available aerial imagery of the project area and identification of potential areas of sensitivity (i.e. wetlands, settlements etc.);
- Areas of sensitivity were identified based on specialist expertise during site surveys;
- A rating of the potential environmental and social sensitivities were provided and based on specialist expertise and guideline/reference documents; and
- All sensitive areas identified were mapped using a Geographic Information System (GIS).

A sensitivity plan has been generated for each specialist area; these maps have been appended to this report as Plans 16 to 26 in Appendix 6. The terrestrial and aquatic ecology, water resources, cultural heritage, traffic and social and health aspects were identified as key resources/receptors with a medium to high sensitivity to the originally proposed site layout plan. The analysis resulted in the following sensitivities being identified based on the proposed site layout:

- Surface water: the primary water resources were highlighted as streams of high sensitivity as these water resources are linked to various drainage lines within the project area. All other secondary streams/drainage lines have been assigned a medium sensitivity. These streams and drainage lines would be traversed and/or mined through;
- Ground water: the nearest production boreholes are located along the south eastern corner of the plant area which currently serves the Ditlotswana community;
- Wetland: one of the site options of the waste rock dump may potentially impact a wetland feature;



- Rocky ridge: the eastern boundary of the tailings dam is located on a rocky ridge which are considered important features for the conservation of biodiversity;
- Cultural heritage: the rocky ridges are also considered to be of high cultural heritage value due to the known Langa settlements of the project area; and
- Traffic: the proposed process plant is located across a provincial road (D3534).

Based on these sensitivities, the original site layout plan (Plan 4 in Appendix 4) has been revised with the following changes (reflected in a revised site layout plan in Plan 3 in Appendix 4):

- WRD option 1 was chosen as the preferred site with an increased footprint due to there being two open pits;
- The tailings dam was shifted from the north east to the south west to avoid the rocky outcrops and the footprint was reduced to 69 ha; and
- The footprint of the concentrator plant area was reduced to 62 ha to avoid the rocky outcrops and the provincial road to the east of the proposed plant.

The revised site layout plant may undergo further small changes based on environmental, social, technical and economic criteria identified during the EIA phase. Feedback from I&APs will also be considered, however to date, I&APs have not provided comments on the proposed site layout.

These iterations of the site layout plan will be presented as layout alternatives. The layout alternatives are further assessed in Section 10.



10 Item 2(h)(i): Details of all Alternatives Considered

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives help identify the most appropriate method of developing a project, taking into account location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the no-go alternative. Alternatives also help identify the activity with a reduced environmental and/or social impact.

With reference to mining, the nature of the ore deposit determines the mining activities and processes. Furthermore, the location of the resource determines the location of the mining operation. These two factors reduce the identification of possible location and/or activity alternatives. The following section provides an overview of the alternatives identified, these include:

- Site layout alternatives;
- Technology alternatives;
- No-go option.

10.1 Site Layout Alternatives

The site layout alternatives were identified based on a site sensitivity analysis as described in Section 9 above. The original site layout considered the footprints of the tailings dam, WRD and concentrator plant. A comparison of these layouts and reasoning for shifting the project infrastructure is presented in the sections that follow:

10.1.1 Tailings Dam

The tailings dam was originally positioned along the eastern boundary of the open pit 1. The new position of the tailings dam is to the west of open pit 2, on the opposite side of the D4380 Provincial Road. This revised layout will avoid the following sensitivities identified during the site sensitivity analysis:

- Rocky ridges are defined as landscape features with a slope of 5° or more such as hills, koppies and gorges and kloofs. Ridges are important for the conservation of biodiversity as they have a high propensity for the occurrence of plant and animal Species of Special Concern (SSC) and they serve as wildlife corridors in highly developed areas. The eastern boundary of the tailings dam was located well within the 200m buffer of the rocky ridge. This has now been avoided through the revised site layout
- Wetlands are defined according to the National Water Act, 1998 (Act No. 36 of 1998) (NWA) as: "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." The DWS have recommended a buffer of 100 m around all wetlands in South Africa, according to the NWA. The



tailings dam was located over secondary drainage lines, this has now been avoided through the revised site layout and by reducing the total footprint of the tailings dam from 124 ha to 69 ha;

The numerous hills within the region are known to contain several historic Langa settlements, including Segopa, Magope, Fothane, Matlhogo and Ditlotswane. These sites are intricately associated with the historical events within the region, including the 1854 Siege of Makapan and subsequent socio-political history and establishment of locations. The original location of the tailings dam was located on these hills, which has now also been avoided through the revised site layout;

The revised layout of the tailings dam is therefore the preferred alternative based on the sensitivities avoided. This alternative will therefore be assessed further during the EIA phase.

10.1.2 Waste Rock Dump

There were two options under consideration for the location of the WRD, separated by the D4380 Provincial Road. As per the original site layout map, waste rock dump option 1 is located to the north of the road and has a 169 ha footprint. Waste rock dump option 2 is located to the south of the road and has a 161 ha footprint. The revised layout aimed to avoid similar sensitivities as discussed above. From an ecological perspective, waste rock dump option 2 was located on a wetland, therefore WRD option 1 is considered more favourable. The total footprint of WRD option 1 is now 243 ha. WRD option 1 will be considered further during the EIA phase.

10.1.3 Concentrator Plant

The original site layout of the concentrator plant traversed a secondary drainage line, a provincial road, in close proximity to production boreholes, used for drinking water and located close to the hills of cultural significance. The revised site layout illustrates that the concentrator plant has been shifted west and the footprint has been reduced from 236 ha to 62 ha. The drainage line, provincial road and hills of cultural significance have therefore been avoided. This revised site layout is therefore the preferred alternative and will be assessed further during the EIA phase.

10.2 Technology Alternatives

There are two process alternatives under consideration relating to the disposal of tailings material. The disposal of the tailings material currently requires an area of 69 ha. The applicant is considering the use of paste thickeners which will result in the thickening of the tailings which will have several benefits when compared to conventional tailings thickening, these include:

 Reduction of water sent to the tailings dam by 50%, resulting in a significant overall reduction in water consumption;



- Due to the high solids content, results in a reduction of the area required for a tailings dam;
- Due to the fact that there is little free water in the tailings, seepage from the tailings dam is greatly reduced;
- Due to the reduction in slurry volume being deposited, there is a potential reduction in energy required for pumping; and
- Once deposited, the paste dries out similarly to conventional thickener underflow.

The paste thickening alternative will be assessed against the conventional tailings alternative based on its economic and technical viability.

10.3 No-Go Option

The no-go or do nothing option means that the status quo would be maintained. All potential impacts are assessed against the current biophysical and socio-economic baseline; therefore all identified alternatives are assessed against the no-go option.

This alternative would mean that the project site would remain as is, covered by vegetation and used as agricultural and grazing land by the Bakenburg Tribal Authority. The no mining alternative would mean that the project would not go ahead and as a result any potential impacts associated with the project and its alternatives would not occur. These include positive and negative impacts.

If the project were not to proceed, the expected revenue, economic activity, skills development and job opportunities would not be realised. Furthermore, the ore reserves at the project site would remain unutilised. Likewise, the potential negative impacts associated with mines such as degradation of ecological habitat, increased dust, noise and traffic and pollution of surface water and groundwater resources would not occur if the project does not go ahead. The no-go alternative will be assessed further during the EIA phase.



11 Item 2(h)(ii): Details of the Public Participation Process Followed

A Public Participation Process (PPP) has been initiated, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by the project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. The comments of stakeholders will be included in the Comment and Response Report (CRR) and used to refine the scope of specialist studies that will be commissioned as part of the EIA.

11.1 Stakeholder Identification

To ensure a proper representation of all stakeholders, the following identification methods were used to develop a stakeholder database:

- Verify the existing stakeholder database for area; and
- Conduct Windeed searches in and around the project site to verify land ownership and obtain contact details;

Stakeholders are grouped into the following categories:

- Government: National, Provincial, District, Local authorities;
- Landowners: Directly affected and adjacent landowners;
- Communities: Directly affected and adjacent communities;
- Land occupiers and land claimants: Directly affected and adjacent (including tribal authorities);
- Non-Governmental Organisations (NGOs): Environmental organisations and community based organisations; and
- Business: small medium enterprises, mines and formal business organisations.

11.1.1 Government

The following government departments will be informed and/or consulted with:

- National Department of Environmental Affairs;
- National Department of Mineral Resources;
- National Department of Agriculture, Forestry and Fisheries;
- National Department of Water and Sanitation;
- South African National Heritage Resources Agency;
- Limpopo Department of Mineral Resources;
- Limpopo Regional Office of the Department of Water and Sanitation;



- Limpopo Department of Economic Development, Environment and Tourism;
- Limpopo Department of Rural Development and Land Reform;
- Limpopo Tourism and Parks Agency;
- Limpopo Heritage Resources Agency;
- Limpopo Department of Public Works, Roads and Transport;
- Limpopo Department of Labour;
- Limpopo: Department of Health & Social Development;
- Mogalakwena Local Municipality;
- Waterberg District Municipality; and
- Working for Wetlands (driven by Government); and
- Water Research Commission (WRC) parastatal.

11.1.2 Directly Affected Land Owners

The following directly affected landowners will be consulted as per Table 11-1. Refer to Plan 5 in Appendix 5 for the Land Tenure Plan.

Farm	Portion	Registered Landowner
Vogelstruisfontein 765 LR	RE	National Government of the Republic of South Africa
Vriesland 781 LR	RE	Langa Bakenberg Tribe
Vliegekraal 783 LR	RE	Langa Bakenberg Tribe
Schoonoord 786 LR	RE	According to the previous owner, the property has been
		transferred to the Department of Public Works. An
		email was sent to the Department of Public Works to
		verify the information provided by Suid -Afrikaanse
		Ontwikkelings Trust, however no feedback from the
		Department of Public Works has been received.
Bellevue 808 LR	RE of 1	National Government of the Republic of South Africa
Bellevue 808 LR	RE of 2	Broad Brush Investments 26
Bellevue 808 LR	3	Educated Risk Investments 40
Bellevue 808 LR	4	Kotze Abel Daniel-Trustees
Bellevue 808 LR	5	Trekdrift Boerdery CC
Bellevue 808 LR	6	Unknown

11.1.3 Adjacent Land Owners

The adjacent land owners are reflected in Table 11-2below.

Table 11-2: Adjacent Property Details



Farm	Portion	Registered Landowner
Haakdoorndraai 758 LR	1	Republiek van Suid-Afrika
Hellem Bricksteen 761 LR	RE	Government of Lebowa
Goede Hoop 762 LR	3	Unknown
Vlakfontein 763 LR	3	Unknown
Groningen 779 LR	RE	Government of Lebowa
Malokongskop 780 LR	RE	Langa Bakenberg Tribe
Malokong 784 LR	RE	National Government of The Republic of South Africa
Malokong 784 LR	1	Government of Lebowa
Malokong 784 LR	2	Langa Bakenberg Tribe
Klipplaatdrift 787 LR	RE	Suid-Afrikaanse Ontwikkelingstrust
Eyssellsdrift 788 LR	RE	National Government of the Republic of South Africa
Inhambane 802 LR	RE	National Government of the Republic of South Africa
Leyden 804 LR	RE	National Government of the Republic of South Africa
Eckstein 806 LR	1	Meijer Jacob Hendrik
Mozambique 807 LR	1	Molekwa Clan Communal Prop Assoc
Mozambique 807 LR	RE	Unknown
Mozambique 807 LR	2	National Government of the Republic of South Africa
Mozambique 807 LR	3	Unknown
Delagoa 809 LR	RE	Marqott Farming Pty Ltd
Gillimberg 861 LR	5	Unknown

11.1.4 Communities

Two traditional authorities will be affected, namely, the Bakenberg and Mapela traditional authorities. The project site falls within the Bakenberg Traditional Council and the Mapela Traditional Council has jurisdiction over land that is adjacent to the proposed project site. There are fifteen villages that are potentially affected, including:

- Pudiakagopa;
- Taolome;
- Malokongskop;
- Mabusela
- Kwenaite
- Rooiwal;
- Dithotswane;
- Kaditshwene;
- Sepharane;
- Basogadi;
- Matlaba;



- Mautjane;
- Mmotong;
- Claremont; and
- Good Hope.

The ward councillors for the two affected wards will also be consulted throughout the process.

11.1.5 Land Occupiers and Land Claimants

During the consultations with traditional authorities and land owners, no further land occupiers were identified. Digby Wells also enquired about the land claims on the various properties and a letter has been submitted to Mr Mphasha of the Limpopo Department of Rural Development and Land Reform, Land Claims Commission, on the 28 January 2015. A letter was received on 9 February 2015 from the land claims commission and the results of the land claims enquiry are reflected Table 11-3 below.

Farm Name and	Portio	Local Claimant		Status
Number	n	Municipality		
Directly Affected La				
Vogelstruisfontein	RE	Mogalakwena	Bakenburg Tribe	Research
765		Local Municipality		
Vriesland 781	RE	Mogalakwena		No information
		Local Municipality		available at this stage
				on under mentioned
				property
Vliegekraal 783	RE	Mogalakwena	Kwenaite M	Research
		Local Municipality		
Schoonoord 786	RE	Mogalakwena	Sebueng Family	Gazetted 04/092009
		Local Municipality		Notice No 1213 of
				2009
Bellevue 808	RE	Mogalakwena	Bakenburg Tribe	Research
		Local Municipality		
Bellevue 808	1	Mogalakwena		
		Local Municipality		
Bellevue 808	2	Mogalakwena		
		Local Municipality		
Bellevue 808	3	Mogalakwena		
		Local Municipality		
Bellevue 808	4	Mogalakwena		
		Local Municipality		
Bellevue 808	5	Mogalakwena		

Table 11-3: Land Claimants



Farm Name and	Portio	Local	Claimant	Status
Number	n	Municipality		
		Local Municipality		
Bellevue 808	6	Mogalakwena		
		Local Municipality		
Indirectly Affected L	andowne	ers		
Haakdoorndraai	1	Mogalakwena	Bakenburg Tribe	Research
758	I	Local Municipality		
Hellem Bricksteen	рг	Mogalakwena		
761	KE	Local Municipality		
Goede Hoop 762		Mogalakwena		
	3	Local Municipality		
Vlakfontein 763	2	Mogalakwena		
	3	Local Municipality		
Groningen 779		Mogalakwena		
	RE	Local Municipality		
Malokongskop 780	рг	Mogalakwena		
	KE	Local Municipality		
Malokong 784	4	Mogalakwena		
	1	Local Municipality		
Malokong 784		Mogalakwena		
	2	Local Municipality		
Klipplaatdrift 787	DE	Mogalakwena		
	KE	Local Municipality		
Eyssellsdrift 788	рг	Mogalakwena		
	KE	Local Municipality		
Inhambane 802		Mogalakwena		
	RE	Local Municipality		
Leyden 804	DE	Mogalakwena		
	RE	Local Municipality		
Eckstein 806	1	Mogalakwena		
	1	Local Municipality		
Mozambique 807	DE	Mogalakwena	Molekwa	Settled on Ptn 1 on
	RE	Local Municipality	Community	;10/062008
	1	Mogalakwena	Bakenburg Tribe	Research
		Local Municipality		
2		Mogalakwena	Mapela Community	Gazetted on Ptn 1
		Local Municipality		and 2 on 09/05/2008
	3	Mogalakwena		
		Local Municipality		
Delagoa 809	DE	Mogalakwena		No information
-	KE	Local Municipality		available at this stage



Farm Name and	Portio	Local	Claimant	Status
Number	n	Municipality		
				on under mentioned
				property
Gillimberg 861		Mogalakwena		No information
	_	Local Municipality		available at this stage
5			on under mentioned	
				property

11.1.6 NGOs

The following NGOs have been identified and will be consulted with during the process:

- Agri SA;
- South African National Civic Organisation;
- Transvaal Agricultural Union S.A (TLUSA);
- Northern Transvaal Agricultural Union (NTLU);
- Lawyers for Human Rights (LHR);
- Endangered Wildlife Trust (EWT);
- Birdlife South Africa;
- Arend Dieperink Museum, Mokopane; and
- Rock Art Research Institute.

11.1.7 Business

The following businesses or business entities have been identified and will be consulted with during the process:

- Anglo Platinum;
- Chamber of Mines;
- Ivanhoe Mines Ltd;
- Mokopane Business Chamber; and
- Richard Spoor Inc Attorneys.

11.2 Consultation with I&APs

A summary of the consultation activities are provided in Table 11-4. Consultation with I&APs during the Scoping phase of the EIA was undertaken, as follows:

 The Scoping Report was available at the Mogalakwena Public Library, the Bakenberg Community Library and on the Digby Wells website from Friday 13 March 2015 till Thursday 16 April 2015 (30 days), ecluding public holidays;



- A letter was emailed and posted to the full stakeholder database to announce the availability of the Scoping Report on Thursday 12 March 2015;
- A SMS was sent to the full stakeholder database on Friday, 13 March 2015 to inform all stakeholders of the availability of the Scoping Report and Public Meeting.
- Advertisements were placed in the Daily Sun on Friday 13 March 2015; and
- Site notices (20) were put up at various places including local libraries, and venues in the proposed project area on Monday 16 March 2015.

The following stakeholder meetings will be conducted during the Scoping phase:

- Bakenberg Traditional Council Meeting: The project site falls directly within the Bakenberg Traditional Council's area of jurisdiction. A meeting was held with the Bakenberg Traditional Council on Monday, 23 March 2015. A PowerPoint presentation was presented in Sepedi.
- Mapela Traditional Council Meeting: The Mapela Traditional Council area is adjacent to the project site. A meeting with the Mapela Traditional Council was arranged by email on the 12 March 2015. A response was received from the council on the 17 March 2015 to state that they would contact Digby Wells with a date and time which would be suitable to the council. A reply email was sent on 17 March 2015 requesting the 26 of March 2015 as a possible date for the meeting. A follow up meeting request was sent on 20 March offering 24, 27, and 30 March 2015 as alternative dates for the meeting with the council. This was followed up with a phone call. It is likely that the meeting with the Mapela Traditional Council will only take place in the EIA phase of the project.
- Village Meetings: Meetings with the neighbouring villages of; Pudiakagopa; Taolome; Malokongskop; Mabusela Kwenaite Rooiwal; Dithotswane; Kaditshwene;Sepharane; Basogadi Mautjane Claremont; and Good Hope took place between Monday, 23 March 2015 to Tuesday, 31 March 2015. Meetings which were scheduled with the villages of Matlaba and Mmotong did not take place as the village representatives did not call people to the meetings. However, these villages had the opportunity to attend the public meeting at the Bakenberg Stadium. A PowerPoint poster presentation was made in Sepedi at all the village meetings.
- Commercial Farmers: A meeting with commercial farmers took place on Thursday, 26 March 2015 at the Mapedi Lodge situated close to the project site. The PowerPoint poster presentation was made in English and Afrikaans translation was provided during the open discussion.
- Focus Group Meeting: A focus group meeting was held on 27 March 2015 in Mokopane with the district and local municipalities, NGOs, Mokopane Business Chamber other key stakeholders were invited to attend this meeting.
- Public Meeting: a public meeting was held on Saturday, 28 March 2015 at the Bakenberg Stadium. The date and venue for the public meeting was provided in the



newspaper advertisement, site notices, letters distributed and SMS sent. The meeting was also advertised by loud hailing in all the affected villages on Friday, 27 March 2015. All stakeholders on the I&AP database were invited to attend this meeting. Information about the proposed project was shared by means of a formal PowerPoint presentation and Sepedi translation was provided.

The needed Sepedi and Afrikaans translation was provided at all stakeholder meetings as appropriate. A letter will be sent to stakeholders, informing people of the availability of the updated scoping report. . I&APs will also be informed of the release of the updated scoping report by email and SMS.

The purpose of the updated Scoping Report is for I&APs to confirm that all issues raised have been incorporated in the report. The updated report will be submitted to the DMR at the same time as the release of the report to the public.

Activity	Details	Reference in Report	
Scoping Phase			
Identification of stakeholders	Stakeholder database which, also includes I&APs, from various sectors of society including directly affected and adjacent landowners in and around the project area.	Appendix 7(1) Stakeholder Database	
Land Claims Commissioner	A letter was sent on the 28 January 2015 to Mr Mapasha of the Limpopo Department of Rural Development and Land Reform: Land Claims Commission. Details on the land claimants are attached.	Appendix 7(2)	
Distribution of proposed project announcement materials	Background Information Document (BID), announcement letter with comment and registration sheet was emailed and posted to stakeholders on <i>Thursday, 12 March 2015.</i> The Background Information Document was also available on <u>www.digbywells.com</u> , <i>on Thursday,</i> <i>12 March 2015.</i>	Appendix 7 (3) BID, letter with registration and comment sheet Proof of emails sent	
Placing of adverts	An advert was placed in the Daily Sun on <i>Friday,</i> 13 March 2015.	Appendix 7 (4) Advert	
Placing of site notices	Site notices (20) in English and Sepedi were put up at various public places within proposed project site, including at all the affected villages, the Mogalakwena public library and the Bakenberg Community library on <i>Monday, 16 March 2015.</i>	Appendix 7 (5) Site notice report	
Placement of Scoping	The Scoping Report was placed at the		

Table 11-4 Summary of PPP Activities during Scoping Phase



Activity	Details	Reference in Report
Report	Mogalakwena Public Library and Bakenberg Community Library and on the Digby Wells website from Friday, 13 March 2015 till Thursday 16 April 2015	
Announcement of the Scoping Report	A letter was emailed and posted to the full database to announce the availability of the scoping report on <i>Thursday, 12 March 2015.</i> An SMS was also sent to the database on the same day.	Appendix 7(6) Announcement Letter
Stakeholder Meetings	A series of meetings were held between Monday , 23 March to Tuesday , 31 March 2015. These included the communities as mentioned, traditional councils, commercial farmers, key stakeholders and the general public. All comments received at these meetings are captured in the Comment and Response Report.	Appendix 7(7) Comment and Response Report
Placement of updated Scoping Report	This updated Scoping Report was placed at the Mogalakwena Public Library and at the Bakenberg Community Library and on the Digby Wells website.	
Announcement of the updated Scoping Report	A letter will be emailed and posted to the full database to announce availability of the updated Scoping Report. An SMS will also be sent.	Appendix 7 (8) Announcement Letter

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12 Item 2(h)(iii): Summary of Issues Raised by I&APs

A summary of the comments made on the Scoping Report and during the consultation meetings are included in the Table 12-1. The table also provides a response to all comments raised. The detailed comments and responses are included in an Appendix 7(7).



Table 12-1 Interested and Affected Parties

Interested and Affected Parties				Consultation	
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Landowners					
AJ Kotze	Commercial Farmers Meeting	26 March 2015	Air Quality	An Air Quality study will be undertaken as part of the Environmental Impact Assessment (EIA). This study will identify areas that may potentially be impacted from an air quality perspective and recommend mitigation measures to reduce potential negative impacts. The findings of the air quality assessment will be presented in the Draft EIA Report. The report will also recommend monitoring.	
Abel Kotzé & Stephanus Kotzé	Comment Sheet	26 March 2015	Blasting	A Blast and Vibration Assessment will be undertaken to determine the blast radius. A structural survey will be completed, prior to commencement of mining, which will record the current status of all houses in the blast radius, including foundations and any existing cracks. If houses crack or cracks increase, the Applicant will consult with	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				owners to reach agreement for repairs and or compensation.	
Abel Kotzé & Stephanus Kotzé	Comment Sheet	26 March 2015		A Social Assessment will be undertaken and presented during the EIA Phase of the Project. This assessment will identify potential safety	
Fanie Kotze	Commercial Farmers Meeting	26 March 2015	The project will result in security issues	and security issues, and present suitable mitigation and management measures to reduce potential safety and security impacts. Specific mitigation and management measures will be recommended to reduce potential negative impacts and enhance positive impacts. The Applicant under the Mine Health and Safety Act (MHSA) will need to secure its mining area. The Applicant will also work with the South African Police Services (SAPS) to address security issues during construction and operation.	
Abel Kotzé &	Comment Sheet	26 March	Change in land use from agriculture to	Pamish will liaise with the district and	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Stephanus Kotzé		2015	mining.	local municipalities. The necessary re- zoning applications will be made	
Fanie Kotze	Commercial Farmers Meeting	26 March 2015		through the appropriate channels.	
Fanie Kotze	Commercial Farmers Meeting	26 March 2015	What is the company shareholding?	Pamish is 64% owned by Bushveld Minerals, a South African owned company listed on the London Stock Exchange. Izingwe owns 36% and is a South African company and Black Economic Empowerment (BBBEE) partner.	
Abel Kotzé & Stephanus Kotzé AJ	Registration and Comment Sheet	26 March 2015		Surface and ground water impact assessments will be undertaken, with the findings presented as part of the EIA Report. The studies will assess	
Manie Uys	Commercial Farmers Meeting	26 March 2015	Water impacts	potential impacts on water quality and quantity, with respect to surrounding receptors. These studies will develop	
AJ Kotze	Commercial Farmers Meeting	26 March 2015		and recommend mitigation and management plans to manage potential	
H van Vuuren	Commercial	26 March		impacts to surface and groundwater	



Interested and Affected Parties			Data of		Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
	Farmers Meeting	2015		resources.	
AJ Kotze	Commercial Farmers Meeting	26 March 2015	Water use.	The Applicant will apply for an Integrated Water Use Licence (IWUL) that will specify where water will be sourced from. However, there is not sufficient ground water to use; therefore the mine will be dependent on piped water.	
Lawful occupier/s of t	he land				
No lawful occupiers hav	ve been identified.				
Landowners or lawful	occupiers on adja	cent properti	ies		
Manie Uys	Commercial Farmers Meeting	26 March 2015	Minimum distance a structure can be from a mine?	Minimum distances are regulated by the MHSA. No infrastructure can be within 100m of a blasting zone. Pamish will abide by these regulations.	
Manie Uys	Commercial Farmers Meeting	26 March 2015	Air Quality	An Air Quality study will be undertaken as part of the Environmental Impact Assessment (EIA). This study will identify areas that may potentially be impacted from an air quality	



Interested and Affected Parties				Consi	
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				perspective and recommend mitigation measures to reduce potential negative impacts. The findings of the air quality assessment will be presented in the Draft EIA Report.	
Manie Uys	Commercial Farmers Meeting	26 March 2015	Impact on game breeding.	A SIA and Macro Economic Study will be undertaken during which community members will be interviewed, including the cattle owners association. These assessments will identify and assess impacts. The assessment will also recommend compensation measures, should the project result in economic displacement.	
Municipal councillor					
No comments have bee	en received from the	ward councill	ors.		
Municipality					
Mpfariseni Nelusi	Key Stakeholders Meeting	27 March 2015	A proper geohydrological assessment must be completed that must include geophysical surveys within a 1 km radius of the project area.	A hydrogeological study will be undertaken and include a detailed hydrocensus, geophysical surveys, aquifer and pump testing, and a	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				numerical model. Please note that the Scoping Report (SR) contains detailed Terms of Reference for specialist studies that will be undertaken during the EIA. The SR will be submitted to DMR who will approve the ToR, or indicate additional requirements. The current phase of the EIA process is an opportunity for all IAPs to comment and suggest additional key issues / concerns.	
Mpfariseni Nelusi	Key Stakeholders Meeting	27 March 2015	MLM will not accept any proposal to construct smelters if the LoM is only five years.	Noted. At this stage there are no plans to develop a smelter as part of the mine. The LoM is in fact 30 years not five.	
Leonard Sone	Waterberg District Municipality	27 March 2015	Will the main source of power be Eskom or other sources?	Main source will be Eskom with whom discussions are under way. But, this does not form part of current Scope of Work (SoW). The current EIA process is specific to mine site only. Any EIA required for a power line will be a separate process undertaken by	



Interested and Affected Parties				Consultation	
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				Eskom.	
Leonard Sone	Waterberg District Municipality	27 March 2015	Most land under the Traditional Council (TC) is currently classified as agricultural.	The necessary re-zoning applications will be made through the appropriate channels.	
Organisations of state	e (Responsible for	Infrastructur	e that may be affected Roads Departme	nt, Eskom, Telkom, DWA etc.	
V Ramala	Limpopo Heritage Resources Authority	20 March 2015	We therefore are looking forward to receiving the Heritage Impact Assessment study that will be undertaken for our comments.	Noted	
Communities					
Frans Mabusela	Basogadi	25 March 2015		An Air Quality study will be undertaken as part of the Environmental Impact	
Lesiba Manala	Sepharane	25 March 2015		Assessment (EIA). This study will identify areas that may potentially be impacted from an air quality	
Phillip Lebeto	Sepharane	25 March 2015	Air quality	perspective and recommend mitigation measures to reduce potential negative impacts. The findings of the air quality	
Magaetsi Manaka	Ditlotswane	24 March 2015		assessment will be presented in the Draft EIA Report	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Sam Kekana	Kwenaite / Moutjane	30 March 2015			
Johanna Temo	Good Hope	30 March 2015			
Mr Sokotla	Good Hope	30 March 2015	L L L L L L L L L L L L L L L L L L L	A Blast and Vibration Assessment will be undertaken to determine the blast radius. A structural survey will be completed, prior to commencement of mining, which will record the current status of all bouses in the blast radius	
Frans Lekutso	Mabula	28 March 2015			Blasting
Phillip Lebeto	Sepharane	28 March 2015		including foundations and any existing cracks. If houses crack or cracks	
Mochacho Magosi	Taolome	27 March 2015		owners to reach agreement for repairs and or compensation.	
Filemon Tala	Basogadi	25 March 2015			
John Ribombo	Kaditshwene	25 March 2015			



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Andries Masanabo	Sepharane	25 March 2015			
Elizabeth Mmotlana	Sepharane	25 March 2015			
Felicia Langa	Ditlotswane	24 March 2015			
Michael Mathaba	Ditlotswane	24 March 2015			
Albert Mabusela	Malokongskop	24 March 2015			
Lesiba Kwenaite	Malokongskop	24 March 2015			
Malungu Malokong	Malokongskop	23 March 2015			
Seofiias Sepira	Pudiakgopa Village	23 March 2015			



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Mack Marakalala	Good Hope	30 March 2015		The mine will produce Green House Gas (GHG) emissions. Part of the EIA process and consequent EMP will be to	
Isaac Mila	Undisclosed	28 March 2015	Will the mine affect the climate?	develop plans to reduce and manage emissions that contribute to climate change. Furthermore, a GHG Emissions Inventory will be compiled as part of this Project.	
Seleka Pila	Claremont	31 March 2015		All graves are protected under South African (SA) legislation; the first thing will be to complete a HIA. Specialists will survey mine area to determine if there are any graves in the project area. If there are graves, these will be avoided as far as possible. If there is a grave that cannot be moved Grave Resettlement Process (GRP) will be required which will include a process to identify relatives and consult with them,	
Ephraim Madibela	Kwenaite / Moutjane	30 March 2015			
Jonas Malapile	Kwenaite / Moutjane	30 March 2015	Will graves be affected?		
Samuel Seabo	Kwenaite / Moutjane	30 March 2015			
Phillip Lebeto	Sepharane	28 March 2015		identifying heritage sites as the specialist can only record what they	



Interested and Aff	ected Parties				Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Samuel Ngobeni	Kaditshwene	25 March 2015		can see.	
Flora Mabusela	Malokongskop	24 March 2015			
Mabusela Esrom Malete	Pudiakgopa Village	23 March 2015			
Seleka Pila	Claremont	31 March 2015			
James Baloyi	Kwenaite / Moutjane	30 March 2015		A SIA and Macro Economic Study will be undertaken during which community members will be interviewed. These	
William Mboweni	Good Hope	30 March 2015	The mine will impact on grazing.	assessments will identify and assess impacts, including loss of fields and grazing. The assessment will also	
Ngoepe	Undisclosed	28 March 2015		recommend compensation measures, should the project result in economic displacement.	
Joel Lamola	Basogadi	25 March 2015			



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Samuel Ngobeni	Kaditshwene	25 March 2015			
Stanley Marakalala	Sepharane	25 March 2015			
Elias Digwaswi	Basogadi	25 March 2015			
Michael Mathaba	Ditlotswane	24 March 2015			
Robert Molomo	Malokongskop	24 March 2015			
Tsogang Mokgahla	Malokongskop	24 March 2015		Mineral rights are owned by State. The applicant must compile and submit a MRA to DMR. If the DMR approves the	
Charles Sethoga	Pudiakgopa Village	23 March 2015	For the MRA the applicant must get consent from the community to mine.	MRA it will grant a mining right. The MRA process requires that the Applicant consult with communities, but there is no formal agreement yet. The legal process is that while the DMR	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				takes the representations of the community into account, it is the State that awards the mining right.	
David John Manganyi	Kwenaite / Moutjane	30 March 2015	Will the mine be underground or open pit?	The mine will be an open pit mine without any shafts. With a maximum depth of 80 m. The Life of Mine (LoM) will be 30 years – which is the maximum time that can be applied for from DMR.	
David Masogo	Taolome	27 March 2015			
Frans Kgomo	Kaditshwene	25 March 2015			
Alfred Mabusela	Malokongskop	24 March 2015			
Name not provided	Bakenberg / Molokong	28 March 2015		Project construction is expected to	
Albert Mabusela	Malokongskop	24 March 2015	When will the mine start, what is the LoM?	commence in 2017. Mining to commence in 2019 and is expected to	
Isaac Mila	Undisclosed	28 March 2015		remain in operation for 30 year period.	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Simon Monene	Waterberg District Municipality	27 March 2015			
David John Manganyi	Kwenaite / Moutjane	30 March 2015	- Will the total 10 109 ha be mined?	The mine infrastructure will be developed in an area smaller than 1 000 ha, on the farm Vriesland and Vliegekraal	
Lucky Mokoka	Sepharane	25 March 2015			
Alfred Matswake	Malokongskop	24 March 2015			
Malungu Malokong	Undisclosed	23 March 2015			
Ronald Moutjane	Kwenaite / Moutjane	30 March 2015		Mineral rights are owned by State. The applicant must compile and submit a MRA to DMR. If the DMR approves the MRA it will grant a mining right. The MRA process requires that the	
Solomon Madibe	Kaditshwene	25 March 2015	Does the community agree with the development of the mine?		
Madimetsa Masako	Pudiakgopa	23 March		there is no formal agreement yet. The	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
	Village	2015		legal process is that while the DMR	
M H Lekutso	Morulaneng / Haakdoringdraai.	28 March 2015		community into account, it is the State that awards the mining right.	
September Majadibudu	Morulaneng	28 March 2015	Why were communities not involved during prospecting?	Izingwe started prospecting in 2004. Pamish does not know how Izingwe consulted before Pamish started with the Prospecting activities. Pamish has consulted with Tribal Council(TC) since 2012. The Kgoshi is aware of the current project. Pamish obtained the Prospecting Licence from Izingwe in 2010. Prospecting was halted due to finances and commenced in 2011 and concluded in 2015. Prospecting licence expired in March 2015. Prospecting right consultation takes place when PRA is submitted. This occurred long before Pamish became involved. The transfer of the PR to Pamish does not require community consultation. However, Pamish involved the TC in	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				Bakenberg since its involvement.	
Mokgoetsi Kwinana	Pudiakgopa Village	23 March 2015		This is not the only meeting. A second public meeting will be held in June 2015. Public participation and	
Chief Lydia Langa	Pudiakgopa Village	23 March 2015	Community must be provided sufficient time to consider and discuss Project.	commenting periods are constrained by the National Environmental Management Act (NEMA) Regulations, 2014 time frames of 30 Days to undertake the scoping phase consultation.	
Robert Molomo	Malokongskop	24 March 2015	Will issues raised in these meetings be recorded?	All issues are captured and included in a Comments and Response Report (CRR) that will be attached to the	
Ngoepe	Undisclosed Public Meeting	28 March 2015		Scoping Report, which will be submitted to the DMR for review and decision making.	
Maloba Malesela	Kwenaite / Moutjane	30 March 2015	How will the community benefit from	As part of the MRA the mine submitted a Social and Labour Plan (SLP) which	
Kgomo Kutlwano	Good Hope	30 March 2015	the mine?	commitment to employ locally as far as possible and commitment to undertake	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
John Nkuna	Morulaneng.	28 March 2015		Local Economic Development (LED).	
Amos Makopa	Sepharane	25 March 2015			
Robert Molomo	Malokongskop	24 March 2015			
Noko Masoga	Pudiakgopa Village	23 March 2015			
Samuel Kgoale	Pudiakgopa Village	23 March 2015			
Peter Malotana	Kwenaite / Moutjane	30 March 2015		The Applicant has committed to a Skills	
Dineo Marakalala	Good Hope	30 March 2015	What opportunities will there be for Grade 12 learners?	Development Plan in the SLP. Part of the plan will be to award bursaries and scholarships, especially in maths and	
Ngoepe	Undisclosed	28 March 2015		sciences fields.	



Interested and Afr	fected Parties				Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Kgase Thema	Good Hope	30 March 2015			
Seleka Pila	Claremont	30 March 2015	Communities need donations for schools, community halls, roads etc.	The representative forums will inform the Applicant on what development needs are in each village. However, this will only be possible from 2017 onwards, subject to the DMR awards the mining right.	
Elizabeth Kobo	Taolome	27 March 2015			
Filemon Tala	Basogadi	25 March 2015			
Alfred Matswake	Malokongskop	24 March 2015			
David Mokhonwana	Ditlotswane	24 March 2015			
Kolobe Mashala	Claremont	28 March 2015	The presentation stated that there is a 36% BBBEE share. How will	Once election of community representatives is finalised, the company will engage in discussions	
Denzo Okwankwa	Mthoathwas	28 March 2015	community benefit from this percentage?	about community benefits. Recruitment offices will be at the mine from where recruitment will take place. The	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				Applicant will ensure that local community members are employed as far as possible.	
Alfred Rachekhu	Taolome	27 March 2015			
Joel Lebeto	Sepharane	28 March 2015			
Charles Langa	Basogadi	25 March 2015			
Elias Digwaswi	Basogadi	25 March 2015	Will the mine recruit locally?	Pamish has committed to employ skilled and unskilled people locally as far as possible.	
Moses Mashitiso	Ditlotswane	24 March 2015			
Sydney Kadi	Kaditshwene	25 March 2015			
Steven Malome	Kwenaite / Moutjane	30 March 2015			



Interested and Affected Parties				Consultation	
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Mack Marakalala	Good Hope	30 March 2015			
Joel Lebeto	Sepharane	28 March 2015	What percentage of workers will be skilled and unskilled?		
David Mokhonwana	Ditlotswane	24 March 2015		Pamish will try to employ locally as far as possible – skilled and unskilled workers will be required for the mine. Pamish will also develop skills via a Skills Development Plan which forms part of the SLP	
Bonnya Madireng	Kaditshwene	25 March 2015			
Joel Lebeto	Sepharane	28 March 2015			
Malungu Malokong	Malokong	23 March 2015			
Ronald Moutjane	Kwenaite / Moutjane	30 March 2015	Will any villages be resettled?	No resettlement will be necessary.	
Robert Molomo	Malokongskop	24 March 2015			



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
Rama Sepelai Masiane	Pudiakgopa Village	23 March 2015			
Mr Sokotla	Good Hope	30 March 2015			
David Makubela	Kwenaite / Moutjane	31 March 2015			
Silas Kwenaite	Malokongskop	24 March 2015	Will the mine provide training?	If the mining right is awarded, skills development will need to be undertaken to comply with the DMR	
J R Mabusela	Village Development Committee	24 March 2015		requirements, through the SLP.	
Mildred Maluleke	Goedehoop	28 March 2015		Noted. A process is underway to consult with individual villages as well	
September Majadibudu	Morulaneng	28 March 2015	between the Bakenberg TC and the community.	as the TC. All villages and TC to come together as a committee. The Applicant prefers not to deal with separate	
M H Lekutso	Morulaneng /	28 March		individuals as this creates issues.	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
	Haakdoringdraai.	2015			
Alfred Rachekhu	Taolome	27 March 2015			
Seabi Abraham Malusi	Ditlotswane	24 March 2015			
Solly Pitseng	Malokongskop	24 March 2015			
Daniel Mashaba	Malokongskop	24 March 2015			
Maria Langa	Ditlotswane	24 March 2015			
Richard Sethoga	Ditlotswane	28 March 2015		Villages must elect representatives to	
Dinah Letsoko	Sepharane	25 March 2015	Community Representatives.	sit on committees which can interact with Pamish	
David Mokhonwana	Ditlotswane	24 March			



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
		2015			
Lesiba Jacob Manamela	Ditlotswane	24 March 2015			
Margaret Pila	Ditlotswane	24 March 2015			
Richard Sethoga	Ditlotswane	24 March 2015			
Seabi Abraham Malusi	Ditlotswane	24 March 2015			
Amos Lesiba Mabusela	Pudiakgopa Village	23 March 2015		Surface and ground water impact assessments will be undertaken, with the findings presented as part of the	
Seleka Pila	Claremont	31 March 2015	Water quality impacts.	EIA Report. The studies will assess potential impacts on water quality and quantity, with respect to surrounding receptors. These studies will develop and recommend mitigation and management plans to manage potential impacts to surface and groundwater	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
				resources.	
Traditional Leaders					
Malunga Malokong	Bakenberg TC Meeting	23 March 2015	Structural damage.	A Blast and Vibration Assessment will be undertaken to determine the blast radius. A structural survey will be completed, prior to commencement of mining, which will record the current status of all houses in the blast radius, including foundations and any existing cracks. If houses crack or cracks increase, the Applicant will consult with owners to reach agreement for repairs and or compensation.	
Lesiba Makgakga	Bakenberg TC Meeting	23 March 2015	What will happen to unidentified heritage site?	Chance Find Procedures (CFPs) will be included in the HIA to mitigate against accidental exposure of heritage sites. All heritage sites are protected in accordance with NHRA, irrespective of whether they have been recorded or not.	
Phillip Lebelo	Bakenberg TC	23 March	How will heritage be protected?	All heritage sites are protected in	



Interested and Affected Parties					Consultation
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)
	Meeting	2015		accordance with NHRA	
Albert Mabusela	Bakenberg TC Meeting	23 March 2015	How will the project affect agricultural lands and grazing?	A SIA and Macro Economic Study will be undertaken during which community members will be interviewed. These assessments will identify and assess impacts, including loss of fields and grazing. The assessment will also recommend compensation measures, should the project result in economic displacement.	
Alfred Matswake	Bakenberg TC Meeting	23 March 2015	Unsure of the location of the project	The mine infrastructure will be developed in an area smaller than	
Mr Mphela	Bakenberg TC Meeting	23 March 2015	area.	1 000 ha, on the farm Vriesland and Vliegekraal.	
Malungu Malakong	Bakenberg TC Meeting	23 March 2015	The area is very large at 10 000 ha.	The mine infrastructure will be developed in an area smaller than 1 000 ha, on the farm Vriesland and Vliegekraal.	
Will any villages be resettled?	Bakenberg TC Meeting	23 March 2015	Will there be any resettlement.	It was explained that there would be no resettlement.	



Interested and Affected Parties					Consultation		
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Status (consensus dispute, not finalised, etc.)		
Department of Land Affairs (Department of Rural Development and Land Reform)							
Mr SR Mphasha	Land Claims Commission	9 February 2015	Confirmation of land claims over affected properties.	Noted			
Department of Environmental Affairs							
No comments have been received from the department.							
Other Competent Authorities Affected							
No comments have been received from any other departments.							

Other Affected Parties					Section and
Name of Individual	Consulted Date of commen received		Issues raised	EAPs response to issues as mandated by the applicant	paragraph reference in this report where the issues and/or responses were incorporated
Hermanus Prinsloo	Anglo-	17 March	Please note on the map that the Magnetite claims relative to our Boikgantsho as well	Thank you for the comment the comment is noted.	



(PhD)	American	2015	as Central and Kwanda North interests.	
Head of Environment			The magnetite ore bodies are situated far	
			into the hanging wall of the Platreef and	
			won't affect any of our operations or plans.	

Interested Parties					Section and
Name of Individual	Consulted	Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	paragraph reference in this report where the issues and/or responses were incorporated
No other comments have been received from interested parties					



13 Item 2(h)(iv): The Environmental Attributes associated with the Site

13.1 Type of Environment Affected by the Proposed Activity

13.1.1 Topography

The project site is relatively flat with the exception of the mountainous area in the north-west corner and some isolated rocky outcrops and ridges. The most significant of these ridges is Malokongskop situated on the eastern side of the project site.

The topographical model (Plan 6 in Appendix 5) indicates that the elevation of the project site increases from 955 metres above mean sea level (mamsl) in the Mogalakwena River valley to 1265 mamsl on the Malokongskop Ridge. The Mogalakwena River valley runs through the southern portion of the prospecting right area with the Malokongskop Ridge located to the north of the project site.

The majority of the project site has gentle slopes of less than 3.5°. Moderate slopes of between 3.6° and 12.1° occur at the foot of the ridge areas. The steepest slopes occur on the ridges and range between 12.2° and 46.8°. The slope aspect of the project site falls in different directions.

13.1.2 Climate

Limpopo province experiences warm wet summers and dry winters. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. In contrast, winter is characterised by atmospheric stability caused by a persistent high pressure system over South Africa. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

There are temperature variations throughout the year. These vary greatly within the daily cycle and according to location, vegetation cover, wind reach, and the presence of any large water bodies.

Site specific Meso-scale Model (MM5) meteorological data for full three calendar years (January 2011 – December 2013) was obtained from Lakes Environmental Consultants in Canada to determine local prevailing weather conditions. This dataset consists of surface data, as well as upper air meteorological data. The sections that follow provide a summary of the data obtained.

13.1.2.1 <u>Temperature</u>

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers. The three-



year average maximum, minimum and mean temperature for the project site is shown in Figure 13-1. The annual mean temperature is 19.7°C. The average monthly maximum temperatures range from 13.2°C in July to 23.8°C in January and December, with daily minima ranging from 11.6°C in July to 23.8°C in January.



Source: Lakes Environmental, 2015

Figure 13-1: Average Monthly Temperature for the Project Site (2011 - 2013)

13.1.2.1 <u>Rainfall</u>

The average total monthly precipitation for the project area is illustrated in Figure 13-2. The annual total rainfall recorded is 798 millimetres (mm) and a monthly average of 44 mm was recorded. The highest monthly maximum rainfall was recorded at 224.8 mm.





Source: Lakes Environmental, 2015

Figure 13-2: Average Monthly Rainfall of the Project Site (2011-2013)

13.1.2.2 Wind

Dispersion of atmospheric pollutants is a function of the prevailing wind characteristics at any site. Wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The spatial and annual variability in the wind field for the project site is illustrated in Figure 13-3. The predominant wind direction is from the north-east, east north-east and south-east. Over the three year period, frequency of occurrence was 11.1% from the north easterly sector, 10.9% east north-east, 9.5% south-east. Calm conditions (wind speeds < 0.5 m/s) occurred for 9% of the time.





Source: Lakes Environmental, 2015

Figure 13-3: Surface Wind Rose for the Project Site (2011 - 2013)

The predominant wind direction is from the north east and south east throughout the day except for night when the predominant wind direction is from the north-west. The morning and evening wind roses are similar to the period wind rose with calm periods of 14% and 3% respectively. The afternoon experiences the calmest period of 16%.

The predominant wind direction in spring and summer is from the north-east and east northeast. In autumn and winter the predominant wind direction is from the south-east and south south-east. The highest calm periods of 11% are experienced in summer and autumn.

13.1.3 Geology

The project site is located on a part of the northern limb of the Bushveld Complex (Baker, 2006) (Cawthorn, et al., 2006. The Bushveld Complex largely comprises mafic rocks, constituting the largest platinum-group elements ore reserves globally (Cawthorn, et al., 2006, p. 261). It is dominated by the Lower, Critical, Main and Upper Zones of the Rustenburg Layered Suite. The predominant rocks that comprise the Rustenburg Layered Suite include gabbro and gabbro-norite – both igneous in origin.

The Rustenburg Layered Suite is overlain by the Lebowa Granite Suite comprising Nebo granite, representing the final stratigraphic unit of the Bushveld Complex in the project area (Cawthorn, et al., 2006, p. 273; Robb, et al., 2000, pp. 269, 276).



The Waterberg Group overlying the Lebowa Granite Suite in the western parts of the project site are considered to be between 1700 Million years (Ma) and 2000 Ma old, and of Kheisian period of the Palaeoproterizoic era. During the Kheisian period, free atmospheric oxygen was available to produce ferruginous mineral oxides (Barker, et al., 2006, p. 301). The oxidisation process allowed the formation of 'red beds', occurring in a cratonic setting in the Waterberg Group. The typical rocks associated with this group are arenite and rudite, that are sedimentary rocks deposited by large braided rivers (Barker, et al., 2006, p. 314). Rudite includes sedimentary rocks composed of conglomerate rounded or angular granules, pebbles, cobbles and boulders.

13.1.4 Soil

13.1.4.1 <u>Soil Types</u>

The soils of the project site are represented by four possible land types namely Ia, Ah, AE and Ea (refer to Table 13-1). These land types are indicated on the 2328 Pietersburg and 2428 Nylstroom land type maps and indicated on Plan 7 in Appendix 5 (Land Type Survey Staff, 1989).

Dominant Land Type Land Type	Dominant soil types	Potential occurrence %	Dominant slope %
la	Red soils such as Oakleaf, Clovelly, Dundee	40	2
	Black clay soils such as Valsrivier, Bonheim	20	2
Ah	A mix of shallow rocky soils and heavy structured clays	3 – 15	1.5 – 2.9
Ae	Mixed red soils	70	3.5 - 4
Ea	Black clay soils	90	2.8 - 3

Table 13-1: Dominant Soil Types and Slopes within the Project Site

13.1.4.1 Land Capability

Land capability depends on the dominant soils that occur within the project site. The land capability present is expected to be Grazing Class IV - V, (Table 13-2 and Plan 8 in Appendix 5).

Table 13-2: Agricultural Potential of Land Types

Land	Dominating Soil	Dominating Land	Agricultural Potential
Type	Capability Class	Capability Class	
la	IV	IV	Grazing



Land Type	Dominating Soil Capability Class	Dominating Land Capability Class	Agricultural Potential
Ea	VI	VI	Limited arable/dominated by grazing
Ah	VI	VI	Grazing
Ae	III	III	Limited Arable

The natural fertility of the dominant soil types occurring within the project site is expected to be high due to the clay content of the soil. However due to the limitations in managing these soils, the agricultural potential remains as grazing.

13.1.5 Surface Water

13.1.5.1 Water Catchment

The project site is located within the boundaries of quaternary catchments A61G and A61B, found within the Limpopo River catchment which is identified as Water Management Area 1. (WMA 01). Refer to Plan 9 in Appendix 5.

The surface water attributes of the affected catchments, namely Mean Annual Runoff (MAR), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE) are summarised in Table 13-3, for quaternary catchments A61G and A61B. The MAP that ends up as MAR in the catchments is 2 % and 4 % respectively.

Tahle	13-3. Surface	Water	Attributes	of the B20D	Quaternary	
Iabic	13-3. Suitace	vvalci	Allibules		^y Qualernary	Gatchinent

Quaternary Catchment	Total Area (km²)	Rainfall Zone	MAP (mm)	MAR (mm)	MAR m ³ * 10 ⁶	Evaporation Zone	MAE (mm)
A61G	927	A6C	585	16.5	15.31	1C	1800
A61B	710	A6D	529	21.1	14.97	1C	1850

Source: Water Research Council, 2005

13.1.5.1 Water Resources

The project site is traversed by several perennial and non-perennial streams. The identified non-perennial streams were found to be dry during a field visit conducted on the 15 January 2015.

The Mogalakwena River, which is a tributary to the Limpopo River, is found on the western side of the project site and flows towards the north into the Limpopo River. The Sterk River also traverses the project area west of the Mogalakwena River. The Sterk River is a tributary to the Mogalakwena River. A non-perennial stream called Borobela exists on the eastern



side of the Mogalakwena River and flows towards the west, feeding into the Mogalakwena River.

An indication of surface water uses was obtained from the Department of Water and Sanitation (DWS) water use registration data base (WARMS) which indicated that the primary water uses are irrigation, mining, urban and rural domestic supply.

13.1.5.2 <u>Surface Water Quality</u>

Surface water quality samples have been collected from the Mogalakwena and Sterkrivier, on 15th and 16th of January 2015. Table 13-4 presents the coordinates of the sampling points.

Point Name	Latitude	Longitude	Location
SW1	-23.97113100	28.69598600	Near the R 518, south of Lyden (Upstream of project site)
SW2	-23.90947000	28.7265100	Along the Mogalakwena River, southeast of Kaditshwene (Downstream of project site)
SW3	-23.87934000	28.68970900	North of Eseldrift (Downstream of project site)
SW4	-23.95324400	28.78766200	Along the Mogalakwena River (Upstream of project site)
SW5	-23.92715000	28.75387500	Along the Mogalakwena River (within the project site)

Table 13-4: Surface Water Monitoring Locations

Samples were submitted to Aquatico Laboratory (Pty) Ltd, a SANAS accredited laboratory in Pretoria to be analysed for physical and chemical water quality parameters. Water quality results have been benchmarked against the South African National Standards (SANS) 241: 2011 drinking water standards and with the Resource Water Quality Objectives (DWA, 2011).



Table 13-5 indicates the water quality results benchmarked against (SANS) 241: 2011 drinking water standards. Table 13-6 indicates the water quality results benchmarked against the Resource Water Quality Objectives (DWA, 2011).

The results have shown that the water quality is within the SANS 241: 2011 drinking water standards for all parameters assessed. In terms of the Resource Water Quality Objectives limits (DWA, 2011):

The site SW4 indicated a high concentration of Total Dissolved Solids (TDS), above the ideal and acceptable limits.

Generally, a very good water quality has been indicated by the results, this might have been influenced by the rains. High flows have been observed and that cleanses or dilutes higher concentration of dissolved chemicals/metals.


Table 13-5: Water Quality Results Benchmarked against the SANS 241-1:2011 Drinking Water Quality Standards

		Sample ID	Total Dissolved Solids (mg/l)	Nitrate NO ₃ as N (mg/l)	Chlorides as Cl(mg/l)	Total Alkalinity as CaCO₃(mg/l)	Sulphate as SO4(mg/l)	Calcium as Ca(mg/l)	Magnesium as Mg(mg/l)	Sodium as Na(mg/l)	Potassium as K(mg/l)	Iron as Fe(mg/l)	Manganese as Mn(mg/l)	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as AI (mg/l)	Free and Saline Ammonia as N (mg/l)	Fluoride as F(mg/l)
	Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5- 9.5	<0.3	<1	<1
	Class	(Max. Allowable)	1000- 2400	10- 20	200- 600	N/S	400- 600	150- 300	70- 100	200- 400	50- 100	0.2-2	0.1-1	150- 370	4-5 or 9.5- 10	0.3- 0.5	1-2	1- 1.5
Date		Duration	7 years	7 years	7 years	N/S	7 years	7 years	7 years	7 years	7 years	7 years	7 years	7 years	No Limit	1 year	None	1 ye ar
2015/01/15		SW01	78.00	0.55	11.30	30.30	3.41	7.38	2.94	7.82	3.33	0.00	0.00	9.80	7.77	0.00	0.15	0.1 3
2015/01/15		SW02	86.00	0.33	11.90	39.10	3.70	8.33	3.80	9.93	2.45	0.00	0.00	11.70	7.79	0.00	0.09	0.0 9
2015/01/15		SW03	84.00	0.35	11.00	35.20	3.61	8.29	3.25	10.60	2.43	0.00	0.00	12.40	7.95	0.00	0.05	0.1 3
2015/01/15		SW04	371.00	0.30	53.70	197.00	43.20	33.80	28.80	57.40	4.31	0.00	0.00	57.30	8.43	0.00	0.04	0.5 2
2015/01/15		SW05	339.00	0.31	51.00	210.00	19.00	31.80	24.50	51.60	3.85	0.00	0.00	51.30	8.41	0.00	0.09	0.6 7



Table 13-6: Water Quality Results benchmarked against the Resource Water Quality Objectives

	Sample ID	Total Dissolved Solids (mg/l)	Nitrate NO ₃ as N(mg/l)	Chlorides as Cl(mg/l)	Total Alkalinity as CaCO₃(mg/l)	Sulphate as SO₄(mg/l)	Calcium as Ca(mg/l)	Magnesium as Mg(mg/l)	Sodium as Na(mg/l)	Potassium as K(mg/l)	Iron as Fe(mg/l)	Manganese as Mn(mg/l)	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al(mg/l)	Free and Saline Ammonia as N(mg/l)	Fluoride as F(mg/l)
	Acceptable	350	10	120	N/A	165	80	100	92.5	50	N/A	N/A	<150	<8.4	N/A	0.044	1
	Ideal	200	6	40	N/A	80	10	70	70	25	N/A	N/A	150- 370	<8	N/A	0.015	0.7
Date																	
2015/01/15	SW01	78.00	0.55	11.30	30.30	3.41	7.38	2.94	7.82	3.33	0.00	0.00	9.80	7.77	0.00	0.15	0.13
2015/01/15	SW02	86.00	0.33	11.90	39.10	3.70	8.33	3.80	9.93	2.45	0.00	0.00	11.70	7.79	0.00	0.09	0.09
2015/01/15	SW03	84.00	0.35	11.00	35.20	3.61	8.29	3.25	10.60	2.43	0.00	0.00	12.40	7.95	0.00	0.05	0.13
2015/01/15	SW04	371.00	0.30	53.70	197.00	43.20	33.80	28.80	57.40	4.31	0.00	0.00	57.30	8.43	0.00	0.038	0.52
2015/01/15	SW05	339.00	0.31	51.00	210.00	19.00	31.80	24.50	51.60	3.85	0.00	0.00	51.30	8.41	0.00	0.09	0.67



13.1.6 Groundwater

13.1.6.1 Groundwater Resources

During November 2014, a hydrocensus was undertaken to gather data on the current use and quality of groundwater resources within and around the project site. Groundwater levels were measured and samples were taken from each borehole identified to determine the baseline conditions of the local aquifer. During the hydrocensus a total of 73 boreholes were identified, as listed below. Refer to Plan 10 in Appendix 5 for the locations of the boreholes.

- 1 borehole was equipped with a wind pump that was not in use;
- 8 boreholes were equipped with hand pumps, but were not in use;
- 33 were private boreholes (27 of the 33 were in use); and
- 31 boreholes are municipal or DWS boreholes (28 used for community water supply).

Thirty-six (36) of the 73 boreholes were open and accessible for groundwater monitoring and water sampling purposes. These boreholes are used primarily for domestic/gardening or as community water supply sources. The water levels in the surveyed area varied between 49.76 metres below ground level (mbgl) to 0.67 mbgl.

13.1.6.1 <u>Groundwater Quality</u>

During the hydrocensus, six groundwater samples representative of the project site were taken and sent for inorganic analysis to Aquatico (Pty) Ltd, a SANAS accredited laboratory in Pretoria. The groundwater quality results were benchmarked against the SANS 241:2011 standards for drinking water and are shown in Table 13-7.

Sample VBH23 (Mosate village) was taken from an open/uncovered borehole with a steel casing and is not in use. Sample VH75 (Rooivaal village) was sampled from a household borehole and the other four boreholes (VBH40, VBH51, VBH58, VBH67) were sampled from community water supply boreholes across the project site.

The Piper diagram presenting the groundwater characteristics (Figure 13-4) shows that groundwater underlying the project site plots in the left quarter, indicating calcium-magnesium-bicarbonate dominance – typically clean or recently recharged groundwater.

The following groundwater quality observations were made:

- Boreholes VBH51 and VBH67 fall in the Class I water quality range, of SANS 241:2011 drinking water guidelines. Borehole VBH51 is located west from Eseldrift village and represents an up gradient water sample. Borehole VBH67 is located outside the village near the Mapela Traditional Council;
- Boreholes VBH58 is located along the southern boundary of the project site, near the village of Sepharane. The water quality falls in the Class II water quality range due to



elevated chloride (351 mg/L), magnesium (83.1 mg/L) and fluoride (1.11 mg/L) concentrations; and

- The following boreholes have dissolved element concentrations that exceed the maximum allowable Class II concentrations and are therefore classified as Class III water – not suitable for human consumption:
 - Sample VBH23 has an elevated manganese concentration (1.54 mg/L) and is located within the Mosate village. The manganese concentrations are most probably related to the local geology;
 - Sample VBH40 has an elevated fluoride concentration (1.58 mg/L) and is located with Lyden village. Elevated fluoride concentrations are most often associated with granitic formations; and
 - Sample VBH75 has an elevated nitrate concentration (63.70 mg/L) and is located within Rooivaal village. The high nitrate concentration is most probably related to discharge from a nearby pit latrine or septic tank.



Table 13-7: Groundwater Quality Results

	Sample ID		Total Dissolved Solids	Nitrate NO ₃ as N	Chlorides as Cl	Total Alkalinity as CaCO ₃	Sulphate as SO4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F
Date	Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5-9.5	<0.3	<1	<1
	Class II	(Max. Allowable)	1000- 2400	10-20	200- 600	N/S	400- 600	150- 300	70- 100	200- 400	50- 100	0.2-2	0.1-1	150- 370	4-5 or 9.5- 10	0.3- 0.5	1-2	1- 1.5
		Duration	7 years	7 years	7 years	N/S	7 years	7 years	7 years	7 years	7 years	7 years	7 years	7 years	No Limit	1 year	None	1 year
2014/12/31		VBH23	433.00	0.20	127.00	228.00	3.10	76.80	40.20	42.00	3.32	0.00	1.54	85.20	8.00	0.00	0.10	0.81
2014/12/31		VBH40	351.00	3.20	39.10	249.00	6.97	77.90	16.00	42.00	1.60	0.00	0.00	62.90	7.80	0.00	0.02	1.58
2014/12/31		VBH51	220.00	0.37	35.20	135.00	14.80	37.70	10.60	34.50	2.94	0.00	0.00	38.80	8.29	0.00	0.02	0.56
2014/12/31		VBH58	992.00	2.09	351.00	381.00	65.50	96.90	83.10	152.00	0.77	0.00	0.00	169.00	8.03	0.00	0.02	1.11
2014/12/31		VBH67	526.00	7.19	53.50	374.00	25.00	69.20	44.60	66.40	6.57	0.00	0.00	85.90	8.09	0.00	0.02	0.51
2014/12/31		VBH75	1019.00	63.70	134.00	293.00	121.00	133.00	97.20	66.10	6.01	0.00	0.00	160.00	8.28	0.00	0.02	0.30





Figure 13-4: Piper Diagram



13.1.7 Air Quality

The project site is located within the Waterberg-Bojanala Priority Area (WBPA) which was declared the third priority area by the Minister in terms of GN R 495 on 15 June 2012. The WBPA comprises the Waterberg District in Limpopo Province and the Bojanala Platinum District in the North West. The overall aim of establishing the WBPA is to regulate and to ensure future sustainable development in the area and maintain the NAAQS. It became critical that a Priority Air Quality Management Plan for the area be developed. A Priority Air Quality Management Plan includes the establishment of emissions reduction strategies and intervention. The implication of this is that all current and future contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following years.

Baseline data was sourced from the ambient monitoring station set up by the Department of Environmental Affairs (DEA), located at the Mahwelereng Police Station in Mokopane. The baseline data presented in the sections that follow were measured from January 2013 to January 2015.

13.1.7.1 <u>Sulphur Dioxide (SO₂)</u>

The daily concentrations of SO₂ fell below the National Ambient Air Quality Standard (NAAQS) limit value of 125 μ g/m³ (48 parts ber billion (ppb)) during the monitoring period. September 2013 had the highest level of SO₂ (30 ppb) with the lowest levels being in January 2014 (<5 ppb).

13.1.7.2 Nitrogen Dioxide (NO₂)

The hourly NO₂ concentrations fell below the NAAQS limit value of 200 μ g/m³. The NO₂ levels increased from January to July and began to decline after October 2013. It is believed that the increase observed in the level of NO₂ is a result of the low wind speed and the low surface temperature during this period, as both conditions do not favour the dispersion of pollutants.

13.1.7.3 Particulate Matter (PM₁₀)

The daily PM_{10} concentrations measured at the station indicate that the NAAQS limit of 120 μ g/m³ was exceeded four times during the period under review. The highest daily PM_{10} concentrations reached ~150 μ g/m³ in September 2014. The lowest concentrations of PM_{10} were recorded during November 2013 and March 2014. From 1 January 2015 the NAAQS limit for this pollutant is 75 μ g/m³. The highest ambient concentration recorded is twice the current limit value.

13.1.7.4 Particulate Matter (PM_{2.5})

The $PM_{2.5}$ concentrations between July to October 2013 exceeded the NAAQS limit and began to decline with the lowest concentrations recorded in February and March 2014. The wind speed usually peaks during the months of July, August and September, hence the



higher ambient concentrations during these months. The current limit is 65 μ g/m³ and the future limit (1January 2016 – 31 December 2029) will be 40 μ g/m³.

13.1.7.5 <u>Carbon Monoxide (CO)</u>

Throughout the period under review, the concentrations of Carbon Monoxide (CO) levels were below the NAAQS limit of 26 parts per million (ppm). The highest concentration of 5 ppm measured in the month of June 2013 may be a once off incident as the general background levels are below 3 ppm.

13.1.8 Flora

The project site falls within the Makhodo Sweet Bushveld, whilst a small proportion of the site coincides with the Central Sandy Bushveld vegetation types, according to Mucina and Rutherford (2006). Three primary vegetation units were identified and are associated with black vertic clays, red iron-rich soils and rocky outcrops. These vegetation units are: *Acacia borleae – Eragrostis rigidior* (Black Turf Savanna), *Acacia tortilis – Eragrostis rigidior* (Savanna) and *Commiphora marlothii – Heteropogon contortus* (Rocky Woodland). Refer to Plan 11 in Appendix 5.

13.1.8.1 <u>Acacia borleae – Eragrostis rigidior</u>

This vegetation unit covered the majority of the project site and comprises open to closed *Acacia* thornveld that was largely infested by the native invader species: *Dichrostachys cinerea* (Sickle Bush). The vegetation unit showed little variation throughout the project site and was found on black vertic clay referred to as "Black Turf". An example of this vegetation unit is shown in Figure 13-5.



Figure 13-5: Landscape of the Acacia borleae-Eragrostis rigidior

13.1.8.2 <u>Acacia tortilis – Eragrostis rigidior Savanna</u>

This vegetation unit was found on iron-rich Oakleaf soils and was relatively limited in extent. Plant diversity was higher when compared to the Black Turfs. Although *Dichrostachys*



cinerea (Sickle Bush) was present, it was not found to be invasive. An example of this vegetation unit is shown in Figure 13-6.



Figure 13-6: Landscape of the Acacia tortilis – Eragrostis rigidior

13.1.8.3 Commiphora marlothii – Heteropogon contortus

Granite outcrops provide a unique habitat for plant species and were colonised by species not found in the open savanna areas of the project site. Such species include *Acacia nigrescens* (Knobthorn), *Steganotaenia araliacea* (Carrot Tree) on north-west facing slopes and *Commiphora marlothii* (Paperbark Corkwood), a species restricted to rocky outcrops (often granite). An example of this vegetation unit is shown in Figure 13-7.



Figure 13-7: Landscape of the Commiphora marlothii – Heteropogon contortus



13.1.8.1 Limpopo Critical Biodiversity Areas

The Limpopo Critical Biodiversity Areas (CBA's) assessment is a bioregional conservation plan, whereby sites were selected based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes. Sites that have been categorised as CBA 1 are regarded as irreplaceable and the conservation of these areas is imperative to meet the biodiversity targets of the Limpopo CBA's. The project site overlays an area that has been classified as CBA 2, as represented in Plan 12 of Appendix 5. CBA 2's are considered "optimal" as there is significant design involved in their identification and should be maintained in their natural state.

13.1.8.2 Species of Special Concern

The PRECIS database lists one Red Data species, namely the rare plant: *Brachystelma inconspicuum*. This species is, however, unlikely to occur on the project site as it is usually found on sandy to loam soils derived from the Waterberg quartzite and conglomerate rocks (Peckover and Victor 2006).

Species that are provincially protected have been listed under Schedule 12 of the LEMA (2003). Species that are nationally protected have been listed under the Protected Trees List as part of the National Forests Act, 1998 (Act No. 84 of 1998). Three plant Species of Special Concern (SSC) were recorded on the project site, as listed in Table 13-8 and represented in Figure 13-8.

Species	Common Name	Threat Status	Habitat
Combretum imberbe	Leadwood	Nationally Protected	Black Turf
Scadoxus puniceus	Royal Paint Brush	Provincially Protected	Red soils
Sclerocarya birrea	Marula	Nationally Protected	Black Turf

Table 13-8: Plant Species of Special Concern





Figure 13-8: Plant SSC recorded on Site (*Combretum imberbe* (Leadwood); *Scadoxus puniceus* (Royal Paint Brush) and *Sclerocarya birrea* (Marula))

13.1.9 Fauna

The Commiphora marlothii – Heteropogon contortus Rocky Woodland habitat is regarded as the most sensitive faunal habitat. Rocky ridges are defined as landscape features with a slope of 5° or more such as hills, koppies and gorges and kloofs. Ridges are important for the conservation of biodiversity as they have a high propensity for the occurrence of plant and animal SSC and they serve as wildlife corridors in highly developed areas. The guidelines for development of ridges by the Gauteng Department of Agriculture and Rural Development (GDARD) were adapted for the ridges in the Limpopo Province as best practice as there is no relevant policy available for the Limpopo Province. The guidelines stipulate that a 200 m buffer should be applied around ridges and rocky outcrops. Rocky outcrops have been delineated and are represented in Plan 13 in Appendix 5. The following sections provide a description of the fauna expected to occur within and around the project site.

13.1.9.1 <u>Mammals</u>

Approximately 171 mammal species occur in the region (SIBIS 2013). It must be noted that some of these species are sensitive to habitat and in some instances; the likeliness for them to occur is minimal. Relatively unspoilt habitat exists within the vicinity of the project site and although the presence of many of these species is not confirmed, there is a possibility that they may still occur on the project site.



13.1.9.2 <u>Avifauna (Birds)</u>

Approximately 247 bird species occurs in the grid squares 2328DC, 2328DD which the project site falls within (SABA, 2014). Table 13-9 lists the avifaunal SSC that may potentially occur on the project site. Please refer to Appendix 8 for the full list avi-faunal species that may potentially occur within the project site.

Table 13-9: Red Data Avifaunal (bird) Species that may occur on the Project Site

Common Name	Species	IUCN Status (Global, Regional)	NEMBA Status	Probabilit y of Occurren ce
Crane, Grey Crowned	Balearica regulorum	EN,EN	EN	Low
Stork, Yellow- billed	Mycteria ibis	EN; LC		Medium
Eagle, Martial	Polemaetus bellicosus	EN; VU	VU	Medium
Harrier, Black	Circus maurus	EN; VU		Medium
Vulture, Cape	Gyps coprotheres	EN; VU	EN	Medium
Lark, Short- clawed	Certhilauda chuana	NT; LC		Medium
Roller, European	Coracias garrulus	NT; NT		Medium
Crane, Blue	Anthropoides paradiseus	NT; VU	EN	Low
Falcon, Lanner	Falco biarmicus	VU; LC		Medium
Stork, Black	Ciconia nigra	VU; LC		Medium
lbis, Southern Bald	Geronticus calvus	VU; VU		Medium
Secretarybird	Sagittarius serpentarius	VU; VU		Medium
Falcon, Peregrine	Falco peregrinus		VU	Medium

The South African Important Bird Area (IBA) Programme is coordinated by BirdLife South Africa. The purpose of the IBA Programme is to identify and protect a network of sites, at a biogeographical scale, critical for the long-term viability of naturally-occurring bird populations. The nearest Important Bird Area (IBA) is the Waterberg System situated 14 km south of the project site.



13.1.9.3 <u>Reptiles</u>

Approximately 13 reptiles and 15 frog species occur in the grid square in which the study occurs (SARCA, 2014), none of which are listed as having Red Data status, however there are 226 reptile and 57 amphibian species found in the Limpopo Province. Eleven herpetofauna have a medium to high propensity to occur within the project site.

13.1.9.4 Macro-invertebrates (Spiders, Scorpions, Beetles and Butterflies)

According to the Animal Demography Unit (ADU) (2015), all three genera of baboon spiders, *Ceratogyrus, Harpactira (spelt Xarpactrica in the NEMBA Schedule) and Pterinochilus* occur in the Limpopo Province, however there are none recorded for grid squares 2328DC and 2328DD. All three genera of scorpions, *Hadogenes, Opisthacanthus and Opistophthalmus* occur in the Limpopo Province, however there are none recorded for grid squares 2328DC and 2328DD (ADU,2015).

According to Picker, *et al* (2014), 5 of the genera of Tiger beetles, 1 genera of Monster Tiger beetle, 1 genera of Velvet Ground beetle and 1 genera of Fruit Chafer beetle are most likely to occur within the project site.

According to ADU 2015, 14 089 species of butterflies occur in the Limpopo province, no species have been recorded in the square 2328DC, 9 species have been recorded in QDQC 2328DD, none of which are protected.

Please refer to Appendix 8 for the full list of macro-invertebrate species that may potentially occur within the project site.

13.1.10 Wetlands

The National Freshwater Ecosystem Priority Areas (NFEPA) contains strategic spatial priorities for conserving the country's freshwater ecosystems and supporting sustainable use of water resources (Nel, et al., 2011). The identified wetland areas play important functions such as the enhancement of water quality, attenuation of floods and biodiversity support. The NFEPA wetlands have been ranked in terms of importance to the conservation of biodiversity. Plan 14 in Appendix 5 illustrates the different NFEPA wetlands present within the project site and in the immediate surrounding area. The Mogalakwena River is classified as a Moderately Modified NFEPA river (Class C). Plan 15 in Appendix 5 provides the desktop wetland delineation undertaken for the project site.

13.1.11 Aquatic Ecology

The Limpopo Conservation Plan encompasses not only terrestrial systems but also crucial aquatic ecosystems. It integrates information from sources including documents compiled for the South African River Health Program (RHP). The range of rankings range between A (Natural) and F (critically modified).

Those aquatic ecosystems, managed on a quaternary catchment level, that have been determined to be healthy are given a class or ranking of A or B depending on the degree of



modification that has occurred within their sub-catchments. Classes also exist from C to F. Table 13-10 demonstrates the descending order of river health classes.

Class	Description
Α	Natural
В	Largely Natural
С	Moderately Modified
D	Largely Modified
E	Seriously Modified
F	Critically Modified

Table 13-10: Classes of River Systems

The systems associated with the project site range from largely natural to moderately impacted. Table 13-11 demonstrates the current present ecological sensitivity of the catchment as well as what, if managed correctly it could become (its best attainable ecological management class).

The estimated importance and sensitivity category ranks the rivers in terms of their biodiversity value, while the present ecological sensitivity is a reflection of the current state of the river. The river will then be managed to the best attainable management class. These categories for the aquatic ecosystems associated with the project are outlined in greater detail below.

Quaternary Catchment	Estimated Importance and Sensitivity Category	Present Ecological and Sensitivity	Best Attainable Ecological Management Class
A62B	Low/Marginal	Class B	Class B
A61G	High	Class B	Class B
A61J	Moderate	Class C	Class B

Table 13-11: Current Ecological and Potentially Achievable Management Classes

Source: Kleynhans (2000)

13.1.11.1 Expected fish species

Data does not exist for catchments A62B and A61G, however sufficient data is present for A61J to provide an indication of which fish may be present in the rivers of the project as they are all linked. Refer to Appendix 8 for the expected fish species within the project area.



13.1.12 Economic

Understanding the size and composition of each sector in the economy in the area under analysis is important for studying the economic impacts that the proposed project may have. This helps to predict the changes that may occur because of the implementation of the project.

The Gross Domestic Product per Region (GDP-R) of the Mogalakwena Local Municipality was valued at R13 142 million in 2013 constant prices. This is equal to a per capita GDP-R of R42 629. This is lower than the national economy but higher than the provincial economy GDP-R per capita of R58 533 and R39 818, respectively. The Waterberg District has the strongest economy of all the study areas with a GDP-R per capita of R74 023. In addition to signalling a stronger economy, a higher GDP-R per capita is usually associated with a higher standard of living.

	GDP-R (R'million)	GDP-R per capita (R)
South Africa	R3 030 263	R58 533
Limpopo	R215 212	R39 818
Waterberg DM	R50 287	R74 023
Mogalakwena LM	R13 142	R42 629

Table 13-12: GDP-R and GVA-R per Capita (2013)

(Quantec, 2015)

Another important indicator of the wellbeing of a region's economy is the rate at which it is growing. Between 2003 and 2013, the Waterberg area's economy grew at an average rate of 0.9% per year. This is much lower than the national CAGR of 3.4% per annum. The Mogalakwena economy also showed a much better performance during that period than the Waterberg, growing at a CAGR of 2.9%.

When one considers the structure of the economy in nominal terms, it becomes evident that the national economy is predominantly a service economy. The tertiary sector comprised 70% of the national economy in 2013, and grew at a CAGR of 4%. The primary sector that includes agriculture and mining contributes the smallest amount to the national economy. These sectors are, however, strategically important for food security and job creation.

In Limpopo, the primary sector contributed 30.7% towards its GDP-R showing a significantly greater reliance on this sector than the national economy; however, the economy of Limpopo is still driven by predominantly tertiary industries with the observed CAGR of 3.5%. The mining industry showed the lowest growth rate in the province, emphasising the need for retention of these industries from a sustainability perspective and most importantly the need for greater investment to support their growth.



The structure of the primary study areas' economy follows that of the province more closely. Mining comprises more than a third of the local municipality's economy; it experienced a CAGR of 1.6% over the period 2003 to 2013. Following the mining sector, the largest sectors in Mogalakwena are general government followed by the trade and finance, insurance and business industries. The agricultural sector contributed a relatively small percentage to the local economy's GDP-R; it, however, experienced a larger CAGR over the period between 2003 and 2013 compared to other study areas.

	South	Africa	Lim	ооро	Waterb	erg DM	Mogalakwena LM		
Sectors	Nomin al 2013	CAGR ('03– '13)	Nomin al 2013	CAGR ('03- '13)	Nomin al 2013	CAGR ('03- '13)	Nomin al 2013	CAGR ('03- '13)	
Primary sector	11.6%	0.2%	30.7%	0.2%	58.9%	-0.5%	34.3%	1.8%	
Agriculture, forestry and fishing	2.4%	1.9%	2.4%	3.5%	2.2%	0.9%	1.5%	4.7%	
Mining and quarrying	9.2%	-0.4%	28.3%	-0.1%	56.7%	-0.6%	32.8%	1.6%	
Secondary sector	18.4%	3.0%	8.3%	3.1%	6.0%	0.4%	9.8%	5.7%	
Manufacturing	11.6%	2.6%	2.4%	2.2%	1.8%	-0.4%	3.3%	3.7%	
Electricity, gas and water	3.0%	1.6%	3.6%	1.9%	2.4%	-2.2%	3.8%	10.0%	
Construction	3.7%	6.8%	2.3%	6.3%	1.8%	5.6%	2.7%	6.5%	
Tertiary sector	70.0%	4.0%	61.0%	3.5%	35.2%	2.6%	56.0%	2.9%	
Trade	16.6%	3.7%	13.7%	3.6%	8.8%	1.4%	13.4%	1.4%	
Transport & & communication	8.9%	3.6%	8.0%	2.7%	5.7%	2.3%	9.5%	3.1%	
Finance, insurance, & business	21.5%	5.1%	15.5%	4.9%	9.5%	4.3%	13.4%	4.0%	
Community services	6.0%	2.6%	4.7%	2.5%	2.5%	1.7%	4.9%	2.9%	
General government	17.1%	3.3%	19.1%	2.8%	8.6%	2.2%	14.8%	3.0%	
TOTAL	100%	3.4%	100%	2.5%	100%	0.9%	100%	2.9%	

Table 13-13: Structure of the study areas' economies (nominal 2013 prices) and CAGR(2003-2013)

Source: Quantec, 2015

13.1.13 Social

13.1.13.1 Administrative Context

The Mogalakwena Local Municipality is the largest municipality within the Waterberg District Municipality in terms of land mass (6 368 square kilometre/km²) and is bordered by Aganang Local Municipality to the east, Mookgophong Local Municipality to the south, Lephalale Local Municipality to the west and Blouberg Local Municipality to the north.



The Mogalakwena Local Municipality has an executive mayor, proportionally elected councillors and ward councillors who are responsible for representing the needs of the people in the respective municipal wards. The population within each ward is represented by a ward committee and councillors. In addition to municipal administration, several areas within this local municipality are under the administration of Traditional Authorities (TA). Each TA is headed by a paramount chief or Kgoshi and his subordinate headmen. There are nine traditional authorities within the municipality.

The local study area (1389km²) is defined as Ward 9,10,11,15, and 16 of the local municipality as well as Ward 18 of the Aganang Local Municipality.

13.1.13.2 Population Growth and Distribution

According to Census 2011 data, South Africa's population was estimated to be above 51 million (Table 13-14). About one out of ten people in the country resided in Limpopo. The Mogalakwena Local Municipality housed about 307 863 people in 2011, or just more than 6% of the Limpopo population. Of the settlements closer to the proposed site, Mokopane and Bakenberg housed 30 150 and 7 98 people, respectively.

As indicated in the table below, the Compounded Annual Growth Rate (CAGR) of the local municipality's population between 1996 and 2011 was 1.3%. It was lower than the CAGR of the national and provincial population figures during the same period, but slightly higher than that of the district. Whilst the population of the rest of the study areas experienced a slowdown in their growth rates, the primary study area's population growth rate has been increasing.

		Historical growth rates							
Study area	Population	1996-2001	2001-2006	2006-2011	1996-2011				
South Africa	51 770 562	1.7%	1.3%	1.1%	1.4%				
Limpopo	5 404 866	3.4%	2.3%	1.8%	2.5%				
Waterberg DM	679 336	1.5%	1.0%	1.0%	1.2%				
Mogalakwena LM	307 863	1.1%	1.2%	1.5%	1.3%				

Table 13-14: Population Size and Historical Growth Rates

Human settlement within the local study area is characterised by two contrasting patterns. The vast majority of land is sparsely populated, while residential uses within the study area are concentrated within densely populated peri-urban settlements (e.g. Mosate, Malokong, Rooivaal, Ditlotswana, Sepharane, Rooivaal, and Kaditswene). These settlements comprise less than 30% of the surface land comprising the local study area, but account for more than 95% of the total population (StatsSA, 2013).



13.1.13.3 <u>Age and Gender Distribution</u>

Gender and age are important variables, as they indicate the labour-sending capacity of an area. Table 13-15 presents the gender distribution of the local study area, and indicates that females outnumber males by 10%, similar to the regional distribution. The gender distribution among households heads indicate that just less than 60% of all households in the local study area are headed by females (StatsSA, 2013). Both these trends point towards male outmigration.

The age distribution shows that the majority of the local study area's population falls within the 15-64 year bracket, while just more than a third is younger than 14 years. This trend is similar to the regional study area and indicates a potentially large labour force.

% of total population								
Gender Age category (in years)								
Female	Male	0-14	15-64	65+				
55% 45% 37% 52% 10%								

Table 13-15: Gender-and Age Distribution

Source: Statistics South Africa, 2013

13.1.13.4 Language and Racial Distribution

The population within the local study area is relatively undifferentiated from a language and race perspective, with most people speaking Sepedi (82%), followed by those speaking XiTsonga (12%). With regards to race, Black Africans constitute the overwhelming majority (99%). Racial integration is gradually being achieved through some Black Africans moving from the traditional settlements and rural areas to settle in Mokopane.

13.1.13.5 <u>Education</u>

A population's average level of education is commonly used as an indicator of human capital and is measured by the percentage distribution of the population older than 20 years and the highest level of schooling they completed. Education levels among the local population is presented in Table 13-16 below, which indicates a relatively modest level of formal education, with more than half of individuals attaining some secondary schooling, irrespective of their gender grouping.



		Study area						
Education level	Local							
	General	Female	Male					
None	6%	8%	4%					
Some primary	26%	25%	27%					
Completed primary	6%	5%	6%					
Some secondary	36%	35%	38%					
Completed secondary	19%	20%	19%					
Higher	7%	7%	6%					

Table 13-16: Highest Level of Education (20 years and older)

Source: Statistics South Africa, 2013

13.1.13.6 <u>Employment</u>

In 2011, the employment rate among the local study area's labour force was 15% of the total population and 50% among the economically active population (Table 13-17). Employment was mostly provided within the formal sector (73%), which is centred on the social and personal, wholesale and retail trade, as well as manufacturing sectors. Although agriculture contributes only slightly to the local economy, the sector is considered a major source of informal employment within the local area. Employment within this sector is usually seasonal and with low remuneration. Unemployment among the economically active population (50%) is high, irrespective of gender grouping.

Due to the high unemployment rate a considerable number of households revert to survival strategies such as subsistence farming, which is prominent in the local study area, especially maize cultivation. The local study area also possesses the capacity for cattle farming, especially areas such as Mapela, Bakenberg and Rebone (MLM, 2012).

Employment category	% of total population
Not economically active	64%
Discouraged work seeker (DWS)	6%
Economically Active	30%
Employed	15%
Unemployed	15%

Table 13-17: Employment Status

Source: Statistics South Africa, 2013

13.1.13.7 <u>Income</u>

Table 13-21 shows the individual monthly income distribution for the population as a whole, as well as the proportionate breakdown across gender groups. Generally income levels within the local study area are extremely low, with almost 80% of people earning less than R 800 a month. The proportion of people earning no income is irrespective of genders. A large



number of people who earn nothing (45%) and a small number (1%) of people who earn over R 12 801 per month, is indicative of a high Gini-coefficient¹ (measure of inequality).

	% of total	Gender proportion		
income category	population	Female	Male	
None	45%	46%	44%	
R1-800	34%	31%	37%	
R801- R12800	20%	22%	18%	
R12801-204801+	1%	1%	1%	

Table 13-18: Individual Monthly Income

Source: Statistics South Africa, 2013

13.1.13.8 <u>Health</u>

The Mogalakwena Local Municipality is serviced by 3 Hospitals, 26 Clinics and 12 Mobile Clinics. More than 80% of the population is within 120 minutes of walking distance from health facilities (Day et al., 2012).

The usable Bed Utilisation Rate (BUR) is a process indicator (identifies activities related to the functioning of the health system) that is also a measure of efficiency. The BUR reflects how many of the usable beds in a hospital were occupied over a given time period, usually a year. A low BUR value for a given hospital may indicate that there is little or no need for the hospital in the particular community or area. Another explanation could be that the community chooses not to use the hospital for any number of reasons. In contrast, a high BUR could indicate that patients are spending too long in the hospital and not being discharged appropriately or it could mean that there are insufficient beds to cater for the needs of the population.

The national BUR was 67.2% in 2011/12. The majority of Limpopo districts exceeded the national rate and the national target. Waterberg district has 1.3 district hospital beds per 1 000 population, higher than both the provincial and national averages of 0.8 and 0.7 respectively. The bed utilisation rate in Mogalakwena Local Municipality was 61.8%, the lowest in the province, with an average length of stay of 4.5 days.

The last HIV prevalence survey in the Mogalakwena Local Municipality was conducted in 2000 and estimated the prevalence to be 10.2% (MLM, 2012).

The TB incidence (all cases) was above 600 per 100 000 between 2008 and 2011 and then decreased to 565.1 per 100 000 in 2012 and 547.2 per 100 000 in 2013. The TB incidence

¹ The Gini-coefficient, developed in 1912 by Italian statistician Corrado Gini, is a mathematical measure of income inequality. Its theoretical maximum value is 1 – which would imply that a single person receives 100% of the total income and the remaining people receive none – and its theoretical minimum value is 0 – in which case everyone receives exactly the same income. The Gini-coefficient of the United States of America is between 0.45 and 0.5, while that of Sweden is 0.23.



decreased from 296 per 100 000 in 2010, and was for the first time below 200 at 148.7 per 100 000 in 2013.

Malaria is endemic in Limpopo, and transmission is distinctly seasonal, with most cases reported during the summer rainy season between September and May. There were 253 reported cases of malaria in the province between October and December 2012. This was a decrease from 504 during the same period in 2011 and 1 744 in 2010. The incidence of malaria in Waterberg District between 1998 and 2005 was about 30.9 per 100,000 person years.

Other non-communicable diseases play an important role in the overall burden of disease in the Limpopo Province. Strokes, chronic lung disease, heart disease, hypertension and diabetes are all mentioned in the top 20 disease burdens in the province (Bradshaw et al., 2004).

13.1.13.9 <u>Water and Sanitation</u>

Safe drinking water and adequate sanitation is a necessity for good health, as households without safe water and proper sanitation systems are more vulnerable to water borne diseases. Government water schemes provide most households within the local study area with piped water; however, a considerable number of households still depend on groundwater resources for domestic and agricultural use (Table 13-19). Rural communities are almost totally dependent on piped ground water abstracted from boreholes by pumps. Data on ground water resources indicates that there are water shortages, especially during the dry season, in the area. Water scarcity in the area prevents local water supply schemes to provide sustainable and reliable water to most rural communities.

In terms of sanitation the majority of households within the local study area only have access to pit toilets, followed by a small number of households (9%) that have access to flush sanitation (Table 13-20). These figures are considerably lower than those of regional study area.

Water source	% Households
Regional/local water scheme	65%
Borehole	23%
Dam/pool/stagnant water	6%
Water vendor/tanker	4%
Other	2%

Table 13-19: Household water supply

Source: Statistics South Africa, 2013



Facility	% Households
Flush toilet (connected to sewerage system)	9%
Pit toilet with ventilation (VIP)	8%
Pit toilet without ventilation	79%
None	3%
Other	1%
Source: StatsSA, 2013	

Table 13-20: Household sanitation facilities

Source: Statistics South Africa, 2013

13.1.13.10 <u>Energy Source</u>

The majority of households within the local study area have access to electricity for lighting purposes (Table 13-21). With regards to cooking and heating there seems to be a greater reliance on alternative energy sources, especially wood. It is reasonable to argue that wood is sourced from areas surrounding rural communities.

Energy source and purpose	Study area		
Lighting			
Electricity	92%		
Candles	7%		
Other	1%		
Cooking			
Wood	51%		
Electricity	46%		
Other	3%		
Heating			
Wood	50%		
Electricity	40%		
None	9%		
Other	1%		

Table 13-21: Energy Sources and Uses

Source: Statistics South Africa, 2013

13.1.13.11 <u>Waste</u>

The local municipality owns two general landfill sites which are both licensed in terms of the Environmental Conservation Act, 1989 (Act No. 73 of 1989). The Rebone Landfill site was classified as G: S: B- and receives only waste from Rebone Township which consists of 1500 households and local businesses. The Mokopane Landfill site is located approximately



4 km south east of Mokopane Central Business District (CBD) and was classified as G:M:B-. According to a study conducted by Worley Parsons the site operated until up the end of 2013 and has remaining airspace of 122 056 m³. The site receives 10 500 m of waste on a monthly basis from various sources such as domestic, commercial and industrial premises. The operation of both sites is done in-house with available resources.

The number of households whose refuse is removed by local authorities weekly has increased from 16.9% in Census 2001 to 26.8% in Census 2011, while those households whose refuse was removed less frequently than once a week declined from 0.8% to 0.4% during the reference period. The percentage of households depending on a communal refuse dump increased slightly from 1.1% to 1.3% between 2001 and 2011. There was a slight increase in the percentage of households that owned their own refuse dumps. Finally, there was a decrease in the proportion of households without any refuse disposal from 9.7% in Census 2001 to 7.7% in 2011 (Mogalakwena Local Municipality Integrated Development Plan, 2010-2011).

13.1.13.12 <u>Housing</u>

In general, housing types vary according to settlement type. There are, for example, a higher proportion of informal houses in rural areas, while formal houses are predominantly a feature of the urban environment. The majority of households (95%) within the local study area reside in formal dwellings, only 3% of housing structures are informal.

Housing type is also linked to ownership. Security of tenure contributes to more permanent and conventional housing types, while a lack of security tends to bring about informal dwellings. Almost 50% of dwellings in the local study area are privately owned, of these the majority have been fully paid off, which is considerably higher compared to the regional area. Just less than half of all dwellings are occupied rent free; this can be ascribed to the fact that the majority of the population reside on traditional land, with no formal land ownership rights.

The Spatial Development Framework (SDF) (2012) for the regional and local study area identifies a major need for housing. Several public housing developments are underway to address this need. Efforts to improve access to housing within the local study area are being undertaken through the private sector as well as government (MLM, 2012). Public sector supported housing projects occurs mainly in the economically depressed areas and informal settlements.

13.1.13.13 <u>Transport</u>

Transport corridors formed by road networks usually play a pivotal part in facilitating and supporting development initiatives. The immobility of communities within the local study area was noted to be a concern. Car ownership within the rural area is low and commuters depend on public transportation (bus and taxi operators). In addition to formal vehicle use, donkeys with trailers are also commonly seen traversing between vehicles and on the side of roads. Donkeys and trailers have been a traditional mode of transport and while the 'horse



and carriage' is privately owned, it is very often leased out for business purposes (SANRAL, 2012).

13.1.13.14 Social Challenges

The increase in the number of households, particularly in the rural areas where there are minimal services have increased backlogs in electricity provision, housing needs, roads, access to water, and sanitation needs. In particular the following issues impede service delivery in the local municipality:

- Lack of water resources and poor water quality;
- Lack of bulk infrastructure (water, electricity, and sanitation);
- Aging of existing infrastructure;
- Inadequate budgeting for operations and maintenance;
- Overflowing of sewer plants;
- Utilisation of unlicensed landfill sites;
- Sector planning is not coordinated and aligned to the municipal planning processes;
- Inadequate capital funding for all infrastructure/service delivery;
- Inadequate institutional capacity to respond to service delivery opportunities; and
- Inadequate intergovernmental integration and support.

The Mogalakwena Integrated Development Plan (IDP) (2012/2013) states that, "one of the key social problems facing the Mogalakwena Municipality is poverty". In particular the IDP notes that women, especially women living in rural areas, are the most affected by lack of job opportunities and other social issues such as access to education, role in society and economic opportunities. These factors together with the high prevalence of HIV/AIDS throughout the local municipality (24%) and the number of households which are indirectly affected by the disease increases the vulnerability of a significant number of families in the local study area.

Within the regional study area just more than 1 out of every 3 individuals receives some type of grant, this figure is expected to be even higher in rural settlement within the local study area (StatsSA, 2011). This figure has almost doubled since 2001, which suggests a premature inclination towards welfare instead of developing sound institutions for education and subsequent employment (StatsSA, 2011). Of the people receiving grants an overwhelming majority (68%) receive grants for childcare.

In addition to the social grant system, approximately 70 000 households within the local municipality were provided with free basic water and electricity services (WDM, 2012). If one takes into consideration that the municipality hosted almost 80 000 households in 2010, it is clear that almost 90% of households within the regional and local study area are considered 'poor' (pronounced deprivation of well-being) (Houghton & Khandker, 2009) and qualify for



free basic water and electricity respectively. This implies that a large percentage of the households within the local study area can be considered as vulnerable.

13.1.14 Traffic

13.1.14.1 <u>Existing Road Network</u>

The material from the proposed mine will either be transported via road, then onto rail in Mokopane and onwards to the nearest port; or via road, directly to Durban/Richards Bay for export. The scope of this EIA is limited to the potential impacts associated with the use of roads only and excludes the potential impacts associated with the rail and port. The roads within the study area may potentially be affected by the Heavy Duty Vehicles (HDV) are outlined in Table 13-22.

Road Link	Jurisdicti on	Function	Road Condition	Classification
D4380	RAL	Links Mokopane via N11 with Mogalakwena-cluster and numerous rural settlements situated further north-west.	Paved	Single Carriageway
D3507	RAL	Provides a link between the D4380 and the D1958. Provides access to several small rural settlements	Paved	Single Carriageway
D3534	RAL	Provides a link between the D4380 and the N11. Provides access to several small rural settlements.	Unpaved	Single Carriageway
D1958	RAL	Provides a link between the D4380 and the R518	Road not sealed	Single Carriageway
D3500	RAL	Links Mokopane with Mogalakwena-cluster and numerous rural settlements situated further north-west	Paved	Single Carriageway
N11	SANRAL	Provides a link between the site and Mokopane.	Unpaved	Single Carriageway, planned upgrade to duel carriageway
N11 Mokopane	SANRAL	Proposed bypass linking N11 and	Planned	Planned

Table 13-22: Roads Potentially Impacted by Project



Road Link	Jurisdicti on	Function	Road Condition	Classification
Ring Road		N1		

There are several route options that will be considered during the impact assessment phase, these include:

- Mokopane via D4380 D1958 R517 N11;
- Mokopane via D4380 R517 D3500 N11;
- Durban / Richards Bay via D4380 N11 Ring Road N1;
- Mokopane via D4380 N11 Ring Road D1312; and
- Mokopane via D4380 N11.

13.1.14.1 <u>Project Site Access</u>

There are several options to provide access to the project site from the D4380, D3507, and D3534. The portion of the project site situated to the north of the D4380 is currently accessible via the D3534. The portion of the project site situated to the south of the D4380 is currently accessible via an existing access from the D4380. The design and type of intersection will be influenced by the traffic generated by the proposed mining operations, and will be determined at a later stage once the level of service can be determined.

13.1.14.1 <u>Future Planned Roads</u>

The proposed N11 Ring Road is included in the recently completed Mogalakwena Municipality Roads and Stormwater Masterplan. The main driver behind the implementation of the Ring Road is to address the deteriorating level of service on the N11, used to transport platinum from the Mogalakwena mines to Polokwane. The ring road will provide an alternative link from mines in its vicinity to the smelter at Polokwane. The implementation of the ring road is a mining industry initiative. Other routes being used by the mining industry are the N11, N1/R101, and or the R37.

The N11 Ring Road will divert traffic on the western side of the existing Sebetiela Toll Plaza in a northern direction and then follow a route along the existing N11 towards Mokopane from where it routes in a south-easterly direction passing east of Tshamahansi and Mahwelereng to link up with the existing R101 just north of Mokopane.

It should also be noted that a 24 km portion (1.130km – 25.088km) of the N11 will be upgraded from single to dual carriageway. This planned upgrade will greatly increase the capacity of this section of the N11.



13.1.15 Noise

Agriculture is the dominant land use (primarily livestock grazing, followed by subsistence maize farming) at the project site, with small areas also being utilised for residential purposes. The dominant land use surrounding the project site is mixed used, comprising residential and agricultural with various traditional communities. The noise levels within the communities are expected to be between 45 – 50 dBA during the daytime and 35 – 45 dBA during the night time. Noise levels in suburban districts may reach up to an average of 55 dBA during the daytime due to noise sources from socialising activities including vehicle movement, trading activities at the local markets, sounds made by livestock (including cattle, poultry etc.) and domestic animals (e.g. dogs).

Some of the surrounding noise sensitive receptor (residential) areas include:

- Sepharane in the proposed project boundary;
- Ditlotswana approximately 0.5 km to the east;
- Rooival approximately 3 km to the north east;
- Ramorulane approximately 3.5 km to the south and
- Pudia approximately 1.5 km to the northwest.

13.1.16 Cultural Heritage

13.1.16.1 <u>Geology and Palaeontological Sensitivity</u>²

Considering the regional geology and palaeontological sensitivity discussed above, the site specific study area has largely no significance. However, a small area with high palaeontological sensitivity is located in the south-western part of the study area. This area has expressions of the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup, dated to between ~2600 Ma and ~2000 Ma.

However, this area is located 2.5 km from the proposed infrastructure development area and is highly unlikely to be affected. Although this area is located outside the infrastructure footprint, the presence of Malmani dolomites is associated with the more extensive Makapan Valley karst landscape. However this is outside of the protected area.

13.1.16.2 <u>Stone Age</u>

The Stone Age is intimately linked with the geological and hydrological features of the landscape. Geologically, raw material for stone tool production is readily available throughout the landscape. Identified lithics from the reconnaissance of the project area are defined as comprising of fine grained Felsic tuff with quarts and feldspar crystals (pers.

² This section was compiled by Johan Nel based on literature cited in text and palaeontological information obtained from the SAHRIS. The content was reviewed by Megan Edwards (*Digby Wells Geologist*).



comm. Megan Edwards, 16 January 2015). This raw material originates from the greenstone belt. These heritage resources are presented in Table 13-23 below.

Lithic scatters and isolated finds associated with the MSA have been reported throughout the landscape. Based on our understanding of the geo-hydrological process associated with the Mogalakwena River and its tributaries, the reported distribution of lithics are expected, as demonstrated in the discussion of the Makapan Valley WHS above. Natural processes of progradation, aggradation and sedimentation of the Mogalakwena River result in the transportation of sediments including lithic material. These lithics are often identified in isolation and outside of discernible context, therefore providing limited scientific information beyond form, function and technique of manufacture.

13.1.16.3 Farming Community

Ceramic sherds and stone walled settlements were identified during the scoping survey of the project area, as well as in several archaeology and heritage studies previously completed in the region. The ceramics provide evidence of Iron Age settlement from at least the 17th century CE continuing to the 19th century CE. This is consistent with the regional study area discussion above. In addition, stonewalled sites were also identified in the scoping survey and in reports. The combination of the various ceramic facies and types of stonewalled sites provide evidence of long-term occupation by Kekana and Langa Northern Ndebele as well as other groups.

13.1.16.4 <u>Historic Period</u>

There is sufficient evidence that prove continuity from Iron Age settlement into the historic period, and the division must be understood as largely artificial.

The site-specific study area is located within the historic Bakenberg Location, also known as the Hendrik Masibi Location, one of the three chiefdoms described above. The area is at present under the Bakenberg Tribal Authority's jurisdiction. The scoping survey, historical aerial images and previously completed assessment studies have provided evidence for several archaeological and historic stonewalled sites within the study area. This includes Hendrik Masibi's historic early 20th century capital that was indicated during the scoping survey.

Previously completed heritage studies have investigated sites associated with the history of the Langa in the study area. These sites include Malokong Hill situated on the eastern border of the project area where a large stone walled settlement was identified. The settlement type conforms to a typical Nguni settlement pattern associated with the Moor Park cluster. The Mabusela clan occupied the area throughout living memory, first settling at the highest point of the hill for security expanding the settlement over five stages. This site was verified during the scoping survey and was noted in historical aerial imagery dating from 1953 through to 2012.

The Bakenberg Tribe has initiated a land claim on several properties within the site-specific and local study areas.



13.1.16.5 <u>Scoping Survey Findings</u>

The scoping survey found that the western portion of the Malokong Hill has been disturbed through granite mining activities. According to a Masters dissertation, the mining has resulted in negative heritage and social impacts experienced by the Rooivaal and Malokong community.

Table 13-23 provides a summarised list and description of tangible heritage resources that were identified during the scoping survey. These findings are not exhaustive, but provide a representative sample of tangible resources likely to be affected by the project. Site location details are not provided, but kept on record by Digby Wells and SAHRIS.

Please refer to Appendix 9 for the full Heritage Scoping Report.



Description Site number Site type Images /Ft/001-003 Surface Scattered surface occurrences of Middle Stone occurrence Age (MSA) stone tools can be found spread across the flat areas of the Project area i.e. proposed opencast pit and waste rock dump areas. The tools include blades, points, scrapers and cores. Figure 13-9: MSA lithics recorded in the Project area

Table 13-23: Identified Heritage Resources within the Project area



Site number	Site type	Description	Images
/Ste/004	Iron Age settlement	A circular stone walled structure (± 15 m in diameter) was identified in close proximity to the closed granite quarry within the proposed TSF area. It is assumed that there may have once been more stone walls, but that have since been damaged and destroyed as a result of the quarrying. Decorated pottery possibly attributed to the <i>Uitkomst</i> <i>facies</i> were identified within the stone walls (See Figure 13-11).	<image/> <image/> <image/>



Site number	Site type	Description	Images
/Ft/005	Surface occurrence	A single decorated ceramic potsherd (as shown in Figure 13-12) was found at the base of a small koppie (See Figure 13-13) within the proposed plant area. The decorations can be characterised as <i>Uitkomst.</i>	<image/> <caption><caption></caption></caption>



Site number	Site type	Description	Images
/Ste/006	Iron Age structure	A small shelter with a single undiagnostic potsherd was identified on the east side of the hill (See Figure 13-14). Stone walling is present behind the shelter (See Figure 13-15).	
			Figure 13-14: Small shelter with undiagnostic ceramic potsherd found at Ste/006
			Figure 13-15: Walling behind the shelter



Site number	Site type	Description	Images
/Ft/007	Feature	A man-made rock pool was identified on the eastern side of the hill (See Figure 13-16). A number of natural springs and drainage lines can be found flowing down the slopes of the hill, and it is assumed that these rock pools were constructed to collect the water during the rainy season. These rock pools may still be in use today, for both drinking water and ritual purposes.	Figure 13-16: Rock pool at the base of the hill found at Ste/007



Site number	Site type	Description	Images
/Ste/008	Iron Age settlement	A stone walled settlement stretching 800 m north from 008 to an existing contemporary settlement. The stone walls consist of circular structures, passageways, rectangular structures and terraces (See Figure 13-17). The settlement is scattered with surface occurrences of ceramic potsherds and decorated potsherds (See Figure 13-18).	<image/> <image/>



Site number	Site type	Description	Images
/Ft/009	Surface occurrence	A decorated lug fragment was identified in a recently dug up area. The lug has an incised triangle on the handle with parallel lines within the triangle. Incised parallel lines are present where the handle meets the pot surface.	
			Figure 13-19: Decorated lug found at Ste/009
			Figure 13-20: Side profile of the lug fragment
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Site number	Site type	Description	Images
/BGG/010	Grave	The grave of Johannes Seleka Lamola (1840-1920) (See Figure 13-21) was identified within the stone walled settlement (Ste/008) referred to above. The grave is located on the eastern side of the hill, approximately 100 m from the gravel road.	Figure 13-21: Grave of Johannes Seleka Lamola at BGG/010

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Site number	Site type	Description	Images
/Ste/011	Iron Age structure	A stone walled enclosure set against large boulders on the western side of the hill (See Figure 13-22). The enclosure measured approximately 10 m in diameter. Approximately 20 m north of the stone enclosure, a rock pool is present (See Figure 13-23). This is similar to the rock pool on the eastern side of the hill (Refer to Figure 13-16), however this one is not as overgrown as the other.	<image/> <image/>



13.2 Description of the Current Land Uses

The majority of the local study area is owned by the Government of the Republic of South Africa, but is identified as indigenous/traditional land. This means that the Traditional Authorities (TA) have jurisdiction over the land and holds the land in trust for its people. Individuals residing in households located on this land are therefore not title deed holders or owners of their plots of land but have been given Permission to Occupy by either the headman or the chief. The Bakenberg TA is headed by Khoshi L.P Langa who presides over large areas of the local study area, including the area that will likely be affected by the project. The settlements administered by this TA include:

Table 13-24: Jurisdiction of Bakenberg TA

Table 13-25 provides an overview of the farms comprising the site-specific study area as well as the land-use activities on each farm. The table also indicates which properties will coincide with the proposed infrastructure (i.e. directly affected) as well as the properties that could possibly be indirectly affected by the project, these properties include the farm portions neighbouring the directly affected properties.

Major land uses within the site-specific study area include residential, agricultural and grazing uses; land that overlaps with the project footprint is mostly used for subsistence agriculture, grazing of livestock, and collection of natural resources such as firewood, medicinal plants and building materials.

Residential land use within the study area is limited to sections of the Sepharane, Mosate, and Ditlotswana communities as well as two smaller rural settlements. Although the proposed project infrastructure does not overlap with any of the aforementioned residential areas, various infrastructure options do encroach to within 500m buffer of residential use.



Agricultural activities within the project site include commercial and subsistence maize farming as well as livestock grazing. Commercial farming is concentrated within the south-western section of the project site on the farm Bellevue 808. Subsistence farming is practiced throughout the study area. Livestock, mostly cattle, goat and sheep, are also kept on a subsistence level and are grazed in communal grazing areas situated on the farms on which the proposed infrastructure will be located. The right to use these areas for grazing purposes are exclusively allocated to households who reside within the jurisdiction of the Bakenberg TA.

Infrastructure within the study area includes formal and informal dwellings, buildings used for business purposes (e.g. commercial farming infrastructure), privately owned service infrastructure (e.g. boreholes, pivot irrigation systems, and dams), public infrastructure (e.g. roads) and grave sites. Roads within the project site include both tarred and gravel roads; the majority of these roads are in a deteriorated condition due to lack of maintenance and become unusable after heavy rains. An inactive granite quarry is situated on a hill within the Vliegekraal property.

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Table 13-25: Farm Portions and Land Uses

	Project components (D-Directly affected; N-Not affected)				Land Use						Occupants			Structures					
Farm	Portion	Plant	Tailings facili	Minning pits	Mining nito	Rock dump	Waste	Residential	Heritage sit (graves/initia	Governmen (roads)	Cultivation (S -subsisten commercial)	Grazing (ca: goat)	Use of natu resources (medicinal pla building mat	Landowner households	Communitie	Potentially households	Formal resi	Informal res	Business (e warehouses workshops, t buildings)
			ity	Option 1	Option 2	Option 1	Option 2		es ıtion sites)	t use	ce; C-	ttle, sheep&	ral firewood, ants, water, erials)		ŭ	vulnerable ³	dential	idential	.g. , offices, 'arm
Vriesland 781	RE	D	D	D	D		D	Х	Х	Х		Х	Х		Ditlotswana, Sepharane	Х	Х	Х	
Vliegkraal 783	RE		D	D		D		х	Х	Х	S	Х	Х		Mosate, Basogadi, & Mothoathoase	Х	Х	Х	
Schoonoord 786	RE							Х			S	Х	Х		Sepharane	Х	Х	Х	
	RE/1									Х		Х	Х		Sepharane	Х	Х	Х	Х
	RE/2										С	Х	W						Х
Polloviuo 909	3										С	Х	W						
Dellevue ouo	4							Х			С		W	Х			Х		Х
	5							Х			С	Х	W	Х			Х		Х
	6							Х			S	Х			Sepharane	Х		Х	
Inhambane 802	RE										S	Х							
Groningen 779	RE	Ν						Х	Х	Х	S	Х	Х		Ditlotswana, Unknown	Х	Х	Х	Х
Malokongskop 780	RE							Х		Х	S	Х	Х		Rooivaal, Unknown	Х	Х	Х	Х
Vogelstruisfontein 765	RE							Х	Х		S	Х	Х		Malokong	Х	Х	Х	Х
Molekong 794	1			Ν				Х			S	Х	Х		Malokong	Х	Х	Х	Х
IVIAIUKULIY / 04	RE							Х			S	Х	Х		Mosate	Х	Х	Х	Х

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		Project components (D-Directly affected; N-Not affected)					Land Use							Occupants			Stru	ictures	
Farm	Portion	Plant	Tailings facili	Mining pits		Waste Rock dump		Heritage site (graves/initiati Residential		Government (roads)	Cultivation (S-subsistem commercial)	Grazing (cat goat) Cultivation	Use of natu resources (t medicinal pla building mate	Landowner households	Communitie	Potentially v households	Formal resid	Informal res	Business (e warehouses, workshops, f buildings)
			ty	Option 1	Option 2	Option 1	Option 2		es tion sites)	t use	ce; C -	tle, sheep&	ral irewood, ants, water, erials)		ŭ	/ulnerable ³	dential	idential	.g. offices, arm
Hellem Bricksteen 761	RE							Х		Х	S	Х			Mosate	Х	Х	Х	Х



13.2.1 Land Claims

The Restitution of Land Rights Act, 1994 (Act No. 22 of 1994) allows individuals or groups to claim land, from which they were previously dispossessed after 19 June 1913 under the apartheid regime. Claimants were given until 31 December 1998 to register a claim in terms of the Restitution of Land Rights Act. During this period approximately 80 000 claims were lodged throughout South Africa.

The Regional Land Claims Commissioner is responsible to verify the rightful claimant, validity of the claim, identify the beneficiaries and determine the extent of the land claim. This is the research stage of the claim. Once this has been completed, the claim is gazetted and therefore development on the land is at risk the claim is settled. This therefore has development implications for existing land owners and surface or mineral rights holders as further development on land, which has a land claim is a risk.

According to the Mogalakwena IDP (2011/2012) 41% of land within the municipal area is subjected to land claims, which is resulting in restrictions in terms of spatial development (MLM, 2011). A land claims enquiry on the farms within the project site showed that there were claims on the Vogelstruisfontein 765 LR, Schoonoord 786 LR and Bellevue 808 LR (Table 13-26).

Affected Property	Claimant				
Schoonoord 786 LR	Sebueng Community				
Schoonoord 786 LR	Bakenberg Tribe				
Bellevue 808 LR	Bakenberg Tribe				
Vogelstruisfontein 765 LR	Bakenberg Tribe				
Source: MLM, 2012; Department of Rural Development and Land Reform, 2011					

Table 13-26: Outstanding Land Claims

13.3 Description of Specific Environmental Features and Infrastructure on the Site

The site sensitivity analysis identified the following biophysical and social features and/or infrastructure on the project site.

13.3.1 Rivers and Wetlands

The Mogalakwena River, which is a tributary to the Limpopo River, flows through the western portion of the project site and flows towards the north into the Limpopo River. The Sterk River also traverses the project area west of the Mogalakwena River. The Sterk River is a tributary to the Mogalakwena River. A non-perennial stream, namely Borobela flows along the eastern side of the Mogalakwena River, and flows towards the west, feeding into the Mogalakwena River. The project site is also characterised by a number of drainage lines



which drain into these main rivers/streams. The affected project area, where proposed infrastructure has been proposed, is placed away from these main rivers and drainage lines.

At a desktop level, several NFEPA wetlands have been identified and occur primarily within the southern section of the project site. Wetland features have been identified within the project affected area. These features will be assessed and delineated during the EIA phase.

13.3.2 Terrestrial Landscape and Habitat

The project site is characterised by rocky outcrops along its eastern boundary. Rocky ridges are defined as landscape features with a slope of 5° or more such as hills, koppies, gorges and kloofs. Ridges are important for the conservation of biodiversity as they have a high propensity for the occurrence of plant and animal species of special concern. Furthermore, they serve as wildlife corridors in highly developed areas. The project affected area is situated in close proximity to these features; however a 200 m buffer has been applied to avoid these features.

13.3.3 Cultural Heritage

The project site and larger area is considered to be culturally sensitive. Karst geology in the project area has the potential to contain bodies of breccia, sandstone and siltstone which can include diverse animal bone fragments including hominid remains and tools.

Stone Age artefacts have been recorded throughout the landscape within which the project is situated. Through our understanding of the geo-hydrological processes of the landscape, specifically the Mogalakwena River and its tributaries, it is expected that stone tools will be exposed within these water courses and erosion gullies.

Ceramic sherds and stone walled settlements were identified during the reconnaissance of the project site. These artefacts are associated with the Iron Age and Historical Period of the region. Furthermore, the numerous hills (as identified above) within the region are known to contain several historic Langa settlements, including Segopa, Magope, Fothane, Matlhogo and Ditlotswane. These sites are intricately associated with the historical events within the region, including the 1854 Siege of Makapan and subsequent socio-political history and establishment of locations.

In addition, agricultural fields are often used as burial sites for the surrounding communities. The project affected area does overlap with land used for agricultural purposes.

13.3.4 Infrastructure

The closest settlement to the project site is Ditlotswana. There are no known settlements to occur within the project affected area, however there is a potential for individual households to occur within this area. A vast majority of the project site is used as communal grazing land; as such there may be fences and gates demarcating these fields.

Furthermore, the provincial road (D3534) runs to the east of the project affected area.



13.4 Environmental and Current Land Use Map

The environmental and current land use features have been illustrated in Plans 6 to 15 in Appendix 5.



14 Item 2(h)(v): Impacts Identified

Impact identification is performed by determining the potential source, possible pathways and receptors. In essence the potential for any change to a resource or receptor (i.e. environmental aspect) brought about by the presence of a project component or by a project-related activity has been identified as a potential impact. This section discusses those potential impacts associated with the proposed project activities and considers those potential impacts as identified by I&APs. Refer to Appendix 7 (7) for the complete Comments and Response Report.

Refer to Table 14-1. The significance, probability and duration of these potential impacts will be assessed as part of the EIA phase once detailed specialist feedback is provided on the sensitivity of the receiving environment.

Table 14-2 lists the potential project risks, these risks will not be assessed as part of the EIA. These risks will be assessed as part of a larger project risk assessment, prior to mine development.

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Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Pro
Soil	Stripping, stockpiling topsoils and subsoils	Soil erosion and loss of topsoil material resulting in loss of fertility and soil functioning.	Construction, Operati
	Open pit development	Loss of land capability for agricultural use, grazing and other uses	Construction and Ope
	Development of infrastructure (i.e. haul roads, concentrator plant)	Soil compaction of the ground will increase surface water run-off thus increasing the potential for soil erosion.	Construction and Ope
Surface Water	Removal of vegetation and construction of infrastructure (i.e. haul roads, concentrator plant)	Increase in surface water run-off which may cause erosion and ultimately the sedimentation of nearby streams/rivers.	Construction
	Stockpiling topsoils and subsoils	Wind and water erosion that may potentially result in sedimentation of nearby streams/rivers.	Construction and Ope
	Blasting	Release of nitrates from explosives may contaminate surface water run- off reducing the overall quality of surface water resources.	Operation
Groundwater	Pit dewatering	Potential contamination of groundwater by trace elements such as Mercury (Hg) and Arsenic (As).	Construction ar Decommissioning
	Development of infrastructure (i.e. haul roads, concentrator plant)	Potential reduction of water quality for human consumption (High TDS, EC, CI and Na concentrations).	Construction, Operati
	Project water consumption	Potential reduction of water quantity available for domestic use.	Construction and Ope
	Development of WRD, pollution control dam and tailings dam	Potential seepage and contamination of trace elements.	Operation, Decommis
Air Quality	Soil stripping, blasting, hauling, ore crushing and conveying	Increase in dust emissions (PM_{10} , $PM_{2.5}$ and TSP) thus reducing the ambient air quality of surrounding communities.	Construction, Operati
	Use of vehicles and machinery (e.g. haul trucks, diesel generators)	Increase in NO_x and SO_2 and PM_{10} thus reducing the ambient air quality of surrounding communities.	Construction, Operati
Flora and Fauna	Vegetation removal	Loss of floral species and destruction of faunal habitat, including medicinal plants.	Construction
	Development of infrastructure (i.e. haul roads, concentrator plant)	Disturbance to faunal species through noise, vibration and light (at night)	Construction and Ope
	Rehabilitation	In-migration of faunal species into the project area (Positive impact) Increased occurrence of invader plant species.	Decommissioning and
Wetlands	Development of infrastructure (i.e. haul roads, concentrator plant) and open pit mining	Loss of wetland habitat thus resulting in desiccation of water resources which may have a negative impact on faunal and floral species	Construction, Operati



Project Phase
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Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Pro
		dependent on the wetland.	
Aquatic Ecology	Development of infrastructure (i.e. haul roads, concentrator plant)	Stream crossings for linear infrastructure may result in damage to stream beds thus resulting in sedimentation which deteriorates the overall quality of water for aquatic ecology.	Construction and Op
	Development of WRD and tailings dam	Potential for oxidative stress in fish and the threat of bioaccumulation of magnetite in the tissues of exposed fish may pose health impacts to people.	Operation, Decommi
Economy	Project capital expenditure	Increase in production and GDP-R of the national and local economies (Positive Impact).	Construction and Op
		Increase in government revenue due to investment (Positive Impact).	
		Benefits derived from investment by the mine into the local economic development projects (Positive Impact).	
	Direct and indirect employment	Skills development due to the creation of new employment opportunities (Positive Impact).	Construction and Op
		Improved standard of living of households directly or indirectly benefiting from created employment opportunities (Positive Impact).	
	Mine development	Potential impact on current economic activities within the directly affected environment (i.e. tourism or other identified economic activity that may be sensitive to the proposed development).	Construction, Operat
		Added pressure on government to provide basic services and social and economic infrastructure.	
		Impact on property and land values in the surrounding area.	
Social	Mine development	Loss of agricultural, grazing or collection of natural resources; loss of this land/resources will result in economic displacement.	Pre-construction
	Use of existing access roads and provincial roads for hauling material	Disruption of daily movement of surrounding communities.	Construction and Op
	Employment	It is possible that conflict might arise between the newcomers (due to population influx) and local residents.	Construction, Operat
		An influx of job-seekers may also lead to an increase in various social pathologies, such as drug and alcohol abuse and domestic violence.	
Community Health	Water management	Surface water run-off reporting to the surrounding streams may potentially be impacted on by a High TDS, EC, CI and Na concentrations). These trace elements may have a resulting impact on	Construction and Op



Project Phase
Operation
missioning and Post-Closure
Operation
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Operation

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Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Pro
		aquatic ecology and people who either use the water for domestic purposes or fish within these streams.	
		Water borne diseases such as cholera, diarrhoea, and typhoid may potentially occur.	
	Employment	Overcrowding, due to influx of people may result in an increase in the prevalence of respiratory diseases in the proposed project area increasing prevalence of respiratory health outcomes, including TB, which is likely to be influenced by housing issues, such as overcrowding. Population influx issues may result in potential rises in STIs including HIV/AIDS.	Construction and Op
		The high density population/influx of people from periphery areas seeking employment on the mine, leading to increased inability of the existing health services to cope.	
	Development and operation of infrastructure (i.e. haul roads, concentrator plant)	Exposure to potentially high noise levels. There is sufficient evidence that noise may cause adverse health effects such as cardiovascular effects. Epidemiology studies have found associations between immune and psychiatric effects and noise exposure.	Construction and Op
	Development and operation of infrastructure (i.e. haul roads, concentrator plant)	Exposure to potentially hazardous materials and resulting malodours may potential may potentially result in respiratory illnesses.	Construction and Op
Cultural Heritage	Development of infrastructure (i.e. haul roads, concentrator plant)	This activity may cause damage to or destroy any physical heritage resources that may be present within the project footprint areas.	Construction, Operat
Visual	Open pit, WRD, tailings dam, stockpiles	Change of the visual landscape will impact the sense of place/perceptions which has a resulting impact on surrounding receptors including road users and nearby communities such as Bakenberg.	Construction, Operat
Traffic	Use of existing access roads and provincial roads for hauling material	Additional traffic and particularly heavy duty vehicles on the existing road network may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	Construction and Op
Noise/Vibration	Development of infrastructure (i.e. haul roads, concentrator plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	Construction, Operat
	Blasting	Potential damage to structures through vibration.	Construction and Op

Table 14-2: Identified Project Risks

Potential Project Risk (Unplanned Occurrences)	Aspect Potentially Impacted	Pr
		1



Project Phase
Operation
Operation
Operation
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Potential Project Risk (Unplanned Occurrences)	Aspect Potentially Impacted	Pr
Hydrocarbon spill from vehicles and machinery or hazardous materials or waste storage facilities	Soil and water resources which would have a resulting impact on ecological and social systems	Construction, Opera
Spills/leaks from pipelines, tailings dam, hazardous materials or waste storage facilities	Soil and water resources would have a resulting impact on ecological and social systems	Construction, Opera
Mine flooding due to no dewatering	Surface and groundwater resources would have a resulting impact on ecological and social systems	Decommissioning a
Safety risk from blasting, heavy vehicle traffic, open pit mining, crushing plant.	Mine workers and surrounding communities	Construction, Opera
Fire and explosions	Mine workers and surrounding communities	Construction, Opera



Project Phase

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15 Item 2(h)(vi): Methodology used in Determining the Significance of the Environmental Impacts

The significance probability and duration of the aforementioned potential project impacts will be assessed as part of the EIA phase. These identified impacts will be revised based on inputs by I&APs, to be obtained during the consultation process.

Refer to Section 16.4 for the complete impact assessment methodology that will be used to determine the significance of the potential project impacts, as identified.

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16 Item 2(h)(vii): Positive and Negative Impacts that the Proposed Activity (in terms of the initial site layout) and Alternatives will have on the Environment and the Community that may be Affected

The site layout alternatives were identified based on a site sensitivity analysis as described in Section 9. The original site layout considered the footprints of the tailings dam, WRD and concentrator plant. A comparison of these layouts is presented in the sections that follow: These layout options do consider the inputs provided by I&APs during the consultation process.

16.1.1 Tailings Dam

The tailings dam was originally positioned along the eastern boundary of the open pit 1. The new position of the tailings dam is to the west of open pit 2, on the opposite side of the D4380 Provincial Road. This revised layout will avoid the following sensitivities identified during the site sensitivity analysis:

- Rocky ridges are defined as landscape features with a slope of 5° or more such as hills, koppies and gorges and kloofs. Ridges are important for the conservation of biodiversity as they have a high propensity for the occurrence of plant and animal SSC and they serve as wildlife corridors in highly developed areas. The eastern boundary of the tailings dam was located well within the 200m buffer of the rocky ridge. This has now been avoided through the revised site layout;
- Wetlands are defined according to the National Water Act, 1998 (Act No. 36 of 1998) (NWA) as: "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." The DWS have recommended a buffer of 100 m around all wetlands in South Africa, according to the NWA. The tailings dam was located over secondary drainage lines, this has now been avoided through the revised site layout and by reducing the total footprint of the tailings dam from 124 ha to 69 ha; and
- The numerous hills within the region are known to contain several historic Langa settlements, including Segopa, Magope, Fothane, Matlhogo and Ditlotswane. These sites are intricately associated with the historical events within the region, including the 1854 Siege of Makapan and subsequent socio-political history and establishment of locations. The original location of the tailings dam was located on these hills, which has now also been avoided through the revised site layout.



The revised layout of the tailings dam is therefore the preferred alternative based on the sensitivities avoided as well as the reduced footprint. This alternative will therefore be assessed further during the EIA phase.

There are also two process alternatives under consideration relating to the disposal of tailings material. The applicant is considering the use of paste thickeners which will result in the thickening of the tailings which will have several benefits when compared to conventional tailings thickening, these include:

- Reduction of water sent to the tailings dam by 50%, resulting in a significant overall reduction in water consumption;
- Due to the high solids content, results in a reduction of the area required for a tailings dam;
- Due to the fact that there is little free water in the tailings, seepage from the tailings dam is greatly reduced;
- Due to the reduction in slurry volume being deposited, there is a potential reduction in energy required for pumping; and
- Once deposited, the paste dries out similarly to conventional thickener underflow.

16.1.2 Waste Rock Dump

There were two options under consideration for the location of the WRD, separated by the D4380 Provincial Road. As per the original site layout map, waste rock dump option 1 is located to the north of the road and has an approximate 169 ha footprint. Waste rock dump option 2 is located to the south of the road and has an approximate 161 ha footprint. The revised layout aimed to avoid similar sensitivities as discussed above. From an ecological perspective, waste rock dump option 2 was located on a wetland, therefore WRD option 1 is considered more favourable. The total footprint of WRD option 1 is now approximately 243 ha. WRD option 1 will be considered further during the EIA phase.

16.1.3 Concentrator Plant

The original site layout of the concentrator plant traversed a secondary drainage line, a provincial road, in close proximity to production boreholes, used for drinking water and located close to the hills of cultural significance. The revised site layout illustrates that the concentrator plant has been shifted west and the footprint has been reduced from approximately 236 ha to approximately 62 ha. The drainage line, provincial road and hills of cultural significance have therefore been avoided. This revised site layout is therefore the preferred alternative and will be assessed further during the EIA phase.



17 Item 2h(viii): Possible Mitigation Measures that could be Applied and the Level of Risk

The table below presents a summary of the key issues raised by I&APs.

Category	Issue	#	%
Affected Villages	Villages that will be affected.	2	0.81%
Air Quality	How will dust and noise impact on communities and how will it this managed.	8	3.25%
Authorities	Pamish to liaise with local and district municipal structures to integrate with local development goals and plans.	5	2.03%
Biodiversity - Fauna	Impact on wild animals.	1	0.41%
Biodiversity - Flora	Impact on medicinal plants.	1	0.41%
Blasting	Impact on structures, increased dust and noise.	16	6.50%
Environmental Impact Assessment	General impact on environment, including climate change.	8	3.25%
Health and Safety	Increased trespassing on farms due to mine developments.	6	2.44%
Heritage - Graves	Will graves be protected and/ or relocated.	9	3.66%
Heritage - Intangible / Living	Will mining affect medicinal plants?	1	0.41%
Heritage - Sites	How will heritage sites be protected?	5	2.03%
Land Use	Impact on grazing, fields and other land uses.	17	6.91%
Mining Right	Agreements between Pamish and communities.	4	1.63%
Organisational Conduct / Ethics	Pamish company structure and agenda.	3	1.22%
Project Specific	Mining method and operations.	10	4.07%
Project Specific - Beneficiation	Product beneficiation to be undertaken locally.	2	0.81%

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Category	Issue	#	%
Project Specific - Life of Mine	Duration / extent of mining licence.	4	1.63%
Project Specific - Mining Area	Extent of operational mining area.	12	4.88%
Project Specific - Prospecting	Expansion of mine / additional prospecting.	7	2.85%
Public Participation	Records of meetings to be provided to DMR.	34	13.82%
Socio-Economic	Engage municipal managers during consultation.	4	1.63%
Socio-Economic - Community Development	How will communities benefit from mine?	33	13.41%
Socio-Economic - Employment	How will people be recruited?	21	8.54%
Socio-Economic - Resettlement	Will people need to be resettled?	6	2.44%
Socio-Economic - Training	Will Pamish provide training and skills development?	3	1.22%
Traditional Leadership / Community Representation	Breakdown in communication structures between Traditional Council and village leaderships / communities.	9	3.66%
Water	Water rights and requirements.	8	3.25%
Water - Ground Water	Abstraction and pollution.	1	0.41%
Water - Water Quality	Impacts on water quality.	6	2.44%
		246	100.00%

Detailed mitigation measures will be proposed for each identified issue as part of the EMPr to compiled during the EIA Phase. Please refer to Table 21-10 for the high level mitigation measures that will be considered to avoid, reduce and/or manage potential impacts.

The revised site layout does however take into consideration both biophysical and socioeconomic sensitivities as highlighted above and as discussed in Section 9.



18 Item 2h(x): Outcome of the Site Selection Matrix and Final Layout Plan

All environmental and social sensitivities have been avoided; however the open pit is positioned on a drainage line. This cannot be avoided due to the position of the mineral resource.

The revised site layout is attached as Plan 3 in Appendix 4. The revised site layout does consider inputs from I&APs as identified in Section 17.



19 Item 2h(x): Motivation where no Alternatives Sites were considered

In terms of mining, alternative sites (i.e. locations) were not considered as the location of the mineral resource determines the location of the mining operation. However, alternative site layouts have been considered as discussed earlier.



20 Item 2h(xi): Statement Motivating the Preferred Site

The preferred site layout has been selected based on the following motivating factors:

- The new layout of the tailings dam avoids the rocky ridges, wetlands and hills of cultural significance located to the east of the project site. Furthermore, the footprint of the tailings dam has been reduced from 124 ha to 69 ha;
- The new layout of the WRD avoids a wetland area;
- The new layout of the concentrator plant avoids the D3534 provincial road, a secondary drainage line and the hills of cultural significance. Furthermore, the footprint of the plant has been reduced to 62 ha. The concentrator plant has also moved away from the nearest community, namely Ditlotswana.



21 Item 2(i): Plan of Study for the Environmental Impact Assessment Process

21.1 Item 2(i)(i): Description of Alternatives to be Considered including the Option of Not Going Ahead with the Activity

The following alternatives will be considered during the EIA phase.

21.1.1 Site Layout

The preferred site layout, as presented under Section 18 will be assessed in detail. This will include the new and revised position of the WRD, concentrator plant and tailings dam as well as their associated footprints.

21.1.2 Technology/Process Alternative

The use of paste thickeners for the tailings material is considered to be the preferred method for depositing tailings, due to all the benefits, as described earlier. The feasibility of this alternative as it applies to the project will however be assessed further during the EIA process.

21.1.3 No-Go Option

The no-go or do nothing option means that the status quo would be maintained. All potential impacts are assessed against the current biophysical and socio-economic baseline; therefore all identified alternatives are assessed against the no-go option.

This alternative would mean that the project site would remain as is, covered by vegetation and used as agricultural and grazing land by the Bakenburg Tribal Authority. This no mining alternative would mean that the project would not go ahead and as a result any potential impacts associated with the project and its alternatives would not occur.

21.2 Item 2(i)(ii): Description of the Aspects to be Assessed as part of the Environmental Impact Assessment Process

The following aspects of the project will be assessed as part of the EIA phase:

- Site clearance and vegetation removal;
- Change of land-use;
- Topsoil removal and stockpiling;
- Development and use of access roads and regional roads;
- Water abstraction and use;
- Infrastructure such as channels, bridges, dams, office and workshop;



- Development of two open pits including blasting;
- Development of waste rock dump;
- Concentrator plant;
- Conveyor belts;
- Tailings dam;
- Pollution control dam, water storage dam and associated pipelines;
- Storage of fuels, process concentrate, maintenance/workshop oils;
- Waste generation, storage and disposal (hazardous and general);
- Product storage (magnetite concentrate);
- Employment and capital expenditure; and
- Rehabilitation of project site.

21.3 Item 2(i)(iii): Description of Aspects to be Assessed by Specialists

A full suite of specialist studies will be undertaken to support the EIA phase, refer to Table 21-1 for a list of the specialist team and their qualifications.

Specialist Study	Name of Specialist	Qualifications
Flora	Crystal Rowe (Digby Wells)	Bachelor of Science and Honours in Botany
Fauna (including avi-fauna)	James Coetzee (Digby Wells)	Diploma in Nature Conservation
		Cert Sci Nat
Aquatics	Russell Tate (Digby Wells)	MSc Zoology Aquatic Ecotoxicology
Soils and Land Capability	Hendrik Smith (Digby Wells)	PhD (Interdisciplinary)
Wetlands	Caroline Wallington (Digby Wells)	BSc Honours in Botany
Hydrology	Lucas Smith (Digby Wells)	MSc (Geohydrology)
Hydrogeology	Robel Grebrekristos (Digby Wells)	PhD in Hydrogeology
Air Quality	Matthew Ojelede (Digby Wells)	MSc Environmental Science

Table 21-1: Specialist Team and Qualifications

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Traffic and Safety	Phillip De Wet (Aurecon)	Masters in Town and Regional Planning
Noise	Lukas Sadler (Digby Wells)	BCom Environmental Management
Blasting and Vibration	Danie Zeeman (Blast Management Consulting)	Dip Explosives Technology Higher Dip Explosives Technology BA Degree Member: International Society of Explosives Engineers
Greenhouse Gas Assessment	Marcelle Radyn (Digby Wells)	BSc(Hons) Environmental Management
Rehabilitation	Brett Coutts (Digby Wells)	BSc (Hons) Ecology
Closure Costs	Renee van Aardt (Digby Wells)	BSc (Hons) Ecology
Social	Nic Boersema (Digby Wells)	MA Anthropology
Stakeholder Engagement	Nestus Bredenhann (Digby Wells)	BCom (Hons) (Communication Management),
Heritage	Johan Nel (Digby Wells)	
		BA (Hons) Accredited member of the Association of Southern African Professional Archaeologists (ASAPA) and the International Council on Monuments and Sites (ICOMOS) South Africa
Health	Natasha Taylor Meyer (Digby Wells)	BA (Hons) Accredited member of the Association of Southern African Professional Archaeologists (ASAPA) and the International Council on Monuments and Sites (ICOMOS) South Africa MSc. (Medicine Virology)
Health Macro-Economic Assessment	Natasha Taylor Meyer (Digby Wells) Elena Broughton (Urban-Econ)	BA (Hons) Accredited member of the Association of Southern African Professional Archaeologists (ASAPA) and the International Council on Monuments and Sites (ICOMOS) South Africa MSc. (Medicine Virology) MSc (Technology Management)

The specialist methodologies for their respective studies are presented below with a brief methodology on the approach.



21.3.1 Soil

Baseline soil information was obtained using published South African Land Type Data. Land type data for the project site was available from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006).

A field survey will be undertaken to determine the soil characteristics of the project site. The project site will be traversed by vehicle and on foot. A hand soil auger will be used to determine the soil type and depth. The soil will be hand augured to the first restricting layer or 1.5 m depth. Soil survey positions will be recorded as waypoints using a handheld GPS. Landscape features such as existing open trenches (if any) will used to determine soil types and depth. The soil forms (types of soil) found in the landscape will be identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification working group, 1991).

The topsoil (0-300 mm) and subsoil (300 - 600 mm) of the dominant soil forms will be sampled. Samples will be analysed for soil acidity and fertility indicators as follows:

- pH (water);
- Extractable cations such as Na, K, Ca, Mg;
- Cation Exchange Capacity (CEC);
- Carbon content; and
- Phosphorus (Bray1).

21.3.2 Surface Water

The objective of the surface water assessment is to further evaluate the identified impacts and mitigation measures to prevent/reduce the identified potential water quality and quantity impacts to the Borabela River, Mogalakwena River and Sterkrivier. Surface water quality and quantity may potentially be impacted on from the proposed open pits, associated surface infrastructure namely, WRDs, topsoil strip stockpiles, pollution control dams, proposed roads and conveyors. There may also be disturbance to drainage lines around the proposed pit activities.

The following methodology will be followed to undertake the surface water assessment.

21.3.2.1 Baseline Description

A further desktop hydrology assessment will be conducted to update the surface water quantity baseline description including the description of the affected catchments, the streamflow and modelled flood peak flows (1:50 and 1:100 year floods) for the delineated sub-catchments.



21.3.2.2 Impact Assessment and Reporting

Detailed impacts on the quality and quantity of water in the Borabela River, Mogalakwena River, Sterkrivier and on the identified drainage lines will further be assessed based on the project description and the associated mining activities. Once impacts have been defined, the impacts will be assessed through a rating process that utilises the probability of an event occurring and the severity of the impact, amongst other factors to determine the significance of a particular environmental risk.

Mitigation measures to prevent/reduce the identified potential surface water impacts over the LoM will be developed together with a surface water monitoring plan prepared in line with the department of Water and Sanitation (DWS) Best Practice Guidelines number 3 (BPG 3): Water quality monitoring. This will indicate the up and down-stream points to be monitored and the frequency of monitoring as well.

A conceptual Storm Water Management Plan (SWMP) as prescribed by the Best Practice Guideline (BPG) G1: Storm Water Management (DWS, 2006) will be prepared. Clean and dirty areas contributing to runoff will be delineated based on the final infrastructure layout plans and site specific hydrological assessments to determine volumes that require to be handled.

21.3.3 Groundwater

The groundwater specialist study phase will involve a number of tasks, which are explained in detail below. Conducting these tasks will assist in defining the underlying aquifer systems in detail and to define potential impacts on the aquifers, but also groundwater users in the area.

21.3.3.1 Geophysical Survey

A ground geophysical survey will be conducted to delineate weathered zones and vertical to sub-vertical geological structures underlying the project site. The geophysical survey will be used to position the proposed new groundwater drilling sites, in combination with remote sensing lineament analysis and review of all existing geological exploration data. A ground geophysical survey (electromagnetic and magnetics) would be employed to delineate fractures, dykes, weathered zones and identify possible linear structures that could act as preferred groundwater flow paths or barriers.

21.3.3.2 Drilling Programme

The drilling programme will be performed using the rotary air percussion method with initial drilling performed at a diameter of 165 mm inner diameter and reamed or enlarged to 203 mm if high yielding boreholes are intercepted.

The depth for characterisation boreholes is dependent on the depth of the proposed open pit. The method of construction for the characterization boreholes is based on previous experience of drilling in similar lithologies to similar depths.



A minimum of six characterisation boreholes are recommended and will be drilled in relatively close proximity to the proposed mining infrastructure areas. They will primarily be used for aquifer characterisation, such as rock permeability evaluation. They can also be used as monitoring boreholes for the mine operational and post closure phase.

An additional three boreholes are proposed to be drilled at the proposed tailings dam site with maximum depth of 40 to 60 m, if required.

21.3.3.3 <u>Aquifer Testing</u>

It is important that the most strategic and successful boreholes drilled during this investigation be aquifer tested to determine aquifer responses and to calculate the parameters presenting the aquifer hydro-dynamics underlying the investigation area. Boreholes selected for aquifer testing will undergo a calibration test prior to conducting the constant discharge tests. The aquifer test analysis will be conducted using the FC programme and Aquifer Test Pro software. The aquifer parameter results calculated from these programmes will assist in accurate characterisation of the aquifers present at the project site and used as input parameters in the scenario modelling and dewatering design.

21.3.3.4 Groundwater Sampling

Water quality samples will be collected following each aquifer test and will be sent to an accredited laboratory in South Africa for chemical analysis.

21.3.3.5 <u>Conceptual Site Model</u>

The conceptual model aims to describe the groundwater environment in terms of the following:

- Aquifers these are rock units or open faults and fractures within rock units that are sufficiently permeable (effectively porous) to allow water flow;
- Interconnections between aquifers;
- Boundaries that result in the change or interruption of groundwater flow;
- Hydro stratigraphic units these are formations, parts of formations, or a group of formations displaying similar hydrologic characteristics that allow for a grouping into aquifers and associated confining layers;
- Precipitation, evapotranspiration;
- Runoff, groundwater head data which yields groundwater flow;
- Hydraulic parameters;
- Recharge and discharge areas, exchange of groundwater and surface water; and
- Hydro-chemical data including major ions and metals.



21.3.3.6 <u>Numerical Model</u>

Once the conceptual model is formulated, it will be transformed into a numerical model. The MODFLOW and MT3DMS numerical modelling packages will be used for this task. The numerical model is calibrated with the available geohydrological data and other mine data collected during the course of this investigation.

Scenarios will be simulated to assess the impacts of the project on the hydrogeological environment during all mining phases. The modelling approach will be as follows:

- Calibrate a steady state regional groundwater flow model (undisturbed by mining activities); and
- Transient model calibration, using time variant information to simulate mine water inflows and contaminant transport.

The simulation package Processing MODFLOW Pro (PMWIN Pro), Version 8.0 (Chiang, 2005) will be used to simulate groundwater flow. MODFLOW is a modular three-dimensional finite-difference groundwater model published by the U.S. Geological Survey.

MT3DMS will be used in conjunction with MODFLOW in a two-step flow and transport simulation .MT3DMS is a modular three-dimensional transport model for the simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems.

21.3.3.7 Impact Assessment and Reporting

A groundwater impact assessment report will be compiled and will include the following:

- Identification and quantification of impacts through the numerical modelling scenario's; and
- Development of proposed mitigation and management measures, including a groundwater monitoring programme.

21.3.4 Air Quality

The air quality impact assessment will be undertaken as follows:

21.3.4.1 Emissions Inventory

The establishment of an emissions inventory forms the basis for any air quality impact assessment. Air pollution emissions may typically be obtained using actual sampling at the point of emission, or estimating it from mass and energy balances or emission factors which have been established at other, similar operations. The method often adopted is the latter. Emission factors published by the US-EPA in its AP-42 document "Compilation of Air Pollution Emission Factors" and "Australian National Pollutant Inventory Emission Estimation Technique Manuals" will be utilised.



21.3.4.2 Dispersion Modelling

Potential emissions from the recycling process will be modelled to determine the ambient air quality concentrations using AERMOD. The AERMOD model is capable of providing ground level concentration estimates of various averaging times, for any number of meteorological and emission source configurations (point, area and volume sources for gaseous or particulate emissions), as well dust deposition estimates. Analysis of modelling results will clearly show:

- The predicted zones of maximum incremental ground level impacts;
- The zone of maximum predicted cumulative ground level impacts of identified pollutants;
- The impact assessment will be undertaken looking at the operations of the proposed mining;
- Evaluation of potential for human health and environmental impacts; and
- Evaluation of predicted air pollutant concentrations based on local ambient air quality standards and guidelines.

The result of the dispersion modelling will be contour maps presenting the results of the assessment. Comparison of the predicted concentrations will be made with the ambient monitoring data (if available) and air quality standards to determine compliance.

21.3.4.3 Impact Assessment and Reporting

Levels of pollutants and prevailing meteorological conditions relevant to the dispersal of pollutants will be incorporated with the predicted ground level concentration in assessing potential impacts to sensitive receptors in the vicinity of project. The anticipated impacts of the proposed project on the ambient air quality of the area will be evaluated in detail and discussed. Recommendations will be provided regarding the mitigation and management of the identified potential impacts.

21.3.5 Green House Gas (GHG) Assessment

The estimated GHG footprint for the project will be developed in accordance with the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) "GHG Protocol: Corporate Accounting and Reporting Standard" (2004). Even though the standard is intended to provide guidance on accounting for and reporting on GHG emissions at the organisational level, the standard can be applied to individual projects.

The GHG emissions will be calculated based on consumption of materials that contribute to climate change. The carbon footprint will take cognisance of Scope 1, 2 and 3 emissions, where practical. Definitions for the various scopes are given below (WBCSD/WRI, 2004):



- Scope 1 Direct GHG emissions: Carbon emissions occurring from sources that are owned or controlled by the company (e.g., emissions from combustion in owned or controlled boilers, furnaces and vehicles, process and fugitive emissions).
- Scope 2 Indirect electricity GHG emissions: Carbon emissions from the generation of purchased electricity, heat or steam consumed by the company.
- Scope 3 Other indirect GHG emissions: Carbon emissions which are a consequence of a company's activities, but occur from sources not owned or controlled by the company (e.g., the extraction and production of purchased materials; and employee travel to and from work).

These materials that will be considered include, but are not limited to, diesel, petrol, air conditioning gas, and process emissions. Consumption of these materials contributes to global GHG emission levels in various ways. Consumption estimates will be used to calculate the predicted GHG emissions once the project is operational. Once the potential GHG emissions are estimated, the potential risk to climate change will be assessed. This will include the consideration of the effect that climate change will have on the project.

The GHG emissions estimation will be carried out in the following steps:

21.3.5.1 Project Boundary

During this phase the project boundaries will be defined. The boundaries will include temporal, spatial, scope (in terms of scope 1, 2 and 3) and gas boundaries (GHGs that are relevant to the project). This phase will identify all components of the project that are material for the inclusion into the GHG estimations.

21.3.5.2 Data Collection and Assessment

Once the boundary is defined, data collection will commence. This will involve scrutinising the details of the project to identify the data required to estimate the potential GHG emissions. Data will be collected from secondary sources which include feasibility studies, scientific literature, manufacturer data sheets and industry standards.

21.3.5.3 GHG Emissions Calculation

Once the requisite data is sourced the calculations will be undertaken. The formulae will be based on the most up to date, relevant information available from sources such as the WRI, IPCC, World Bank and country specific studies. All calculations will result in a CO₂-e estimation that can be used to identify the most significant sources of GHG emissions.

21.3.5.4 <u>Climate Risk Assessment</u>

Once the GHG emission potential is quantified the project's potential to contribute to climate change can be determined. The climate risk assessment does however provide two points of view. Firstly it considers the potential contribution the project could have toward climate change, and secondly it looks at the potential impacts that climate change could have on the



project. The projects potential contribution toward climate change will be assessed by determining the radiative forcing change it could bring about. The risk of climate change to the project will assess changes in temperature, floodlines, weather events etc. and what this could mean for project planning.

21.3.5.5 Mitigation and Monitoring

The mitigation measures proposed will be both to reduce the projects GHG emissions as well as to prepare for the climate change scenarios that could be expected. Mitigation measures will be focused on the emission sources and climatic aspects that pose the most risk. The monitoring programme will be designed to measure the projects GHG emissions through secondary sources to determine whether it is increasing or decreasing from the status quo estimation.

21.3.6 Flora

The flora specialist study will involve a number of tasks, to identify potential sensitive vegetation habitats as well as SCC so that these can be avoided and/or trans located, if required. The flora survey will be completed in adherence to national and provincial legislation.

The potential impacts of the proposed mining development include direct impacts, such as the removal of habitat due to clearing, as well as indirect impacts, such as erosion, the establishment of alien plant species and habitat fragmentation.

21.3.6.1 Baseline Investigation

For vegetation, broad habitats will be defined using aerial imagery. . In addition, the following literature and databases will be used to generate expected species lists and to ascertain the likelihood of the presence of SSC on site:

- PRECIS (Pretoria Computerised Information System). This database provides taxonomic information for plant species occurring in southern Africa and follows the format of Germishuizen and Meyer, 2003. It is updated every two months and is supplied by SANBI. It is accessed on the Plants of Southern Africa (POSA) website;
- SIBIS: SABIF South African Biodiversity Information Facility established by the Department of Science and Technology (DST); and
- Threatened Species Programme (TSP) listing in collaboration with the National Botanical Institute (NBI)].

21.3.6.2 Field Investigation

A field investigation will be undertaken to identify the flora species, after which the sensitivity of the project site will be determined from a flora perspective. Impacts to flora will then be identified. The methodology for the field investigation will be stratified random sampling



where sample plots will be used to determine vegetation distribution in the field. The Braun-Blanquet floristic-sociological approach recognises units by the floristic composition and abundance. This methodology is easier and quicker to use than the alternative point-survey or wheel-point methodology, results in a reliable estimate of cover abundance and it is the most widely used approach for vegetation studies. The Braun-Blanquet method incorporates seven cover-abundance categories as listed in Table 21-2. A general species list will also be compiled from random traversing through the site.

Table 21-2: Braun-Blanquet Analysis Cover Abundance

Cover Abundance	Category
One or few individuals	r
Occasional and less than 5% of total plot area.	+
Abundant and with very low cover, or less abundant but higher cover; in any case less than 5% cover of total plot area.	1
Very abundant and less than 5%, or 5-25% cover, of a total plot area:	
• 2m – Very abundant	
 2a – 5-12.5 % cover, irrespective of number of individuals 	2
 2b – 12.5-25% cover, irrespective of number of individuals 	
25-50% covers of total plot area, irrespective of number of individuals.	3
50-75% cover of total plot area, irrespective of number of individuals	4
75-100% cover of total plot area, irrespective of number of individuals	5

21.3.6.3 Impact Assessment and Mitigation

The potential impacts of the development and operation of the proposed operation on the receiving natural areas within the project area will be assessed. The sensitivity of the natural environment (i.e. SSC) will be considered in rating the impacts. Mitigation measures will be identified, where feasible and practical to avoid potential impacts such as fragmentation. The study will result in a flora impact assessment report.

21.3.7 Fauna

The fauna specialist study will involve a number of tasks, to identify fauna habitats as well as fauna SCC so that these species can be considered in the design of the project (i.e. culverts



for small mammals to move through. The fauna survey will be completed in adherence to national and provincial legislation.

The potential impacts of the proposed mining development include direct impacts, such as the removal of habitat due to clearing, as well as indirect impacts, such as erosion, the establishment of alien plant species and habitat fragmentation.

21.3.7.1 Baseline Investigation

A desktop study will be undertaken to generate a list of fauna species that are found within the study site. The list of possible fauna species was generated using various sources, listed below, and from this a list of possible SSC was also created. The following information sources will be consulted:

- The SIBIS online interactive species distribution map was used to obtain data for the distribution of mammals, reptiles, amphibians and terrestrial invertebrates within the greater study area. Data was acquired for the Quarter Degree Squares (QDS) in which the study is located;
- The potential occurrence of mammals was supplemented by the species distribution maps in Friedman and Daly (2004),
- Lists of birds found in the QDS for the study area were determined using online data from the South African Bird Atlas Project (SABAP 2) for 2011;
- The Convention on International Trade of Endangered Species (CITES) species database;
- The IUCN Red-Data List for South African fauna;
- National Environmental Management Biodiversity Act (NEMBA 10 of 2004) listed species;
- The Mammals of Southern African Sub-Region (Skinner & Smithers, 1990);
- Fauna and Flora Assessment Report for the Proposed Platreef Underground Mine. (Digby Wells, 2013); and
- BirdLife South Africa, 2014 Checklist of Birds- List of Threatened Species.

21.3.7.2 Field Investigation

A field investigation will be undertaken to identify the following fauna species, after which the sensitivity of the project site will be determined

21.3.7.2.1 Small Mammals and Herpetofauna

Small animals will be recorded through opportunistic sightings of species, tracks and dung and mammals will be trapped using non-fatal Sherman traps. Herpetofauna will be trapped using and a Line Array or Pit Fall Trap.



21.3.7.2.2 Larger Mammals

Larger mammals will be identified by visual sightings, tracks and dung. In addition, motionsensitive cameras will be baited and set on site.

21.3.7.2.3 Avifauna

For avifauna, random transects will be walked throughout the site and species will be identified based on their characteristic calls or visual sightings.

21.3.7.2.4 Invertebrates

Invertebrates will be sampled opportunistically and with the use of a butterfly net.

21.3.7.3 Impact Assessment and Reporting

The potential impacts of the development and operation of the proposed operation on the receiving natural areas within the project area will be assessed. The sensitivity of the natural environment (i.e. SSC) will be considered in rating the impacts. Mitigation measures will be identified, where feasible and practical to avoid potential impacts such as habitat fragmentation which result in impacts to fauna. The study will result in a fauna impact assessment report.

21.3.8 Wetland

To determine the boundaries of wetlands, the methodology described by DWAF (2005) will be adopted. The wetland delineation procedure utilises cues such as the presence of water, hydromorphic soils and obligate hydrophilic vegetation.

21.3.8.1 Wetland Delineation and Identification

In accordance with DWAF (now Department of Water and Sanitation (DWS) guidelines (2005) the wetland delineation procedure considers four attributes to determine the limitations of the wetland. The four attributes are:

- Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator identifies the soil forms, which are associated with prolonged and frequent saturation;
- Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

For the purpose of this study, wetlands are considered as those ecosystems defined by the National Water Act as: *"land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with*



shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

21.3.8.2 Wetland Ecological Health Assessment

In accordance with the method described by Kotze *et al.* (2007), a WET-Health assessment is to be undertaken on identified wetlands. A PES analysis is conducted to establish baseline integrity (health) for the associated wetlands. To determine the integrity (health) of the characterised HGM units for the project area, the WET-Health tool is applied. According to Macfarlane *et al.* (2007) the health of a wetland can be defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition.

The health assessment attempts to evaluate the hydrological, geomorphological and vegetation health in three separate modules to attempt to estimate similarity to or deviation from natural conditions. The overall health score of the wetland is calculated using the equation below, which provides a score ranging from 0 (pristine) to 10 (critically impacted in all respects). The rationale for this is that hydrology is considered to have the greatest contribution to health. The PES is determined according to Table 21-3.

Wetland Health =
$$\frac{3(Hydrology) + 2(Geomorphology) + 2(Vegetation)}{7}$$

Table 21-3: Impact Scores and Present Ecological State Categories used by Wet-Health

Description	Combined Impact Score	PES Category
Unmodified, natural.	0-0.9	А
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota has taken place.	1-1.9	В
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	С
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognisable.	6-7.9	E
Modifications have reached a critical level and ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	F


21.3.8.3 Wetland Functional Assessment

In accordance with the method described by Kotze *et al.* (2007), an ecological functional assessment of the associated wetland will be undertaken. This methodology provides for a scoring system to establish the services of the wetland ecosystem. The onsite wetlands are grouped according to homogeneity and assessed utilizing the functional assessment technique, WET-EcoServices, developed by Kotze *et al*, (2007) to provide an indication of the benefits and services. This methodology computes a score out of 4 for each index and provides an indication of the ecological services offered by the different HGM units for the study area. Results are given in the form of a radial plot showing the relative importance of the 15 indices. Ecoservices rated as high are scored more than or equal to 2.8.

21.3.8.1 Impact Assessment and Reporting

The aim of the impact assessment is to strive to avoid damage or loss of ecosystems and services that they provide, and where they cannot be avoided, to reduce and mitigate these impacts (DEA, 2013). Offsets that compensate for loss of habitat are regarded as a last resort, after all efforts have been made to avoid, reduce and mitigate. A wetland study report will be compiled to incorporate these aspects.

21.3.9 Aquatic Ecology

The objective of the aquatic ecology study is to determine the baseline conditions, potential impacts as well as the mitigation measures prescribed to prevent or reduce the impact on aquatic ecology. The aquatic assessment will implement the methodologies recognised by the River Health Programme and various internationally recognised methodologies. The following methodology will be undertaken for the aquatic ecology study.

21.3.9.1 Water Sampling

Water quality analysis will be completed for the project utilising a calibrated water quality meter (EXTECH, DO700). The constituents of water quality which would be completed in this analysis include pH and conductivity (μ S/cm), dissolved and saturation percentage of Dissolved Oxygen (DO) and temperature (°C). In addition to this, laboratory analysis of water will be completed. The analysis will involve the determination of metal content as well as the concentrations of macronutrients such as nitrate, nitrite and phosphate. The analysis would involve the use of spectrophotometry applied techniques used in Inductively Coupled Plasma Mass spectrophotometry (ICP-MS) as well as ICP- Optical Emission Spectrophotometry (ICP-OES).

21.3.9.2 <u>Field Survey</u>

Broad habitat characteristics will be described using aerial imagery (if available). At each site approximately 50 m of river frontage will be assessed, river sections will be selected based on the diversity of habitat at the sites and will usually include runs, riffles, pools with the



inclusion of submerged vegetation. Rough flow estimates will be completed using calibrated flow meters. Clarity will also be measured using a clarity tube.

Habitat assessments will be carried out and will be based on Kleynhans (2008) which includes meso-habitats, velocity depth classes, cover features, flow types and sampling methods that will be conducted according to different habitat types. Habitat assessments will be conducted at each separate fish sampling site within a given reach to produce a comprehensive description of the fish community structures within different available habitats.

The IHAS and the IHIA will be used to determine and classify habitat structures associated with the proposed project area. In addition, the Rapid Habitat Assessment Model (RHAM, RDM (1999)) will be utilised to determine and quantify aquatic habitat features.

Diatoms will be utilised to determine the biological integrity and sensitivity of the aquatic biota associated with the proposed project area. Internationally recognised diatom indices will be applied on samples acquired from relevant sampling sites.

The standard FRAI will be completed and in addition fish community structures and diversity will be determined at each site, this information will be investigated as to determine dominant species. The information and specific characteristics on dominant and present fish species, in conjunction with macroinvertebrate data will also allow for the analysis of the current state of the aquatic ecosystem.

21.3.9.3 <u>Analysis</u>

The following assessments/indices will be used:

21.3.9.3.1 Quantitative Analysis

- SASS5;
- USEPA: Ephemeroptera, Plecoptera and Trichoptera % contribution index; and
- Functional Feeding Group Assessment Index.

21.3.9.3.2 Qualitative Analysis

- Margalef's Measure of Richness Index (1961);
- Shannon-Wieners Diversity Index (1963); and
- Pielou's Eveness Index (1986).

21.3.9.4 Impact Assessment and Reporting

An aquatic ecological impact assessment will be compiled in which the ecological integrity of the aquatic environment and individual biophysical attributes of the systems will be identified and assessed. Mitigation measures will also be presented to prevent or reduce the potential impacts of the project on aquatic ecology.



21.3.10 Macro-Economy

The objective of the economic impact assessment is to determine the potential economic implications of the project activities and associated infrastructure. The following methodology will be undertaken for the study.

21.3.10.1 Impact Modelling

Project data will be used to undertake a modelling exercise with the purpose of determining direct effects, but also associated multiplier effects on the local and regional economies.

Project data will be used to model direct, indirect and induced impacts. Modelling of impacts will be done using economic models developed on the basis of the provincial and national Social Accounting Matrices (SAMs). Impacts determined through the modeling exercise will include production, value added, employment, skills, household income, and government revenue. Differentiation will be made between impacts that are expected to take place within the local municipality, province, and rest of the country provided the input data is spatially disaggregated.

21.3.10.2 Impact Assessment and Reporting

The purpose of this step is to interpret the modelling data and collected information and describe economic implications of the proposed project on the affected economies and economic activities and evaluate their significance. Minutes gathered through public participation process and feedback received from interviews with the local stakeholders will be used to ensure that all concerns related to economic changes in the area are addressed in the study.

For each phase of the project's life-cycle, the following groups of impacts will be examined:

- Impacts directly associated with the construction, operation, and closure/rehabilitation activities, where applicable;
- Secondary impacts that involve the changes in the community structure and economic activities in the environment directly or indirectly affected by the proposed development; and
- Cumulative impacts that take into account other projects or developments that are in the pipeline for the area.

A qualitative assessment of impacts will be employed throughout; however where feasible economic impacts will also be quantified and included in an economic impact assessment report.

21.3.11 Social

The objective of the social impact assessment is to identify and assess the likely socioeconomic impacts of the project such as employment opportunities and community development. The following steps will be undertaken as part of the study:



21.3.11.1 Primary Data Collection

This will involve an investigative site visit of approximately three weeks. Activities to be undertaken during the site visit will include the following components:

- Socio-economic household survey: This will entail a sample survey comprising a maximum of 600 households resident in the identified study area. Geo-spatial records of the surveyed households will be kept, questionnaires captured in a custom designed Microsoft Excel or Access database and analysed using descriptive statistics. It is anticipated that ten locally recruited enumerators will be utilised for the purposes of the survey. These enumerators will undergo thorough training pertaining to the administration of questionnaires; and
- Focus groups and key-informant interviews: It is anticipated that approximately ten such focus groups/ interviews will be conducted during the site visit. These will include stakeholders including, but not limited to, directly and indirectly affected community members, figures of authority (both traditional and governmental), local service providers and other specialists. Interviews will be transcribed and subjected to thematic analysis in order to present the findings in a meaningful manner.

21.3.11.2 Compilation of a Detailed Socio-Economic Baseline

The compilation of a detailed socio-economic baseline profile will be undertaken based on the information collected through the desktop review and investigative fieldwork. Socioeconomic attributes to be described in the baseline profile will include, inter alia, demographics and population distribution, prevalent livelihood activities, levels of education and skills, access to basic services, and main challenges faced by the community.

21.3.11.3 Impact Assessment and Reporting

The identification, assessment and rating of likely socio-economic impacts that may result from the proposed project will be based on the detailed baseline profile of the affected communities, experience with similar projects in the area and specialist opinion. These impacts will be presented in the social impact assessment report, which will also include the following:

- Feasible and cost-effective mitigation measures aimed at reducing the severity of adverse impacts, and enhancement measures for potential benefits; and
- A social management plan, which will define practical steps for implementing the recommended mitigation measures.

21.3.12 Community Health

The objective of the community health study is to describe and assess the community health impacts around a predefined number of "Environmental Health Areas" (EHAs) including vector related diseases, soil, water and waste related diseases, to name a few. This broad scope ensures that the assessment does not limit its focus to disease-specific



considerations, but also addresses cross-cutting environmental and social conditions that could mediate or influence health-related project impacts. This structured approach will be adopted for assessing the likely community health impacts of this project, the methodology for the study is presented below.

21.3.12.1 Desktop Literature Review

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

The findings of other specialist studies conducted as part of the project EIA will be reviewed to identify social or biophysical impacts that may have a bearing on community health or could mediate community health impacts. Particular emphasis will be placed on the findings of the air quality, noise, hydrological, geohydrological and social assessments.

21.3.12.2 Questionnaire Design

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

21.3.12.3 Field Survey

A field survey will be conducted to collect primary participatory data in the form of interviews with women (FGD) in the different project affected communities. A crucial part of the field survey is to consult stakeholders who have special knowledge of the health status as well as socio/cultural behaviours and norms. The aim is to gain a comprehensive picture of the general health situation and to better understand potential health impacts of the proposed Project. The field survey will also provide an opportunity to visualise and assess the prevailing situation in the communities and their relation to the project. This is very important to understand the potential areas of influence of the project and also the general living conditions in the communities living in the project area.



21.3.12.3.1 Key Informant Interviews

Interviews will be conducted with key Healthcare personnel from several Healthcare facilities. The objective here is to gain a better understanding of the structure and capacity of the local health system and also to enquire what health statistics were available at the local level and where possible obtain authorised copies of statistics and reports. These interviews will be conducted with the health personnel at these facilities, using a semi-structured questionnaire. This will contain specific questions about health, social and environmental determinants but with a different emphasis, depending on the level and role of each key informant being interviewed. Interviews and discussions will be open and conducted in English and Sepedi.

21.3.12.3.2 Focus Group Discussions

Women groups will be consulted during the FGD as they are generally considered to be the gatekeepers to family health and usually have a good understanding of critical issues that influence health at the community and household level. This will allow for a high level understanding of the health challenges, from both a biophysical and social health perspective. All discussions will be conducted in Sepedi, as this is the most widely spoken language in the Mokopane area.

21.3.12.4 Impact Assessment and Reporting

Existing evidence will be used to rank the likelihood and consequence of the identified potential health impacts to assess their significance and prioritise them for mitigation. Measures, including alternative options, to avoid/mitigate negative and enhance positive impacts resulting from the project at the relevant project stage will be recommended. These results will be presented in a community health impact assessment.

21.3.13 Visual

The objective of the visual impact assessment is to identify sensitive visual receptors and key viewpoints that will be impacted on by the project, taking into account visibility aspects. A change in the land use of the project area from rural agricultural activities associated with subsistence farming and livestock grazing and natural Bushveld to mining may change the topography, visual aesthetics and sense of place of the project area and surrounds.

21.3.13.1 Identification of Visual Receptors

The study will establish the visual receptors that area likely to be affected, and to what degree they are likely to be affected. The potential visual receptors within the project area and surrounds include residents of the villages within the project area namely: Basogadi, Malokong, Mothoathoase and Sepharane as well as residents of the villages within 10 km of the project area including but not limited to: Ditlotswana, Eseldrift, Ga-Mokwena, Groesbeek, Haakdoring, Kaditshwene, Limburg, Lyden, Malokongskop, Mapela, Mokamole, Mosate, Pudiakagopa, Rooivaal and Taolome.



Road users of the N11 national route and R518 regional route as well as the numerous district roads in the project area are potential visual receptors of the proposed project. The N11 national route is also used by tourists travelling through Limpopo and to Botswana and Zimbabwe. Protected areas such as nature reserves, and recreational and tourism areas are also considered potential visual receptors.

21.3.13.2 <u>Desktop Analysis</u>

A desktop study will be conducted to evaluate the topography of the receiving environment. Chief Directorate: National Geospatial Information (CD: NGI) aerial photography (flown in 2012) of the project site will be examined to determine the surface features. The available vector GIS data will be used to determine the relative location of the features surrounding the project area.

A topographical model will be created using ArcGIS 3D Analyst Extension. The resultant topographical model will then be used to create slope intensity and slope aspect models using the Slope and Aspect Tools of the ArcGIS 3D Analyst Extension. The slope model indicates the slope degree.

21.3.13.3 Field Survey

The information gathered from the desktop study will be verified through a site visit. Photographs will be taken during the site visit and topographical features (natural and manmade), overall visual resources, the variety of landscape characters and sense of place attributes will be assessed.

21.3.13.4 <u>Viewshed Analysis</u>

The Digital Elevation Model (DEM) created during the scoping phase will be used as input to create a viewshed model using ArcGIS 3D Analyst Extension; this will be done to establish the degree of visibility that the proposed infrastructure is likely to have. The height of the proposed above ground infrastructure will be taken into consideration in the modelling process.

21.3.13.5 Characterisation of Visual Impacts

The expected visual impact will be categorised based on the type of receiving environment and the type of development as detailed in Table 21-4 and Table 21-5. Table 21-4 provides an indication of the visual impacts that can typically be expected for different types of developments in relation to the nature of the receiving environment based on the category of the development as defined in Table 21-5.



Table 21-4: Categorisation of Expected Visual Impact (adapted from Oberholzer, 2005)

Type of	Type of Development (Low to High Intensity)										
Environment	Category 1 Development	Category 2 Development	Category 3 Development	Category 4 Development	Category 5 Development						
Protected / wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected						
Areas or routes of high, scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected						
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected						
Areas or routes of low scenic, cultural or historical significance	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected						
Disturbed or degraded sites / run down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected						



Table 21-5: Key to Categorisation of Development (adapted from Oberholzer, 2005)

Type of Development	Examples of Development
Category 1	Nature reserves, nature related recreation, camping, picnicking, trails and minimal visitor facilities
Category 2	Low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure
Category 3	Low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure
Category 4	Medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure
Category 5	High density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants

21.3.13.1 Impact Assessment and Reporting

A visual impact assessment report will be compiled and will consider the following:

- Identify the impacts, pre- and post-mitigation that the proposed infrastructure will have on the visual landscape, by rating the scale, duration, severity and probability of the impacts occurring;
- Describe the current and post development visual aspects of the project area in a specialist report with supporting visualisations including photo montages; and
- Provide mitigation measures and recommendations in an attempt to reduce the potential visual impacts.

21.3.14 Cultural Heritage

The objective of the HIA is to identify all heritage resources within the impact footprint as far as possible, including intangible heritage resources and to assess both the positive and negative impacts on the individual heritage resources and cultural landscape.

The highest likelihood of changes to heritage resources is associated with activities that will be undertaken during the construction phase, when damage or destruction is likely. The primary risk during the operational phase will be associated with the alteration of the sense-of-place of the project area.



21.3.14.1 <u>Field Survey</u>

Primary data collection through a reconnaissance field survey will aim to identify record and document tangible heritage resources that may occur in the project area. The survey will be completed following a structured, extensive survey methodology. An archaeological reconnaissance will be undertaken to identify and record archaeological resources within the impact footprint. Furthermore, burial grounds and graves that may exist in the impact footprint will be recorded and documented.

21.3.14.1 <u>Literature Review</u>

Evaluation of heritage significance will be based on information collected during a focused literature review. This information will be reviewed and updated to address specific heritage resources identified during the field survey. Where necessary supplementary secondary data will be sourced and reviewed to provide more context to the identified heritage. Findings from other specialists will also be integrated into this evaluation to take into account aspects such as Indigenous Knowledge Systems Significance (IKS), genius loci (sense of place) and other intangible attributes.

21.3.14.1 Impact Assessment and Reporting

Ratings will be assigned to each identified heritage resource using a specifically designed matrix that incorporates criteria for assessment stipulated in the NHRA as well as employing international best practice.

Assessment of impacts on identified heritage resources will be undertaken employing an impact matrix taking into account extent, duration, intensity and probability of impacts occurring. Impact ratings will in addition take into account the significance value assigned to identified heritage. A SCF Report will be compiled to outline requirements from SAHRA and/or LIHRA. This report will also stipulate in non-technical terms how the requirements need to be integrated and implemented in the EMPr.

21.3.15 Traffic

This study will be compiled to determine the significance of increased heavy duty vehicles on the surrounding project site road network.

The traffic impact assessment will include the following steps.

21.3.15.1 <u>Trip Generation, Assignment & Capacity Analyses</u>

The following steps will be undertaken as part of the traffic modelling:

Preparation of a trip generation table to define the traffic generated by the site. The material from the proposed mine will either be transported via road, then onto rail in Mokopane and onwards to the nearest port; or via road, directly to Durban/Richards Bay for export. The scope of this EIA is limited to the potential impacts associated with



the use of roads only and excludes the potential impacts associated with the rail and port;

- Traffic survey counts will be processed, distributed and assigned to the road network along with development traffic;
- Capacity analyses of affected intersections;
 - 2014 Base scenario Weekday AM and PM;
 - 2019 Background scenario, without development Weekday AM and PM;
 - 2019 Background scenario, with development Weekday AM and PM;
 - Mitigation scenario, with development Weekday AM and PM
- Interpretation of modelling results; and
- Queuing analysis at accesses, particularly HGV movements to determine the appropriate sizing and throat distances required.

21.3.15.2 Impact Assessment and Reporting

A traffic impact assessment will be compiled for the project and will outline the results of the various trip generation scenarios and the potential impacts on road users and on the road condition. The following potential impacts of the proposed development will be considered:

- Impact on the existing traffic conditions on the external road network;
- Impact on pedestrians and cyclists;
- Impact on road safety conditions; and
- Impact on the condition of the road network.

Road upgrades to mitigate development traffic if appropriate will be defined and appropriate recommendations will be made, including:

- Consider existing Site Development Plan (SDP) and provide advice in relation to access control, stacking space requirements, access geometry and sight distances;
- Consider and advise on required traffic management arrangements if appropriate; and
- Advice on road safety considerations in implementing safe road infrastructure compliant with design standards.

21.3.16 Blast and Vibration

The objective of this study is to determine the effects that blasting operations may potentially have on the surrounding environment. The study investigates the related influences of expected ground vibration, air blast, fly rock, and noxious fumes on neighbouring houses and owners or occupants.

To complete the study, the following steps will be undertaken.



21.3.16.1 <u>Field Survey</u>

A site visit will be undertaken to determine the typical structures and installations that are found within a 3 500 m radius from the proposed open pit area. Based on the field surveys a structure profile will be compiled, which is later used for modelling purposes.

21.3.16.2 <u>Modelling</u>

Modelling will be undertaken to determine the expected impact based on planned drilling and blasting methods for the open pit.

Various accepted mathematical equations¹ are applied to determine the attenuation of ground vibration, air blast and fly rock. These values will be calculated over distance from the project site and shown as amplitude level contours. These contours will be overlayed with the location of the various receptors which will provide the potential consequence to these receptors.

21.3.16.3 Impact Assessment and Reporting

Evaluation of each receptor according to the predicted levels will indicate the level of possible influence and required mitigation if necessary. A blast and vibration impact assessment report will be compiled and will outline the results of the structure profile, modelling and receptor analysis to provide potential impacts and associated mitigation measures.

21.3.17 Noise

The baseline noise measurements will be carried out to provide the noise levels of the existing soundscape at the relevant surrounding receptors. The scope of work will be carried out in the following steps.

21.3.17.1 <u>Receptor Identification</u>

For the detailed assessment of the focus area, potentially Noise Sensitive Receptors (NSRs) such as surrounding villages and communities will be identified. The co-ordinates of these receptors will be captured using a Geographic Information System (GIS) and then plotted on a map.

21.3.17.2 Field Work and Noise Measurements

A site visit will be organised in conjunction with the client and local landowners, during which baseline noise monitoring will be conducted at the selected NSRs surrounding the proposed activities.

All measurements will be taken in accordance with the National Noise Control Regulations, R.154 (10 January 1992) in terms of Section 25 of the Environmental Conservation Act, 1989 (Act 73 of 1989) as well as the SANS 10103:2008 guidelines. Measurements will be for a period 24 hours at the recommended localities. A Cirrus, Optimus Green, precision



integrating sound level meter will be used for the measurements. The instrument will be field calibrated with a Cirrus, sound level calibrator.

21.3.17.3 Baseline Interpretation

Recordings from the sound level meter will then plotted in graphical format and then analysed in relation to the SANS 10103:2008. The comparison to the SANS day and night-time standards for rural districts will provide a noise baseline for the area, indicating how much noise currently exists in the area.

21.3.17.4 Noise Dispersion Modelling

The propagated noise levels will be calculated by means of the dispersion modelling software 'Soundplan'. This model will depict in detail, what the expected noise levels are to be at sensitive receptors, and can predict, per receptor, the intensity of the noise impact. Step 5: Significance Rating of Impact

The significance of the noise impact of both options will be rated by comparing the expected noise levels from the models to the existing ambient noise levels as well as by comparing it to the SANS 10103:2008 limit guidelines for the various districts surrounding the project areas of both options.

The kind of mitigation measures and management programme will depend on the significance rating of the noise impact.

21.4 Item 2(i)(iv): Proposed Method of Assessing the Environmental Aspects including the Proposed Method of Assessing Alternatives

The significance rating process follows the established impact/risk assessment formula:



And

Consequence = Intensity + Extent + Duration

Probability = Likelihood of an impact occurring

And



Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 21-6. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this EIA/EMP Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 21-7, which is extracted from Table 21-6. The description of the significance ratings is discussed in Table 21-8.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.



Table 21-6: Impact Assessment Parameter Ratings

Pating	Severity/Irreplaceability		Spatial scale	Duration/Irrovorsibility	Probability		
Rating	Environmental	Social, cultural and heritage	Spatial Scale	Duration/inteversionity	Frobability		
	Very significant impact on the	Irreparable damage to highly valued	International	Permanent: No	Certain/ Definite.		
	environment. Irreparable damage	items of great cultural significance or	The effect will	Mitigation	The impact will		
	to highly valued species, habitat or	complete breakdown of social order.	occur across	No mitigation measures	occur regardless of		
	eco system. Persistent severe		international	of natural process will	the implementation		
	damage.		borders	reduce the impact after	of any preventative		
		The positive impact will be of high		implementation.	or corrective actions.		
	The positive impact will result in a	significance which will result the					
7	significant improvement to the	improvement of the socio-economic					
'	initial/post disturbance	status of a greater area beyond the					
	environmental status and will	boundary of the directly affected of					
	benefit ecological and natural	the community and/or promote					
	resources.	archaeological and heritage					
		awareness and contribute towards					
		research and documentation of sites					
		and artefacts through phase two					
		assessments.					
	Significant impact on highly valued	Irreparable damage to highly valued	National	Permanent:	Almost		
	species, habitat or ecosystem.	items of cultural significance or	Will affect the	Mitigation measures of	certain/Highly		
		breakdown of social order.	entire country	natural process will	probable		
	The positive impact is of high			reduce the impact.	It is most likely that		
6	significance which will result in a	The positive impact will be of high			the impact will		
	vast improvement to the	significance and will result in the			occur.		
	environment such as ecological	upliftment of the surrounding					
	diversification and/or rehabilitation	community and/or contribute towards					
	of endangered species	research and documentation of sites					



Doting	Severity/Irreplaceability		Spotial coole	Duration/Irrovaraibility	Brobability		
Rating	Environmental	Social, cultural and heritage	Spatial Scale	Duration/inteversionity	Probability		
		and artefacts through phase two assessments					
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate The positive impact will be moderately high and will have a long term beneficial effect on the natural environment	Very serious widespread social impacts. Irreparable damage to highly valued items The positive impact will be moderately high and will result in visible improvements on the socio- economic environment of the local and regional community, and/or promote archaeological and heritage awareness through mitigation	Cercle/ Region Will affect the entire Cercle or region	Project Life The impact will cease after the operational life span of the project.	Likely The impact may occur.		
4	Seriousmediumtermenvironmentaleffects.Environmentaldamagecanbereversed in less than a yearThepositiveimpacton	On-going serious social issues. Significant damage to structures / items of cultural significance The positive impact on the socio- economic environment will be of a	Commune Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.		



Dating	Severity/Irreplaceability		Spatial cools	Duration/Irrovaraibility	Brobobility
Rating	Environmental	Social, cultural and heritage	Spatial Scale	Duration/inteversibility	Probability
	environment will be moderate with visible improvement to the natural resources and regional biodiversity	moderate extent and benefits should be experience across the local extent and/or potential benefits for archaeological and heritage conservation			
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month. The positive impact will be moderately beneficial to the natural environment, but will be short lived.	Ongoing social issues. Damage to items of cultural significance. The positive impact will be moderately beneficial for some community members and/or employees, but will be short lived and/or there will be a moderate possibility for archaeological and heritage conservation	Local Local extending only as far as the development site area	Medium term 1-5 years	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. The positive impacts will be minor and slight environmental improvement will be visible.	Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected. Minor positive impacts on the social/cultural and/ or economic environment	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The



Pating	Severity/Irreplaceability		Spatial scale	Duration/Irroversibility	Probability
Nating	Environmental	Social, cultural and heritage	Spatial Scale	Duration/inteversionity	Frobability
					possibility of the
					impact materialising
					is very low as a
					result of design,
					historic experience
					or implementation of
					adequate mitigation
					measures
	Limited damage to minimal area of	Low-level repairable damage to	Very limited	Immediate	Highly unlikely/None
	low significance, (e.g. ad hoc spills	commonplace structures.	Limited to	Less than 1 month	Expected never to
	within plant area). Will have no		specific		happen.
	impact on the environment.	The positive impact on social and	isolated parts		
1		cultural aspects will be insignificant	of the site.		
•	The positive impact on the				
	environment will be insignificant				
	and will not result in visible				
	improvements				



	Sig	nifica	nce																																		
	7 -147	7 -140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63 70	0 <mark>77</mark>	84	91	98	105	112	119	126	133	140	147
	<mark>6</mark> -126	6 -120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54 60	066	72	78	84	90	96	102	108	114	120	126
	5 <mark>-10</mark>	5 -100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	15 50) 55	60	65	70	75	80	85	90	95	100	105
>	4 <mark>-84</mark>	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36 40) 44	48	52	56	60	64	68	72	76	80	84
ility	<mark>3-63</mark>	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24 2	27 30	33	36	39	42	45	48	51	54	57	60	63
bab	<mark>2-42</mark>	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	1820) 22	24	26	28	30	32	34	36	38	40	42
Pro	1 <mark>-21</mark>	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	78	8 9	9 10	D 11	12	13	14	15	16	17	18	19	20	21
	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7 8	8 9	9 10	0 1 1	12	13	14	15	16	17	18	19	20	21
	Cor	nsequ	ence																																		

Table 21-7: Probability/Consequence Matrix



Table 21-8: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe effects	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects	Major (negative)

21.5 Item 2(i)(v): Proposed Method of Assessing Duration Significance

Refer to Section 21.4 above.

21.6 Item 2(i)(vi): Stages at which the Competent Authority will be Consulted

The DMR will be consulted at the following stages:



- On submission of application (March 2015);
- Submission of Scoping Report for comment (March 2015); and
- Submission of EIA Report for comment (May 2015).

21.7 Item 2(i)(vii): Particulars of the Public Participation Process with regard to the Impact Assessment Process that will be Conducted

The purpose of the PPP for the EIA phase is to enable I&APs to verify that their issues have been captured and responded to in the Impact Assessment Process undertaken for the project and for the EAP to provide feedback regarding the specialist studies which were undertaken for the EIA. The following section provides the activities which will be undertaken as part of the impact assessment phase of the EIA.

21.7.1 Steps to be Taken to Notify Interested and Affected Parties

I&APs will be informed of the availability of the EIA / EMP report for public comment via email, letters and SMS.

21.7.2 Details of the Engagement Process to be Followed

The following activities will be undertaken as part of the EIA. A series of meetings will be undertaken and will include:

Meetings with Traditional Councils: Meetings will be held with the Bakenberg and Mapela Traditional Councils.

Focus Group Meeting: A focus group meeting will be held in Mokopane with the district and local municipalities, NGOs, businesses, commercial farmers and other key stakeholders will be invited to attend this meeting;

Public Meeting: A public meeting will be held on a Saturday at the Bakenberg Stadium. The date and venue for the public meeting will be announced in emails, letters and SMS. The meeting will also be advertised by laud hailing in all the affected villages.

Village Meetings: Due to the mistrust of the community of the Traditional Councils and the difficult logistics of getting people to attend the Public Meeting, it is recommended that individual meetings be held with the villages during the Impact Assessment Phase.

At all the meetings, feedback with regards to the specialist studies undertaken will be shared by means of a formal PowerPoint presentation. Sepedi and Afrikaans translations will be provided as relevant. All comments made at the meetings will be captured in the CRR.

Table 21-9 provides a summary of activities to be undertaken as part of the EIA PPP.



Table 21-9: Summary of PPP Activities in the EIA Process

Activity	Details							
EIA Phase								
Placement of EIA / EMP report	The EIA/EMP report will be placed at the Mogalakwena Public Library and at the Bakenberg Community library for a comment period of 30 days							
Announcement of availability of the EIA/EMP report for public comment	I&APs will be informed of the availability of the EIA / EMP Report for public comment by email, letter and SMS.							
Meetings	A series of meetings will be held with the two traditional councils, key stakeholders, individual villages and the general public. All comments raised at these meetings will be captured in the CRR.							

21.7.3 Description of the Information to be Provided to Interested and Affected Parties

The EIA/EMP report will be placed at the Mogalakwena Public Library and at the Bakenberg Community library for a comment period of 30 days. The EIA and EMP will include the following information:

- Project description and activities;
- Baseline environment;
- Potential biophysical and socioeconomic impacts of the proposed activities;
- Proposed mitigation measures; and
- A recommendation on whether the development should proceed or not.



21.8 Item 2(viii): Description of the Tasks that will be undertaken during the Environmental Impact Assessment Process

The following tasks will be undertaken during the EIA phase:

- Further define the project activities;
- Further assess the project alternatives based on technical, economic, social and environmental criteria;
- Supplement the legal review of the project;
- Undertake detailed specialist investigations;
- Assess potential impacts using the methodology provided herein;
- Provide detailed and feasible mitigation and management measures in an EMPr; and
- Public participation activities, including public and key stakeholder meetings.



21.9 Item 2(i)(ix): Measures to avoid, reverse, mitigate, or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored

Table 21-10 lists the potential impacts resulting from the project activities and provides preliminary mitigation measures. The project activities have been condensed into the following primary activities:

- Site clearance activities including vegetation removal, stripping and stockpiling topsoils and subsoils;
- Development of surface support infrastructure (i.e. haul roads, concentrator plant, conveyors, pipelines, workshop, offices, waste storage facilities) and development of mine;
- Blasting;
- Water abstraction and use;
- Development of WRD and tailings dam and pollution control dams;
- Employment;
- Project capital expenditure; and
- Rehabilitation.

Activities	Potential Impacts	Mitigation Type	Potential for
Site clearance activities including vegetation removal, stripping and stockpiling topsoils and subsoils	Wind and water erosion that may potentially result in sedimentation of nearby streams/rivers and the loss of topsoil material.	Avoid through appropriate placement of topsoil materials (i.e. away from water courses). Physical control measures such as mesh, sand bags.	Due to the na approximately risk.
	Loss of land capability for agricultural use.	Control through effective placement of infrastructure with reduced footprints.	The project si Approximately infrastructure.
	Increase in dust emissions (PM ₁₀ , PM _{2.5} and TSP) thus reducing the ambient air quality of surrounding communities.	Control through dust suppression measures (i.e. use of dust-a side on roads). Manage through regular monitoring of ambient air quality and remedy through identifying the potential sources and modifying design/control measures where necessary.	There are like
	Loss of floral species and destruction of faunal habitat.	Avoid through effective placement of infrastructure with reduced footprints.	The project si Approximately infrastructure.
Development of surface support infrastructure (i.e. haul roads, concentrator plant, conveyors,	Soil compaction of the ground will increase surface water run-off thus increasing the potential for soil erosion and ultimately the siltation of surface water resources.	Control through the design and development of storm water channels/berms and associated silt traps.	There are like
waste storage facilities) and development of mine.	Potential reduction of water quality for human consumption (High TDS, EC, CI and Na concentrations).	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximately risk.
	Increase in NO_x and SO_2 and PM_{10} thus reducing the ambient air quality of surrounding communities	Modify through effective design/technology measures. Manage through regular monitoring of ambient air quality and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximately risk.
	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	Physical control measures such as noise mufflers on heavy machinery and equipment. Manage through placement of noisy infrastructure away from noise sensitive receptors. Manage through regular monitoring of noise levels and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximately risk.
	Disturbance to faunal species through noise, vibration and light (at night)	Physical control measures such as down-lighting.	Due to the na approximately risk.
	This activity may cause damage to or destroy any physical heritage resources that may be present within the project footprint areas.	Manage through regular monitoring of project activities and remedy through contacting the relevant authorities.	Due to the his residual risk.

Table 21-10: Preliminary Proposed Measures



or Residual Risk

nature and duration of the activity (i.e. mining for tely 30 years), there will be a potential for residual

t site (10 109 ha) is classified as agricultural land. tely, 569 ha will be required for the proposed ire.

ikely to be high wind events in the project area.

t site (10 109 ha) is classified as agricultural land. tely, 569 ha will be required for the proposed ire.

ikely to be high rainfall events in the project area.

nature and duration of the activity (i.e. mining for tely 30 years), there will be a potential for residual

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nature and duration of the activity (i.e. mining for tely 30 years), there will be a potential for residual

nature and duration of the activity (i.e. mining for tely 30 years), there will be a potential for residual

history of the project area, there is potential for

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	Detential Immedia	Million True	Detential for
Activities	Potential Impacts	Mitigation Type	Potential for
	Additional traffic and particularly heavy duty vehicles on the existing road network may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	Physical control measures such as design and regular maintenance of access roads.	The project a roads, thus th
	Exposure to potentially hazardous materials, noise and malodours resulting in the potential for respiratory illnesses. There is sufficient evidence that noise may cause adverse health effects such as cardiovascular effects. Epidemiology studies have found associations between immune and psychiatric effects and noise exposure.	Modify through effective design/technology measures. Manage through regular monitoring of ambient air quality and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximatel risk.
	Disruption of daily movement of surrounding communities.	Avoid through effective mine planning and design, particularly on roads used.	The project a roads.
	Loss of wetland habitat thus resulting in desiccation of water resources which may have a negative impact on fauna and floral species dependent on the wetland.	Avoid through effective placement of infrastructure with reduced footprints.	The project s required for t may be direc
	Stream crossings for linear infrastructure may result in damage to stream beds thus resulting in sedimentation which deteriorates the overall quality of water for aquatic ecology.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximatel risk.
	Potential impact on current economic activities within the directly affected environment (i.e. tourism or other identified economic activity that may be sensitive to the proposed development). Added pressure on government to provide basic services and social and economic infrastructure.	Manage through consultation processes to determine expectations and reduce through inclusion of LED programmes.	Due to the na approximatel risk.
	Impact on property and land values in the surrounding area.		
	Loss of agricultural, grazing or collection of natural resources; loss of this land/resources will result in economic and physical displacement of several households.	Manage through consultation processes to determine expectations and reduce through implementation of RAP.	The project s Approximatel infrastructure
Blasting	Release of nitrates from explosives may contaminate surface water run-off reducing the overall quality of surface water resources.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximatel risk.
	Potential damage to structures through vibration.	Manage through consultation processes.	There are a for the project site
Water abstraction and use	Potential reduction of water quantity available for domestic	Manage through regular monitoring of water resources and remedy	Due to the na



r Residual Risk

activities involve frequent use of site and access here is a potential residual risk.

ature and duration of the activity (i.e. mining for ly 30 years), there will be a potential for residual

activities involve frequent use of site and access

site is 10 109 ha, approximately, 569 ha will be the proposed infrastructure, thus wetland habitat ctly or indirectly impacted.

ature and duration of the activity (i.e. mining for ly 30 years), there will be a potential for residual

ature and duration of the activity (i.e. mining for ly 30 years), there will be a potential for residual

site (10 109 ha) is classified as agricultural land. ely, 569 ha will be required for the proposed e.

ature and duration of the activity (i.e. mining for ly 30 years), there will be a potential for residual

few communities located within a 3 km radius of ite.

ature and duration of the activity (i.e. mining for

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Activities	Potential Impacts	Mitigation Type	Potential for
	use.	through identifying the potential sources and modifying design/control measures where necessary.	approximate risk.
	Surface water run-off reporting to the surrounding streams may potentially be impacted on by a High TDS, EC, CI and Na concentrations). These trace elements may have a resulting impact on aquatic ecology and people who either use the water for domestic purposes or fish within these streams. Water borne diseases such as cholera, diarrhoea, and typhoid may potentially occur.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Minimal due in the project
	Potential contamination of groundwater by trace elements such as Mercury (Hg) and Arsenic (As) due to pit dewatering.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximate risk.
Development of WRD and tailings dam and pollution control dams	Potential seepage and contamination of trace elements.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximate risk.
	Change of the visual landscape will impact the sense of place/perceptions which has a resulting impact on surrounding land-uses.	Manage through consultation processes to determine expectations.	Due to the po tailings dam,
	Potential for oxidative stress in fish and the threat of bioaccumulation of magnetite in the tissues of exposed fish may pose health impacts to people.	Manage through regular monitoring of water resources and remedy through identifying the potential sources and modifying design/control measures where necessary.	Due to the na approximate risk.
	Transport of waste rock along or over provincial roads, may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	Physical control measures such as design and regular maintenance of access roads.	The project a roads, thus t
Employment	It is possible that conflict might arise between the newcomers (due to population influx) and local residents. An influx of job-seekers may also lead to an increase in various social pathologies, such as drug and alcohol abuse and domestic violence,	Manage through consultation processes to determine expectations.	Approximate operations, t
	Overcrowding, due to influx of people may result in an increase in the prevalence of respiratory diseases in the proposed project area increasing prevalence of respiratory health outcomes, including TB, which is likely to be influenced by housing issues, such as overcrowding. Population influx issues may result in potential rises in STIs including HIV/AIDS.	Manage through consultation processes to determine expectations and reduce through inclusion of LED programmes, skills development programmes etc.	Approximate operations, t



r Residual Risk

ely 30 years), there will be a potential for residual

to the relatively low occurrence of such diseases at area.

hature and duration of the activity (i.e. mining for ely 30 years), there will be a potential for residual

hature and duration of the activity (i.e. mining for ely 30 years), there will be a potential for residual

permanent presence of the open pits, WRD, , there will be a potential for residual risk.

hature and duration of the activity (i.e. mining for ely 30 years), there will be a potential for residual

activities involve frequent use of site and access here is a potential residual risk.

ely 150 workers will be employed during thus there will be a potential residual risk.

ely 150 workers will be employed during thus there will be a potential residual risk.

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Activities	Potential Impacts	Mitigation Type	Potential for
	The high density population/influx of people from periphery areas seeking employment on the mine, leading to increased inability of the existing health services to cope.		
	Skills development due to the creation of new employment opportunities (Positive Impact) Improved standard of living of households directly or indirectly benefiting from created employment opportunities (Positive Impact).	Manage through consultation processes to determine expectations and reduce through inclusion of LED programmes, skills development programmes etc.	None for posi
Project Capital Expenditure	Increase in production and GDP-R of the national and local economies (Positive Impact). Increase in government revenue due to investment (Positive Impact). Benefits derived from investment by the mine into the local economic development projects (Positive Impact).	Control by monitoring LED projects and ensuring benefits are realised.	None for posi
Rehabilitation	In-migration of faunal species into the project area (Positive impact) Increased occurrence of invader plant species.	Physical control (i.e. mechanical or chemical treatment)	The project si potential resid



r Residual Risk

sitive impact.

itive impact.

site is approximately 10 109 ha, hence there is a idual risk for invader species to spread.



22 Item 2(I): Other Information required by the Competent Authority

22.1 Impact on the Socio-economic Conditions of any Directly Affected Person

A social impact assessment will be undertaken as part of the EIA, the following issues impacting directly affected persons will be investigated during the EIA phase.

Impact description	Issue to be investigated
Creation of employment opportunities	Projected construction and operational workforce Skills levels of the local population, influencing its ability to take advantage of new employment
	opportunities
Physical and economic displacement	Current on-site land uses, vulnerability of households, extent of displacement and alternative land use activities
Disruption of daily movement patterns, increase in road accidents and deterioration of local road conditions	Expected traffic volumes and routes, community movement patterns, access to residential and business properties as well as services
Damage or disturbance to archaeological and cultural heritage	Nature and extent of damage and the social implications thereof
Decreased quality of life due to nuisance effects related to blasting, noise, dust, etc., impact on water	Expected vibration, noise, air quality and water- related impacts

Table 22-1: Issues to be Investigated to Assess Potential Impacts

22.2 Impact on any National Estate referred to in Section 3(2) of the National Heritage Resources Act

A heritage impact assessment will be undertaken as part of the EIA process. Based on the current understanding of the cultural landscape and the identified heritage resources within the project area, Digby Wells will be undertaking the following:

- Exemption from further palaeontological assessments for the proposed infrastructure footprint as the palaeo-sensitivity is insignificant;
- An HIA will be undertaken that includes the following heritage components:
 - An Archaeological Impact Assessment including reconnaissance to identify and record archaeological resources within the impact footprint;
 - An assessment of burial grounds and graves including reconnaissance to identify, record and document all burials that may exist in the impact footprint;
 - Integration of additional specialist studies to determine any possible living heritage in the project area. Studies that may be considered for integration include Social Impact Assessment, Biophysical Assessment and Visual Assessment.



23 Item 2(m): Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity. The outcome of the investigation has been provided in Item 2(h)(i-xi) of this Scoping Report.



24 Item 2(j): Undertaking Regarding Correctness of Information

I ______Mellerson Pillay______herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

Signature of the EAP:

fillay

Date:

22 April 2015

25 Item 2(k): Undertaking Regarding Level of Agreement

I ______Mellerson Pillay______herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP:

llay

Date:

22 April 2015



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Appendix 1: EAP Qualifications

Appendix 2: EAP CV

Appendix 3: Locality Plan

Appendix 4: Original and Revised Project Infrastructure Plans Appendix 5: Site Environmental Plans

Appendix 6: Sensitivity Plans

Appendix 7: PPP Materials

Appendix 7 (1): Stakeholder Database

Appendix 7 (2): Land Claims Commissioner Correspondence Appendix 7 (3): Background Information Document and Comment Sheet Appendix 7 (4): Project Advertisement

Appendix 7 (5): Project Site Notice

Appendix 7 (6): Project Notification and Availability of Scoping Report

Appendix 7 (7): Comments and Response Report

Appendix 7 (8): Notification of Final Scoping Report

Appendix 8: Biodiversity Species List

Appendix 9: Heritage Scoping Study