mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

NAME OF THE APPLICANTS:	**CUCHRON (PTY) LTD STEAMBOAT GRAPHITE (PTY) LTD**
REFERENCE NUMBER:	**LP 30/5/1/2/3/2/1(10193) EM**

DRAFT COMBINED ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH A MINING RIGHT APPLICATION (CUCHRON (PTY) LTD) AND A MINERAL BENEFICIATION PLANT (STEAMBOAT GRAPHITE (PTY) LTD))

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 of 2002) (AS AMENDED).

JULY 2021

Compiled by: Diphororo Development

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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (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 (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 (EAP) 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.

OBJECTIVES OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

1) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
2) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
3) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, biophysical, biological, social, economic, heritage and cultural aspects of the environment;
4) determine the –
    a) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    b) degree to which these impacts –
        i) can be reversed;
        ii) may cause irreplaceable loss of resources; and
        iii) can be avoided, managed or mitigated;
5) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
6) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
7) identify suitable measures to manage, avoid or mitigate identified impacts; and
8) identify residual risks that need to be managed and monitored.

In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended in 2017) the Environmental Impact Assessment Report (EIAR) must comply with Appendix 3 of the NEMA 2014 EIA Regulations.

Legal Requirement		**Relevant Section in EIAR**
(1)	An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-	
(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 1.2.2 Appendix A
(b)	the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in terms(i) and (ii) and is not available the coordinated of the boundary of the property or properties;	Section 1.4
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on the land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 5.3 Table 5-4 Appendix C
(d)	a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Section 2
(e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 3
(f)	a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context to the preferred location development footprint within the approved site as contemplated in the accepted scoping report;	Section 4
(g)	a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5.3
(h)	a full description of the process followed to reach the proposed development footprint within the approval site as contemplated in the accepted scoping report including; (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reason for including them; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance; including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development (locations) footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development (location) footprint within the approved site as contemplated in the accepted scoping report;	 Section 5 Section 7 Appendix B Section 7.2 Table 7-6 Section 6 Section 8.2 Table 8-11 Section 8.1 Section 8.2 Table 8-11 Section 8.3 Section 5.2 Section 5.3

Legal Requirement		Relevant Section in EIAR
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred (location) development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 8
(j)	an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	Section 8.2
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 8.4
(l)	an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred (site) development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 9
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed (impact management objectives, and the) impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 9.1 Section 9.2
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 5.1
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 9.2
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 8.5
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 9.3
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Section 10.5
(s)	an undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 10.6
(t)	where applicable, details of any financial provision or the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 10.4
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including— (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	N/A
(v)	any specific information that may be required by the competent authority; and	Section 10
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Section 10

DMRE SCOPING ACCEPTANCE REQUIREMENTS

Acceptance Requirement	Reference in document
Please ensure that comments from all relevant stakeholders are submitted to the Department with the Environmental Impact Assessment Report (EIAR). This includes but is not limited to the Provincial Environmental Department (LEDET), Department of Agriculture, Forestry and Fisheries (DAFF), Department of Water and Sanitation (DWS) and the local municipality. Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department.	EIA Section 7
Consultation with all Interested and affected parties and provide proof that the concerns have been raised, addressed and incorporated into the EIAR and EMP. Include the proof of detailed participation and the results thereof. Notwithstanding the geographical location (i.e., in relation to town and communities/farmlands) and ownership of the area applied for, please note that as part of the results of Public Participation the following details must be indicated: • Date of public meetings, • Minutes of the meetings, • Attendance register with name of the organisation, contact number and the signature thereof, • Views and concerns of the interested and affected parties, etc	EIA Section 7
Also note that you may employ different methods to inform interested and affected parties about the public participation such as newspaper advert, notification letters, public notices, etc. Ho we v er, the s e methods shall not be viewed as results of public participation rather means of notifying different parties.	EIA Section 7
A specialist must investigate the impact of the proposed project on surface and ground water resources and deduce mitigation measures thereof and performance monitoring standards.	EIA Section 8.2.4
d) An Archaeological Impact Assessment must be conducted to determine if there will be any graves, old houses, signs of historical significance and/or materials of archaeological importance. Incorporate recommendations of such report into the EIAR and EMP.	EIA Section 6.11 Appendix E6
Measures to mitigate visual impacts of the activities must be developed.	EIA Section 8.2.9
The total footprint of the proposed development should be indicated	EIA Section 5.3
Should a Water Use License be required, proof of application for a license needs to be submitted	To be submitted once MRA decision has been made in Phase 2 license applications
Possible impacts and effects of the development on the vegetation ecology, especially the protected trees identified on the proposed project	EIA Section 8.2.3
The impacts of the proposed facility on wildlife must be assessed in the EIAR phase.	EIA Section 8.2.3
Possible impacts and effects of the development on the surrounding industrial area	Not applicable – no industrial area
Should blasting be required, appropriate mitigation measures should be provided	EIA Section 8.2.12
You are advised to also undertake any studies which may be relevant during the impact analysis	No further studies required
Please ensure that the EIAR includes the A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, have the following attributes: Maps are relatable to one another; Co-ordinates; Legible legends; Indicate alternatives; Scale and Vegetation types of the study area.	Appendix C
Further, it must be reiterated that, should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provisions of any Specific Environmental Management Acts (SEMAs), proof of such application will be required	To be submitted once MRA decision has been made in Phase 2 license applications
You are requested to submit three (3) hard copies of the EIAR and EMPr on prescribed time frames in terms of Regulation with at least one electronic copy of the complete EIAR and EMPr to this Regional Office. Please note that such copies are not including	Noted

Acceptance Requirement	Reference in document
the hardcopies which to be forwarded to organs of state administering a law relating to matters affecting the environment. The EIAR and EMPr must be submitted within 106 days of the acceptance of the scoping report.	
You are therefore requested to consult with every organ of state that administers a law relating to a matter affecting the environment relevant to this application of environmental authorisation and submit the comments to this department.	EIA Section 7.1.5 Appendix B

LIST OF ACRONYMS

B-BBEE: Broad-Based Black Economic Empowerment
BID: Background Information Document
BLM: Blouberg Local Municipality
LEDET: Limpopo Department of Economic Development Environment and Tourism
DMRE: Department of Mineral Resources and Energy
DWA: Department of Water Affairs
DWS: Department of Water and Sanitation
EA: Environmental Authorisation
EAP: Environmental Assessment Practitioner
EIA: Environmental Impact Assessment
EIAR: Environmental Impact Assessment Report
EMP: Environmental Management Plan
EMPr: Environmental Management Programme
GNR: Government Notice Regulation
ha: Hectare
HIA: Heritage Impact Assessment
I&APs: Interested and Affected Parties
CRR: Comments and Response Register
IWUL: Integrated Water Use Licence
Diphororo: Diphororo Development (Pty) Ltd
km: Kilometer
LOM: Life of Mine
MAE: Mean Annual Evaporation
MAP: Mean Annual Precipitation
mbsl: Metres below sea level
m: Meter
mm: Millimeter
m_2: Square meter
m_3: Cubic meter
MWP: Mining Work Programme
CDM: Capricorn District Municipality
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)
NWA: National Water Act, 1998 (Act 36 of 1998)
PCD: Pollution Control Dam
PP: Public Participation
PPE: Personal Protective Equipment
PPP: Public Participation Process
RDL: Red Data List
ROM: Run of Mine
RWQO: Resource Water Quality Objectives

SAHRA: South African Heritage Resources Agency
SCC: Species of Conservation Concern
S&EIR: Scoping & Environmental Impact Reporting
SLP: Social and Labour Plan
StatsSA: Statistics South Africa
WML: Waste Management Licence
WUL: Water Use Licence

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- Appendix E2: Surface Water / Hydrology Assessment Report
- Appendix E3: Ecological and Biodiversity Assessment Report
- Appendix E4: Soil, Land Use and Land Capability Assessment Report
- Appendix E5: Social Impact Assessment Report
- Appendix E6: Archaeological Assessment Report
- Appendix E7: Palaeontological Assessment Report

1 INTRODUCTION

1.1 Background

The project name is the Steamboat Project, related to the farm name “Steamboat”. Cuchron holds a valid Prospecting Right No LP/5/1/1/2/10321PR for Graphite over the farm's Steamboat 306MR and Inkom 305MR, covering an area of 1,453 hectares, situated along the Mogalakwena River in the Province of Limpopo.

Steamboat Graphite will establish a Beneficiation Plant in proximity to the mine, to beneficiate and process the graphite for a broader market.

A Mining Right Application has been submitted by Cuchron for the mine development, and acceptance was received on 12 November 2020.

Two Environmental Authorisation Applications has been submitted:

- Cuchron has applied for Environmental Authorisation for the Mine Development and Associated Infrastructure
- Steamboat Graphite has applied for the Environmental Authorisation for the Beneficiation Plant and associated infrastructure.

Approval has been received from DMR to follow a joint and consolidated approach to the Environmental Impact Assessment Process, and produce combined reports for the two applications as envisaged in terms of Regulation 11(4) of the EIA regulations 2014 (as amended) which states “*if one or more proponents intend undertaking interrelated activities at the same or different locations within the area of jurisdiction of a competent authority, the competent authority may, in writing, agree that the proponent or proponents submit a single application in respect of all of those activities and to conduct a consolidated assessment process but the potential environmental impacts of each activity, including its cumulative impacts, must be considered in terms of the location where the activity is to be undertaken*”.

Further approval was received from DMRE on 2 December 2020 for an additional 30 days to finalise the Scoping Report (SR). The final Scoping Report was submitted on 15 February 2021 and acceptance of the SR was received on 29 March 2021.

1.2 Applicant and Specialist Details

1.2.1 Applicant

Project Sections	**Mining**	**Beneficiation**
Name of Company / Applicant	Cuchron (Pty) Ltd	Steamboat Graphite (Pty) Ltd
Name of the Mine / Production Operation	Steamboat Graphite Mine	Steamboat Graphite Beneficiation
Responsible Person	Dawn Makwakwa	Wenzel Kerremans

Project Sections	Mining	Beneficiation
Physical Address	174 Veale Street, Nieuw Muckleneuk, Pretoria 0181	20 The Gallops Drive, Blue Hills Country Estate, Beaulieu, Midrand 1684, Johannesburg
Postal Address	PO Box 96023, Waterkloof Village 0146	PO Box 98407, Sloane Park, 2152
Cell Number	082 267 1321	082 444 8792
Telephone Number	082 267 1321	082 444 8792
Fax Number	086 602 5566	086 602 5566
Email:	dmakwakwa@gmail.com	wenzelk@mweb.co.za

1.2.2 Environmental Assessment Practitioner

EAP:	Mrs Lizinda Dickson		
Qualifications:	Master's in Environmental Assessment and Management, University of Pretoria		
Professional affiliation/registration:	EAPASA awaiting approval IAIA & AP2		
Experience	25 years		
Contact person (if different from EAP):	Mrs Lizinda Dickson		
Company:	Diphororo Development		
Physical address:	151 Sefako Makgatho Drive, Sinoville		
Postal address:	PO Box 13509, Sinoville		
Postal code:	0129	**Cell:**	082 922 2261
Telephone:	012 543 9093	**Fax:**	086 602 5566
E-mail:	lizinda@diphororo.com		

The CV of Lizinda Dickson is attached at Appendix A.

1.2.3 Specialist Team

The specialist team has been appointed to assist Diphororo Development with the EIA is:

Specialist area	Specialist team lead
Heritage	Johnny van Schalkwyk
Soils, land use and capability	Dr Andries Gouws
Groundwater	Gerdes Steenekamp / Gerhard Steenekamp
Surface Water / Hydrological	Tinashe Maramba / Celia Siebani
Ecological study	Prof LR Brown / Mr C Cook
Social Impact Assessment	Mrs Fransis Stoltz

The team members, with their qualifications and professional registrations and affiliations is presented in Table 1.

Table 1-1: Qualification and professional registrations and affiliations of EIA specialists

Aspect	Company	Specialist	Qualifications / Professional registrations
Heritage	JA van Schalkwyk	Johnny van Schalkwyk	D Litt et Phill ASAPA Registered
Soils, land use and capability	Index (Pty) Ltd	Dr Andries Gouws	PhD: Integrated agricultural development SACNASP Registered
Groundwater	Groundwater Complete	Gerhard Steenekamp	MSc Geohydrology / Hydrology SACNASP Registered

Aspect	Company	Specialist	Qualifications / Professional registrations
Surface Water / Hydrological	Humba Environmental Consultancy	Celia Siebani	BSc Hydrology and Water Resources
Biodiversity	Enviroguard Ecological Services cc	Prof LR Brown	PhD Terrestrial plant ecology MSc. Water ecology BSc Hons (Botany) BSc (Ed) (Botany, Zoology, Education) Wetland and Riparian Delineation (DWAF Accredited Course) Soil Classification and Wetland Short Course SACNASP Registered
		Mr C Cook	MSc Zoology (Aquatic Science) BSc Hons Zoology Bsc Borany & Zoology Wetland and Riparian Delineation (DWAF Accredited Course) SACNASP Registered
Social	Diphororo Development	Dr Carien Joubert	D.Phil Social and Behavioural Sciences
		Mrs Fransis Stoltz	Diploma in Travel and Tourism Certificate in EIA Certificate in ArcGIS Pro

1.3 Project Location

The projects are located on the farm's Steamboat 306MR and Inkom 305MR, which is situated approximately 36km south-west of Alldays and 54km north-west of Vivo in the Blouberg Local Municipality, Capricorn District of Limpopo Province. The total extent of the properties is 1453.5761ha. The projects will require the following footprints:

- Mining Open Pit and Associated infrastructure: 14ha (1% of properties)
- Beneficiation Plant and Associated infrastructure: 13ha (1% of properties)

The combined size of the two projects is 27ha in total.

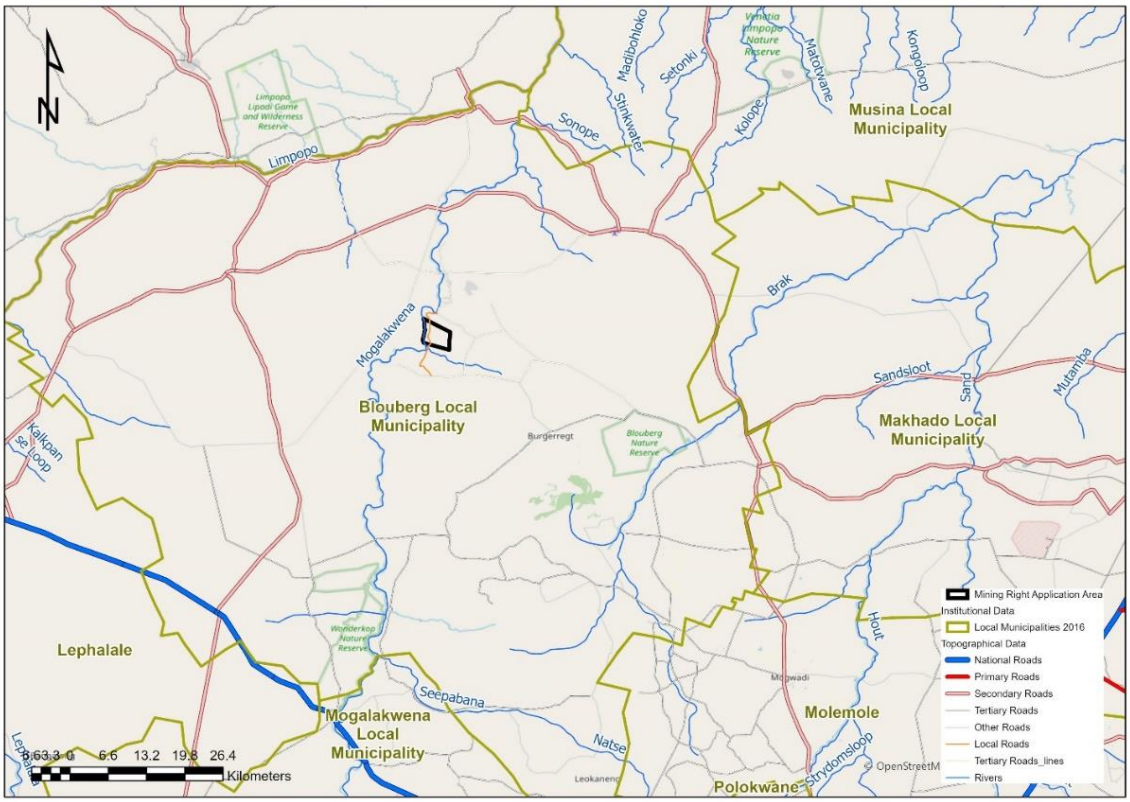


Table 1-2: Locality Map

The projects are located within Ward 17 with Ward 16 bordering the project area to the south.

1.4 Description of the Properties

Steamboat 306MR and Inkom 305MR are state-owned under the jurisdiction of the Ga-Kibi tribe and is currently utilised for livestock grazing.

Table 1-3: Project Properties

21 digit SG code	Properties	Size (ha)	Title deed	Landowner
	Steamboat 306MR	663.7223	T24557/1952PTA	National Government of the Republic of South Africa
	Inkom 305MR	789.8538	T24557/1952PTA	National Government of the Republic of South Africa
	Total	1453.5761		

The following adjacent properties are present:

Table 1-4: Adjacent Properties

Properties	Direction	Landowner	Comment
Arrie 308 MR	North	Government of the Republic of South Africa	Part of the Ga-Kibi Traditional Authority area
Zondagfontein 300 MR Ptn 1	West	Government of the Republic of South Africa	
Zondagfontein 300 MR Ptn 3	West	Roman Catholic Church	
Zondagfontein 300 RE	West	Ramakwa Project Trust	LRAD community project
Goudmyn 327 MS RE	South	Government of Lebowa	Part of Bahananwa Traditional Authority
Royston 326 RE	East	Government of the Republic of South Africa	Part of the Ga-Kibi Traditional Authority area

Voorhout 310 RE	East	Government of the Republic of South Africa	Part of the Ga-Kibi Traditional Authority area

1.5 Municipal areas

The project is located within the Blouberg Municipal area that forms part of the Capricorn District Municipality in Limpopo Province. The project area is situated in Ward 17 and neighboured to the south by Ward 16.

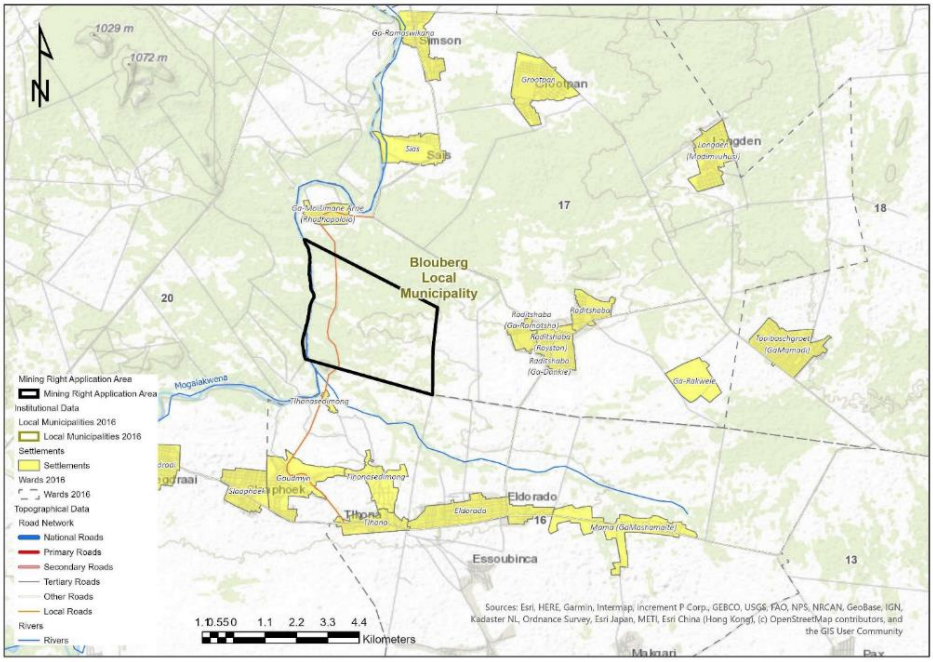


Table 1-5: Municipal Boundaries

1.6 Settlements

The principal settlement in Blouberg LM is the All-days town, with a large area of rural settlements under Traditional Authority jurisdiction.

Table 1-6: Settlements with distances from the operation

Town / Area	Approximate Direct distance	Direction
Voorhout / Royston	2km	East
Ga-Moisamane Arrie	2.5km	North
Thonasedimong	2.9km	South
Alldays	35km	North-east
Botswana Border	34km	North-West
Bochum/Senwabarwana	55km	South-east
Groblersbrug	85km	West
Louis Trichardt/Makhado	117km	East
Musina	137km	North-East
Polokwane	134km	South-east

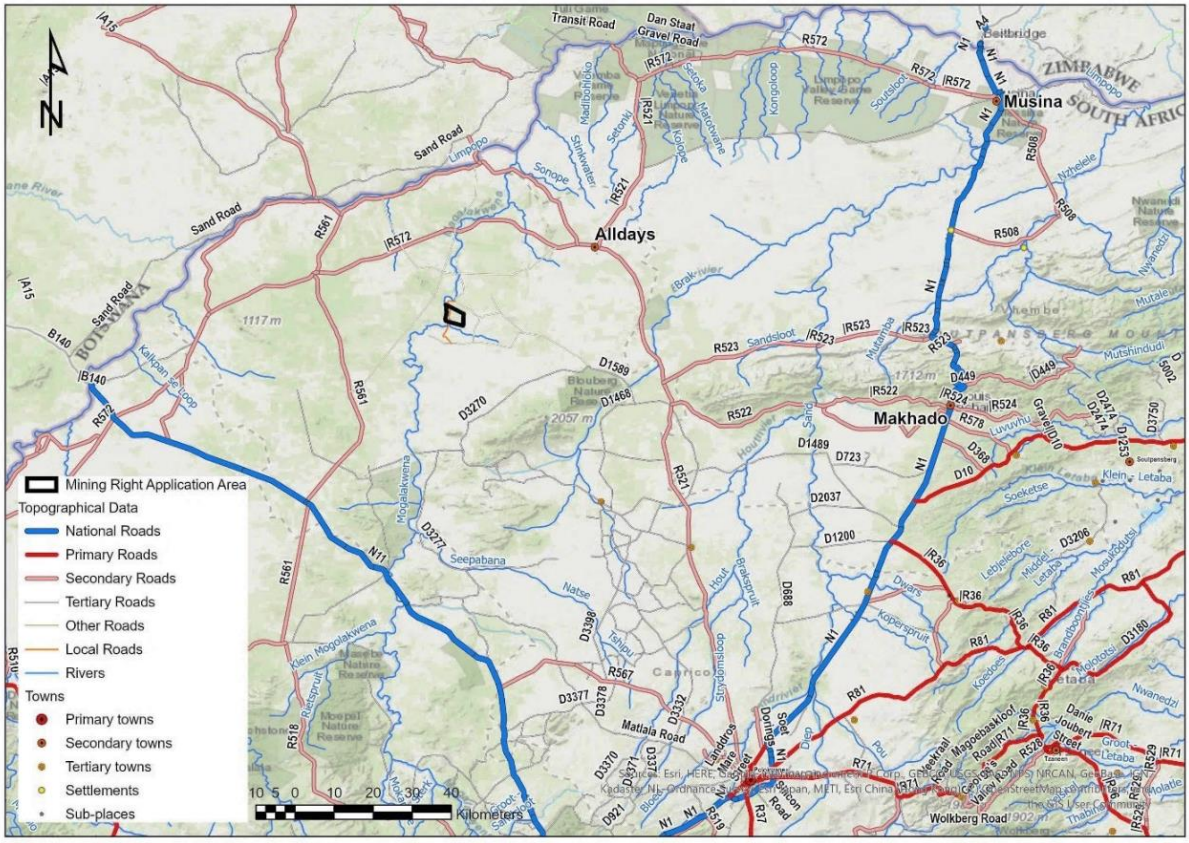


Table 1-7: Main Towns

1.6.1 Traditional Authority Areas

The operations are located within the Bahanawa-Ba-Kibi Traditional Authority area. The Bahananwa Traditional Authority borders the MRA to the south.

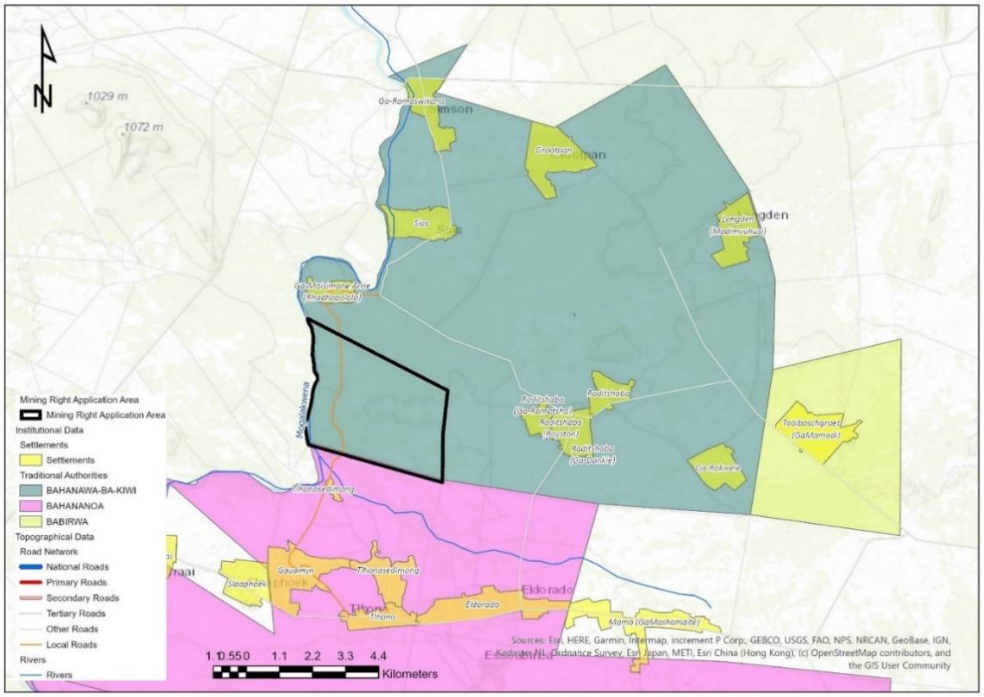


Table 1-8: Traditional Authorities

1.7 Road Network

Local and tertiary roads mostly serve the project area. Community roads link the project site with the D3297, D217 to the D572 to the north. The community roads link with the D3287, D3308, D1589 to the R521 to the east. See figure below.

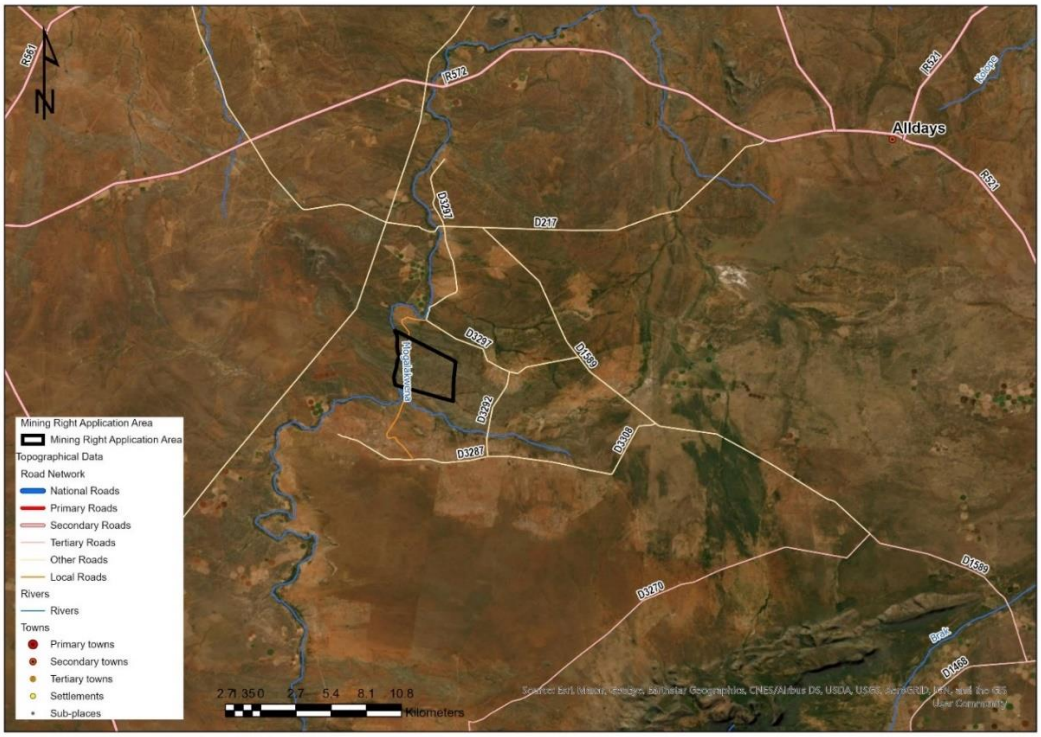


Table 1-9: Road Network

2 PROJECT SCOPE AND ACTIVITIES

2.1 Listed and Specific Activities

2.1.1 Mine Listed Activities - Cuchron (Pty) Ltd

The Cuchron Mine Development will be open pit mining and has a potential Life-of-Mine (LOM) of 20 years. The envisaged mining method for the open pit area is a conventional drill and blast operation with truck and shovel, load and haul.

The proposed infrastructure to be developed includes:

- Mining Office, Workshop and Storage Area
- Internal Roads

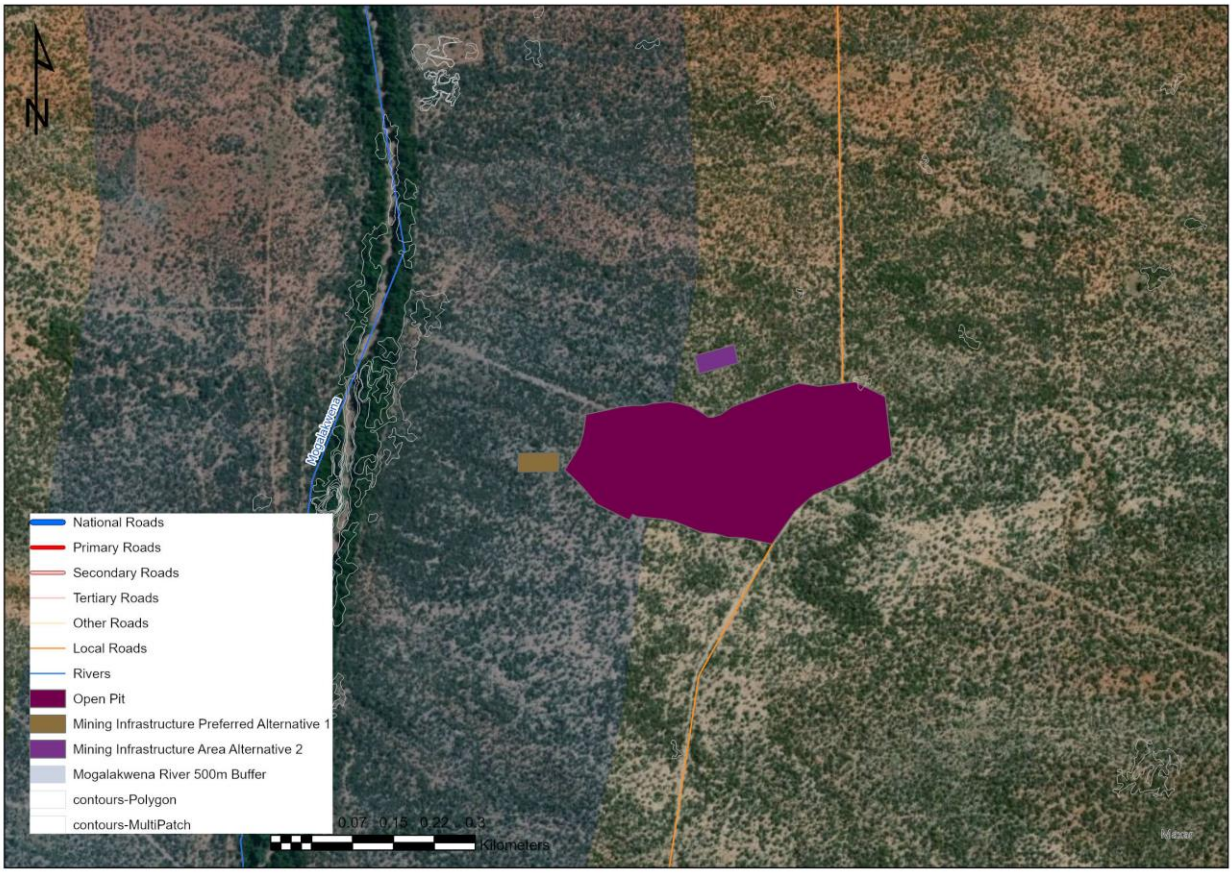


Table 2-1: Mine Infrastructure Site Location Alternatives

Table 2-2: Mine Listed Activities - Cuchron (Pty) Ltd

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
Open Pit with a size of 110,000m2 (11ha) Including water management infrastructure: Potable Water Pipelines: 1000m x 5. = 5 000m2, Dewatering Pipeline: 1000m x 5m = 5 000m2 and a Dewatering dam: 250m2, volume: 500m3 (0.5Ml). Pipelines will have a throughput below 120 liters per second and an internal diameter that is below 0.36 meters.	120 250m2 (12.025 ha)	X R983 (R327) R984 (R325) R985 (R324)	R983 (R327): - Activity 9 - Activity 12 - Activity 19 - Activity 27 - Activity 28 R984 (R325): -Activity 17 R985 (R324): - Activity 2 - Activity 12 - Activity 14	
Mining Office, Workshop and Storage Area	10 000m2 (1ha)	X R983 (R327) R984 (R325) R985 (R324)	R983 (R327): - Activity 14 - Activity 27 R984 (R325): -Activity 17 R985 (R324): - Activity 2 - Activity 10 - Activity 12 - Activity 14	
Access and Haul Roads: Construct internal service roads: 400m x 8m = 3200m2	Size of all new roads: 3,200m2 (0.32ha) Total length of roads: 400m	X R983 (R327) R985 (R324)	R983 (R327): - Activity 12 - Activity 19 - Activity 24 R985 (R324):	

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
	Width of roads with shoulder: 8m		- Activity 4 - Activity 12 - Activity 14	

2.1.2 Beneficiation Plant Listed Activities – Steamboat Graphite (Pty) Ltd

The Beneficiation Plant will be a separate business entity, operated by Steamboat Graphite.

The Beneficiation Plant will entail the following infrastructure:

- Beneficiation Plant
- Crushers, Mills and Screens
- Discard and Tailings Facilities
- Sewage Facility
- Syngas Power Generation Facility

The following listed activities are triggered by this development:

Table 2-3: Beneficiation Plant Listed Activities – Steamboat Graphite (Pty) Ltd

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
Graphite Beneficiation Plant with a size of 20,000m2 (2ha) Including water management infrastructure: Process Water Pipeline: 2000m x 5m = 10 000m2, Potable Water Pipelines: 1000m x 5. = 5 000m2 and a Pollution Control Dam: 500m2, volume: 1000m3 (1Ml). Pipelines will have a throughput below 120 liters per second and an internal diameter that is below 0.36 meters.	38 500m2 (3.85ha)	X R983 (R327) R984 (R325) R985 (R324)	R983 (R327): - Activity 9 - Activity 10 - Activity 12 - Activity 27 - Activity 28 R984 (R325): - Activity 6 - Activity 21 R985 (R324): - Activity 2 R985 (R324): - Activity 12 - Activity 14	**X** Category B Activity 11
Electricity Generation Facility with a generation capacity of 3MW, utilizing non-renewable resources	Size: 3ha Output: 3MW	X R983 (R327) R985 (R324)	R983 (R327): - Activity 2 - Activity 12 R985 (R324): - Activity 12 - Activity 14	**X** Category A Activity 5, 6, 12 Category C Activity 1
Discard Dump including stormwater management	Dump Size: 32, 000m2 and Volume: 570 tons total Stormwater channels of 1500m x 2m = 3 000m2	X R983 (R327) R985 (R324)	R983 (R327): - Activity 9 - Activity 12 - Activity 19 - Activity 27 R985 (R324): - Activity 12 - Activity 14	**X** Category B Activity 11
Access and Haul Roads: Construct internal service roads: 350m x 8m = 2800m2 and a new Access Road: 800m x 8m = 6,400m2	Size of all new roads: 9,200m2 (0.9ha) Total length of roads: 1150m Width of roads with shoulder: 8m	X R983 (R327) R985 (R324)	R983 (R327): - Activity 12 - Activity 19 - Activity 24 - Activity 27 R985 (R324): - Activity 4 - Activity 12 - Activity 14	

NAME OF ACTIVITY	Aerial extent of the Activity (Ha or m²)	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORISATION
Product Transport Roads: The upgrade of existing roads, alternative is 800m x 8m = 6,400m2 and alternative 2 200m x 8m = 17,600m2	17,600m2 (1.76ha) Length 3000m Widening of road with 4m	X R985 (R324)	R985 (R324): - Activity 4 - Activity 18	
Hazardous storage of Waste: Diesel tanks and Emulsion/Chemical stores that exceed 500m3 Electricity Generation Facility processing waste of more than 10 tons per day but less than 100 tons	Stores capacity: 1000m3 Waste processing: 99 tons per day	X R983 (R327) R984 (R325) R985 (R324)	R983 (R327): - Activity 14 R984 (R325) -Activity 4 R985 (R324): - Activity 10 - Activity 12	**X** Category A Activity 5, 6, 12 Category C Activity 1

2.1.3 Marketing Strategy

The product will be delivered to the local market, exclusively through the stand-alone Beneficiation Plant.

The local graphite market consists of the sales of feed grade graphite bearing ore & compounds to entities for beneficiation and are thereafter used in refractory materials, the chemicals and composite material industries, electrical applications, batteries and mechanical applications.

Feed grade graphite ore is a non-metallic mineral consisting of graphitic carbon. Most commercial feed grade graphite ore is mined and often contains other minerals requiring mineral processing such as froth flotation to concentrate the graphite. Graphite is a good conductor of heat and electricity. It is stable over a wide range of temperatures and highly refractory with a high melting point at 3650°C. Beneficiated graphite is mainly used in brake linings, foundry operations, lubricants, refractory applications and steelmaking.

Mining legend Robert Friedland likes to point out that if the world is going to sustain its push to green technologies, it will need specialist minerals. Graphite is one of them, and southeastern Africa is home to some of the largest untapped deposits in the world. Like Mozambique, Tanzania and other southern African countries, South Africa has very few graphite resources, none of which have as yet been exploited. The Steamboat graphite deposit will be the first graphite deposit to be exploited in South Africa.

The mining of the Steamboat Graphite in South Africa will also stimulate the beneficiation and further manufacturing industries in South Africa.

The uses of beneficiated graphite lend itself to the development of inter alia industries in composite materials, batteries, building materials, insulation materials, pipes, agricultural and mining support struts and other products.

2.1.3.1 Global Market

The global graphite market reached a value of nearly $1,282.7 million in 2018, having declined at a compound annual growth rate (CAGR) of -0.9% since 2014. The decline in the historical period was mainly due to the drastic fall in graphite prices during 2015 and a slight decrease in graphite production volumes in 2016, partially due to low demand from the steel sector. Post-2016, the global market started a gradual recovery supported by increasing demand from various end-user industries and rising prices. Asia-Pacific was the largest region in the global graphite market, accounting for 70.2% of the global market in 2018. It was followed by Western Europe, North America and then the other regions. The opportunity exists for Eastern Europe, and African graphite market to grow.

As a result of the Covid-19 pandemic resulting in a worldwide economic slowdown, the market for graphite has however suffered greatly. It is, however, anticipated that the market should start seeing a recovery from the second quarter of 2022.

Going forward, growing demand for electric vehicles, the opening of new graphite mines is expected to ensure steady and strong supply, rising commercial applications of graphene (made from graphite), and growing demand for energy storage will drive growth. Factors that could hinder the growth of the graphite market in the future include reductions in free trade and innovations in lubrication technology.

2.2 Description of Activities

2.2.1 Open Pit Mining and Associated Infrastructure – Cuchron (Pty) Ltd

2.2.1.1 Open Pit Mining

Conventional open-pit mining techniques will be used for this mine. Topsoil will be removed at a rate of 2000m^3 per annum. The ore will be accessed through drilling and blasting, and effectively involve the removal of blocks of ore, dug from the open pit of the deposit.

2.2.1.2 Mining Model and Schedule

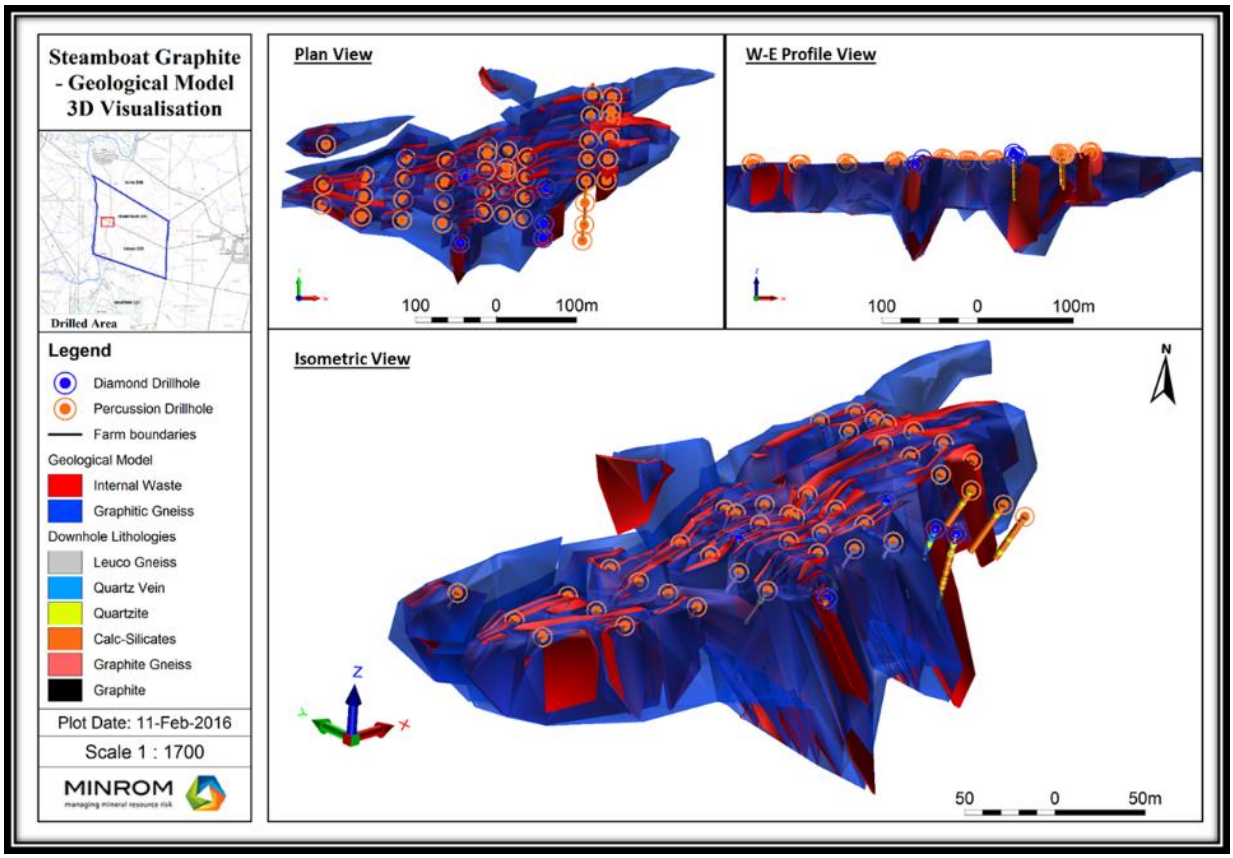


Table 2-4: Open Pit 3D model

2.2.1.3 Production Profile

RoM Graphite Feed Grade will be delivered to the customer. It is envisaged that production will be ramped-up from just over 100,000 tonnes per annum in the first year of production to the 500,000 tonnes per annum in the third year of production. The initial Life of Mine (LoM) is estimated at 20 years at the planned mining rate. The life of mine may be expanded as further resources are identified on the properties. The following figure provides the production schedule.

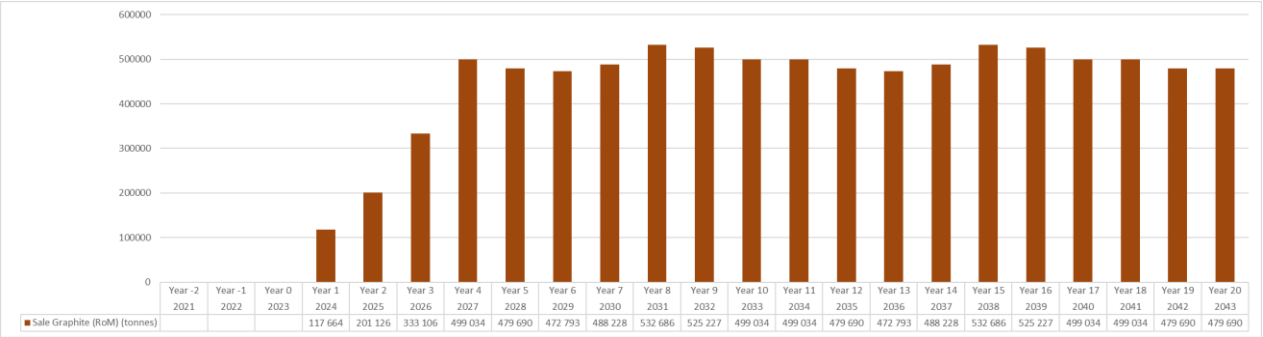


Figure 2: LOM Production profile

2.2.1.4 Resource Particulars

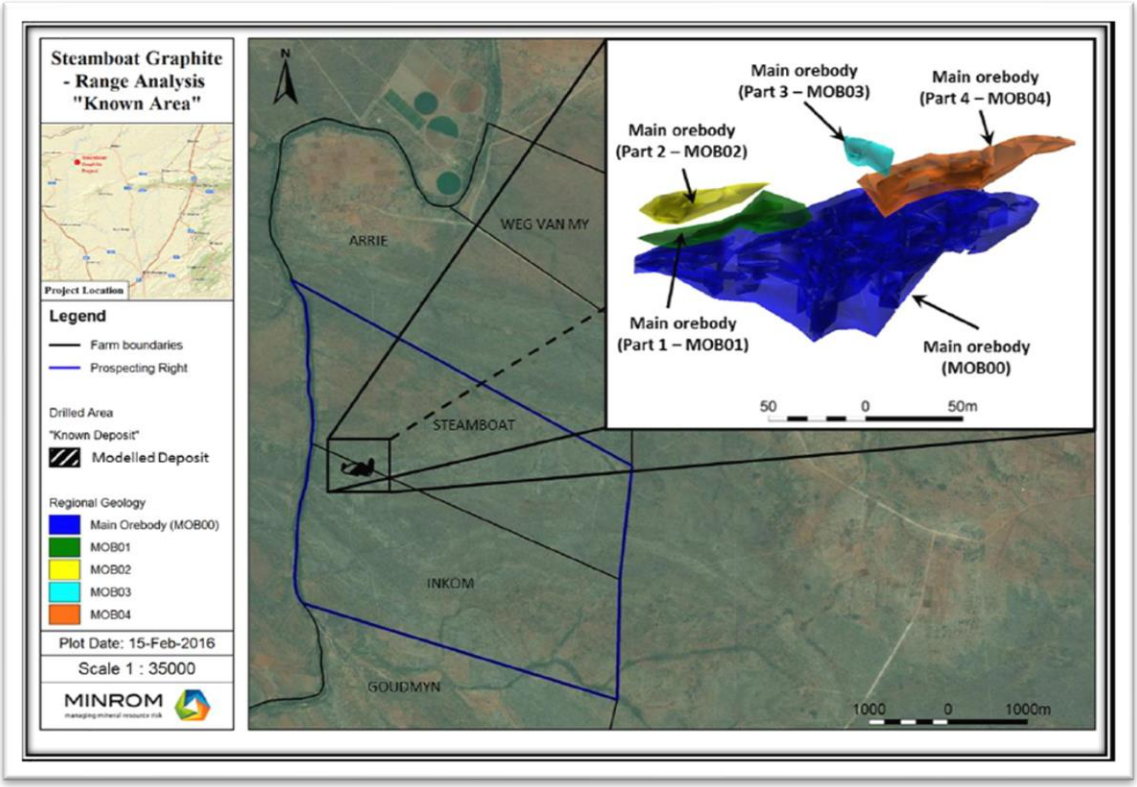


Table 2-5: Location and size of Phase 1 mining

The ore body that was modelled consists of five (5) parts, which collectively are referred to as the Phase 1 mining. Each part reflects a zone of ore-bearing graphitic gneiss which in-turn consists of a variable amount of internal waste[1].

Each of the five (5) parts of the geological model have been assigned a name and code. The nomenclature can be seen in Figure 21 and is as follows:

- Main orebody (code: MOB00) - the majority of the Phase 1 deposit,
- Main orebody part 1 (code: MOB01) - the orebody section just northeast of the Main orebody which is separated from the Main orebody by a thick unit of barren calc-silicate,
- Main orebody part 2 (code: MOB02) - the orebody section just north of the MOB01 which represents lens of graphitic gneiss completely surrounded by calc-silicate and quartzite units,
- Main orebody part 3 (code: MOB03) - the orebody section directly north of the Main orebody which consists of graphitic gneiss separated from the Main orebody by a series of quartz veins,
- Main orebody part 4 (code: MOB04) - the orebody section north-west of the Main orebody which is encapsulated by calc-silicate units but is likely connected to the Main orebody at depth.

[1] *Internal waste is defined as any lithology that does not contain graphite*

The assumptions that the tonnage estimations are based on are as follows:

- The orebody was modelled based on the mapping and drilling data,
- The orebody depth:
  - Does not extend below 120m,
  - Is not less than 20m.
  - The majority of the orebody does not extend below 50m,

- The specific gravity (density) was:
  - Conservatively estimated to be 2.58 for the graphitic gneiss (ore bearing lithology) based on the major lithological and mineral composition of the graphitic gneiss and host calc-silicates,
  - Conservatively estimated to be 1.9 for the Concentrated Graphite Bands, based on the density of graphite.

- The grade values used:
  - were based on the diamond drilling sample data,
  - were based on a total of 14 samples,
  - were assumed to be graphitic carbon percentages and not total carbon percentages,
  - were weighted against the sample length and averaged to yield a weighted average grade for the entire modelled area.

An individual volume and tonnage were calculated for each of the five (5) parts of the geological model. These are shown in the table below:

Table 2-6: Resource Estimate

Category	Subcategory	Surface Area (m2)	Depth	SG	Estimated Resource		
					Bulk Tonnage	Wt. Ave. %GC Grade	In-situ Graphite
Main Ore Body (MOB00)	Graphite Gneiss	50 834	50 – 100m	2.58	4 082 198	7.66	312 696
	Concentrated Graphite Bands	3 438	<100m	1.90	7 676	7.22	554
Secondary Ore Bodies	MOB01	5 779	50m	2.58	181 898	7.66	13 933
	MOB02	4 209	50m	2.58	163 123	7.66	12 495
	MOB03	1 959	50m	2.58	99 515	7.66	7 623
	MOB04	10 584	50m	2.58	581 646	7.66	44 554
TOTAL		76 803			5Mt	7.59% GC	0.4Mt

Run Of Mine (ROM) Graphite Contained Feed Grade Ore, estimated 500,000 tonnes per annum when in full production, delivered on a daily basis.

2.2.1.5 Rehabilitation and Closure Planning

At this stage it is envisaged that backfilling will only start after decommissioning of the mine. During the next study phase an optimised mine plan will be developed to create enough space for in-pit backfilling as soon as practically possible. This will be addressed in the Rehabilitation, Decommissioning and Closure Plan that will be developed in line with the requirements of Government Notice No. R.1147 (GN R.1147): "Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations" promulgated in November 2015. Financial provision will be updated on an annual basis in line with the requirements of GN R.1147. Refer to the EMPr that deals with the closure management objectives for the Cuchron Mine Project.

2.2.2 Description of the Beneficiation Plant

Steamboat Graphite will establish a beneficiation plant for the further processing and beneficiating of the raw graphite ore. The main aspects of the beneficiation process are:

- Primary, Secondary and Tertiary Crushing
- Primary Milling and Flash Flotation
- Rougher Flotation
- Primary Concentrate Cleaning Circuit
- Fine-Flake Concentrate Cleaning Circuit
- Final Concentrate Attritioning and Cleaning Circuit
- Concentrate leaching
- Concentrate Handling
- Concentrate Screening and Bagging
- Final Tailings Handling and Disposal

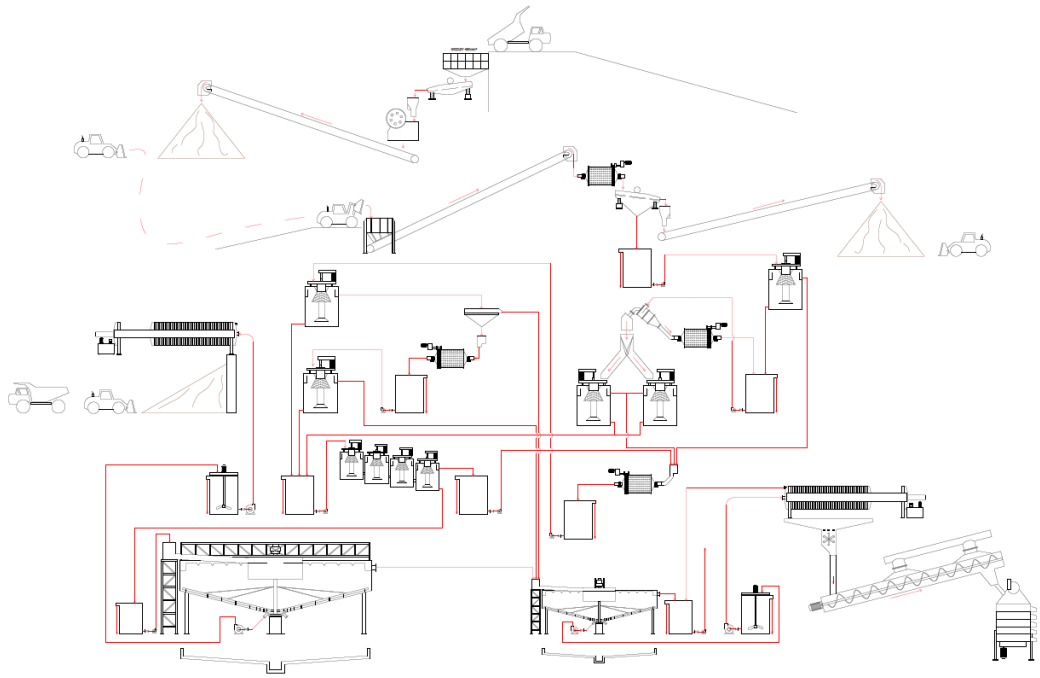


Figure 2: Processing Flow Chart

These processes are explained more fully below.

- **Primary, Secondary and Tertiary Crushing**: The crusher circuit is fed with ROM material using a front-end loader (FEL) at a rate of 100 t/h. The ROM material is screened using a ROM static grizzly screen, located at the top of the primary crusher bin to reject rocks larger than 300 mm (oversize material). The oversize material shall be stockpiled near the feed bin and may be manually crushed using rock breakers. The static grizzly undersize material (-300 mm) is further screened using the grizzly feeder, which is fitted with 70 mm openings; the oversize material (+70 mm) is discharged into the jaw crusher. The crusher is set to a Closed Side Setting CSS value of 75 mm and is expected to produce 100% -120 mm material. The crusher product and the grizzly undersize are discharged onto the primary crusher discharge conveyor. The primary crusher product is fed to the classification screen via the classification screen feed conveyor. The classification screen is fitted with two decks; the top deck is fitted with 35 mm screen panels while the bottom deck is fitted with 16 mm panels. Oversize from the top deck (+35 mm) discharge into the secondary crusher feed bin and is fed to the secondary crusher via a feed conveyor and the secondary crusher feeder. Oversize material from the bottom deck (-35+16 mm size fraction) flows by gravity into the tertiary crusher feed bin and is fed to the tertiary crusher via the tertiary crusher feed conveyor and the tertiary crusher feeder. Products from the secondary and tertiary crushers are combined and recycled back to the classification screen. The bottom deck screen undersize (-16 mm size fraction) from the classification screen is fed to the mill feed bin via the mill feed conveyor.

- **Primary Milling and Flash Flotation**: The crushed material from primary mill feed bin is fed to the primary mill scalping screen at the flowrate of 30 t/h via the mill feed bin feeder and the primary mill feed conveyor. The scalping screen is fitted with 2 mm aperture panels. Oversize from the screen (+2 mm) flows into the primary ball mill by gravity. Spillage material in the primary milling circuit is pumped to the scalping screen through the mill area spillage pump. The mill is expected to produce a product with a grind of 80% passing 500 microns; this product is discharged into the primary ball mill discharge sump. Slurry from the mill discharge sump is pumped (via the primary mill discharge pump to the primary mill screen which is fitted with a 600 µm aperture panels and discharges the oversize (+600 µm) back into the primary mill. The -2 mm material from the scalping screen flows by gravity into the flash flotation cell; the flash flotation cell is installed to recover graphite flakes liberated at coarse particle sizes. Flash flotation produces a concentrate at a mass yield of 3%. Flash flotation tailings are pumped into the primary mill discharge sump via the flash flotation tails pump.

- **Rougher Flotation**: The rougher flotation feed slurry (-600 µm), which consists of the combination of flash flotation tailings and the primary mill product, flows into the rougher flotation bank by gravity at the solid's flowrate of 29 t/h. Frother and collector reagents are added into rougher cell no.1 and rougher cell no.3. Rougher concentrate mass pull is expected to be 8%. The flash flotation concentrate and primary rougher

concentrate are combined in the total concentrate sump and pumped to the primary concentrate cleaning circuit using the pumps. The tailings from the rougher flotation circuit are discharged into the combined tailings sump; the combined tailings stream is then pumped to the final tailing's thickener using the combined tailings pump. Any spillage from the rougher flotation section is pumped to the primary ball mill scalping screen using the rougher flotation spillage pump.

- **Primary Concentrate Cleaning Circuit**: The combined concentrate is screened on the primary cleaner dewatering screen; the screen is fitted with 74 µm panels. The oversize from the dewatering screen is discharged into the primary polishing mill. The mill discharge and the dewatering screen undersize are discharged into the primary polishing mill discharge sump. The primary mill discharge sump slurry is pumped to the primary cleaner column cell using the primary polishing mill discharge sump pump. The column flotation cell tailings are pumped to the primary cleaner flotation bank; the tailings stream from this bank is discharged into the primary cleaner scavenging flotation cell bank, which consists of three flotation cells. The primary cleaner flotation concentrate is recirculated back to the primary cleaner column cell. The cleaner scavenger concentrate is recycled back to the polishing mill feed classification screen, while the tails are pumped to the combined tails sump in the rougher flotation area via the final cleaner tails' sump and the final cleaner tails pump. The concentrate from the primary cleaner column cell is screened on the primary column flotation cell concentrate screen, which is fitted with 212 µm screen panels. The oversize from this screen flows by gravity into the fine flake cleaning circuit while the undersize is pumped to this circuit using the primary column cell concentrate undersize pump.

- **Fine-Flake Concentrate Cleaning Circuit**: The undersize from the primary column flotation cell concentrate (fine flakes stream) is dewatered at 75 µm on the fine flake dewatering screen. Oversize from the dewatering screen flows into the fine flake polishing mill; the discharge from the mill and the dewatering screen undersize are discharged into the fine flake polishing mill discharge sump. The sump slurry is pumped to the fine flake column cell using the fine flake polishing mill discharge pump to produce a concentrate at a mass pull of about 7%. The fine flake column concentrate is combined with the primary flotation column screen oversize stream from the primary cleaning circuit; this combined stream is pumped to the attrition cleaning circuit using the combined cleaner concentrate pump. The fine flake column flotation tailings are subjected to cleaning and scavenging flotation. Concentrate from the cleaner cells is recycled back to the fine flake column cell by gravity while the scavenger concentrate is pumped back to the fine flake dewatering screen. The tailings from the scavenger cells flow by gravity back into the final cleaner tails' sump in the primary concentrate cleaning circuit.

- **Final Concentrate Attritioning and Cleaning Circuit**: The cleaner concentrate stream is subjected to thickening in the attrition concentrate thickener; overflow from the thickener is discharged into the process and storm water tank in the water services

area. The underflow, which has a density of 1.19 RD, is pumped to the attrition mill. Product from the attrition mill flows into the attrition mill discharge sump and this is pumped to the attrition cleaner column flotation cell using the attrition mill discharge pump. Tailings from the attrition column flotation cell are pumped to the attrition cleaner and scavenging flotation cells. The concentrate from the cleaners is recirculated by gravity back to the attrition column flotation cell while the scavenger concentrate is pumped back to the attrition concentrate thickener. The tailings from the scavenger cells are recycled by gravity back to the final cleaner tails' sump in the primary concentrate cleaning circuit.

- **Concentrate leaching:** A percentage of the flake product may need to be a higher percentage of graphitic content than that can be obtained by physical separation. This does not apply to all the graphite Flake**,** only a certain percentage of the larger flake material as determined by market demand will be treated chemically to remove 2.4% additional, non-Graphitic impurities.

In order to increase the purity of the graphite from 93.6% to 96% the final concentrate is leached with sulphuric acid to remove impurities. Leaching is done for 120 minutes at a liquid/solid's ratio of 5 in 10% sulfuric acid concentration at 85 degrees Celsius.

In order to be environmentally neutral a process to recycle this spent sulfuric acid is planned, this proven process has considerable cost savings for raw material and effluent disposal using the De Dietrich Process.

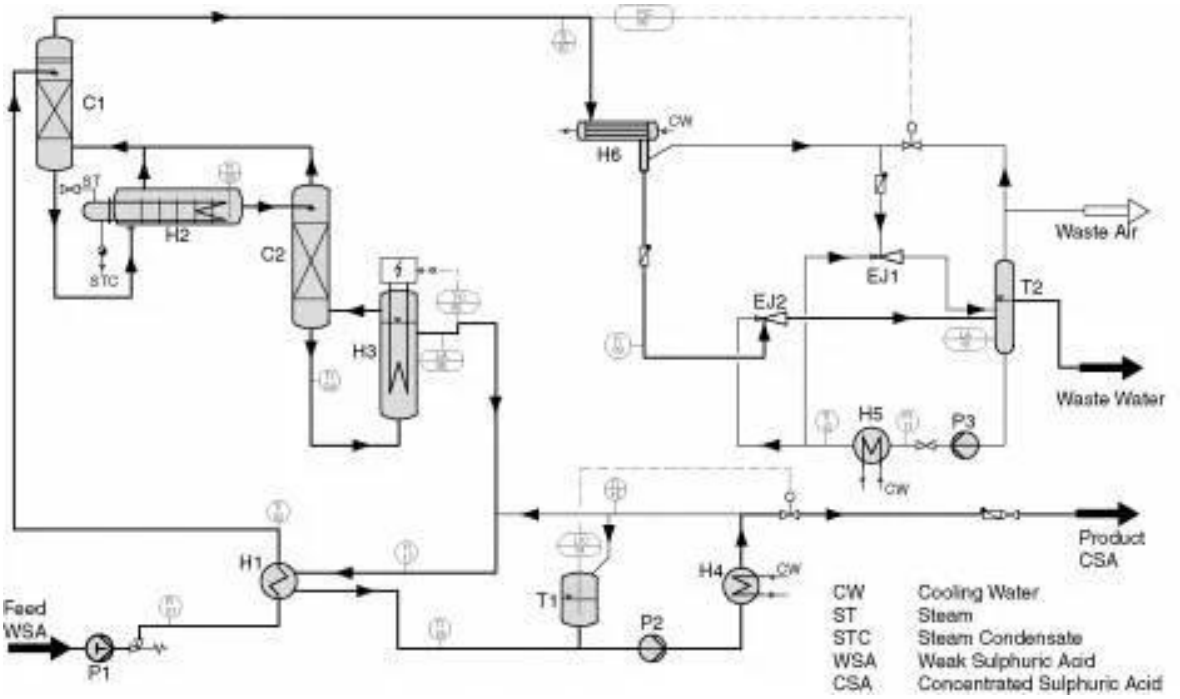


Table 2-7: DDPS standard plant

The DDPS standard plant for concentration of sulfuric acid is depicted in the flowsheet shown above. Weak sulfuric acid, e.g., sulfuric acid of 80 wt.-% H_2SO^4, is fed by dosing pump P1 via recuperator H1, into scrubbing column C1.

In H1 the acid is preheated by means of the of concentrated product acid, e.g. sulfuric acid of 96 wt.-% H_2SO^4. In scrubbing column C1 the acidic content of the vapour, produced in evaporator H2 and scrubbing column C2, is washed out. Next, the acid enters the horizontal evaporator H2 at one end and leaves it with higher concentration at the other. Evaporator H2 is designed as a horizontal vessel made of borosilicate glass.

The lower part of the evaporator is equipped with baffles in the transverse direction. Inflow direction the baffles approximate to a chamber cascade, and the acid is concentrated step by step within the chambers.

Discharge of higher concentrated acid out of horizontal evaporator H2 is done via free overflow, and the acid is fed to the top of scrubbing column C2. The aim of column C2 is the first step purification of the vapour rising from evaporator H3. The further scrubbing of acidic content from the vapour out of evaporator H3 is carried out together with the vapour out of evaporator H2 in scrubbing column C1.

Intermediate strength acid from column C2 enters evaporator H3 and leaves this vessel with the desired concentration. The heating of evaporator H3 is maintained electrically by immersion heating units made of quartz, enabling operation at temperatures of 180-220°C.
Discharge of high concentrated product acid from evaporator H3 to recuperator H1 is done via the free overflow. The horizontal concept of both evaporators and of the free flow acid discharge eliminates the need for any pump in the hot process section.

Vapour from scrubbing column C1 is condensed in condenser H6. Arising condensate leaves the plant via free overflow out of separator T2. Vacuum generation is achieved by a liquid jet pump where the arising condensate is used as working fluid.

Due to the use of condensate as the working fluid, additional waste streams are avoided. QVF standard plants for sulfuric acid concentration are equipped with automated process control systems, and the operation is through "on-screen" control.

- **Concentrate Handling:** The final concentrate is thickened in the final concentrate thickener. The thickener overflow is discharged into the process water dam, whereas the underflow is filtered in the final concentrate filter press, which is expected to produce a filter cake with less than 20% moisture. The filtrate is pumped back to the final concentrate while the filter cake is discharged onto the final concentrate filter cake conveyor and fed to the final concentrate drying and bagging circuit.

- **Concentrate Screening and Bagging**: The filter cake concentrate from the filter is fed into a diesel-fired dryer via a conveyor. The filter cake is dried to a moisture content of lower than 1% (w/w). The dry concentrate is then screened into four size fractions:

+400, -400+200, -200+150 and -150 micron. Each of the size fractions is bagged separately as the final product. The area will be located within a closed building with dust collection and filtering systems to contain all airborne dust and Graphite.

2.3 Infrastructure Layout

Refer to Table 2-8 for the placement of site location alternatives of the beneficiation plant and associated infrastructure.

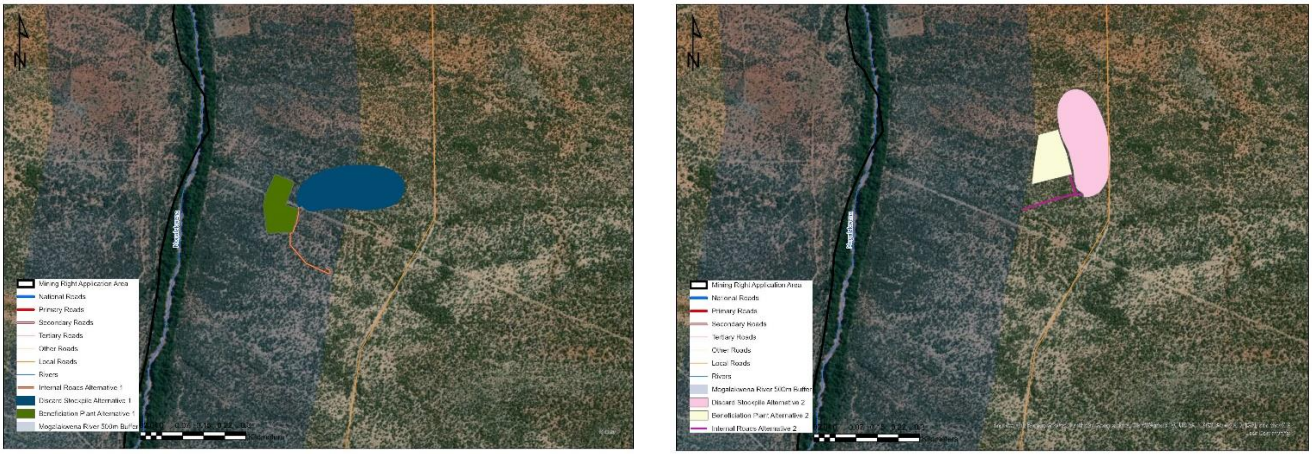


Table 2-8: Beneficiation Plant & Infrastructure and Discard Stockpile Site Location Alternatives

2.3.1 Road Infrastructure

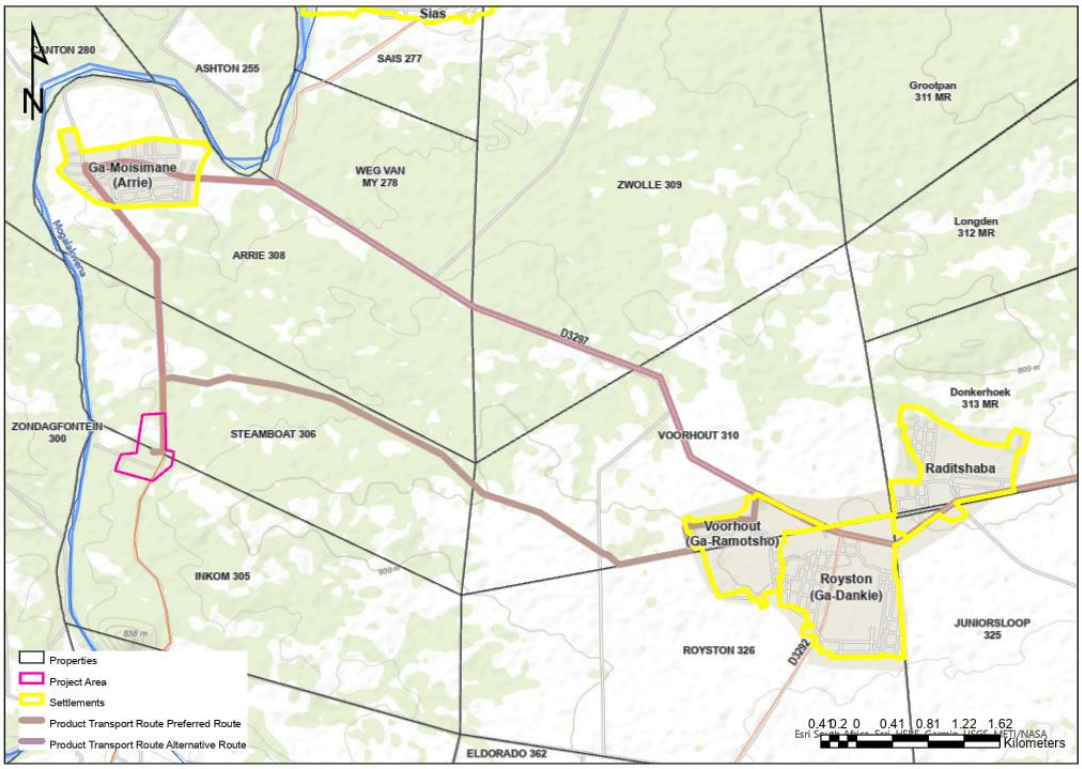


Table 2-9: Product Transport Alternatives

After further investigation during the EIA phase the product transport alternatives were revised. The following two alternative routes for Product Transport on existing roads has been considered and investigated:

- Alternative 1 (14.2km) follows an eastern direction from the site for 8.4km which passes the Voorhout community, onto the D3297 for 5.8km to join the D1589 towards Polokwane
- Alternative 2 (18km) follows a northern direction from the site for 5.5km which passes through Arrie (Ga-Moisimane) community, onto the D3297 for 12.5km to join the D1589 towards Polokwane.

2.3.2 Security and Access Control

Perimeter fencing is planned around the infrastructure areas. These fences will be maintained for the duration of the project. Access control and a security office would be established at the entrance to the infrastructure and operational areas. Safety barriers will be placed around the perimeter of the open-pit mining areas.

2.3.3 Waste Management

2.3.3.1 Discard and Tailings Facilities

In-pit waste dumping will be utilised as far as practically possible, and the remaining waste to be accommodated on the surface near pit exit in a combined discard and tailings facility. The tailings from the beneficiation plant will be dewatered and co-disposed onto the discard dump facility using the paddock theory. Tailings stream from the combined tailings sump in the rougher flotation circuit is thickened in the final tailing's thickener. The thickener underflow from the thickener, which has a slurry density of 1.51 RD, is pumped to the final tailing's filtration circuit and disposal circuit through the final tails' thickener underflow pump and the final tails pump. The thickener overflow stream flows into the process and stormwater tank in the water services area. This part of the circuit is operated in a semi-batch manner and is expected to produce a filter cake with 15% moisture. The final tailings thickener underflow material from the final filtration feed tank is pumped to the final tails filter; the filtrate is discharged into the final tails filtrate tank and recycled to the final tails thickener while the filter cake is stockpiled and discarded by an FEL. During the active waste-tipping phase the waste dump will be contoured to 18 degrees to allow for slope stability and re-vegetation. The waste dump will progress by tipping from a higher level against a window and progressively pushing the waste out with a dozer. Waste dumps should be progressively rehabilitated with topsoil, where possible. Low-grade and ore stockpile dumps will be constructed in close vicinity to the primary crusher tipping point in order to minimise the reclamation costs.

2.3.3.2 Sewage Facility

The only sewage expected to be generated on the mine is from the ablution facilities and washrooms at the plant area. It is envisaged that this sewage will be treated in a package plant, fed by gravity from the various facilities. The proposed sewage treatment works will be

a semi-package plant design. The proposed plant has already been utilised on many mines and carries the approval of the Department of Human Settlements, Water and Sanitation (DHWS). The processes included in the proposed plant are:

- Primary settling
- Anaerobic digestion
- Aerobic digestion
- Final settling
- Disinfection

2.3.3.3 General and Hazardous Waste

Upon approval of the project, a dedicated, approved (registered) waste contractor will be appointed by the mine to manage the non-mining waste generation and safe disposal thereof. The following waste types will be generated during the project:

- Domestic waste
- Hazardous waste, including used oil/diesel/greases
- Fluorescent tubes
- Glass and plastics
- Chemicals
- Medical waste
- Scrap metal
- Building rubble (construction & demolition activities)
- Used tyres
- Old explosives

The different waste streams will be segregated and disposed of in appropriate designated receptacles. All waste will be disposed off-site at approved landfill sites. No landfill site will be established on the Steamboat site.

2.3.4 Power Generation for Own Supply

Although ESKOM power supply is available, the capacity and reliability of this supply are not confirmed. Consequently, a self-generation model will be used by establishing a 3MW Biomass/Coal Gasification Facility. This facility will provide 100% of the mine site requirements on a continuous basis. High voltage power will be reticulated around the mine with the reticulation voltage to be determined from the results of final power studies. The facility will involve the installation of a gasifier that will produce syngas from a feedstock of mainly biomass supplemented with coal. The syngas will be used as a fuel for 2 sets of gas turbines to produce a combined approximate 3 MWe Electricity.

The main targets of this project are to:

- Generate electricity through the gasification of biomass
- Reduce fossil fuel dependency for the production of clean energy.
- Reduce industry dependency on the national electricity grid.

- Possible utilisation of ash/char by-product as fertiliser or in cement production pending chemical analysis.

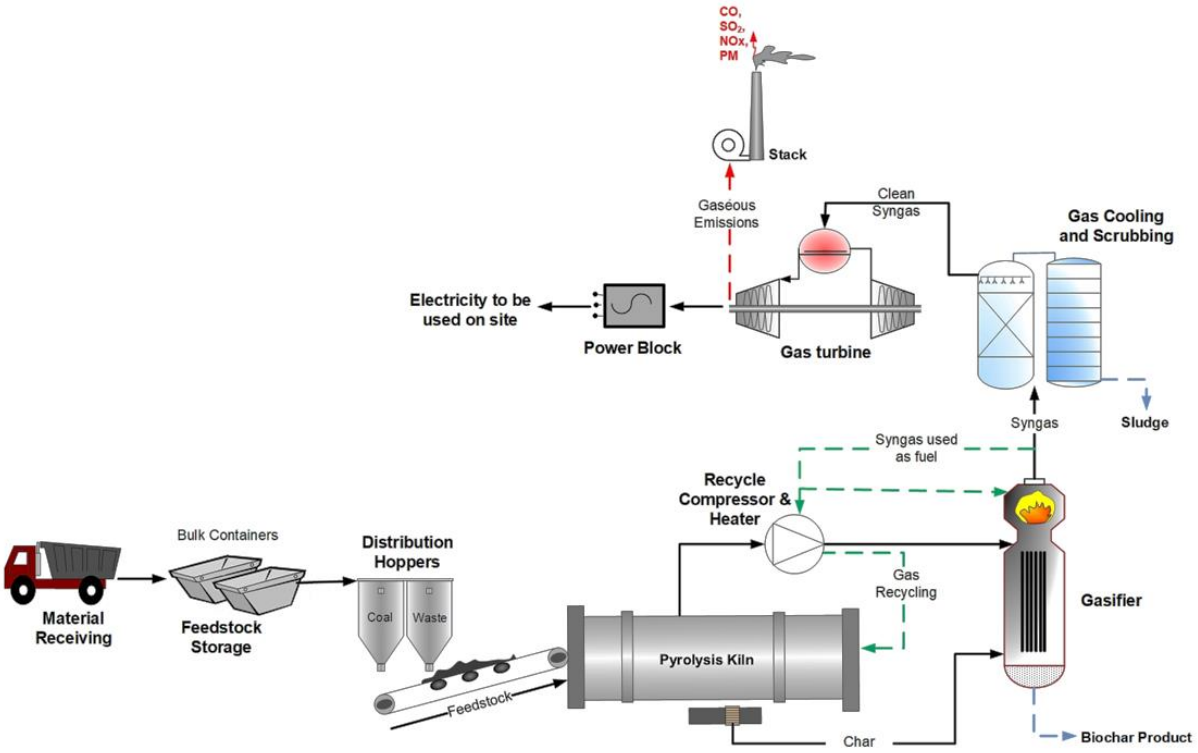


Table 2-10: Gasification Facility Process Flowchart

The following aspects regarding the facility should be noted:

- **Waste Receiving and Processing**: Biomass and other solid wastes will be sourced locally and delivered to the site via trucks. The waste is to be stored in water-resistant, flexible bulk containers on an impermeable floor. Coal that will supplement waste feeds will also be delivered to site via road either pre-blended with the feedstock or stored in a hopper. From storage, the waste will be fed into a receiving hopper of a variable speed incline conveyor system that will feed the material into a pyrolysis kiln. The coal will be used only as feedstock security and will be fed proportionally with the feedstock onto the conveyor as required.

- **Gasification Process**: The pyrolysis kiln is a heated, oxygen-starved environment which drives off moisture and volatile gases contained in the feedstock. Pyrolysis produces carbon char and ash that moves into a separate, externally heated gasification reactor, which converts the solid carbon molecule into a gaseous state. Gasification is accomplished with heat, pressure, and the injection of ionised water. The injection of ionised water in a process known as steam reformation creates a water shift reaction to produce syngas. The hot syngas is water quenched and cleansed of its impurities in a scrubber system, thus delivering a clean, dry syngas with no liquid discharge from the plant operation.

- **Electricity Production**: The clean syngas will be directed into an internal combustion engine coupled with a generator to produce up to 3MWe electricity, to be used within an industrial complex.

- **Energy Use**: All feedstock is to be processed in an enclosed and sealed reactor, allowing contaminants to be efficiently captured and disposed of in ash collectors or through water scrubbing processes. Pollutants are not to be released into the atmosphere in this process, as they would be in a combustion-centric process. A gas recycles compressor will allow for some gas from the pyrolysis kiln to be recycled back to power the kiln. The gasifier will be able to utilise the syngas to fire the burner and will recycle the process water such that the facility has zero liquid discharge. Ash recovered from the system can be further processed to recover elements contained in the ash, and/or the ash can be used in the production of cement or used as a fertiliser. A portion of the ash can be recovered as a bio-char and used as a soil amendment, which provides for carbon capture and sequestration in addition to improved crop performance.

- **Waste Hierarchy**: The proposed project is in line with the national waste management strategy and the promotion of the waste hierarchy through the recovery of waste and subsequent reduction of waste being disposed of to landfill. The Project is aligned with Goal 1 of the National Waste Management Strategy: Goal 1: to Promote waste minimisation, reuse, recycling and recovery of waste. The establishment of the gasification plant will effectively result in:
  - Recovery of waste where such materials might otherwise be disposed of
  - Generation of electricity through the gasification of biomass and other wastes
  - Reduction of solid waste being disposed of to landfill

2.3.5 Bulk Water Supply

2.3.5.1 Water Requirements

Make-up water demand for the Steamboat Project is estimated at 0.5Ml/day (195Ml/annum). The water balance is provided below:

Water Supply will be sourced from inflow groundwater into the pit and groundwater boreholes. The daily bulk water requirements for the Cuchron and Steamboat Project is as follow:

- Beneficiation Plant – 102 200 m³/annum
- Power Generation – 58 400 m³/annum
- Dust suppression – 18 250 m³/annum.
- Washbay – 3 650 m³/annum.
- Potable water – 1 8250 m³/annum.
-

The available water sources, as calculated with the available information, can be summarised as follow:

- Average annual rainfall – 4 644 m^3/annum.
- Open Pit abstraction – 158 800 m^3/annum
- Groundwater abstraction – 47 304 m^3/annum
- Recyclable beneficiation plant water – It is estimated at this stage that 45% of the water used within the plant will be recycled for reuse and has been incorporated into the water balance.

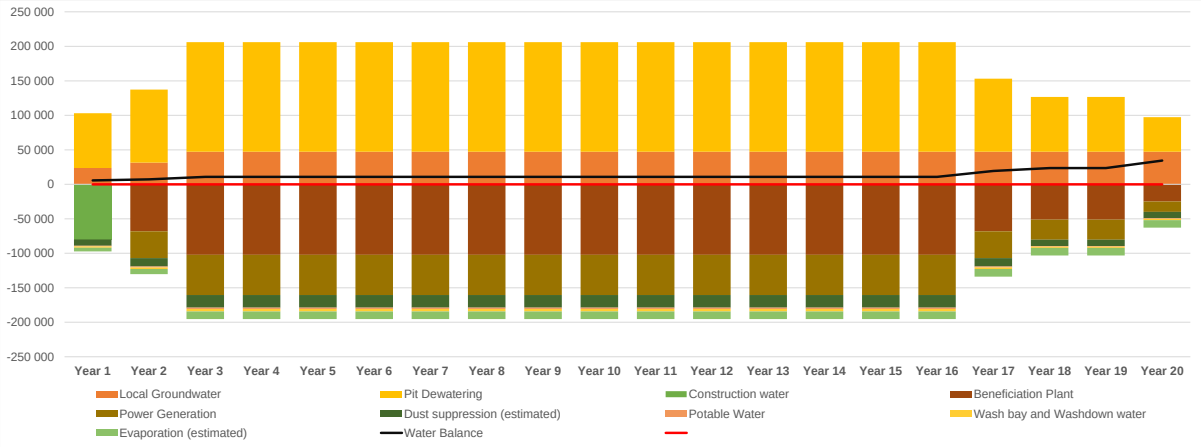


Table 2-11: Water Balance

In-pit flows will provide approximately 435m^3/day and 3 boreholes can provide 130m^3/day, which together can provide 565m^3/day. The mine and beneficiation plant requirements are 535m^3/day. A network of pipelines will connect to a single main pipeline, which will pump water to the Process Plant Raw Water Dam.

2.3.5.2 Water treatment and storage reservoirs

On-mine water treatment and storage facilities will be established to facilitate daily demands. The following infrastructure is planned:

- Potable water tanks
- Raw and service water Reservoir.

2.3.5.3 Stormwater Management

The majority of the stormwater network for project will be designed as an open channel network with separate systems for dirty water areas and clean water areas. The stormwater conveyance elements will include the following items such as Channels, Berms and Culverts. The open system alleviates the necessary maintenance procedures to keep the network clean of silt, while access to the various structures opposite of the channels will be provided using culvert crossings.

Stormwater storage dams serve as the receiving bodies for stormwater runoff from dirty and clean water systems on the mine site. The design and operation of stormwater dams will comply with the legal requirements, including the assessment of the required dam capacity, the location of the dam and the discharge frequency (Government Notice 704 of 4 June 1999).

Stormwater storage dams will include:

- Clean water storage dam
- Dirty water storage dam

2.3.5.4 Hydrocarbon Requirements

A total of 50 m^3 of hydrocarbon storage facilities will be required for the operational phase, as indicated in Table 2-12.

Table 2-12: Hydrocarbon requirements for the Project

Quantity	Volume	Location
1	30 000 litres	Bulk storage for diesel at the workshop area facility
1	10 000 litres	Bulk storage facilities for new oils and lubricants at the workshop area
1	10 000 litres	Bulk storage facilities for used oils at the workshop area

3 POLICY AND LEGISLATIVE CONTEXT

3.1 Applicable Legislation, Policies and Strategies

The legal frameworks within which the mining development, beneficiation development and associated infrastructure aspects operate are complex and include many acts, associated regulations, standards, principle, guidelines, conventions and treaties on an international, national, provincial and local level. The main legal frameworks that require compliance in terms of Environmental Authorisation are:

- Act No. 28 of 2002: Mineral and Petroleum Resources Development Act (MPRDA), as amended
- Act No. 107 of 1998: National Environmental Management Act (NEMA), as amended
- Act No. 36 of 1998: National Water Act (NWA), as amended
- Act No. 25 of 2014: National Environmental Management Laws Amendment Act (NEMLAA)

Other legislative frameworks applicable to the Project include (list not exhaustive):

- Act No. 108 of 1996: The Constitution of South Africa
- Act No. 25 of 1999: National Heritage Resources Act (NHRA)
- Act No. 10 of 2004: NEMA: Biodiversity Act (NEMBA)
- Act No. 43 of 1983: Conservation of Agricultural Resources Act (CARA)
- Act No. 84 of 1998: National Forests Act (NFA)
- Act No. 39 of 2004: National Environmental Management: Air Quality Act (AQA)
- Act No. 57 of 2003: National Environmental Management: Protected Areas Act
- Act No. 59 of 2008: National Environmental Management: Waste Act (NEMWA)
- Act No. 26 of 2014: National Environmental Management Act: Waste Amendment Act
- Act No. 101 of 1998: National Veld and Forest Fire Act
- Act No. 15 of 1973: Hazardous Substances Act
- GN No. 704 of 4 June 1999: Regulation on use of water for mining and related activities aimed at the protection of water resources
- GN No. R. 982-986 of 4 December 2014: NEMA: EIA Regulations, as amended in 2017
- GN No. 634 of 23 August 2013: NEMWA: Waste Classification and Management Regulations
- GN No. R. 921 of 2013: NEMWA: Waste Management Activities, as amended by GN No. R.332 of 2 May 2014 and GN No. R.633 of 24 July 2015
- GN No. R.248 of 31 March 2010: AQA: Atmospheric Emissions Activities, as amended in 2013
- GN No. R.152 of 2007: NEMBA: Threatened or Protected Species (TOPS) Regulations
- GN No. R.1147 of 20 November 2015: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations
- Act No. 7 of 2003: Limpopo Environmental Management Act (LEMA)
- Act No. 29 of 1996: Mine Health and Safety Act
- Act No. 125 of 1991: Physical Planning Act

- Act No. 16 of 2013: Spatial Planning and Land Use Management Act (SPLUMA)
- Act No. 16 of 2014: Special Economic Zones Act
- Act No. 117 of 1998: Municipal Structures Act
- Act No. 32 of 2000: Municipal Systems Act
- Act No. 2 of 2000: Promotion of Access to Information Act
- Act No. 3 of 2000: Promotion of Administrative Justice
- Act No. 75 of 1997: Basic Conditions of Employment Act
- Act No. 66 of 1995: The Labour Relations Act
- Act No. 4 of 2000: Promotion of Equality and Prevention of Unfair Discrimination Act
- Act No. 85 of 1993: Occupational Health and Safety Act
- Act No. 53 of 2003: Broad Based Black Economic Empowerment Act
- Act No. 9 of 1972: National Road Safety Act
- Act No. 93 of 1996: National Road Traffic Act
- Act No. 19 of 1998: Prevention of Illegal Eviction from and Unlawful Occupation of Land Act
- Act No. 3 of 1996: Restitution of Land Rights Act
- Act No. 112 of 1991: Amendment of the Upgrading of Land Tenure Rights Act

Strategies, guidelines and other documents of importance to this project (list not exhaustive) are:

- National Protected Areas Expansion Strategy, 2010 (NPAES)
- National List of Threatened Terrestrial Ecosystems for South Africa, 2011
- National Biodiversity Assessment, 2011 (NBA)
- Mining and Biodiversity Guideline: Mainstreaming Biodiversity into the Mining Sector, 2013
- Implementation Manual for Freshwater Ecosystem Priority Areas, 2011
- Important Bird Areas, BirdLife South Africa
- Limpopo Conservation Plan Version 2, 2013 (LEMA)
- Good Practice Guidance for Mining and Biodiversity: International Council on Mining and Metals
- Convention on Biological Diversity (1995)
- Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora
- International Union for Conservation of Nature (IUCN)
- World Summit for Sustainable Development (2002)
- National Climate Change Adaption Strategy, 2017
- Limpopo Development Plan (LDP), 2015-2019
- Waterberg District and Lephalale Local Municipal Spatial Development Framework
- Waterberg District and Lephalale Local Municipal Integrated Development Plan

3.2 Environmental Authorisation Process

Government's "One Environmental Management System" commenced on 8 December 2014 when the new Environmental Impact Assessment (EIA) Regulations (Government Notice Nos R.982 to R.985 of 2014) came into effect. These regulations have streamlined the licensing processes for Environmental Authorisation, such that the licensing processes for the different regulatory regimes are served by a single EIA process.

The mine and beneficiation developments are located on the same properties, Steamboat 305MR and Inkom 306MR, but applications have been submitted separately for the mine development (Cuchron Pty Ltd) and the beneficiation plant (Steamboat Graphite).

In terms of Regulation 11(4) "if one or more proponents intend undertaking interrelated activities at the same or different locations within the area of jurisdiction of a competent authority, the competent authority may, in writing, agree that the proponent or proponents submit a single application in respect of all of those activities and to conduct a consolidated assessment process but the potential environmental impacts of each activity, including its cumulative impacts, must be considered in terms of the location where the activity is to be undertaken.

A consolidated assessment will thus be followed for the Environmental Authorisations (EA) for the two activities. The Waste Management Licence (WML) and Integrated Water Use Licence Applications will be submitted as soon as detail designs are completed and the Water Resource for the project has been finalised.

The applications will follow timeframes as stipulated in the 2014 EIA Regulations (as amended in 2017). The proposed consolidated project triggers a Scoping and Environmental Impact Reporting (S&EIR) process, which entails the following key tasks:

- Applications: Submission of two application forms to the relevant Competent Authority, in this case, the Limpopo Department of Mineral Resources and Energy (DMRE) for the Mine Development EA and the Beneficiation Plant EA.
- Scoping Phase: Compilation of a draft consolidated Scoping Report (DSR) and providing it for comment to all registered Interested and Affected Parties (IAPs). The DSR will identify the key issues and alternatives to be assessed and recommend the approach to be followed during the EIA Phase to follow. Comments received from IAPs are incorporated in the DSR, and the Final Scoping Report (FSR) is submitted to the Competent Authority, whereupon they accept or refuse it.

- EIA Phase: Upon Authority acceptance of the FSR, the EIA Phase can commence. This includes the preparation of the consolidated Environmental Impact Assessment Report (EIAR), which provides detailed assessments of the significance of biophysical and social impacts, as well as a Environmental Management Programme (EMPr) for each of the developments, i.e. Mine Development and Beneficiation Plant. The draft consolidated EIAR and separate EMPrs are again provided to registered IAPs for comment and comments are responded to in the Final EIAR and EMPrs, which is submitted to the Competent Authority for decision-making.
- Authority review and decision-making: The Competent Authority reviews the information and recommendations provided in the Final EIAR and EMPrs and is required to issue a decision to authorise (or refuse to authorise) the project within 107 days of submission of the documents.

The total time frame for the "non-substantive" S&EIR process is legislated to take no more than 300 calendar days (excluding public holidays and the December break). This implies a process where all issues could be satisfactorily resolved, and no substantive changes need to be made, or new and unexpected information needs to be added to the environmental reports.

In parallel to the EIA process, a comprehensive Public Participation process must be conducted. This offers stakeholders the opportunity to learn about the projects, to raise issues that they are concerned about, and to make suggestions for enhanced project benefits.

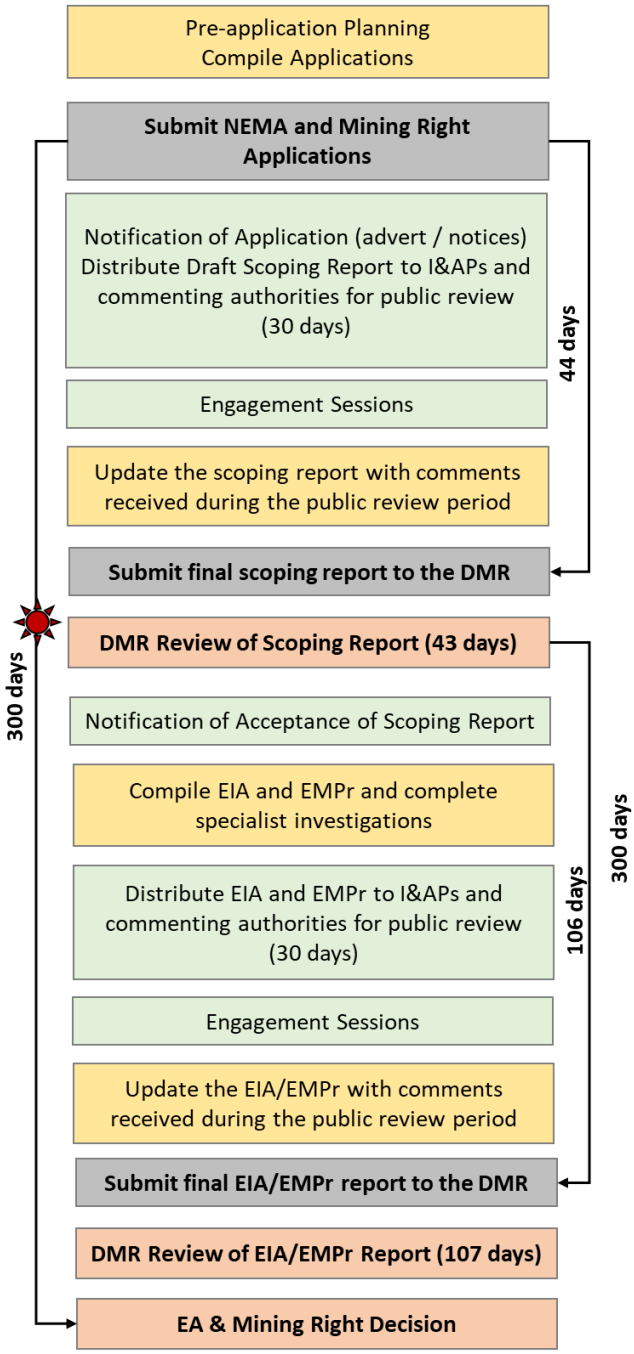


Table 3-1: EA Process

3.3 Licensing Requirements

The following preliminary licencing requirements have been identified:

Legislation	Requirement	Comment
MPRDA	Submission of Mining Right Application (MRA) to Limpopo DMR	Cuchron (Pty) Ltd applied for a Mining Right
NEMA, EIA Regulations (2014), as amended in 2017	Application for Environmental Authorisation to Limpopo DMRE for a) the mine development and associated infrastructure; and b) the beneficiation development and associated infrastructure. Listed activities trigger the threshold limit for a Full EIA required in terms of GN984.	EA application submitted. Combined process followed for the two applications
NEMWA, Waste Regulations (2013)	Waste Management Licence to Limpopo DMR	Application to be submitted once MRA and EA decision received.
NWA, S21	Section 21 water use license application to DWS	Application to be submitted once MRA and EA decision received.
NEMAQA (Act 39 of 2004, as amended)	Atmospheric Emissions Licence (AEL) from the District Municipality for the Syngas Facility	Application to be submitted once MRA and EA decision received.
Forest Act	Permit application to DAFF if applicable	Permits required for the destruction and/or relocation of protected tree species.
NEM:BA, TOPS regulations	Permit application to LEDET if applicable	Permits required for the destruction and/or relocation of protected species.
NHRA	Permit application to SAHRA if applicable	Permits required for Phase 1B and Phase 2 studies.

Note: The list is not exhaustive and will be finalised during the EIA Phase as the specialist impact studies and associated impact assessments become available.

It is important to note that the approach for the consolidated Project is to first apply for the mining right and associated EA in terms of the NEMA: 2014 regulations. Once this process is completed and the applicant has conducted further feasibility studies and detail designs in respect of its development, the application for the Water Use Licence in terms of the NWA, Waste Management License in terms of NEMWA AND Air Quality Emission licence in terms of NEMAQA will be submitted to the relevant authorities.

4 NEED AND DESIRABILITY OF THE PROJECT

4.1 Specialist Market Analysis

The product will be delivered to the local market, exclusively to the stand-alone Beneficiation Plant.

The local graphite market consists of the sales of feed grade graphite bearing ore & compounds to entities for beneficiation and are thereafter used in refractory materials, the chemicals and composite material industries, electrical applications, batteries and mechanical applications.

Feed grade graphite ore is a non-metallic mineral consisting of graphitic carbon. Most commercial feed grade graphite ore is mined and often contains other minerals requiring mineral processing such as froth flotation to concentrate the graphite. Graphite is a good conductor of heat and electricity. It is stable over a wide range of temperatures and highly refractory with a high melting point at 3650°C. Beneficiated graphite is mainly used in brake linings, foundry operations, lubricants, refractory applications and steelmaking.

Mining legend Robert Friedland likes to point out that if the world is going to sustain its push to green technologies, it will need specialist minerals. Graphite is one of them, and southeastern Africa is home to some of the largest untapped deposits in the world. Like Mozambique, Tanzania and other southern African countries, South Africa has very few graphite resources, **none of which have as yet been exploited**. **The Steamboat graphite deposit will be the first graphite deposit to be exploited in South Africa.**

The mining of the Steamboat Graphite in South Africa will also stimulate the beneficiation and further manufacturing industries in South Africa.

The uses of beneficiated graphite lend itself to the development of inter alia industries in composite materials, batteries, building materials, insulation materials, pipes, agricultural and mining support struts and other products.

The global graphite market reached a value of nearly $1,282.7 million in 2018, having declined at a compound annual growth rate (CAGR) of -0.9% since 2014. The decline in the historical period was mainly due to the drastic fall in graphite prices during 2015 and a slight decrease in graphite production volumes in 2016, partially due to low demand from the steel sector. Post-2016, the global market started a gradual recovery supported by increasing demand from various end-user industries and rising prices. Asia-Pacific was the largest region in the global graphite market, accounting for 70.2% of the global market in 2018. It was followed by Western Europe, North America and then the other regions. The opportunity exists for Eastern Europe, and African graphite market to grow.

As a result of the Covid-19 pandemic resulting in a worldwide economic slowdown, the market for graphite has however suffered greatly. It is, however, anticipated that the market should start seeing a recovery from the second quarter of 2022.

Going forward, growing demand for electric vehicles, the opening of new graphite mines is expected to ensure steady and strong supply, rising commercial applications of graphene (made from graphite), and growing demand for energy storage will drive growth. Factors that could hinder the growth of the graphite market in the future include reductions in free trade and innovations in lubrication technology.

4.2 Social Development

The National Development Plan (NDP, 2030) aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality by 2030. The NDP Executive Summary notes 10 critical actions on the road to success for South Africa. They are:

1. A social compact to reduce poverty and inequality and raise employment and investment.
2. A strategy to address poverty and its impacts by broadening access to employment, strengthening the social wage, improving public transport and raising rural incomes.
3. Steps by the state to professionalise the public service, strengthen accountability, improve coordination and prosecute corruption.
4. Boost private investment in labour-intensive areas, competitiveness and exports, with adjustments to lower the risk of hiring younger workers.
5. An education accountability chain, with lines of responsibility from state to classroom.
6. Phase in national health insurance, with a focus on upgrading public health facilities, producing more health professionals and reducing the relative cost of private health care.
7. Public infrastructure investment at 10 percent of Gross Domestic Product (GDP), financed through tariffs, public-private partnerships, taxes and loans and focused on transport, energy and water.
8. Interventions to ensure environmental sustainability and resilience to future shocks.
9. New spatial norms and standards – densifying cities, improving transport, locating jobs where people live, upgrading informal settlements and fixing housing market gaps.
10. Reduce crime by strengthening criminal justice and improving community environments.

Both Cuchron (Pty) Ltd and Steamboat Graphite (Pty) Ltd is committed to the above actions in the form of:

- Job creation;
- Human resource development;
- Human and community development;
- Environmental sustainability; and
- Governance and policy.

4.3 Economic Benefits

The following economic benefits may be anticipated:

- Capital Investment and expected Revenue generation with a contribution to economic growth.
- Employment and the generation of household income for the duration of the mining activities, including indirect and induced impacts within the local and regional economies.
- Secondary benefits in the creation of electricity to supply the domestic demand. In addition to the quantifiable economic benefits that will result from this development, there are also a number of benefits that are not measurable in the same way, but that should be considered.

These benefits could include:

- Technology: Technology used on the mine will work towards improving knowledge on available technologies and skills in using such technology. This may enable local communities to run their own successful businesses in the future.
- Skills development: Local community members who may not have any marketable skills other than a basic education will be able to acquire skills through employment on the mine. In addition to technical skills, there will be numerous roles imparting valuable management and leadership skills as well.
- Asset base: The capital expenditure outlaid into the land in the area will result in an asset base upon which future development can occur. In addition to this, the asset base adds value to the municipality itself and provides a starting point for future developments.
- Local procurement and SMME opportunities: Local communities will be enabled and provided with opportunities to participate in contracts and other new businesses that would become available during the construction and operational phases.

4.4 Cuchron's Social and Labour Plan

Cuchron (Pty Ltd is committed to optimise opportunities in the local communities through the implementation of the Social and Labour Plan (SLP). The SLP implementation will only commence once a decision has been made by the DMR on the granting of the Mining Right.

4.5 Job Creation

The Cuchron and Steamboat Graphite Projects will create a combined number of approximately 82 temporary job opportunities at authorisation and commencement of construction. Within the first year of mining, there is an opportunity to create a combined estimated 78 permanent positions once both projects are operational. These will be made up as follows:

- Employment for the first phase of mining is not huge, approximately 10 – 20 employees including managers, technical / mining skilled, operators and support
- Employment for the beneficiation plant is approximately 58 permanent employees including managers, engineers, foreman, fitters, boilermakers, electricians, technicians, operators, storemen, cleaners, general workers and support in finance, admin and human resources.

Both Cuchron and Steamboat Graphite has signed a cooperation agreement with the Ga-Kibi Community with a commitment to localise recruitment as far as possible, provided sufficient skills are available.

4.6 Workforce Development

Both Cuchron and Steamboat Graphite plans to implement a comprehensive workforce development plan through adult basic education and training, core business training, artisan training, learnerships, bursaries and internships programmes. These will be supported by career-path planning and mentorship.

4.7 Community Development

To further support local communities, Cuchron is proposing Community Development projects and supporting small business development. The community will be further engaged to finalise the specific Community Development projects based on the needs within the community.

Although not required from a beneficiation project as part of an SLP, Steamboat Graphite plans to further implement Community Development Programmes in agreement with the local communities.

5 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT

5.1 Development Alternatives Considered

The identification and investigation of alternatives is a key aspect during the S&EIA process. All reasonable and feasible alternatives must be identified and assessed during the Scoping Phase to determine the most suitable alternatives to consider and assess during the EIA Phase. There are, however, some significant constraints that have to be considered when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed in the evaluation of the alternatives. The preferred option is to be highlighted and presented to the authorities.

Alternatives can typically be identified according to:

- Site Location alternatives;
- Land Use alternatives;
- Technological alternatives;
- Locality & Layout alternatives; and
- Activity alternatives (including the No-go option).

For any alternative to be considered feasible, such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical and environmental perspective. Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

5.1.1 Site Location

No site location alternatives have been considered as mining can only be undertaken in areas where economically mineable resources occur. This area was established through prospecting and geological modelling.

5.1.2 Land Use Alternatives

The property is currently utilised for grazing, as part of the Socio-economic Assessment two alternative land use options will be considered, that of mining the property and that of continuing with livestock farming.

5.1.3 Technology Alternatives - Mining Methodology

Mining method selection is one of the most critical activities of mining engineering. The factors that have a major impact on the mining method selection include:

- Physical and mechanical characteristics of the deposit such as ground conditions of the mineral deposit, nature of overlying strata and parting between seams, type and strength of roof and floor rocks, deposit thickness, general shape, the orientation of deposit, plunge, depth of mineral below the surface, quality and strength of mineral, etc. The basic components that define the ground conditions are rock material shear strength, natural fractures and discontinuities, orientation, length, spacing and location of major geologic structures, in situ stress, hydrologic conditions, etc.;
- Economic factors such as capital cost, operating cost, mineable tons, quality and value;
- Technical factors such as mine recovery, the flexibility of methods, machinery, and mining rate; and
- Productivity factors such as annual productivity, equipment, efficiency, and environmental considerations.

The selected mining method for this project is an open-pit truck and shovel operation. This mining method has been employed extensively in numerous similar deposits globally. The selection of this mining method is based on the following four key criteria:

- Production targets - required graphite and waste tonnes to be excavated;
- The geometry of the graphite deposit;
- Anticipated in-pit mining conditions; and
- Flexibility of mining multiple benches within the defined open pit operation.

Underground mining is not considered feasible due to the shallow nature of the resource, which is only conducive to open-pit mining operations. These types of operations lead to optimal resource extraction, which results in lower operating costs.

5.1.4 Design and Layout Alternatives

5.1.4.1 Mining Development and Associated Infrastructure by Cuchron

Refer to Table 5-1 for the placement of site location alternatives.

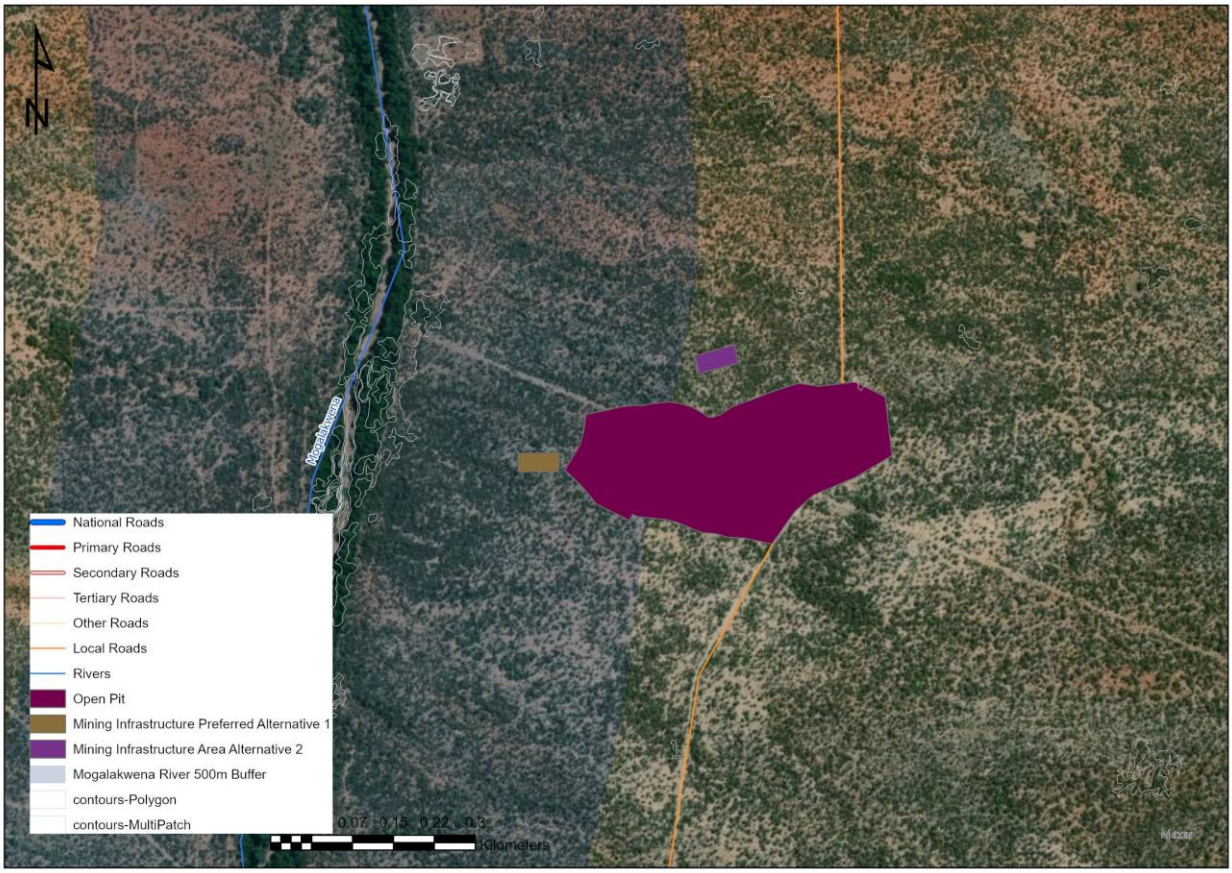


Table 5-1: Mine Infrastructure Site Location Alternatives

- **Open Pit Mining**: No site location alternatives have been considered as mining can only be undertaken in areas where economically mineable resources occur. This area was established through extensive prospecting and geological modelling.

- **Mining Workshops and Offices**: Two alternative positions are being considered for the placement of the mine workshops and offices. These alternatives will be further evaluated during the EIA phase. Selection of the two alternatives were based on:
  - Access to the Open pit
  - Underlying mineral resources
  - Access to services (road, water and electricity)
  - Preliminary environmental factors such as topography, hydrology, sensitivity of the sites

5.1.4.2 Beneficiation Development and Associated Infrastructure by Steamboat Graphite

Refer to Table 5-2 for the placement of site location alternatives of the beneficiation plant and associated infrastructure.

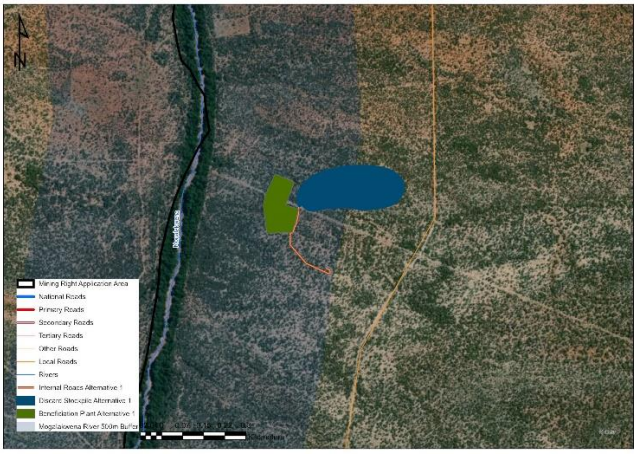


Table 5-2: Beneficiation Plant & Infrastructure and Discard Stockpile Site Location Alternatives

Two site location alternatives were considered for both the Beneficiation Plant and its associated infrastructure, and the discard stockpile. These alternatives will be further evaluated during the EIA phase. Selection of the two alternatives was based on:

- Vicinity to primary product source (Open pit)
- Underlying mineral resources
- Required capacity and footprint extent
- Preliminary environmental factors such as topography, hydrology, the sensitivity of the sites

5.1.4.3 Product Transport

Refer to Table 5-3 for the product transport alternatives.

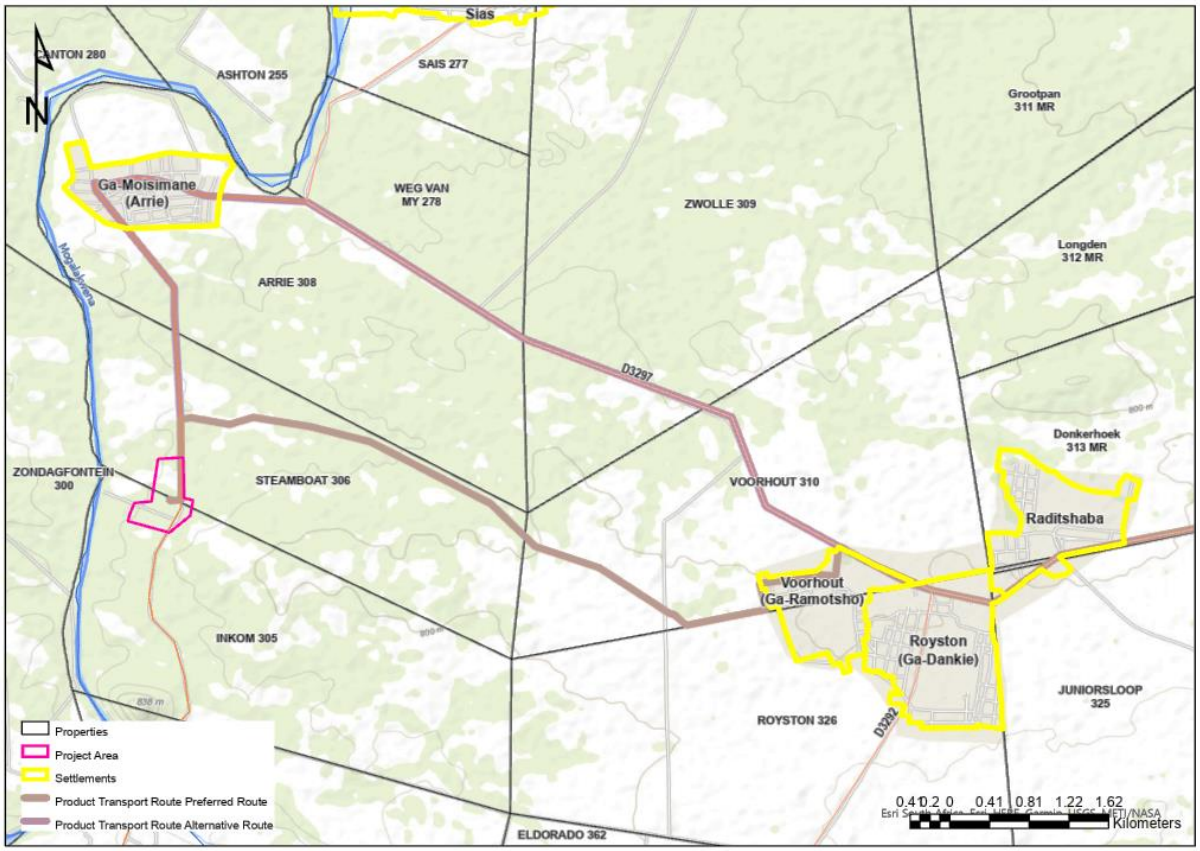


Table 5-3: Product Transport Alternatives

After further investigation during the EIA phase the product transport alternatives were revised. The following two alternative routes for Product Transport on existing roads has been considered and investigated:

- Alternative 1 (14.2km) follows an eastern direction from the site for 8.4km which passes the Voorhout community, onto the D3297 for 5.8km to join the D1589 towards Polokwane
- Alternative 2 (18km) follows a northern direction from the site for 5.5km which passes through Arrie (Ga-Moisimane) community, onto the D3297 for 12.5km to join the D1589 towards Polokwane.

Evaluation of these alternatives considered the following aspects:

- The distance of the product transport route
- Quality of the existing roads
- Environmental and Social constraints

The following was found:

Criteria	Alternative 1	Alternative 2
Distance	Total distance to main road is 14.2km **Preferred**	Total distance to main road is 18km **Not preferred**
Quality of roads	First portion of the road from the site is poor and would need	First portion of the road from the site is poor and would need

Criteria	Alternative 1	Alternative 2
	to be properly constructed (5.5km), balance of the road, is gravel and will require upgrades. **Not preferred**	to be properly constructed (1km), balance of the road, is gravel will require upgrades. **Preferred**
Environmental constraints	The initial route passes through thick vegetation which will require some clearing but is located on existing roads and have a limited impact on the biophysical environment. **Neutral**	The initial route passes through thick vegetation which will require some clearing but is located on existing roads and have a limited impact on the biophysical environment. **Neutral**
Social constraints	Passes through Voorhout for 1km utilising a side road of the settlement (27 residential stands). No other community facilities are close to the road. Road passes through Voorhout, close to the Mabotha High School. **Preferred**	Passes through Arrie for 2km utilising the settlement's main road which passes 200 meters from a primary school, 50 meters from the community graveyard, as well as a public transport pick-up point. Road passes through Voorhout, close to the Mabotha High School. **Not preferred**
Overall Evaluation	Shorter with less social constraints **Preferred**	Longer, with additional social constraints **Not preferred**

Both the alternatives will have social, traffic and safety related impacts that will need to be mitigated, but Alternative 1 has the least constraints and is shorter in distance and has therefore been selected as the preferred alternative.

5.1.5 No-Go Option

The main consequence of the No-Go Option is the loss of opportunity to develop a viable mineral resource with an estimated LOM of 20 years or more which has the potential for increased economic benefits on the local, provincial and national level in terms of employment and the contribution to the GDP. Other socio-economic benefits that will be lost include the skills development opportunities, Local Economic Development projects (SLP) and Local procurement and SMME opportunities.

5.2 Motivation where No Alternative Sites were Considered

No alternatives site locations have been considered as mining can only be undertaken in areas where economically mineable resources occur. This area was established through extensive prospecting and geological modelling. Infrastructure to support the project has been laid out and engineered to best suit the topography and mining pit layout. The Beneficiation Plant has been placed close to the mine development to reduce transport to the facility from the mine.

5.3 Motivation for Preferred Site Alternatives

Based on the assessments, the following are the preferred site locations for both the Cuchron Mine Development and the Steamboat Beneficiation Project and their associated infrastructure.

Table 5-4: Preferred Alternative

The selected preferred alternative supports the technical requirements, while also avoiding environmental and socially sensitive areas to some extent. The site infrastructure, apart from the open pit is located further than 500m from the Mogalakwena river is the main hydrological feature. The topography of the sites is relatively flat. Limited biodiversity sensitivities were identified.

6 ENVIRONMENTAL AND SOCIAL CONTEXT (BASELINE)

The specialist reports have addressed the baseline environment in detail and are attached as appendices. The following section is a summary of the specialist baseline work and relevant important environmental attributes associated with the mining site.

6.1 Geology

The graphite mineralisation on the farm Steamboat 306MR and Inkom 305MR is located within the Gumbu Group of the Beit Bridge Complex. The Gumbu Group is characterised by predominantly calc-silicate rocks and marbles, and the occurrence of fine-grained metapelites. Quartzites and quartzofeldspathic gneisses are rare whereas marbles grading into calc-silicate rocks and compositional banding of layers richer and poorer in silicate are common. Rocks may contain calcite, dolomite, olivine, phlogopite, diopside, plagioclase, microcline, quartz and graphite, depending on their composition. Recent studies indicated that carbonate rocks from the Gumbu Group in the area east of Mesina in part display a positive carbon isotope anomaly that occurs worldwide in strata between 2000 and 2200 Ma old. As a result, lithostratigraphic units of the Gumbu Group seem to be of early Proterozoic age. (Kramers et al., 2006)

The rocks in the area have been intensely deformed and sheared. Folding is abundant and occurs as tight, isoclinal folds. This is especially evident in the northern most units of the area. As described by Germiquet et al. (1991), graphite mineralisation of the proposed deposit occurs within a graphitic gneiss unit which is found in an E-W trending structure. The gneiss is enveloped on one side by a narrow amphibolite layer, and the entire sequence is enclosed in more competent calc-silicates and amphibolites which outcrop in the area of farm Steamboat 306MR and Inkom 305MR. The graphite gneiss contains narrow quartz veins, pegmatites and occasional scapolite 5 bands. The general dip of the lithologies in the area ranges between 60° to 80° towards the south with a strike between 85° and 95°.

The graphite ore body is interpreted as westerly plunging anticlinal structure, which is overturned towards the north. The southern limb of the overturned anticline is truncated by an ENE-trending fault. The northern limb, on the other hand, has been traced for 2.5km towards ENE using electromagnetic surveying. In the eastern part of the graphite deposit, the 5m wide graphite horizon has been displaced 20m towards the north by faulting. The graphite deposits are usually elliptically in shape and rarely extend more than 200m on the surface.

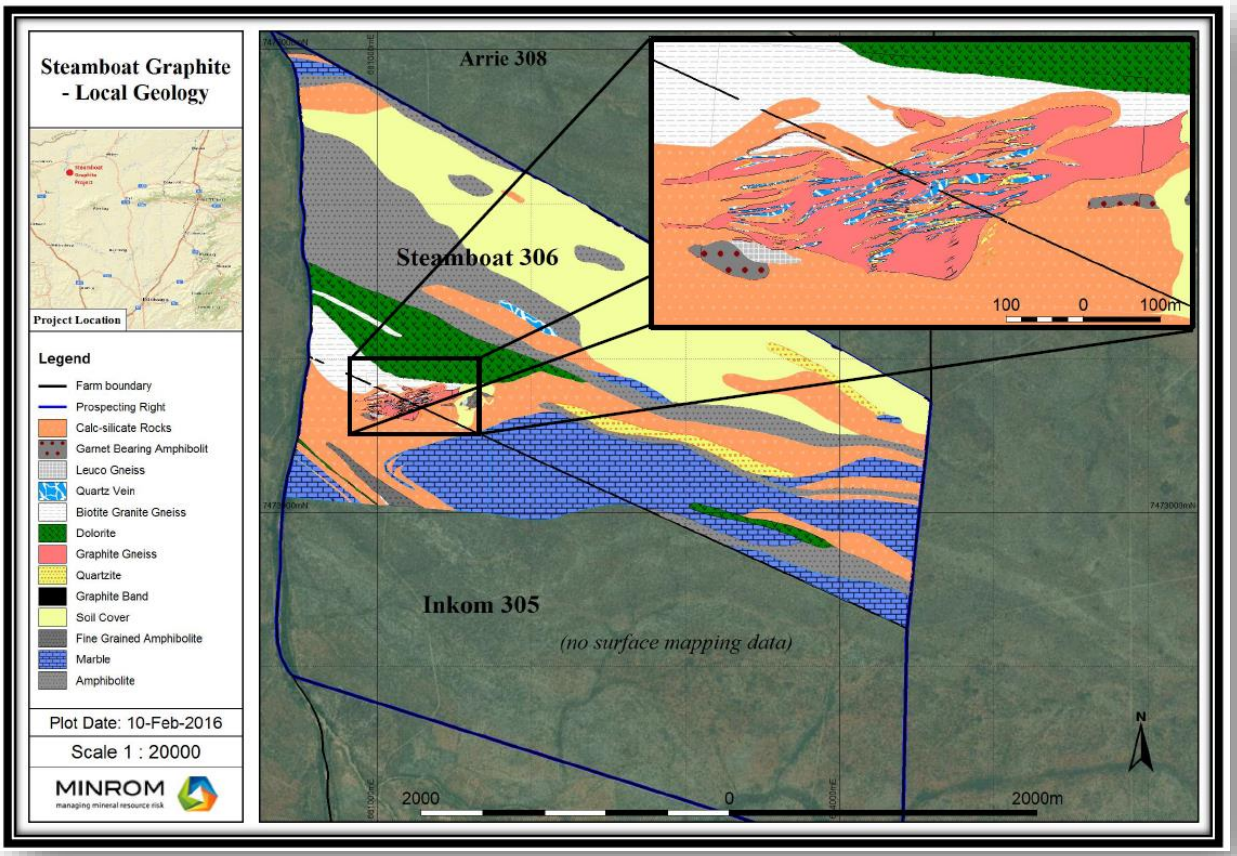


Table 6-1: Locality Specific Geological Map

The properties subject to this application forms part of the Achaean Gneissic Terrain. The graphite occurs in marble, graphitic gneisses of the Gumbu Group, Beitbridge Complex. Graphite occurs within the graphite gneiss as disseminated flakes up to 2mm in size, but the flakes are not necessarily orientated concordantly with the foliation of the surrounding rocks. In places, graphite is present in the form of nodules of pure or mixed graphite ranging from 5mm to 20mm in diameter.

6.2 Topography

The topography of the project area can be described as being gently undulating with surface elevations (±4 km radius) varying from approximately 760 to 880 meters above mean sea level (mamsl), with a gentle slope towards the Mogalakwena river and to the south of the site.

The figures below indicate the elevations from a north-south perspective and east-west perspective:

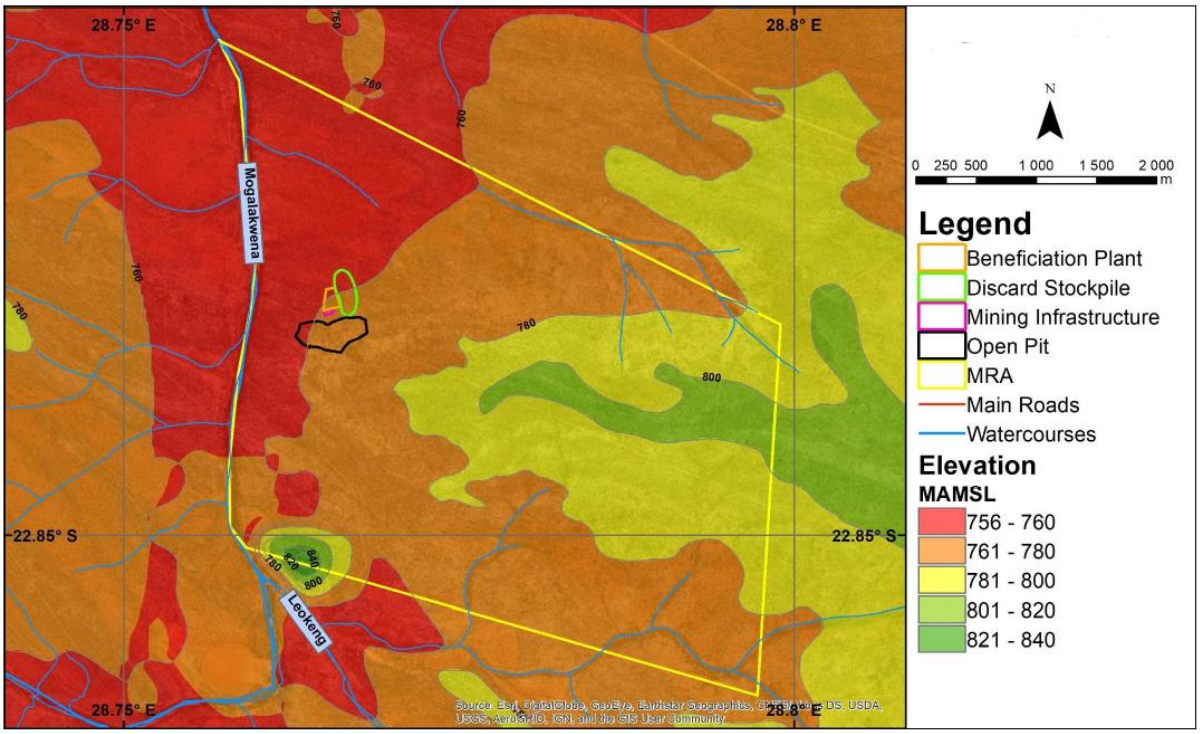
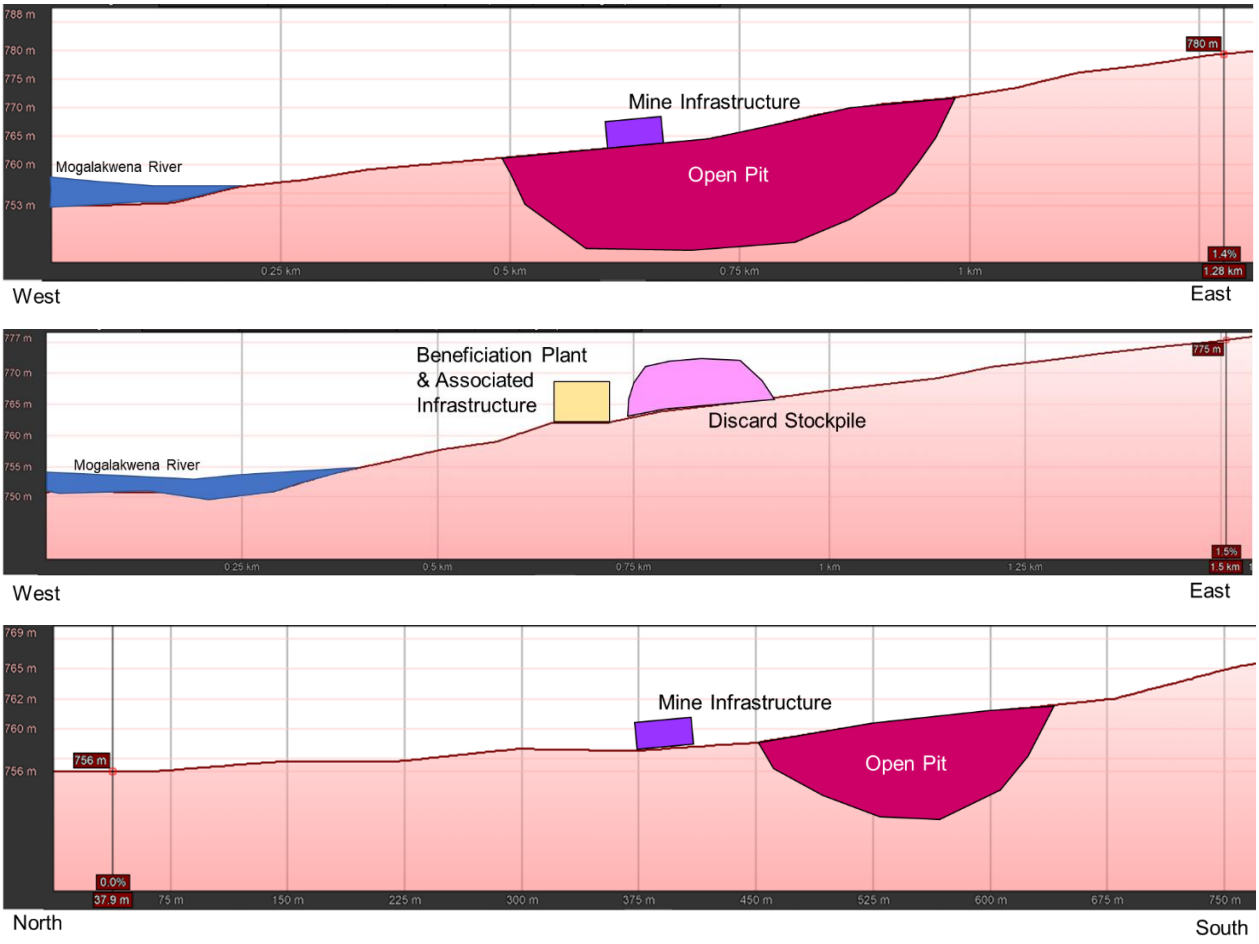


Table 6-2: Topography



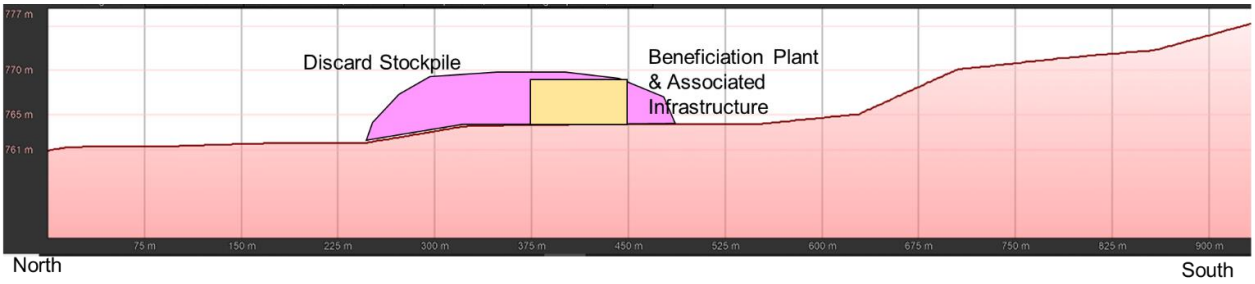


Table 6-3: Elevation of the Site

6.3 Climate

6.3.1 Regional Climate

Limpopo falls in the summer rainfall region, with the western part semi-arid and the eastern part largely sub-tropical. The western and far northern parts experience frequent droughts. Winter throughout Limpopo is mild and mostly frost-free. The climatic conditions vary within the Limpopo Water Management Area (WMA), which ranges from the Waterberg Mountains in the south, northwards to the hot, dry Limpopo River valley on the border with Zimbabwe and Botswana.

Monthly rainfall and evaporation figures for the years 1968 to 2014 were obtained from the nearest DWS meteorological station (A6E004) located approximately 40 kilometres south of the MRA area.

6.3.2 Rainfall

The project area is located in a summer rainfall region and receives mean annual rainfall of approximately 490 mm. The area is characterised by warm to hot summers and mild winters with no frost.

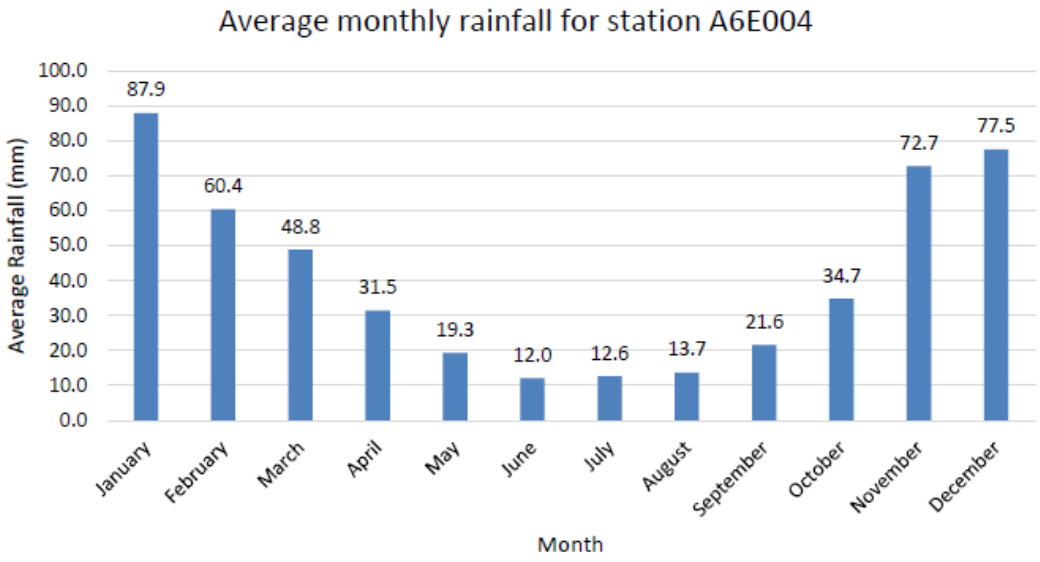


Table 6-4: Precipitation

6.3.3 Evaporation

The mean annual evaporation rate for the project area is between 2000 and 2200 mm, which far exceeds rainfall. The project area therefore has a net environmental moisture deficit throughout the year when considering the annual rainfall and evaporation figures.

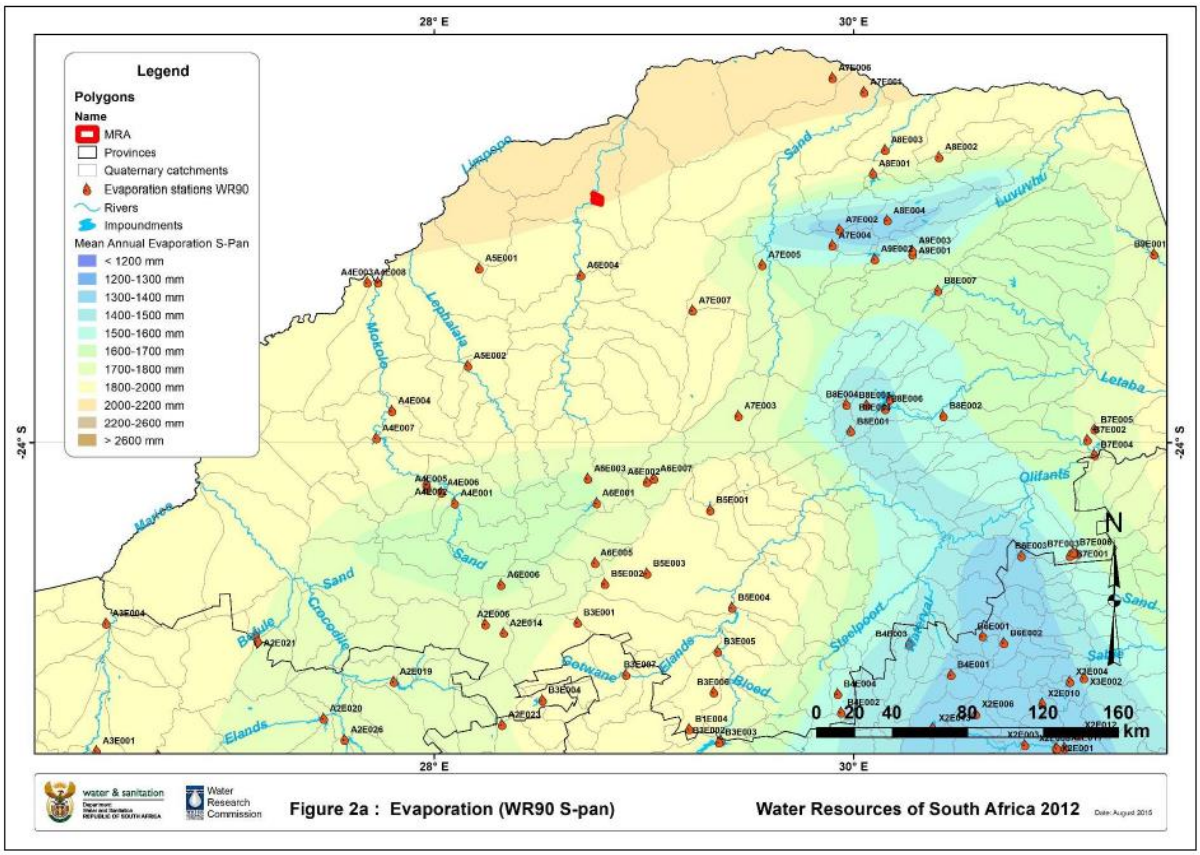


Table 6-5: Mean monthly evaporation figures for meteorological station B2E001 (DWS)

6.3.4 Temperature

The mean annual temperature ranges between 16°C in the south to more than 22°C in the north. with an average of 20°C for the catchment as a whole. Maximum temperatures are usually experienced in January, and minimum temperatures occur on average in July.

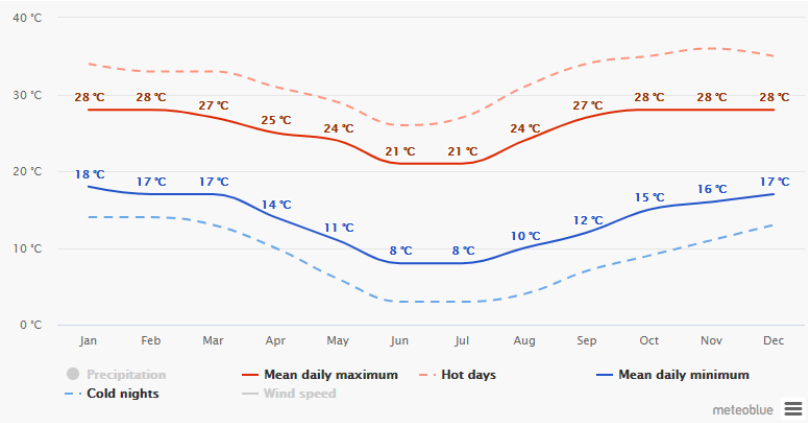


Table 6-6: Minimum and Maximum Temperatures

The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for the project area. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.

6.3.5 Wind

The predominant wind direction is from north-northwest, with the secondary component from the northwest and west northwest. Contributions from the north and northeast quadrant are observed. Wind class frequency distribution per sector is given in Table 6-7.

Wind speeds vary between 6 – 11 kilometers per hour.

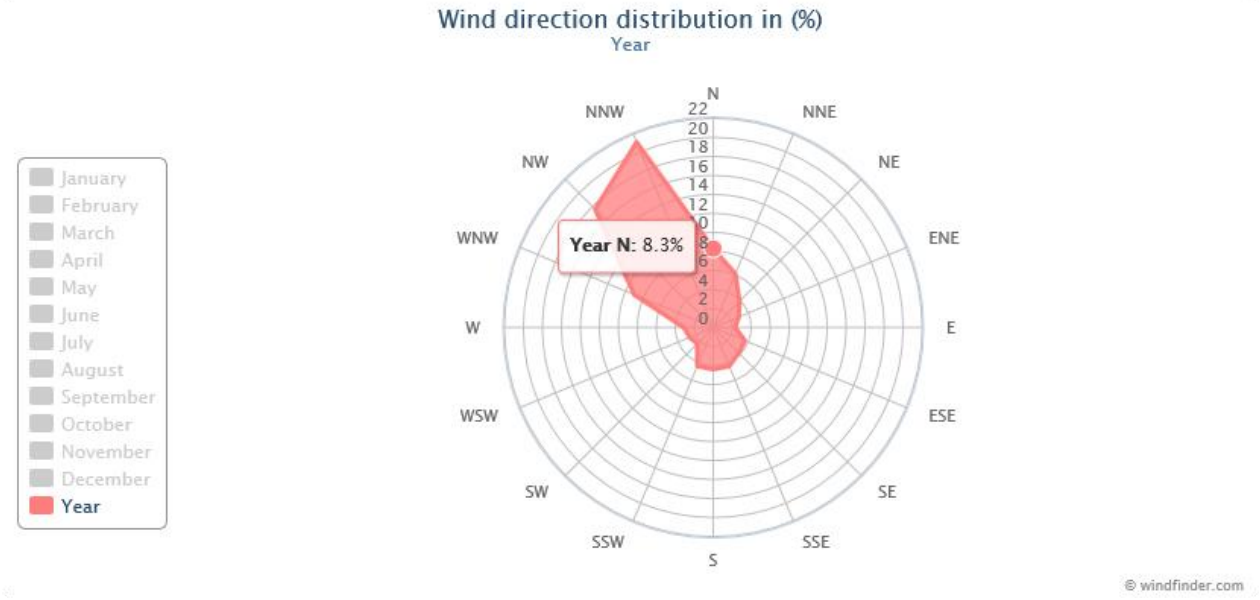


Table 6-7: Wind direction distribution

6.3.6 Extreme weather conditions

Thunderstorms occur frequently in summer and are usually accompanied by lightning, heavy rain, strong winds and occasional hail.

Periods of extreme heat during summer months occur frequently. This can be accompanied by drought conditions.

6.4 Soils and Land Capability

6.4.1 Soils

The regional soil type is Glenrosa or Mispah soil forms of varying depth. Lime is generally present in the entire landscape.

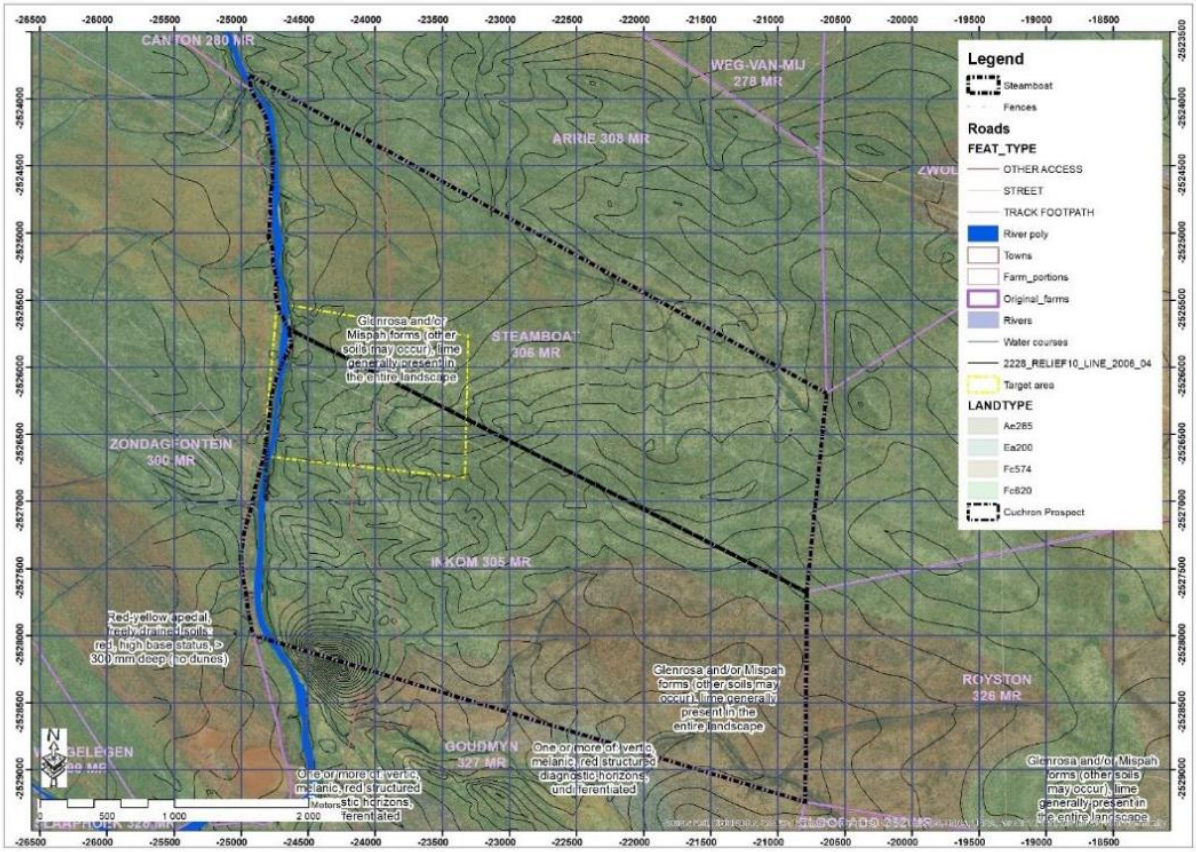


Table 6-8: Soil forms of the MRA

The northern part of the site is quaternary sands. They are reddish coloured with rocky outcrops where the schist outcrops. All the other soils are on schist, which is metamorphic rock and is the material in which the graphite is captured.

In terms of the infrastructure area, most of the land is covered by medium grained sand. There are many loose stones and rock throughout the prospecting area. All the land in the region that is cultivated occurs on the quaternary sands. They are all irrigated, and mostly from the Mogalakwena River. Further discussion is confined the mining area, because this is the only portion that will be impacted on by the mining activities.

Four soil types were identified, they are as follows:

Map Symbol	Description	Dominant Soil form
Gs350R	Greyish to light brown, sandy loam grainy structured topsoil that overlies partially weathered schist. Nodules and course fragments are common. The soil	Glenrosa, Mispah, Hutton, Rock

Map Symbol	Description	Dominant Soil form
	depth is generally less than 400 mm. Rocky outcrops occur in many places.	
Hu450R	Reddish brown and yellowish sandy loam topsoil that overlies brown sands with a blocky structure. The general geology is alluvium. Loose rock and stones are common.	Hutton, Glenrosa, Oakleaf
R	Rocky outcrops and shallow rocky soils	Rock, Mispah Glenrosa
WC	Watercourse. It is the Mogalakwena river that drains the area. It has well developed riparian vegetation. The banks are alluvium.	

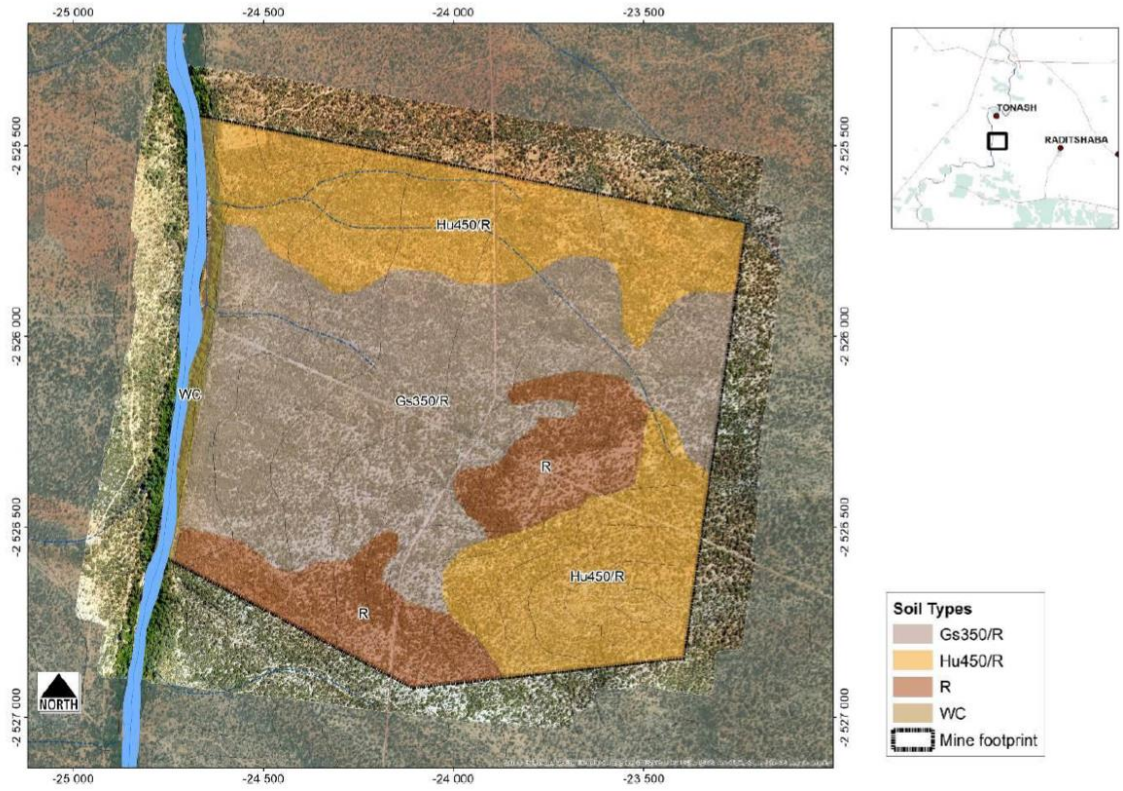


Table 6-9: Soil forms of the Site infrastructure

Table 6-10: Photo Rocky outcrops found throughout the mining area and Sandy plains with frequent stone and rock outcrops

6.4.2 Pre-Mining Land Use

Current Land use is subsistence grazing for livestock from the local Ga-Kibi Communities residing in the surrounding area. The Social Impact Assessment conducted a survey amongst livestock owners within the Ga-Moisimane (Arrie), Ga-Ramotsho (Voorhout) and Ga-Dankie (Royston) Communities, which determined that Ga-Ramotsho (Voorhout) mostly uses Steamboat 306MR and Ga-Dankie (Royston) mostly uses Inkom 305MR for grazing land. Ga-Moisimane (Arrie) uses Arrie 308MR for grazing, which is a neighbouring property.

The properties provide the following grazing land:

Table 6-11: Available grazing land in and around the project area

Property	Available Grazing Land
Steamboat 306MR	663.7ha
Inkom 305MR	789.85ha
Voorhout 310MR	918.94ha
Royston 326MR	879.24ha
Arrie 308MR	677.64ha
Total	3929.4ha

The properties indicated in green are project properties.

Interviews with the livestock owners from these communities were held in May 2021. Interviews were completed with 156 livestock owners, (43 from Voorhout, 72 from Royston and 41 from Ga-Moisimane). During the interviews it was clear that households from Voorhout mostly utilizes grazing from Steamboat 306MR and Voorhout 310MR, Royston households mostly utilizes grazing from Inkom 305MR and Royston 326MR and households from Arrie (Ga-Moisimane) mostly utilizes grazing from Arrie 308MR.

The communities have the following large livestock units that graze these properties:

Table 6-12: Livestock owned and location of grazing

Propert(ies)	**Voorhout**	**Royston**	**Arrie (Ga-Moisimane)**	**Total**
Arrie 308MR			994	994
Inkom 305MR / Royston 326MR	76	2078		2154
Steamboat 306MR / Voorhout 310MR	806	36		842
Total	882	2114	994	3990

Apart from the large livestock units, the households also own 966 goats and sheep, that mostly grazes around the villages.

Grazing areas are already under strain and overgrazing takes place widely, at about 3 times the number of livestock that the grazing capacity indicates. The Ga-Kibi community need to improve the grazing quality and capacity of the land in consultation with Department of Agriculture (i.e., seeding, debushing, etc).

Development in the immediate region is mainly limited to low-density residential dwellings and related outbuildings.

6.4.3 Land Capability

Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards. It is considered by many land use planners as one of the only methods to describe the potential of land for development. The evaluation involves consideration of:

- Difficulties in land use owing to physical land characteristics;
- The risks of land damage from erosion and other causes; and
- Climate.

The classic eight-class land capability system (Klingebiel & Montgomery, 1961) was adapted for use with Agriculture Geographic Information System (AGIS) in South Africa. Land capability is classified according to guidelines published by the DALRRD in AGIS.

Land Capability is determined by the collective effects of soil, terrain and climate features and shows the most intensive long-term use of land for rain-fed agriculture. At the same time, it indicates the permanent limitations associated with the different land-use classes.

- Order A: Arable land – high potential land with few limitations (Classes i and ii)
- Order B: Arable land – moderate to severe limitations (Classes iii and iv)
- Order C: Grazing and forestry land (Classes v, vi and vii)
- Order D: Land not suitable for agriculture (Class viii)

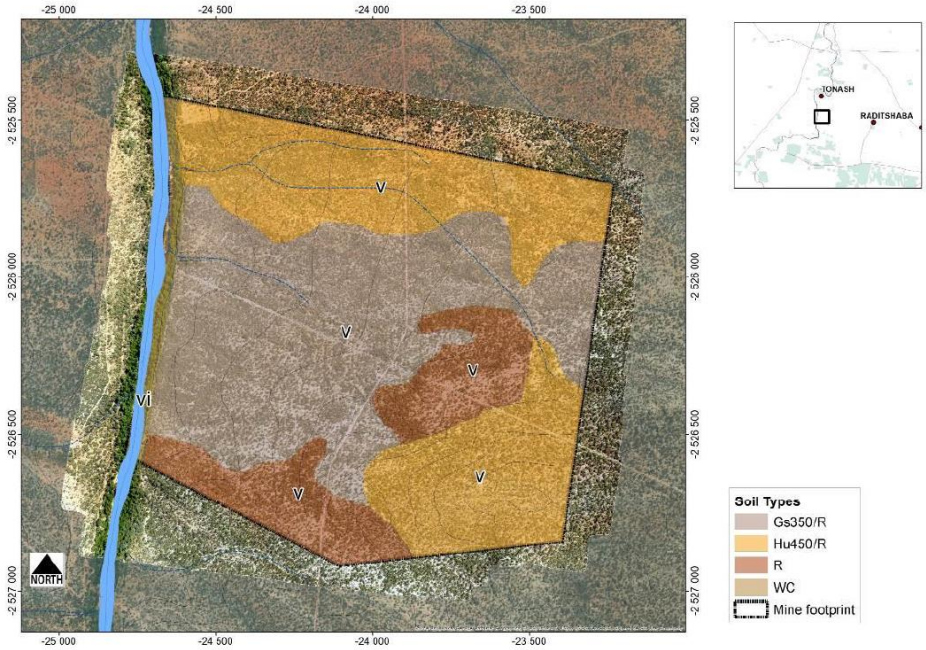


Table 6-13: Land capability

6.5 Terrestrial Ecology

The vegetation of vegetation units 1 and 2 are degraded mostly due to grazing practices. This has caused the degradation of the herbaceous layer and provided (and still provides) the woody species the opportunity to germinate and increase in density. This has resulted in the woody layer becoming densified thereby preventing the establishment of the grasses.

Except for the riverine area the total study area consists mostly of one large woodland vegetation unit but has been divided into two vegetation units based mainly on the topography and the soil present namely: 1) Low-lying woodland; 2) Rocky woodland, and 3) Riverine area.

The protected tree Boscia albitrunca is present in vegetation units 1 & 2. This tree is usually found in the drier parts of the country such as the study area. The tree is regarded as a medium-sized tree that can grow up to 7m tall. It plays an important role in the ecosystem by providing food, shelter and shade to various animal and bird species. The tree also provides habitat for different herbaceous species to grow underneath its canopy. Humans use the roots of the tree to make porridge, while it is also used as a substitute for coffee in some areas. It is therefore important that these trees are not unnecessarily removed from the ecosystem. If single individuals of these species have to be removed, a permit from the Department of Agriculture, Fisheries and Forestry (Forestry Branch) and Nature Conservation will have to be obtained for this purpose.

Only two medicinal plants were found within the study area. None of these species are threatened, while one is a pioneer weed that grows in degraded areas and disturbed riverbanks. No or red data plant species were identified in the study area. The alien plant species identified should be eradicated from the property.

6.5.1 Conservation Characteristics

The vegetation of the study area (Limpopo Sweet Bushveld vegetation type - SVcb 19) is not regarded as a threatened ecosystem on a National basis, though the study area is regarded as a Critical Biodiversity Area on Provincial level.

According to the Limpopo Conservation Plan 2 (LCPv2) (Desmond et al., 2013) the purpose of the plan is to develop the spatial component of the bioregional plan that facilitate biodiversity conservation and also inform natural resource management plans, land-use planning, environmental impact assessments and authorisations. Since the plan and associated maps are done on a relatively coarse scale it is important to note that it does not replace site assessments for Environmental Impact Assessment purposes and still requires specialist interpretation and assessment (Desmond et al., 2013). It is furthermore important to note that the classification of an ecosystem within a specific category is based on various aspects including, birds, vegetation, herpetological data, rivers, wetlands, birds, conservation areas etc.

Based on the assessment, the proposed study area is not located within any protected areas, or threatened ecosystems. The study area is considered important for meeting biodiversity targets in Limpopo seeing that it falls within a Critical Biodiversity Area 2 (CBA2). The CBA 2 primarily refers to the Mogalakwena river corridor and the aquatic sensitivity of this area.

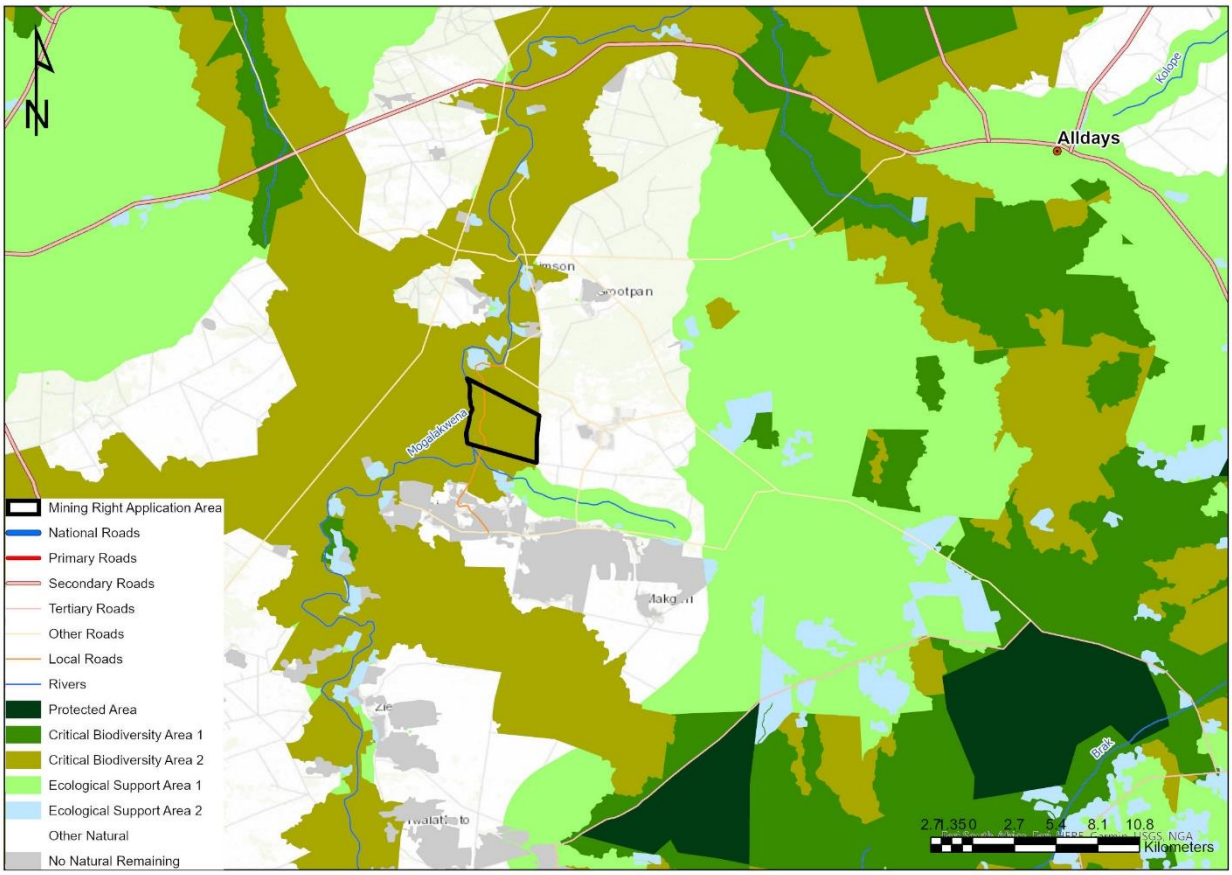


Table 6-14: Limpopo Conservation Plan 2

There is further no Important Bird and Biodiversity Areas (IBA) located within 10 km of the study area.

6.5.2 Flora

Project infrastructure is located within Unit 1 and 2.

6.5.2.1.1 Vegetation Type

Table 6-15: Vegetation Types

Type	Low-lying woodland (Unit 1)	Rocky woodland (Unit 2)	Riverine area (Unit 3)
Status	Degraded woodland (68.7 ha of MRA)	Natural encroached woodland (78.5 ha of MRA)	Mostly natural (10.4 ha)
Vegetation Structure	Open to closed woodland	Dense woodland	Tall riverine forest
Topography	Level to slight southern slopes (30)	Level to undulating	River valley
Soil	Shallow rocky	Shallow rocky - sodic	Deep clay and sand
Rock cover	10%	10-35%	5%
Need for rehabilitation	Medium-high	Medium	Medium
Conservation Priority	Low-medium	Medium	High
Typical Species	Terminalia prunelloides, Dichrostachys cinerea, Grewia flava, Grewia flavescens, Vachellia tortilis and Dovyalis caffra are prominent throughout this unit in the woody layer. The herbaceous layer is sparse and include the grasses Enneapogon scoparius, Schmidtia pappophoroides, Aristida stipitata and the forbs Blepharis subvolubilis, Evolvulus alsinoides, Thesium utile, Bidens pilosa, Sansevieria aethiopica, Kyphocarpa angustifolia and Ipomoea crassipes.	Wooded species: Vachellia tortilis, Terminalia prunelloides, Dichrostachys cinerea, Catophractes alexandri, Vachellia robusta, Senegalia senegal, while Senegalia nigrescens, Combretum apiculatum and Cadaba aphylla are locally prominent. The herbaceous layer is degraded though patches of the grasses Enneapogon scoparius, Schmidtia pappophoroides and Eragrostis lehmanniana Forb Species: Hermbstaedtia odorata, Indigofera filipes, Leonotis ocymifolia, Chenopodium album and Selaginella dregei.	Trees: Combretum erythrophyllum, Faidherbia albida, Ficus sur, and Senegalia ataxacantha, while the tree Ziziphus mucronata is prominent. Herbaceous layer is degraded with the alien invasive weed Ricinus communis and Xanthium strumarium forming dense clumps all along the embankments. Other species present include the woody species Senegalia erubescens, Gymnosporia buxifolia, Terminalia prunelloides, the grasses Brachiaria deflexa, Panicum maximum, Urochloa panicoides, and the forbs Alternanthera pungens, Gomphocarpus fruticosus, and Gomphrena celosioides.
Red Data Species	No red data species or suitable habitat were found within this unit, and it is unlikely that such species would be present due to the degraded condition thereof.	No red data species were found within this unit, and it is not thought that the habitat is suitable for such species due to the degraded herbaceous layer.	No red data species were noted within this unit.
Protected Species	One protected tree species, Boscia albitrunca was found within this unit.	Boscia albitrunca	
Alien Plant Species	Opuntia stricta	Opuntia stricta	Crotalaria agatiflora, Verbena bonariensis, Ricinus communis, Xanthium strumarium
Medicinal Species			Gomphocarpus fruticosus, Ziziphus mucronata

The figure below indicates the location of the units.

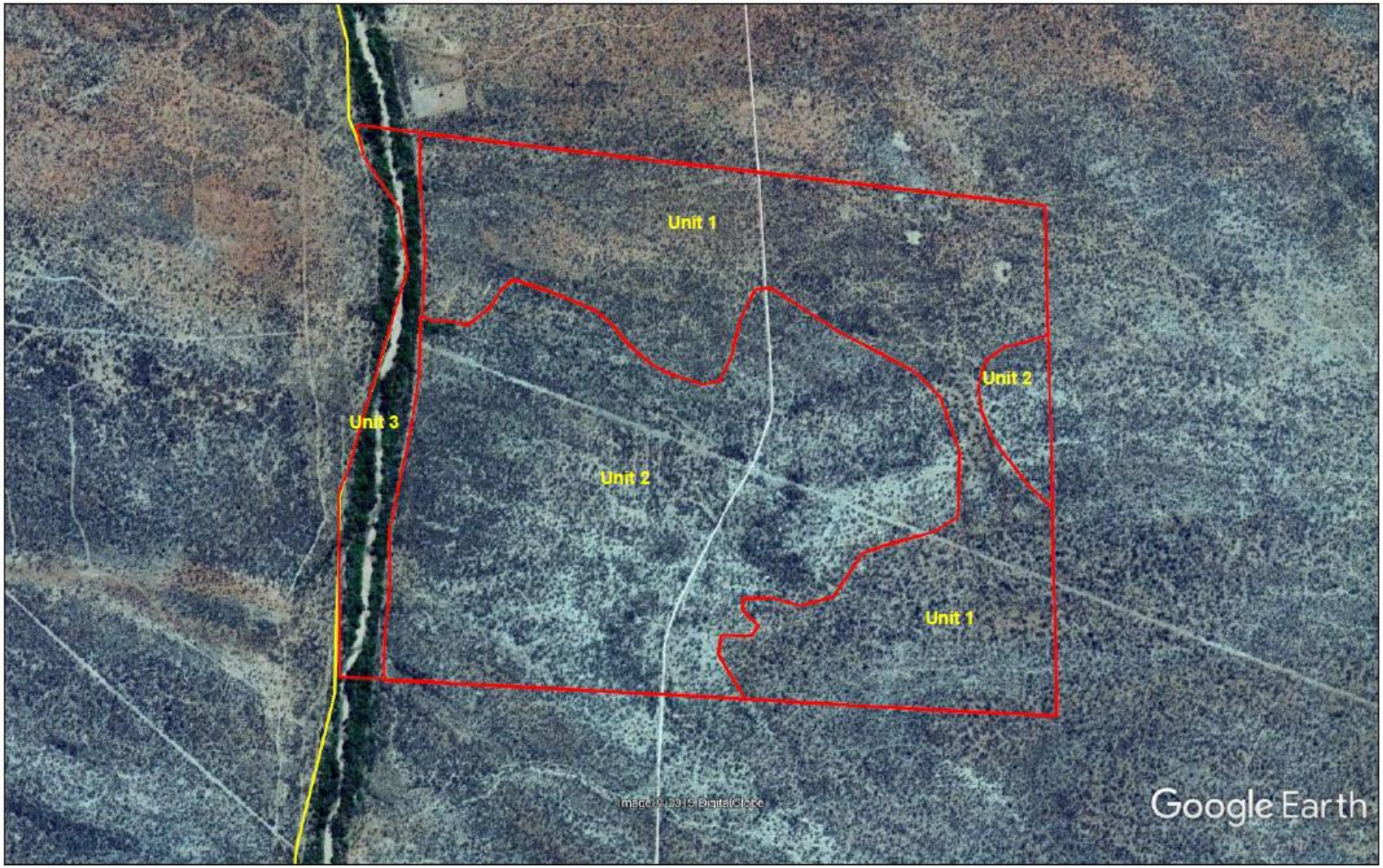


Table 6-16: Vegetation types and distribution

6.5.3 Fauna

The current land use on the farm is that of cattle grazing. The following species may occur in the study area:

- Amphibians:
  - Bushveld Rain Frogs (Breviceps adspersus), Tremelo Sand Frogs (Tomopterna cryptotis), Olive Toad (Sclerophrys garmani), Snoring Puddle Frogs (Phrynobatrachus natalensis), Banded Rubber Frogs (Phrynomantis bifasciatus), Common Caco (Cacosternum boettgeri), Tremelo Sand Frogs (Tomopterna cryptotis), Common Platanna (Xenopus laevis laevis) and Guttural Toads (Sclerophrys gutturalis), Southern Foam Nest Frog (Chiromantis xerampelina), Plain Grass Frog (Ptychadena anchietae).
- Reptiles:
  - The degraded Senegalia nigrescens-Terminalia prunoides sweet Bushveld with scattered logs and rocks offers suitable habitat for Cape Gecko (*Pachydactylus capensis*), Transvaal Thick-toed Gecko (*Pachydactylus affinis*), Eastern ground Agama (*Agama aculeata distanti*), Variable Skink (*Trachylepis varia*), Striped Skink (*Trachylepis striata*), Speckled Rock Skink (*Trachylepis punctatissima*), Rainbow Skink (*Trachylepis margaritifer*), Cape Skink (*Trachylepis capensis*), Yellow-throated Plated Lizard (*Gerrhosaurus flavigularis*), Spotted Sand Lizard (*Pedioplanis lineoocellata lineoocellata*), Spotted Sandveld Lizard (*Nucras intertexta*), Common Rough Scaled or Savanna Lizard (*Meroles squamulosus*). The sand soils, rocky outcrops on the site and logs provide suitable habitat for the fossorial Sundevall's Writhing Skink (*Mochlus sundevallii sundevallii*).
  - The adjacent rocky hill to the south of the mining site, as well as low-lying rocky extrusions, provide suitable habitat for rupicolous (living on or amongst rocks) reptile species including several species of snakes, skinks and geckos such as Turner's Gecko (*Pachydactylus turneri*). Snake species likely to occur include Bibron's Blind Snake (*Afrotyphlops bibronii*), Boomslang (*Dispholidus typus*), Spotted Bush-Snake (*Philothamnus semivariegatus*), Puff Adder (*Bitis arietans arietans*), Horned adder (*Bitis caudalis*), Southern African Python (*Python natalensis*), Western Yellow-bellied Sand Snake (*Psammophis subtaeniatus*) Striped Grass Snake (*Psammophylax tritaeniatus*), Mole Snake (*Pseudaspis cana*), Black Mamba (*Dendroaspis polylepis*), Snouted Cobra (*Naja annulifera*), Mozambique Spitting Cobra (*Naja mossambica*), Common House Snake (*Boaedon capensis*), Rhombic Egg-Eater (*Dasypeltis scabra*) and Rhombic Night Adder (*Causus rhombeatus*).
  - The closed woodland riparian zone including the flood-bench of the Mogalakwena River provides suitable habitat for arboreal reptile species including Southern Tree Agama (*Acanthocercus atricollis*), Common Dwarf Gecko (*Lygodactylus capensis capensis*), Flap-necked Chameleon (*Chamaeleo dilepis dilepis*), Spotted Bush Snake (*Philothamnus semivariegatus*), Boomslang (*Dispholidus typus typus*). The

termite mounds within the closed riparian woodland, as well as seasonal pools, provides suitable habitat for the "protected' Southern African Python (*Python natalensis*), Nile Monitor (Varanus niloticus) as well as White-throated or Southern Rock Monitor (*Varanus albigularis*). The pools within the Mogalakwena River provide suitable habitat for Cape or Marsh Terrapin (*Pelomedusa subrufa*).

- Mammals
  - Larger carnivores likely to occur in the area especially within the adjacent private conservation areas include Leopard (*Panthera pardus*), Brown Hyaena (*Parahyaena brunnea*), Caracal (*Caracal caracal*), Serval (*Leptailurus serval*), Honey Badger (*Poecilogale albinucha*), and Blacked-backed Jackal (*Canis mesomelas*). Antelope species likely to be recorded from the study area include Kudu (*Tragelaphus strepsiceros*), Bushbuck (*Tragelaphus scriptus*), Impala (*Aepyceros melampus*), Reedbuck (*Redunca arundinum*), Grey Rhebok (*Pelea capreolus*), Klipspringer (*Oreotragus oreotragus*), Steenbok (*Raphicerus campestris*) and Bush Duiker (*Sylvicapra grimmia*). The population sizes will depend on the current levels of hunting and poaching within the site and adjacent neighbouring properties.
  - Mammal species recorded within the Mogalakwena River and riparian zone included Kudu (*Tragelaphus strepsiceros*), Bushbuck (*Tragelaphus scriptus*), Steenbok (*Raphicerus campestris*) and Common Duiker (*Sylvicapra grimmia*). A Scrub hare (*Lepus saxatilis*) was flushed from a small Senegalia erubescens. The quills of a Cape Porcupine (*Hystrix africaeaustralis*) were observed within the closed riparian woodland. Abandoned Warthog (*Phacochoerus aethiopicus*) burrows were observed within the site as well as digging activities within the active channel of the Mogalakwena River. The majority of the larger mammals will use the site on a transient basis and due to high levels of anthropogenic disturbances associated with the livestock grazing and hunting are not resident.
  - The rocky hill to the south of the proposed mining area and low-lying rocky extrusions or outcrops provide suitable habitat for several rupicolous mammal species such as Namaqua Rock Mouse (*Aethomys namaquensis*), Spiny Mouse (*Acomys spinosissimus*), Eastern Rock Elephant Shrew (*Elephantulus myurus*) and Chacma Baboon (*Papio ursinus*). Rodent species likely to occur within the open woodlands on the site include Tree Squirrel (*Paraxerus cepapi*), Springhare (*Pedetes capensis*), Bushveld Gerbil (*Tatera leucogaster*), Acacia Rat (*Thallomys paedulcus*), Black-tailed Rat (*Thallomys nigricauda*), Southern Multimammate Mouse (*Mastomys coucha*), Striped mouse (*Rhabdomys pumilio*), Namaqua Rock Mouse (*Micaelamys namaquensis*), Woodland Dormouse (*Graphiurus murinus*), Red Veld Rat (*Aethomys chrysophilus*). Bat species recorded from the area include Egyptian Free-tailed Bat (*Tadarida aegyptiaca*), Rusty Pipistrelle (*Pipistrellus rusticus*), Cape serotine bat (*Eptisecus capensis*), Schreiber's Long-fingered Bat (*Miniopterus schreibersii*), Yellow House Bat (*Scotophilus dinganii*), Common Slit-faced Bat (*Nycteris thebaica*). No bat surveys are planned during the faunal habitat assessment.
- Avifauna

- The savanna biome, and specifically short open woodland as well as thickets of Senegalia erubescens, Senegalia mellifera and Dichrostachys cinerea, is particularly well represented in the study area. The degraded short open woodland tends to have fewer species than the adjacent tall moist closed woodland or riparian zone of the Mogalakwena River. Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of vegetation types above, it is even more important to examine the microhabitats available to birds.
- Recent records of Cape Vulture and Whitebacked Vulture from the 2245_2845 pentad during the current South African Bird Atlas Project (SABAP2). Apart from Red Data species, the study area provides habitat for several non-Red Data raptor species, such as Wahlberg's Eagle, African Hawk Eagle, Steppe Eagle, Brown Snake Eagle, Black-chested Snake-Eagle and a multitude of medium-sized raptors, for example, the migratory Steppe Buzzard, Gabar Goshawk, Dark Chanting Goshawk, Southern pale Goshawk African Goshawk, African Harrier Hawk (Gymnogene),. The smaller raptors observed included a Little Sparrowhawk foraging within the closed woodland, riparian zone. The degraded short open woodland offers suitable habitat for the migratory European Roller which is listed as 'Near-threatened'.
- The Mogalakwena River and closed wooded riparian zone (flood-bench) are important habitats for remaining birds in the area. The Mogalakwena River and closed wooded riparian zone offer suitable habitat for African Fish Eagle and stork species such as African Openbill, Marabou Stork, Black Stork and Yellowbilled Stork and a variety of other waterbirds. The riparian habitat along the Mogalakwena River provides refuge for shy and skulking species such as the African Finfoot and possibly Whitebacked Night Heron. The eroded macro-channel banks of the Mogalakwena River could provide favourable nesting, foraging and dispersal habitat for the Half-Collared Kingfisher.

6.6 Aquatic Ecosystems

6.6.1 Catchment

The Project area is located in Drainage Region A, within the Limpopo WMA and the Mogalakwena River Catchment – A6 (figure below), more specifically within Quaternary Catchment A63B.

Quaternary catchment A63B is drained by the perennial Mogalakwena River flowing in a northerly direction and which is fed by the westward-flowing Lekoeng, Seepabana, Matlalane, Klein Mogalakwena rivers and a number of unnamed tributaries. The area around the project site is generally flat, with elevation ranging between 748 and 1008 mamsl.

The naturalised runoff around the project site is simulated at a unit runoff of 15 mm per annum. The runoff, when expressed as a percentage of rainfall, equates to 1.5%. Streamflow data for

station Leniesrus (A6H035) at Mogalakwena River was obtained to understand the streamflow and used to calculate peak flows.

6.6.2 Freshwater Features

A watercourse is defined in the NWA as follows:
(a) River or spring;
(b) A natural channel in which water flows regularly or intermittently;
(c) A wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Based on current information the project area has no watercourses present on it, but the Mogalakwena River passes to the west of the project site, approximately 500m away from infrastructure.

In terms of the National Freshwater Ecosystem Priority Areas of South Africa (NFEPA), the Mogalakwena River has a Present Ecological state of Largely Modified.

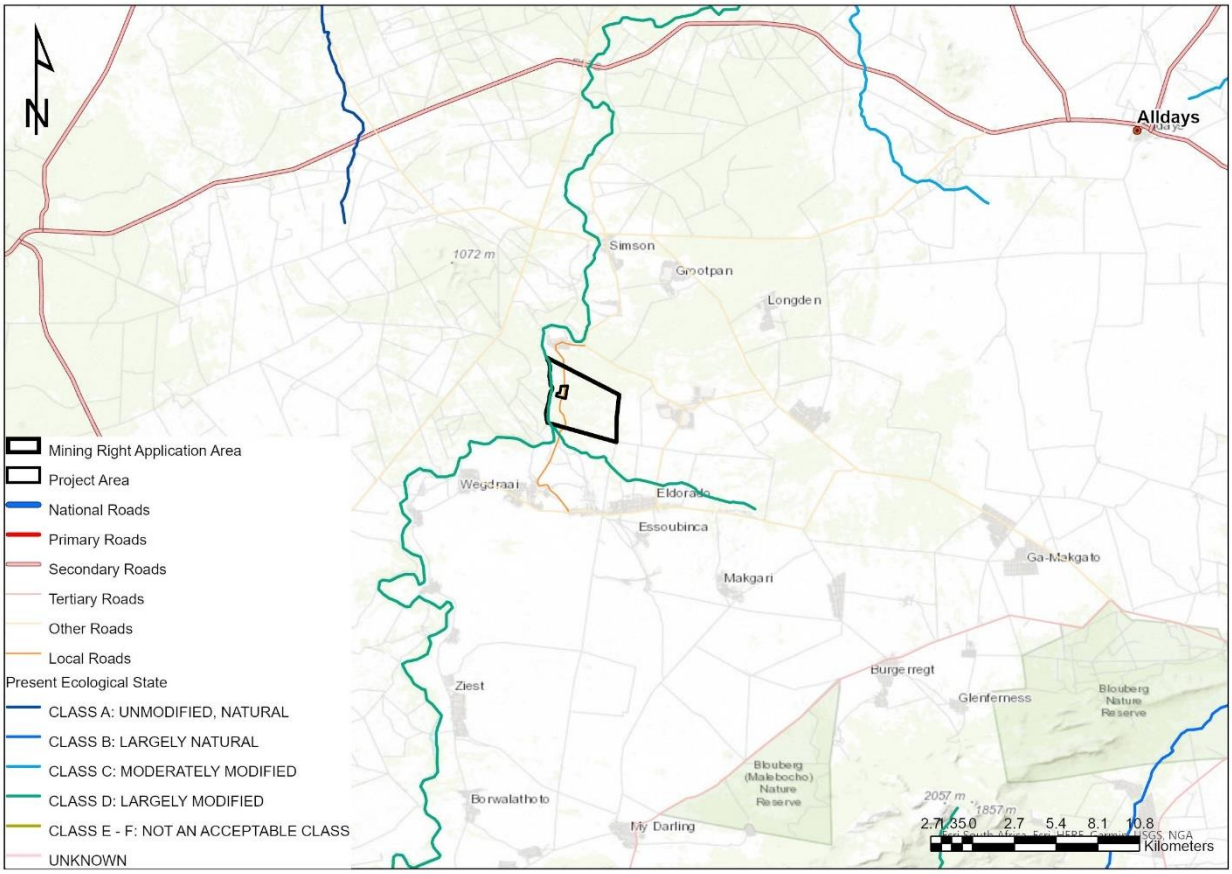


Table 6-17: NFEPA Rivers

6.6.3 Flood Lines, Peaks and Volumes

Sub-catchments were delineated for the determination of flood lines on the Mogalakwena River reach that would be influenced by the proposed Steamboat graphite mine project. Floodlines for the 1:50-year and 1:100-year recurrence intervals were determined for the Mogalakwena River passing through the project site. The proposed project and mine surface infrastructure were determined to be located outside the 1:50- and 1:100-year floodlines. The proposed project and mine surface infrastructure were also located outside the 100m buffer from the watercourse.

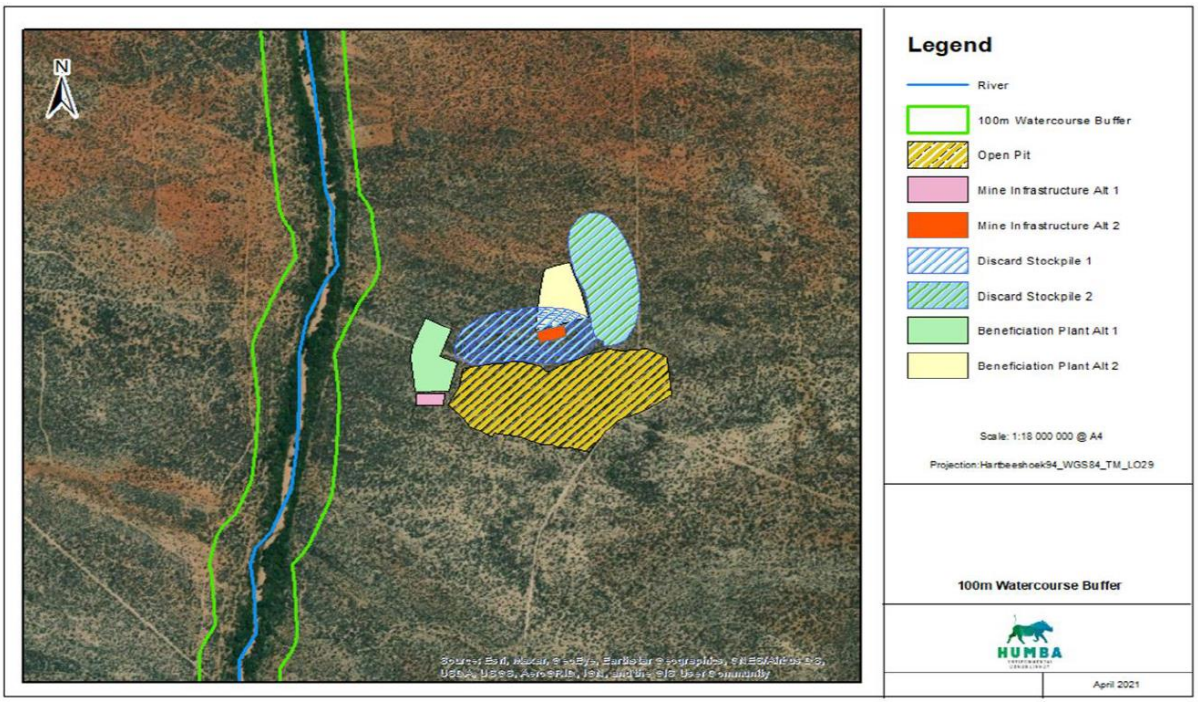


Table 6-18: Floodline Determination

6.6.4 Surface Water Quality

This part of the catchment is populated with rural settlements that are mainly supplied from groundwater. This poses a risk for surface water quality, as well as groundwater quality due to the high concentration of pit latrines. This can lead to long-term contamination of underlying aquifers with E.coli and nitrate as well as unsafe concentrations of bacteria, viruses and chemicals. Large scale irrigation to the north in this catchment can lead to deterioration of water quality due to runoff of potential agrochemical pollutants into the water source.

The project site is in the low-lying areas of the quaternary catchment A63B, which are largely rural. The catchment is mostly taken up by rural areas where natural flows are through preferential flow and natural drainage, as such, the probability of the catchment self-rehabilitating is high.

6.6.5 River Diversions

No river diversions are considered.

6.6.6 Water Authority

Department of Water and Sanitation: Limpopo Regional Office.

6.6.7 Surface Water Use

Current neighbouring surface water use is largely domestic and livestock use. Irrigation takes place to the north, downstream from the project area.

The permissible surface water use on the two project properties in terms of Notice 538 of 2016, published in Government Gazette No 26187 of 2 September 2016 is 4000m^3 (2000m^3 per property) at an abstraction rate of 1 litre per second.

6.6.8 Wetlands

No evidence of any natural wetlands such as valley bottom wetlands or seasonal pans/depressions were observed on the site.

6.7 Groundwater

6.7.1 Hydrocensus

A hydrocensus/groundwater user survey was conducted in March 2021 by Aquatico Scientific within the mining right application area (MRA area) and the surrounding communities and properties. The main aims of the hydrocensus field survey were as follow:

- To locate all interested and affected persons (I&APs) with respect to groundwater – thus groundwater users;
- To collect all relevant information from the I&APs (i.e. name, telephone number, address, etc.);
- Accurately log representative boreholes on the I&APs properties; and
- To collect all relevant information regarding the logged boreholes (i.e. yield, age, depth, water level etc.) but especially the use of groundwater from the borehole.

Summaries of the findings are provided in the table below. A total of six user boreholes were located, and their positions are indicated in Figure 4-1. Most of these boreholes were used for domestic purposes, livestock watering and irrigation at the time of the surveys. Exploration boreholes drilled in the 1970's and 1980's were located and water level measurements could be obtained from six of the holes.

Notes:

- The hydrocensus/user survey was conducted on the properties surrounding Steamboat.
- A total of six user boreholes are located within the hydrocensus area.
- Additionally, six of the old exploration boreholes were useful for water level measurement.

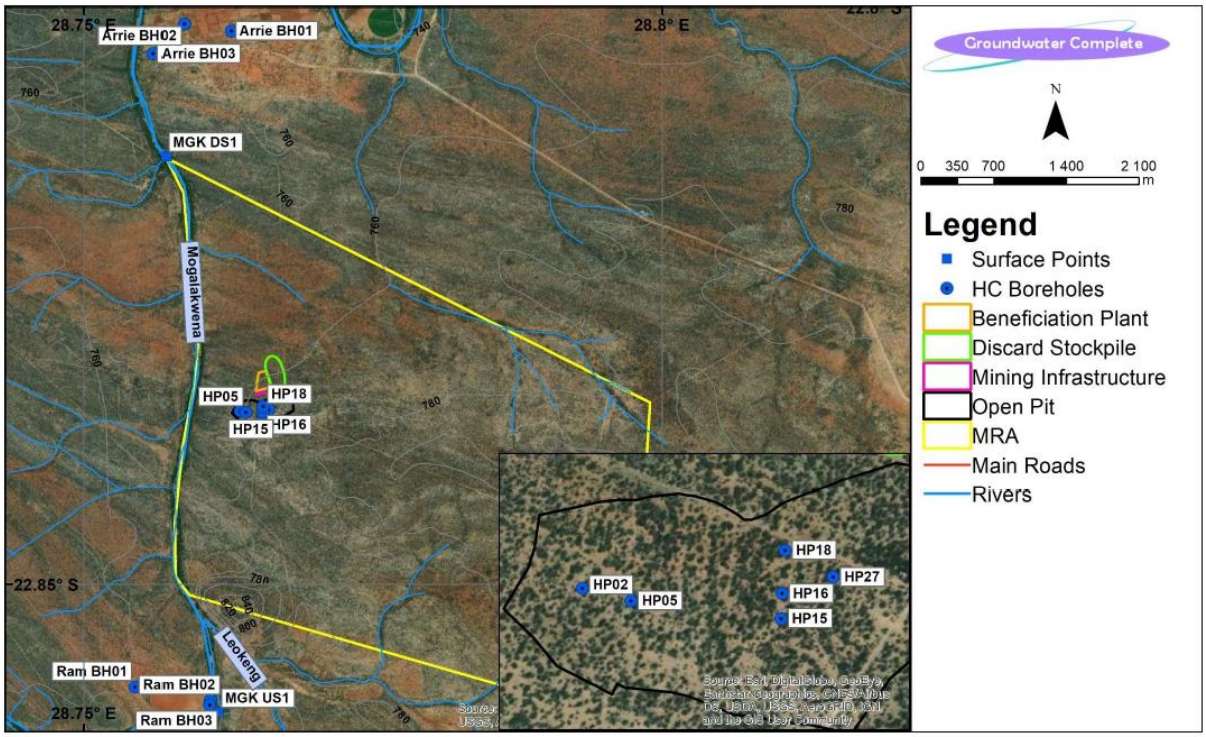


Figure 6-1: Hydrocensus Borehole positions

Table 6-19: Positions of boreholes recorded during the hydrocensus and user surveys

Locality	Type	Water Level	Uses	Pump inst.	Borehole Depth	Sampled	Coordinates
Arrie BH01	Abstraction BH	NA	Community Water Provision	Yes	Unknown	No	S22.80204˚ E28.76272˚
Arrie BH02	Abstraction BH	NA	Community Water Provision	Yes	Unknown	Yes	S22.80142˚ E28.75864˚
Arrie BH03	Abstraction BH	7.8	Community Water Provision	Yes	100+	Yes	S22.80400˚ E28.75602˚
Ram BH01	Abstraction BH	NA	Agriculture	Yes	Unknown	No	S22.85880˚ E28.75445˚
Ram BH02	Abstraction BH	6.4	Agriculture	Yes	Unknown	No	S22.85997˚ E28.76087˚
Ram BH03	Abstraction BH	5.8	Agriculture	Yes	Unknown	Yes	
HP27	Exploration	25.2	None	No	30	Yes	
HP02	Exploration	22.5	None	No	28	No	
HP05	Exploration	23.5	None	No	29	No	
HP15	Exploration	24	None	No	29	No	
HP16	Exploration	24.2	None	No	29	No	
HP18	Exploration	24.2	None	No	29	No	

Dedicated source monitoring boreholes were drilled at six of the seven locations identified by the geophysical survey and their positions are indicated in Table 6-20.

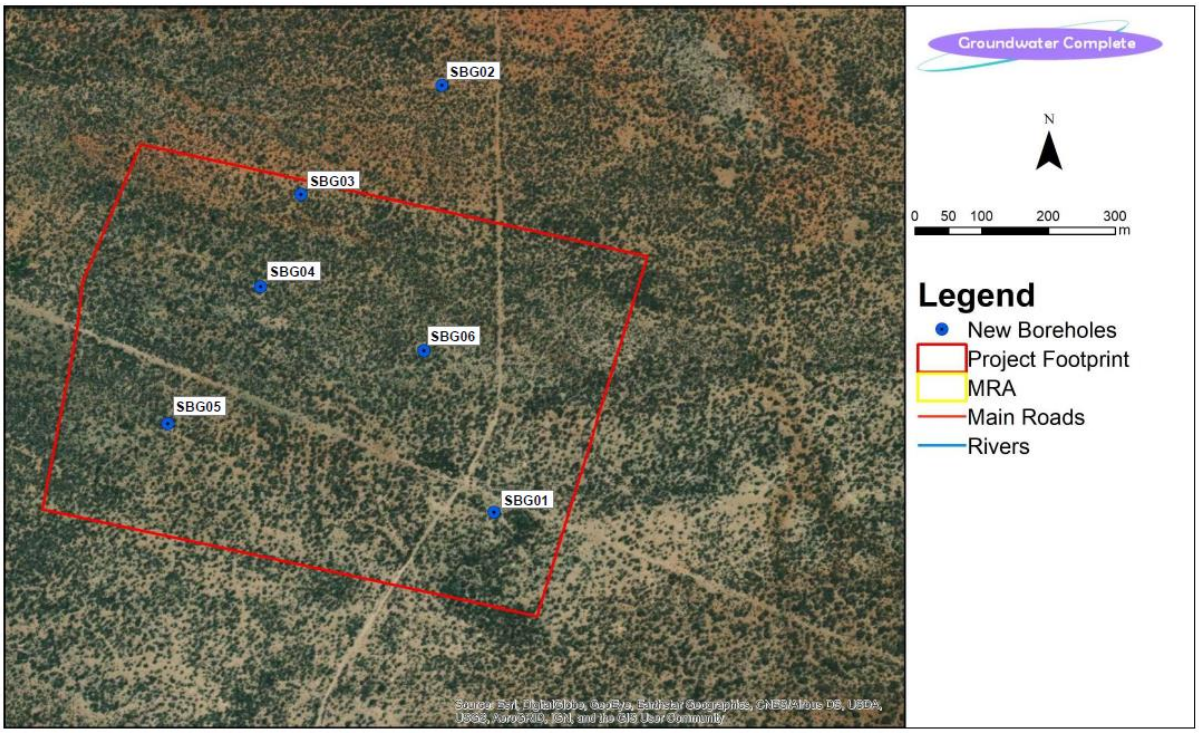


Table 6-20: Groundwater Monitoring Borehole Locations

Table 6-21: Monitoring Borehole data

Locality	Type	Water Strike Depth	Borehole Depth	Blow Yield	Geology	Coordinates
SGB01	Monitoring	None	40	Dry	Gneiss	S22.8353° E28.7672°
SGB02	Monitoring	None	39	Dry	Gneiss	S22.8295° E28.7665°
SGB03	Monitoring	28	30	4 000	Gneiss & Quartz	S22.831° E28.7646°
SGB04	Monitoring	21 - 23	50	15 000	Gneiss & Quartz	S22.8323° E28.764°
SGB05	Monitoring	17 – 20	30	4 000	Quartz & Gneiss	S22.8341° E28.7628°
SGB06	Monitoring	None	40	Dry	Gneiss & Weathering	S22.8331° E28.7662°

Groundwater levels in the project area generally vary between ± 15 and 35 meters below surface (mbs), with the average being ± 20 mbs.

6.7.2 Aquifer Classification

Information from geological maps, drilling results and experience gained from numerous studies conducted in similar geohydrological environments suggest that two different types of aquifers may be present in the project area.

The first aquifer is a shallow, semi-confined or unconfined aquifer that occurs in the transitional soil and weathered bedrock zone or sub-outcrop horizon. Yields in this aquifer are generally low (less than 0.5 l/s) and the aquifer is usually not fit for supplying groundwater on a sustainable basis. Consideration of the shallow aquifer system becomes important during seepage estimations from pollution sources to receiving groundwater and surface water

systems. The shallow weathered zone aquifer plays the most important role in contaminant transport simulations from process and mine induced contamination sources because the lateral seepage component in the shallow weathered aquifer often dominates the flow. According to the Parsons Classification system, this aquifer is usually regarded as a minor- and in some cases a non-aquifer system.

The second aquifer system is the deeper secondary fractured rock aquifer that is hosted within the sedimentary rocks of the Karoo Supergroup, which underlies the southern half of the MRA area. Groundwater yields, although more heterogeneous, can be higher. This aquifer system usually displays semi-confined or confined characteristics with piezometric heads often significantly higher than the water-bearing fracture position. Fractures may occur in any of the co-existing host rocks due to different tectonic, structural and genetic processes. According to the Parsons Classification system, the aquifer could be regarded as a minor aquifer system, but also a sole aquifer system in some cases where groundwater is the only source of domestic water.

According to the Groundwater Quality Management (GQM) classification system the aquifer underlying the project area has a medium vulnerability and is considered a minor aquifer. This indicates that a medium level of protection is required.

6.7.3 Groundwater Elevations, Gradients and Flow Directions

Groundwater flow from the Steamboat area was simulated to be towards the west as indicated in Table 6-22. The average groundwater gradient in this direction was simulated to be approximately 1º.

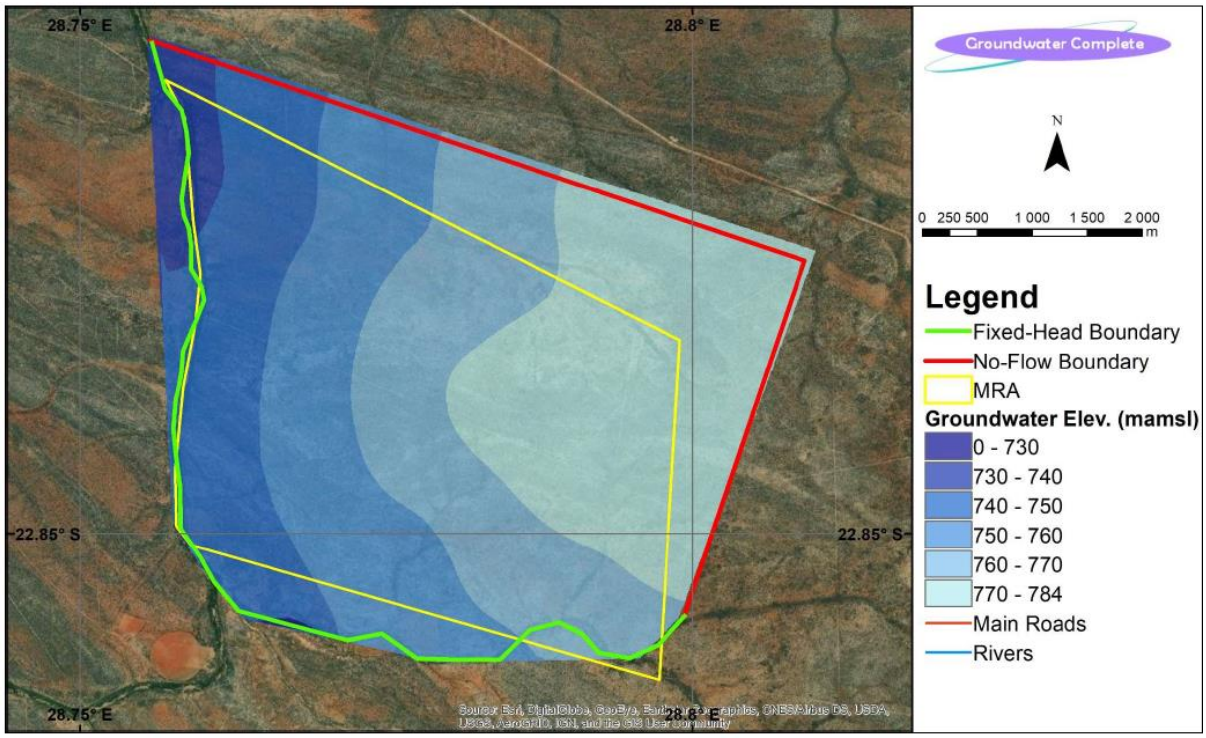


Table 6-22: Steady state calibrated groundwater elevations

6.7.4 Groundwater Quality

Groundwater within the Steamboat project area is considered to be of marginal or poor quality for domestic use if compared to the South African National Standards for drinking water purposes (SANS 241:2015) and still representative of the ambient or unaffected environment.

Groundwater TDS concentrations vary between 770 mg/l and 2600 mg/l. The high salinity of the ambient groundwater is considered to be a result of the following contributing factors:

- The very hot and dry climate resulting in high evapotranspiration and salinity increase;
- Salinity contribution by the underlying geological formations due to natural salinity in the aquifer host rock as exacerbated by the metamorphic processes which included late stage fluids after re-crystallization.

The groundwater quality in the user boreholes around Steamboat indicate somewhat better quality as they are located closer to the Mogalakwena River in a primary aquifer. The river provides freshwater recharge to the primary aquifers around it. The hydrocensus boreholes are situated in close proximity to the river and the groundwater is therefore of better quality.

6.8 Air Quality

6.8.1 Existing sources of Pollution

Currently, a detailed emissions inventory for the area under investigation has not been undertaken. Based on an aerial photo, site visits and the site description of the area, the following sources of potential air pollution have been identified:

- Veld fires;
- Domestic fuel burning;
- Vehicle entrainment;
- Agriculture;

A qualitative discussion on each of these source types is provided in the subsections which follow.

6.8.1.1 Veld fires

A veld fire is a large-scale natural combustion process that consumes various ages, sizes, and types of flora growing outdoors in a geographical area. Consequently, veld fires are potential sources of large amounts of air pollutants that should be considered when attempting to relate emissions to air quality. The size and intensity, even the occurrence, of a veld fire depends directly on such variables as meteorological conditions, the species of vegetation involved and their moisture content, and the weight of consumable fuel per hectare (available fuel loading).

Once a fire begins, the dry combustible material is consumed first. If the energy released is large and of sufficient duration, the drying of green, live material occurs, with subsequent burning of this material as well. Under suitable environmental and fuel conditions, this process may initiate a chain reaction that results in a widespread conflagration. It has been hypothesized, but not proven, that the nature and amount of air pollutant emissions are directly related to the intensity and direction (relative to the wind) of the veld fire and are indirectly related to the rate at which the fire spreads.

The factors that affect the rate of spread are:

- weather (wind velocity, ambient temperature, relative humidity);
- fuels (fuel type, fuel bed array, moisture content, fuel size); and
- topography (slope and profile).

However, logistical problems (such as size of the burning area) and difficulties in safely situating personnel and equipment close to the fire have prevented the collection of any reliable emissions data on actual veld fires, so that it is not possible to verify or disprove the hypothesis.

The major pollutants from veld burning are particulate matter, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulphur oxides are negligible (USEPA, 1996). A study

of biomass burning in the African savanna estimated that the annual flux of particulate carbon into the atmosphere is estimated to be of the order of 8 Tg C, which rivals particulate carbon emissions from anthropogenic activities in temperate regions (Cachier et al, 1995).

6.8.1.2 Domestic fuel burning

It is anticipated that the lower income households in the surrounding villages are likely to use coal and wood for space heating and/ or cooking purpose.

Globally, almost 3 billion people rely on biomass (wood, charcoal, crop residues and dung) and coal as their primary source of domestic energy. Exposure to indoor air particulates from the combustion of solid fuels is an important cause of morbidity and mortality in developing countries. Biomass and coal smoke contain a large number of pollutants and known health hazards, including particulate matter, carbon monoxide, nitrogen dioxide, sulphur oxides (mainly from coal), formaldehyde, and polycyclic organic matter, including carcinogens such as benzo[a]pyrene (Ezzati and Kammen, 2002).

Monitoring of exposures in biomass-burning households has shown concentrations are many times higher than those in industrialized countries. The latest Air Quality Objectives, for instance, required the monthly average concentration of PM10 (particulate matter < 10 µm in diameter) to be < 200 µg/m3 (annual average < 100 µg/m3). In contrast, a typical 24-hr average concentration of PM10 in homes using biofuels may range from 200 to 5000 µg/m3 or more throughout the year, depending on the type of fuel, stove, and housing. Overall, it has been estimated that approximately 80% of total global exposure to airborne particulate matter occurs indoors in developing nations. Levels of CO and other pollutants also often exceed international guidelines (Ezzati and Kammen, 2002).

6.8.1.3 Vehicle entrained dust

The force of wheels of vehicles travelling on unpaved roadways causes the pulverisation of the surface material. Particles are lifted and dropped from the rotating wheels and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic as well as the speed of the vehicles. These types of roads could also be used, and new ones may be created to ensure access to the new facility where access cannot be obtained from the main roads in the area. The movement of construction vehicles and other infrastructure parts will result in unusually heavy loads being placed on the roads, which is likely to result in additional damage to the road surface (USEPA, 1996).

6.8.1.4 Agriculture

Agricultural activity can be considered a significant contributor to particulate emissions, although tilling, harvesting and other activities associated with field preparation are seasonally based. Little information is available with respect to the emissions generated due to the

growing of crops. The activities responsible for the release of particulates matter would however include:

- Particulate emissions generated due to wind erosion from exposed areas;
- Particulate emissions generated due to the mechanical action of equipment used for clearing of fences and roads, tilling and harvesting operations; and
- Vehicle entrained dust on paved and unpaved road surfaces.

6.8.2 Baseline Air Quality Monitoring

No baseline monitoring is conducted by Capricorn District Municipality near the project site, mainly due to the limited air quality pollution in the area. The project site is remote and isolated. Due to the distance of the project from sensitive receptors (2km and more), no specific baseline air quality information was gathered.

6.9 Noise

6.9.1 Identified noise sources

Potential background noise at the project site can be attributed to the following:

- Vehicles using the gravel road that extends through the site as well as other gravel roads in the immediate area; and
- Agricultural activities associated with the various farms on-site and the immediate surrounding area;

6.9.2 Factors influencing the sound character of the area

Existing land use and/or environmental components that may contribute or change the sound character in the area include:

- **Topography**: The area can be described as being gently undulating. There are some natural features that could act as noise barriers such as the rocky outcrops to the east of the project infrastructure focus area reducing the practical distances at which sound propagates.
- **Surrounding Land Use**: The area in the vicinity of the proposed development is currently classified as mostly vacant and utilised for grazing.
- **Roads**: There are several gravel district roads that traverses the broader area to the north and south. Based on observations made during this and previous site visits, the gravel roads do not carry any traffic of acoustic significance.
- **Residential areas**: Residential areas are located to the north, east and south but are more than 1km from project infrastructure focus area.
- Other industrial and commercial processes: There are no industrial areas within a 20km radius from the site with only some small commercial areas located within the

settlements, these are more than 1km from the project infrastructure focus area. It is too far to influence the ambient sound levels in the vicinity of the proposed development.

- Ground conditions and vegetation: The area falls within the Savannah biome, with the vegetation type being Limpopo Sweet Bushveld vegetation type. The ground is covered with grasses, shrubs and trees and would be considered as 50% acoustically absorbent. This influences the propagation of the sound from the mine, as the fraction of sound that is reflected from the ground would be influenced as certain frequencies would be partly absorbed by the ground surface.

6.9.3 Baseline Noise

The project site is remote and isolated. Due to the distance of the project from sensitive receptors (2km and more), no specific baseline noise information was gathered.

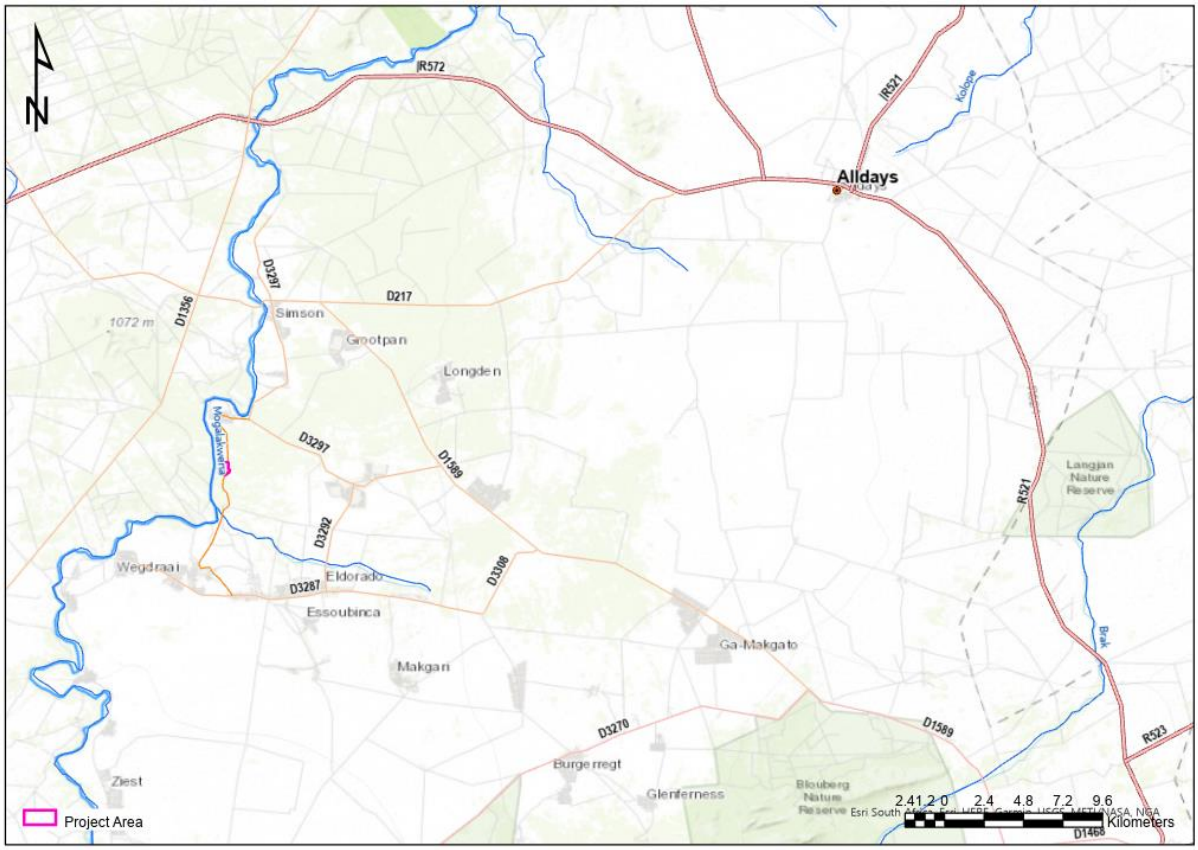
6.10 Traffic

No traffic counts were conducted, as roads within the vicinity of the project area are mostly rural in nature with limited existing traffic volumes.

Traffic is generated from the rural settlements towards each other and to the formalised township areas such as Alldays.

Roads affected include:

- D3297 2.6km north of the project site stretching from a west-east direction, joining the D1589
- D1589 12km east of the project site stretching from a north-south direction, joining the D217 in the north and the D1468 (R521) in the south-east.



6.11 Sites of Archaeological and Cultural Interest

6.11.1 Palaeontology

The site is underlain by the Quaternary sediments, Karoo Supergroup and the Limpopo Belt.

Graphite occurs in gneiss in the eastern part of the Beit Bridge Complex. It formed during the metamorphism process of carbon rich shale. Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Fossils may be present in the Quaternary, but not in the Beit Bridge Complex. Inland quaternary deposits are much more extensive than marine deposits and are terrestrial, but usually unfossiliferous.

The Quaternary Formation may contain fossils. A very wide range of possible fossil remains, though these are often sparse. Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to be determined due to thick topsoil, subsoil, overburden and alluvium.

6.11.2 Stone Age Remains

Stone Age artefacts, mostly dating to the Middle Stone Age occur in low numbers scattered in parts of the study area. The density of artefacts is less than 1/20m2 overall. The tools are mostly made from quartzite. The tools are very poorly made and also shows a lot of weathering.

6.11.3 Iron Age

No sites, features or objects of cultural significance dating to the Iron Age were identified in the project area.

6.11.4 Graves, Cemeteries and Burial Grounds

What seems to be a single grave, marked by a packed circle of stone and a small, different type of stone as headstone was identified. It seems to be very old and no other signs of habitation could be detected.

6.11.5 Structures older than 60 years

A series of trenched and deep pits confined to a section where the open pit is planned. It is as yet impossible to attribute a definite date to these excavations. Some of the trenches are also much overgrown with trees and shrubs, indicating that they are quite old. According to local community members, they have been playing here since they were very young, implying that the mining took place prior to that, making possibly older than 60 years. However, it is also stated that there were some exploration being done here in the late 1980s by Mintek and the South African Development Trust (Badenhorst 2019:126), although the extent of this exploration is not indicated.

6.12 Socio-Economic Character

6.12.1 Demographics

The population of BLM is estimated at a total of 172,602 people, where 45% are male, and 55% are female.

Table 6-23: Population and households

Area	Population	Households	Members per household
Limpopo	5,404,868	1,418,100	3.8
Capricorn District	1 330 436	378 301	3.5
Blouberg	172 602	43 747	3.9
Ward 16	7 548	1 855	4
Ward 17	7 334	1 830	4

Spatially, Blouberg is the largest municipality within the Capricorn DM. Yet, the total population of 172,602 (Community Survey, 2016) accounts for only 12% of the District's population and 11.5% of its household numbers. The population in Capricorn DM has increased by 0.95% from 1 261 462 in 2011. The population of Blouberg declined from 194 119 in 2007 to 175 085 in 2011, thereafter declined further to 172 602 in 2016. This decline can be attributed to among other things, the low fertility rate, high mortality rate compared to birth rate or the out-migration by the economically active population to the industrial centres such as Polokwane and Gauteng to seek better economic prospects. Households, however, had increased steadily

over the past 20 years from 33 468 in 2001 to 43 747 in 2016. Household sizes decreased from an average of 5 members per household in 2001 to 4 members per household in 2016.

The majority (98%) of the people in the Blouberg LM are Black African of whom the majority stay in the rural tribal areas. Sepedi is the language most spoken in the LM.

6.12.2 Gender Profile

The predominant gender in the CDM and Blouberg LM is female. In the Blouberg LM, the female population (55%) exceeds the male population (45%). The gender distribution in Ward 16 consists of 45.5% males and 54.5% females.

6.12.3 Age Profile

The age structure in CDM and Blouberg LM has remained relatively constant since 2011. However, there has been a slight increase in the number of young people (0-9 years) in the local municipality. The number of older adults in the District has decreased slightly.

The younger generation (aged between 10 and 39 years) make up the majority of the people living in the Blouberg LM (50%), followed by the group between the ages of 0 and 9 years with 27.6%. The majority of people in Ward 16 are aged 10 – 19 years (29%), followed by 0 – 9 years (28%) and 20 – 29 years (13%). The majority of people in Ward 17 are aged 0 – 9 years (30%), followed by 10 – 19 years (27%) and 20 – 29 years (12%).

6.12.4 Education Profile

In terms of education levels in the LM, 20% of the adult population (over 20 years of age) have no education at all, while 54% have primary or secondary level education (Community Survey, 2016). Those with Matric and higher educational qualifications accounted for 17% of the population. In Ward 16 32% and Ward 17, 27% of the population of individuals older than 20 has no formal schooling. 20% of the population aged 20 and older within the Blouberg LM area has no education, and only 17% of the individuals aged 20 and older have completed Matric or have a higher education qualification.

6.12.5 Basic Service Delivery

6.12.5.1 Access to Water

According to the stats (Community survey, 2016), the majority (53.6%) of people in the Blouberg LM area get their water from a service provider, followed receiving water from a water scheme (18.7%) and making use of their own services (18.1%).

6.12.5.2 Sanitation

Pit latrines are mostly used in rural areas where there is no proper piped water system. The sanitation backlog requires a considerable amount of money to bring up to date. The scarcity of water resources exacerbates it, which poses a challenge to implement waterborne

sanitation systems and to expand the reticulated water networks. Little improvement has taken place in the Blouberg LM during the period 2011 to 2016.

6.12.5.3 Electricity

The 2016 Community survey estimates that 97.8% of the Blouberg LM has access to electricity, meaning 2.2% use energy sources such as gas, paraffin, candles, solar and so forth. Challenges that are experienced include illegal connections, cable theft, vandalism of transformers, the cutting of trees leads to deforestation and soil erosion, limited Eskom capacities and budgetary constraints.

6.12.5.4 Refuse Removal

Most of the people in the Municipal area are in rural areas. They do not have access to a formal refuse removal system.

6.12.6 Status of Infrastructure

6.12.6.1 Road infrastructure and public transport

Blouberg Local Municipality is a predominantly rural municipality situated to the northwestern boundary of the Republic of South Africa, with Botswana and Zimbabwe. Roads R521 (P94/1 and P94/2) provides a north-south link between Blouberg and Molemole, Polokwane and Makhado municipality. To the east, the municipality is served by road R523 (D1200) that allows access to the towns such as Mogwadi, Morebeng, Duiwelskloof, Tzaneen and Lephalale. There is another critical road (N11) from Mokopane town to Botswana that passes through the municipality, which has the potential to stimulate the economy.

The roads network serves as essential vital linkages, which serve as corridors and gateways to major economic destinations. Inadequate roads are one of the five leading challenges faced by municipalities in Limpopo (CS 2016). According to the BLM IDP, their current focus is on improving access to the appropriate plant and machinery for the maintenance and improvement of existing roads.

Public transport in the municipal area is predominately minibus taxi's as bus services have been suspended. Another transport mode is donkey carts and bicycles mostly used by the communities.

6.12.6.2 Social Infrastructure

Access to social infrastructure is indicative of a community's development. Social infrastructure inclusive of educational, social and health facilities, police stations, and recreational and sports facilities are determining factors concerning a community's welfare and ability to develop sustainably. The existence of a platform for dialogue between communities and local government is equally indicative of a community's social development. The figure below indicates the social infrastructure in the vicinity of the project area.

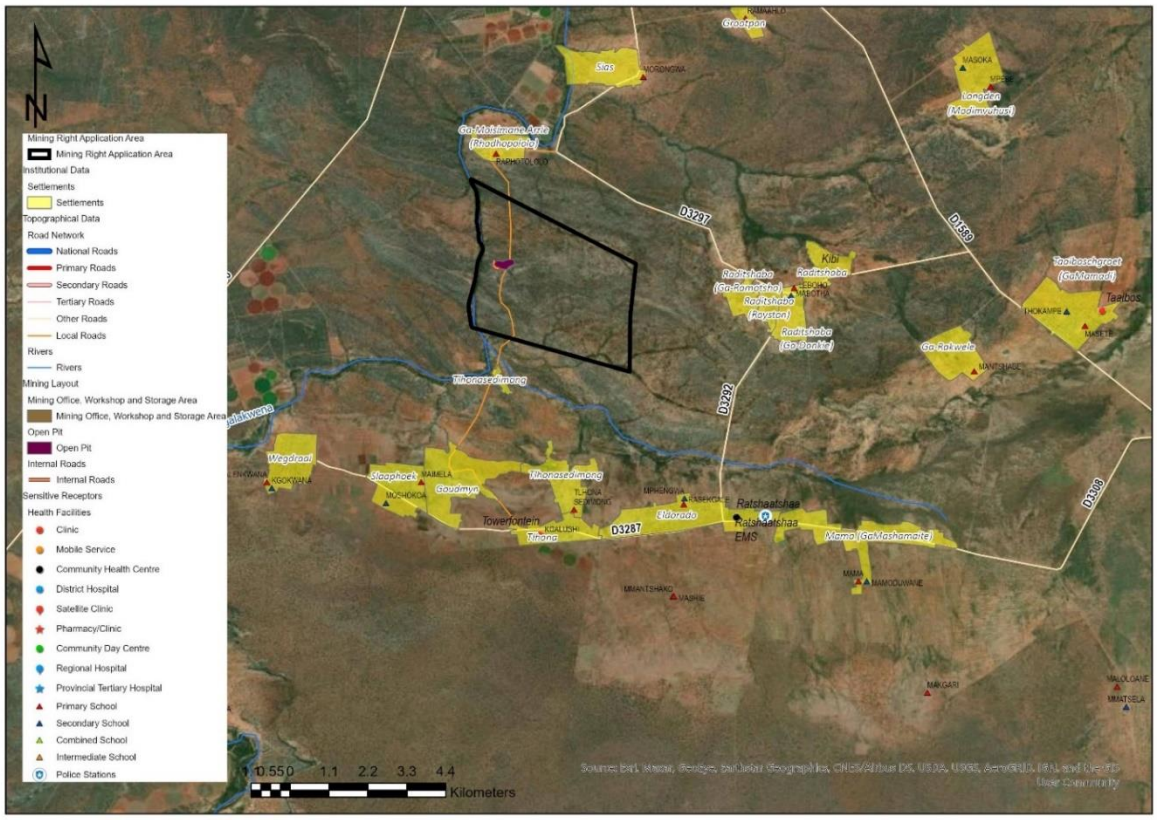


Table 6-24: Social Infrastructure

6.12.7 Employment Profile

The Census 2011 data indicates that the Blouberg LM had about 93,647 people within the working-age population (54.3% of the total population). Of these, 17.7% of the people were economically active; 17.9% are unemployed or discouraged work seekers, and 64.4% of the working-age population was not economically active (NEA). The employed labour in the LM was estimated at 16,602. In contrast, the unemployed and discouraged work-seeker population was estimated at 16,756, reflecting an actual unemployment rate of 50.2% (excluding the non-economically active population). This is higher than the Limpopo real unemployment rate of 46.4%.

The situation in the project area Wards is even worse with 70.8% actual unemployment rate in Ward 16 (which is just south of the MRA), and 50.2% real unemployment rate in Ward 17. This relates to 1 363 people being unemployed in the two Wards.

Of those employed within the municipality, 54.06% are employed in the formal sector, and 28.7% are employed in the informal sector. In the project wards, 77.5% in Ward 16 and 64.6% in Ward 17 are employed in the formal sector. The total employment in the informal sector increased by 8.3% between 2000 and 2010 and grew further by 7% in 2016 (BLM IDP, 2020). The year on year growth in the informal sector reflects a growing economy that is, however, not able to accommodate all the economically active population.

6.12.8 Income Profile

To determine the people's living standards, as well as their ability to pay for basic services such as water and sanitation, the income levels of the population, are analysed and compared to the income level in the province in general.

The average household income in the Blouberg LM is about R15,000 per annum, with 14.4% of the households earning no income at all. On average, 83.6% of the income bearing population brings an income into the household; this includes pensions and social grants.

6.12.9 Economic Contribution and Activities

Ward 16 and 17 contribute 2.8% and 3.6% to the Blouberg Local Municipality, which in turn contributes 5.1% to the Capricorn District Municipality. Capricorn contributes about 23.8% to the Limpopo Province, which only provides approximately 7.1% to the National GVA.

The various contributing sectors within Blouberg is dominated by the General government & community, social and personal services sector, trade, financial and business services and then Agriculture. Mining only contributes about 3.9% to the Blouberg GVA.
Blouberg has the lowest mining activities of the four constituent's municipalities in the Capricorn district. The most significant mining activities take place in Polokwane, followed by Lepelle- Nkumpi and Molemole municipalities. Blouberg mining activities are still at the exploration stage, which upon maturity will undoubtedly increase the mining GVA and employment (BLM IDP 2020).

6.12.10 Poverty Index

The National Development Plan strives to eliminate poverty by 2030. Poverty is measured through the reduction of people living below the poverty line (food poverty) that the NDP states are currently at US$2.34 per capita per day (which relates at the current exchange rate to approximately R40 per person per day). This is a household income of roughly R4,800 per month or R57, 600 per annum.

The Statistics SA Poverty Report (2017) revealed that despite an increase in the social grant system covering almost 17 million people, poverty has worsened and nearly half of the population currently lives below the poverty line.

In the Blouberg LM, 60.5% of the population has an average income of R15,000 per annum or less, which relates to about R10.42 or US$0.62 per person per day. A further 11.7% have a household income between R20,000 – R40,000 per annum. 25.8% of the households within Blouberg is above the poverty line and 72.2% below.

6.12.11 Profile of the Livestock Owners

The project properties are utilised for grazing by livestock owners. Three communities were surveyed, and interviews completed with 156 livestock owners:

- 43 from Voorhout – 54% of Voorhout's total households
- 72 from Royston - 39% of Royston's total households
- 41 from Arrie – 25% of Arrie (Ga-Moisimane)'s total households

It should be noted that of the three communities only Voorhout and Royston indicated that they utilise the project properties.

The majority of the livestock farmers are male in the age group of 60 – 69 (31%). Of the livestock farmers 6% is younger than 39 years, 13% is aged between 40 – 49 years, 22% between 50 – 59 years, and 28% is older than 70 years of age. This could be an indication that there is no interest in livestock farming from the youth, or that they are more interested in modern day employment than land-based livelihoods.

The livestock Farmers support a total of 869 people (207 in Voothout, 432 in Royston and 230 in Arrie).

Of the 156 owners 133 (85%) are registered with the Department of Agriculture and 103 utilize/employ cattle herders to look after their cattle.

All the communities farm in majority with cattle, with some also having donkeys, goats and sheep. Farmers reported that some of the livestock is used for additional meat or milk at home, but the majority sell the livestock for an additional income.

7 DETAILS OF THE PUBLIC PARTICIPATION PROCESS

The Public Participation Report is attached as Appendix 1 and reflects the Public Participation conducted to date. It should be noted that the Public Participation Process has not yet been concluded and will be further implemented in line with legislative requirements for the EIA and decision-making Phases. Below a summary of the Public Participation Process to date.

7.1 Public Participation to Date

7.1.1 Register of Interested and Affected Parties

A preliminary list of potential IAPs was compiled at the start of the process and updated during the process. The register includes all relevant Government Departments and other agencies, landowner, neighbouring landowners, communities and Environmental Interest groups/NGO's.

The following Authorities are included in the IAP Register due to their relevancy to the project:

- Limpopo Department of Mineral Resources (DMR)
- Limpopo Department of Economic Development, Environment and Tourism (LEDET)
- Limpopo Department of Water and Sanitation (DWS)
- Limpopo Department of Rural Development and Land Reform (DRDLR): Regional Land Claims Commission
- Limpopo Department of Agriculture, Forestry and Fisheries (DAFF)
- Limpopo Department of Roads and Transport (DRT)
- Limpopo Department of Transport
- Capricorn District Municipality
- Blouberg Local Municipality

Additional Authorities and Agencies included in the IAP register are:

- South African Heritage Resource Agency (SAHRA)
- Limpopo Heritage Resource Agency (LIHRA)

The IAP register will be maintained and updated throughout the process as required by the 2014 EIA Regulations, as amended in 2017. Refer to Appendix B-1 for a copy of the IAP Register.

7.1.2 Written Notice of Application

The following written notifications were sent prior to and in the announcement of the project and application:

- Notification of the submission of a Mining Right and Environmental Authorisation Application. (Appendix B-2). This notification included a summary of the Draft Scoping report (DSR) and request to I&APs to register and comment on the DSR.
- Notification of the availability of the Final Scoping Report (Appendix B-2); and

- Notification of the acceptance of the Final Scoping Report by DMR (Appendix B-2).

Table 7-1: Notification table

STAKEHOLDER GROUP	INTERESTED & AFFECTED PARTY	METHOD OF NOTIFICATION	DATE OF NOTIFICATION
Organs of State	All relevant Authorities contained in the Authority Register	Background Information Document and Notification of Availability of the Draft Scoping Report emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021
Municipalities	All District and Local Municipalities as contained in the I&AP Register	Hand delivery of Draft Scoping Report Background Information Document and Notification of Availability of the Draft Scoping Report emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021
Landowner, Lawful Occupier, Community	All landowners identified as contained in the Property Register	Background Information Document and Notification of Availability of the Draft Scoping Report emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021
	Traditional Authorities / Leaders	Background Information Document and Notification of Availability of the Draft Scoping Report emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021
	Land Claimants / Communities	Advertisement placed / On-site notices Notification Letter emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021
Other Interested and Affected Parties	Other, as registered	Advertisement placed / On-site notices Notification Letter emailed	3 Dec 2020
		Notification of the availability of the Final Scoping Report	16 February 2021
		Notification of the acceptance of the Final Scoping Report by DMR	1 April 2021

The announcement of the submission of the Mining Right application was sent to all IAPs and contained the following information:

- Details of the proposed application which is subjected to public participation
- Explanation of the proposed project's nature, location and planned activity
- Stating the required regulated processes in terms of the relevant legislations
- Stating where further information on the application can be obtained

- Stating the manner in which a person can become involved / register as an IAP

7.1.3 Advertisements

The following advertisements (Appendix B-3) were placed for announcing the project and application:

Table 7-2: Advertisement Table

TYPE OF MEDIA	NAME OF MEDIA	DISTRIBUTION	DATE OF PLACEMENT
Newspaper	Capricorn Voice	Limpopo Province	9 – 15 Dec 2020

7.1.4 On Site Notifications

The following on-site notifications (Appendix B-4) were placed for announcing the project and application on 4 December 2020:

Table 7-3: On-site notices table

Settlement	Place	Coordinate
Ga-Moisimane Arrie Village	Mashilo Ngoako Restaurant	-22.804707, 28.763854
Ga-Moisimane Arrie Village	Magwathana Shop	-22.804707, 28.763854
De Vrede Village / Ga-Kibi	Molepa Tuck Shop	-22,90376, 29,01317
De Vrede Village / Ga-Kibi	Mashilompana General Dealer	-22.90967, 29.02517
Edwinsdale (A) Village	Bahlaloga General Dealer	-22.98247, 29.00341
Edwinsdale (B) Village	Mphengwa General Dealer	-22.98268, 29.00561
Simson (Ga-Ramasikwana) Village	Sedimo Tuck Shop (B)	-22.75024, 28.79357

7.1.5 Availability of Project Documentation

The following documents were made available throughout the process:

Table 7-4: Public Documents table

Document	Timeframe	Date of availability	Date of comment closure
Notification letter, Background Information Document & Registration form	Ongoing throughout the process		Not applicable
The Draft Scoping Report (DSR)	30 days	3 Dec 2020	23 Jan 2021
Extended period for DSR	13 days	24 Jan 2021	5 Feb 2021
Final Scoping Report		16 Feb 2021	N/A
Draft Environmental Impact Assessment and Management Programme Reports	30 days	13 July 2021	13 August 2021

7.1.6 IAP Engagements and Meetings

The following engagements have been held during the Scoping Phase:

- A Ga-Kibi community function was held to introduce the project on 24 October 2020.
- A workshop on the process was held on 2 November 2020 with the Traditional Authority and Community Representatives.
- Notification of the submission of a Mining Right and Environmental Authorisation Application was sent on 3 Dec 2020. This notification included a summary of the Draft Scoping report (DSR) and request to I&APs to register and comment on the DSR.
- A meeting was held with the Blouberg Local Municipality on 4 December 2020, where a copy of the Draft Scoping Report was handed to them.

- Notification of the availability of the Final Scoping Report was sent on 16 February 2021.
- Notification of the acceptance of the Final Scoping Report by DMR was sent out on 1 April 2021.
- A meeting was held with the Community representative Committee on 13 April 2021
- A meeting with the livestock owners from Voorhout, Royston and Arrie on 26 April 2021

Minute notes and Attendance Registers are attached as Appendix B-5.

Table 7-5: Engagement session table

Party	Type of Engagement	Date of Engagement
AFFECTED PARTIES		
Landowners		
Project Landowners	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021
Lawful occupier/s of the land		
No occupants on property	Not applicable	Not applicable
Land Claimants		
Land Claimants & DRDLR		
Municipality		
Ward Councillors	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 24 Oct 2020 4 Dec 2020 16 Feb 2021 1 April 2021
District Municipality	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021
Local Municipality	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 24 Oct 2020 4 Dec 2020 16 Feb 2021 1 April 2021
Traditional Leaders		
Ga-Kibi Traditional Authority	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Workshop Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR Engagement with representatives	3 Dec 2020 24 Oct 2020 2 Nov 2020 4 Dec 2020 16 Feb 2021 1 April 2021 13 & 26 April 2021
Communities		
No communities residing on property but utilise the land for grazing	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Workshop Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR Engagement with livestock owners	3 Dec 2020 24 Oct 2020 2 Nov 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021 26 April 2021
Organs of State		

Party	Type of Engagement	Date of Engagement
Department of Mineral Resources	Pre-application consultation Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	19 Nov 2020 3 Dec 2020 16 Feb 2021 1 Apr 2021
Department of Environmental Affairs	Background Information Document and Notification of Availability of the Draft Scoping Report Delivery of Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021
Department of Water and Sanitation	Background Information Document and Notification of Availability of the Draft Scoping Report Delivery of Draft Scoping Report Site visit Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 4 Dec 2020 21 Jan 2021 16 Feb 2021 1 Apr 2021
Department of Rural Development and Land Reform	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021
Department of Agriculture	Background Information Document and Notification of Availability of the Draft Scoping Report Delivery of Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021
South African Heritage Resource Agency Limpopo Heritage Resource Agency	Background Information Document and Notification of Availability of the Draft Scoping Report Upload of Draft Scoping Report on SAHRIS Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021
OTHER AFFECTED PARTIES		
Adjacent landowners		
Landowners adjacent to the project area	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021
Adjacent Traditional Leaders		
Ga-Kibi Traditional Authority	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Workshop Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 24 Oct 2020 2 Nov 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021
Bahananwa Traditional Authority	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021
Adjacent communities		
Ga-Kibi	Background Information Document and Notification of Availability of the Draft Scoping Report Community Function Workshop Meeting Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR Engagement with community representatives Engagement with livestock owners	3 Dec 2020 24 Oct 2020 2 Nov 2020 4 Dec 2020 16 Feb 2021 1 Apr 2021 13 April 2021 26 April 2021
INTERESTED PARTIES		
All other parties on register	Background Information Document and Notification of Availability of the Draft Scoping Report Notification of the availability of the Final Scoping Report Notification of the acceptance of the Final Scoping Report by DMR	3 Dec 2020 16 Feb 2021 1 Apr 2021

7.2 Summary of Issues Raised By IAPS

Table 7-6: Comments and Response Summary

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
AFFECTED PARTIES					
Landowners					
The property is owned by the state under the Ga-Kibi Tribe jurisdiction, therefore refer to comments under Traditional Authority and Department of Rural Development.					
Lawful occupier/s of the land					
The area is utilised for Grazing by the Ga-Kibi communities. No occupiers reside on the properties					
Land Claimants					
The land claimants are the Ga-Kibi Tribe that currently have surface rights over the properties					
Municipal Councillor					
Ward Committee Member	X	15 Jan 2021	In support of the project	Noted	
Municipality					
Capricorn District Municipality	X	13 Jan 2021	After reviewing the consolidated Draft Scoping Report submitted, we would like to inform you that at this stage we do not have any particular comments and will await the final Scoping Report and EIA Report for further commenting.	Noted	Not finalised, EIA consultation to still take place
Blouberg Local Municipality	X	5 Dec 2020	In support of the project, want to be involved in the process	Noted	Consensus
Traditional Leaders					
Ga-Kibi Traditional Authority	X	29 Jan 2021 26 April 2021	Support project Impacts on grazing and livestock Benefits to be shared with the Ga-Kibi Community	The project area only requires about 30ha which is only 2% of the total area of the two properties, therefore the impact on grazing is expected to be limited. A social impact assessment will be conducted to investigate the potential positive and negative impacts on the community. A Cooperation Agreement between the Community and the applicants have been signed that safeguards the benefits to the local community.	Not finalised, EIA consultation to still take place

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
Communities					
No communities residing on the project properties					
Organs of State					
Department of Mineral Resources	X	19 Nov 2020	Two applications can be joined and a combined Scoping and EIA report submitted	Noted	Consensus
Department of Environmental Affairs					
Department of Water and Sanitation					
Department of Rural Development and Land Reform	X	11 Jan 2021	Land claims were dismissed.		
	X	15 Jan 2021	Land claims were non-compliant.		
Department of Agriculture			No comments received		
South African Heritage Resources Agency	X	21 Jan 2021	As the proposed development is undergoing an EA Application process in terms of the National Environmental Management Act, 107 of 1998 (NEMA), NEMA Environmental Impact assessment (EIA) Regulations for activities that trigger the Mineral and Petroleum Resources Development Act, No 28 of 2002 (MPRDA)(As amended), it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is done as per section 38(3) and 38(8) of the National Heritage Resources Act, Act 25 of 1999 (NHRA). This must include an archaeological component, palaeontological component and any other applicable heritage components. The HIA must be conducted as part of the EA Application in terms of NEMA and the NEMA EIA Regulations.	A Heritage Impact Assessment and Paleontological Assessment has been conducted and are included in the EIA	Pending HIA & PIA review
OTHER AFFECTED PARTIES					
Adjacent landowners					
No comments to date					
Adjacent Traditional Leaders					
No comments to date					
Adjacent communities	x	26 Dec 2020	Project support Benefits and community upliftment important	The companies are in the process of further developing their social and labour plan in parallel to the EIA. The companies are committed to implement projects that will have a positive impact on the communities where a need exists. Projects or needs that already fall under the responsibility of a Government Department or Agency will be considered in	Not finalised
	x	9 Jan 2021	The project is supported.		
	x	19 Jan 2021	The community needs job opportunities.		
	x	23 Jan 2021	Need access to water.		

Interested and Affected Parties		Date Comments Received	Issues raised	EAPs response to issues as mandated by applicant	Consultation Status (consensus, dispute, not finalised)
				partnership or collaboration with the relevant Government institution	
INTERESTED PARTIES					
Local business owners	X	4 Jan 2021 26 Jan 2021 29 Jan 2021	Interested to register as a vendor to supply goods or services	The companies have committed to prioritise local business where opportunities exist, and services are available.	Consensus

A detailed Comment and Response Report (CRR) is attached as Appendix B-7. Copies of written submissions are included in Appendix B-8.

7.2.1 Availability of the EIA/EMPr

The draft EIAR/EMPr are made available for 30 calendar days. The results from the specialist studies will be presented at a Public Meeting with translation into Sepedi. The draft EIA/EMPr will be accompanied with a Non-Technical Executive Summary distributed at the meeting.

Notifications are sent to all registered IAPs indicating where copies of the report can be accessed. Hard copies of the reports are submitted to relevant Authorities and placed at Public Places. The report is available for download or a Compact Disc can be posted on request. Provision will be made to facilitate access to the report by communities.

7.2.2 Authority Engagement

The draft EIAR/EMPr is provided to all relevant Departments (including District and Local Municipal representatives) for their comments and inputs.

7.2.3 Public Meeting

If Covid regulations allow, the Community Committee will be workshopped on the results of the EIAR, then a combined Community and Public Meeting will be held where all IAPs will be provided with an opportunity to raise concerns, make comments and or suggestions to the EAP and the Applicant. The meeting will be held within the Municipal area in proximity to the communities.

8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Risk Assessment Methodology

According to the NEMA Regulations, 'significant impact means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment'. In line with the Regulations, and based on the qualitative findings of the activities undertaken, each potentially significant impact has been assessed with regard to:

- the nature and status of the impact
- the extent and duration of the impact
- the probability of the impact occurring
- the effect of significance on decision-makings
- the weight of significance
- the mitigation efficiency

8.1.1 Status of Impact (S)

The impacts are assessed as either having a:

- Negative effect (i.e. at a `cost' to the environment),
- Positive effect (i.e. a `benefit' to the environment), or
- Neutral effect on the environment.

8.1.2 Extent of the Impact (E)

- (1) Site (site only),
- (2) Local (site boundary and immediate surrounds),
- (3) Regional,
- (4) National, or
- (5) International.

8.1.3 Duration of the Impact (D)

The length that the impact will last for is described as either:

- (1) Immediate (<1 year)
- (2) Short term (1-5 years),
- (3) Medium term (5-15 years),
- (4) Long term (ceases after the operational life span of the project),
- (5) Permanent.

8.1.4 Magnitude of the Impact (M)

The intensity or severity of the impacts is indicated as either:

- (0) None,
- (2) Minor,
- (4) Low,

- (6) Moderate (environmental functions altered but continue),
- (8) High (environmental functions temporarily cease), or
- (10) Very high / unsure (environmental functions permanently cease).

8.1.5 Probability of Occurrence (P)

The likelihood of the impact actually occurring is indicated as either:

- (0) None (the impact will not occur),
- (1) Improbable (probability very low due to design or experience)
- (2) Low probability (unlikely to occur),
- (3) Medium probability (distinct probability that the impact will occur),
- (4) High probability (most likely to occur), or
- (5) Definite.

8.1.6 Significance of the Impact without Mitigation (SWOM)

Based on the information contained in the points above, the potential impacts are assigned a significance rating (S). This rating is formulated by adding the sum of the numbers assigned to extent (E), duration (D) and magnitude (M) and multiplying this sum by the probability (P) of the impact.

SWOM = (E+D+M) x P

The significance ratings are given below;

- **(<60) low** (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **(60-100) medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **(>100) high** (i.e. where the impact must have an influence on the decision process to develop in the area).

8.1.7 Mitigation Efficiency (ME)

The mitigation efficiency must be rated as follows:

- Low (0.8) - the efficiency of the proposed mitigation measures will not have a substantial influence in the reduction of the impact.
- Medium (0.6) - the efficiency of the proposed mitigation measures will have a moderate influence in the reduction of the impact.
- High (0.4) - the efficiency of the proposed mitigation measures will have a high influence in the reduction of the impact and will reduce the impact to acceptable levels.
- Very High (0.2) - the efficiency of the proposed mitigation measures will avoid or totally ameliorate the impact and will reduce the impact to normal levels.

“Mitigation” is a broad term that covers all components of the ‘mitigation hierarchy’ defined hereunder. It involves selecting and implementing measures, amongst others, to conserve biodiversity and to protect, the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or,

where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated:

- Avoid/prevent impact: can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high, the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels.
- Minimise (reduce) impact: can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project.
- Rehabilitate (restore) impact is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land.
- Offset impact refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be a last resort to compensate for residual negative impacts on biodiversity.

According to the DMR (2013) "Closure" refers to the process for ensuring that mining operations are closed in an environmentally responsible manner, usually with the dual objectives of ensuring sustainable post-mining land uses and remedying negative impacts on biodiversity and ecosystem services.

8.1.8 Significance of the Impact with Mitigation (SWM)

Based on the information contained in the Significance without Mitigation and Mitigation Efficiency, the potential impacts are multiplied with the mitigation efficiency to determine Significance with mitigation.

SWM = SWOM x ME

The significance ratings are given below;

- **(<60) low** (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- **(60-100) medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- **(>100) high** (i.e. where the impact must have an influence on the decision process to develop in the area).

8.2 Impacts and Risks Identified

The assessment of impacts will be addressed by using standards in terms of the scale of the impact, the duration, probability of occurrence and the nature of the impact. These standards are widely used and vary to a certain extent from project to project depending on the environment and implementing agent. It is, however, a practical tool to ascertain and determine qualitatively what impact the project has on the total environment.

8.2.1 Geology and Topography

8.2.1.1 Discussion

The topography of the area is undulating with some rocky outcrops to the east of the project area. The development will be at the foot and side of the rocky outcrop. This would entail partial excavation of the outcrop and changing the topography of the site.

Impacts to geology relate to the overall subsidence left post mining, that would alter the geological formations and have a secondary impact on groundwater movement as indicated in the groundwater study.

8.2.1.2 Impact Assessment

Potential risks to the receiving environment by the proposed project have been identified and are presented in the bullets below:

- Disturbance of natural geology: Mining and associated activities will alter the geology of the site. Risk of subsidence and sterilisation of mineral resources are also a possibility.
- Alteration of topography: The development of the opencast pit and infrastructure will alter the topography of the proposed project area. Loss of natural topography and drainage pattern.

Impact period:

Impact	Construction	Operational	Decommissioning	Closure
Disturbance of natural geology	Yes	Yes	No	No
Alteration of topography	Yes	Yes	Yes	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Disturbance of natural geology	Negative	Site specific	Permanent	Moderate	Definite	Medium	Medium	Low to Medium
Mine development	Alteration of topography	Negative	Site specific	Permanent	Moderate	Definite	Medium	Medium	Low to Medium

8.2.1.3 Mitigation Measures

Potential mitigation measures have been identified:

- No mitigation is possible for the changes in the geological profile however subsidence can be controlled/prevented. Compaction of overburden and discards placed in the bottom of the pits to limit the potential for subsidence on the rehabilitated open pit.
- Sterilisation of mineral resources can be mitigated by optimal infrastructure design.

- Rehabilitating the area as close to the pre-mining area as close as possible or reach an agreement for post-mining land use. The rehabilitated area must be vegetated with indigenous flora.

8.2.2 Soils, Land Capability and Land Use

8.2.2.1 Discussion

The nature of the impact of opencast mining on the soil environment include the stripping and stockpiling of topsoil (consisting of A and B soil horizons) and the compaction of soils during the construction of facilities such as discard dumps, overburden stockpiles, pollution and run-off control dams and any other possible footprint structures. Heavy machinery traffic on the soil surface and possible chemical pollution of soil through polluted water or seepage from certain geological materials could constitute further impacts on soil.

The actual loss or sensitivity related to high potential land, grazing land, agricultural production or the loss of farming infrastructure due to the mine is very small and insignificant. The growing season is in the summer and follows rain with a dry winter period during which little vegetative growth takes place. The grazing capacity for livestock of the natural veld is estimated at 12 hectares per large stock unit (LSU). Steamboat mining area is 27 hectares, which is sufficient grazing for 2 LSU.

8.2.2.2 Impact Assessment

Potential impacts include:

- Loss of original soil depth and soil volume.
- Loss of original fertility and organic carbon content
- Soil compaction from heavy machinery
- Loss of grazing land (27ha)
- Loss of animal production

Impact	Construction	Operational	Decommissioning	Closure
Loss of original soil depth and soil volume	Yes	Yes	Yes	No
Loss of original fertility and organic carbon content	Yes	Yes	Yes	No
Soil compaction from heavy machinery	Yes	Yes	Yes	No
Loss of grazing land	Yes	Yes	Yes	No
Loss of animal production	Yes	Yes	Yes	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Loss of original soil depth and soil volume.	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium
Beneficiation Development	Loss of original soil depth and soil volume.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
Mine development	Loss of original fertility and organic carbon content.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
Beneficiation Development	Loss of original fertility and organic carbon content.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
Mine development	Soil compaction from heavy machinery	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Beneficiation Development	Soil compaction from heavy machinery	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium
Mine development	Loss of grazing land	Negative	Site specific	Long term	Low	High probability	Medium	Low	Low to Medium
Beneficiation Development	Loss of grazing land	Negative	Site specific	Long term	Low	High probability	Medium	Low	Low to Medium
Mine development	Loss of animal production	Negative	Site specific	Long term	Low	High probability	Medium	Medium	Low
Beneficiation Development	Loss of animal production	Negative	Site specific	Long term	Low	High probability	Medium	Medium	Low

8.2.2.3 Mitigation Measures

Potential mitigation measures have been identified:

- The available topsoil will be stripped prior to construction for final rehabilitation.
- A soil analysis will be performed prior to seeding (post-rehabilitation) and the soil fertility rectified (if necessary) to facilitate vigorous growth.
- Minimize affected grazing land
- Implement measures to improve current grazing capacity, i.e. seeding
- Develop a final land use plan and implementation programme as part of the closure plan, taking into account important issues such as ongoing operational and maintenance requirements and long-term responsibilities and ownership.
- Set final closure objectives and standards to ensure conformance to the final land use plan, the requirements of the IAPs and relevant environmental legislation.

8.2.3 Terrestrial Ecology

8.2.3.1 Discussion

Any development will have a negative effect on the natural ecosystem in particular the vegetation thereof.

It is expected that most of the plant species of units 1, & 2 (low ecological sensitivity) will be damaged or destroyed by the proposed development on the property. Since these areas are degraded and not regarded as being near-pristine it is thought that the loss of species would not be significant in terms of overall habitat and biodiversity.

Alien species poses a huge threat to the natural environment due to their competitive nature that leads to the displacement of natural indigenous species (plants and animals), and also due to their excessive use of soil water.

Most development and/or mining activities are characterised by large areas of sealed surfaces such as roads, footpaths, houses etc. As a result, water infiltration is considerably reduced with an increase in surface run-off. Run-off is generally discharged to surface water systems and often contains pollutants. Development activities associated with development can lead to short-term erosion unless adequate measures are implemented to control surface run-off. Sheet erosion occurs when run-off surface water carries away successive thin layers of soil over large patches of bare earth. This type of erosion is most severe on sloping soils, which are weakly structured with low infiltration, which

promotes rapid run-off. It occurs on the site where vegetation has been destroyed. Continual erosion in sheet-eroded slopes is a common cause of gully erosion. Gully erosion results from increased flow along a drainage area, especially where protective vegetation has been removed and soils are readily transported. A gully has steep, bare sides and is often narrow and deep. Once formed, a gully usually spreads upstream through continual slumping of soil at the gully head. Gully erosion can be associated with salting as the saline sub-soils are readily eroded.

Alteration of the vegetation of the proposed site will directly, and indirectly, impact on the smaller sedentary species (insects, arachnids, reptiles, amphibians and mammals) adapted to their ground dwelling habitats. Larger, more agile species (birds and mammals) will try and re-locate in suitable habitats away from the construction activities and since it is a nature reserve they should not be affected negatively in the long-term.

8.2.3.2 Impact Assessment

Potential risks to the receiving environment by the proposed project have been identified and are presented in the bullets below:

- Loss of habitat and biodiversity
- Loss of animal and plant species
- Loss of medicinal species
- Increased soil erosion
- Alien plant invasion

Impact	Construction	Operational	Decommissioning	Closure
Loss of habitat and biodiversity	Yes	Yes	Yes	No
Loss of animal, plant, and medicinal species	Yes	Yes	Yes	No
Loss of medicinal species	Yes	Yes	Yes	No
Increased soil erosion	Yes	Yes	Yes	No
Alien plant invasion	Yes	Yes	Yes	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Loss of habitat and biodiversity	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
Beneficiation Development	Loss of habitat and biodiversity	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
Mine development	Loss of animal and plant species	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
Beneficiation Development	Loss of animal and plant species	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
Mine development	Loss of medicinal species	Negative	Site specific	Short term	Low	Low probability	Low	Medium	Low
Beneficiation Development	Loss of medicinal species	Negative	Site specific	Short term	Low	Low probability	Low	Medium	Low
Mine development	Increased soil erosion	Negative	Local	Medium term	Moderate	Low probability	Low	Medium	Low
Beneficiation Development	Increased soil erosion	Negative	Local	Medium term	Low	Low probability	Low	Medium	Low
Mine development	Alien plant invasion	Negative	Site specific	Long term	High	Low probability	Low	Medium	Low
Beneficiation Development	Alien plant invasion	Negative	Site specific	Long term	High	Low probability	Low	Medium	Low

8.2.3.3 Mitigation Measures

Potential mitigation measures have been identified:

- No development within unit 3 (Riverine area) is recommended.
- Any bulbous or succulent plant species encountered should be removed and temporarily planted in a suitable container and replanted in the area after mining has been completed. No unnecessary removal of plants must take place.
- Where vegetation needs to be "opened" to gain access, it is recommended that the herbaceous species are cut short rather than removing them. That will ensure that they regrow during the growing season and also protect the soil against erosion.
- The removal of indigenous woody species should be avoided as far as possible.
- The topsoil should be stored adjacent to the mining area and must be used to restore the area after mining has ceased. All temporary stockpile areas, litter and dumped material and rubble, must be removed during and on completion of mining activities.
- Vegetation clearance should be restricted to the mining areas allowing remaining animals an opportunity to move away from the disturbance.
- No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site.
- No hunting with firearms (shotguns, air rifles or pellet guns) or catapults should be permitted on the property as well as neighbouring areas.
- A Re-vegetation and Rehabilitation Manual should be prepared for the use of contractors, landscape architects and groundsmen to rehabilitate areas that became degraded due to mining activities.
- All alien vegetation should be eradicated within the study site and invasive species, as listed in this report should be given the highest priority. Where herbicides are used to clear vegetation, selective and biodegradable herbicides registered for the specific species should be applied to individual plants only.

8.2.4 Surface Water Resources

8.2.4.1 Discussion

There are several potential sources of pollution in various project phases that can potentially pollute surface water, particularly in the unmitigated scenario. In the construction, decommissioning and closure phases, these potential pollution sources are temporary and diffuse. Although these sources may be temporary during the construction and decommissioning, and closure phases, they will be regular during the operational phase. The operational phase will present more long-term potential sources of pollution.

Deterioration of water quality may be as a result of the following:

- Clearing the surface and site preparations for the mine infrastructure resulting in the exposure of soil surfaces to erosion. When a large area of vegetation is cleared and topsoil disturbed, it exposes a large area of loose material which is susceptible to erosion. During rainfall events, runoff from the exposed site will transport the soil material into the Mogalakwena River.
- Poor management of waste during the construction phase, if not adequately managed, may occur and cause pollution. Typically, the following pollution sources may exist at the site: fuel

and lubricants, chemicals, general waste, and erosion of particles from exposed soils in the form of suspended solids.

- The discharge of wastewater into the river, depending on the waste discharge options, may compromise the Mogalakwena River's water quality status.

Natural drainage across the project area is via preferential flow paths (natural drainage line). The development of the mine will alter the affected area's hydrologic response. Development of the mine and associated surface infrastructure implies that beneficial vegetation will be replaced by impervious surfaces, reducing the site's pre-developed evapotranspiration and infiltration rates. Construction and operation of the mine infrastructure such as offices, workshops and the mine plant may increase runoff reporting to the Mogalakwena River through an acceleration of runoff on impervious surfaces. With adequate rehabilitation and closure, some of the catchment is returned to self-sustaining systems, and natural drainage patterns will be restored.

Site clearing, digging of trenches and topsoil removal will be undertaken during construction of various infrastructures such as the beneficiation plant, offices, workshops, the discard stockpile, and open pit might lead to erosion and consequently siltation of watercourses.
The project could cause water resources pollution through sediment transport and other chemical parameters from runoff from the surface operations. The impact of sedimentation is directly linked to erosion, as eroded soil particles will end up in nearby watercourses as sedimentation.

Floodlines for the 1:50- and 1:100-year recurrence intervals were determined for the Mogalakwena River draining adjacent to the project site. The local surface water resources are considered to be of high sensitivity. The proposed mine infrastructure is located outside of the 1:50- and 1:100-year flood lines and thus, the project is deemed safe and has a low impact on the surface water resources should all mitigation and rehabilitation measures be implemented.

8.2.4.2 Impact Assessment

The following surface water potential risks are anticipated:

- Water Quality Deterioration
- Alteration of drainage and flow
- Sedimentation

Impact	Construction	Operational	Decommissioning	Closure
Water Quality Deterioration	Yes	Yes	Yes	No
Alteration of drainage and flow	Yes	Yes	Yes	No
Sedimentation	Yes	Yes	Yes	No

The preliminary impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Water Quality Deterioration	Negative	Regional	Long term	Moderate	High probability	Medium	Very High	Low
Beneficiation Development	Water Quality Deterioration	Negative	Regional	Long term	High	Medium probability	Medium	Very High	Low

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Alteration of drainage and flow	Negative	Regional	Long term	High	High probability	Medium	High	Low to Medium
Beneficiation Development	Alteration of drainage and flow	Negative	Regional	Long term	High	Medium probability	Medium	High	Low
Mine development	Sedimentation	Negative	Regional	Long term	High	High probability	Medium	High	Low to Medium
Beneficiation Development	Sedimentation	Negative	Regional	Long term	High	Medium probability	Medium	Medium	Low to Medium

8.2.4.3 Mitigation Measures

Potential mitigation measures have been identified:

- Water Quality Deterioration
  - Drip trays should be placed under all standing machinery.
  - Oil recovered from any vehicle or machinery on-site should be collected, stored and disposed of by accredited vendors for recycling.
  - Traffic and movement over stabilised areas should be controlled (minimised and kept to specific paths), and damage to stabilised areas should be repaired timeously.
  - A water quality monitoring plan must be formulated before construction.
  - A stormwater management plan that separates dirty and clean water must be developed.
- Alteration of Flow and Drainage
  - A construction work method statement must be compiled by the applicant/contractor for all activities and phases associated with the construction process.
  - A stormwater management plan that channels runoff and separate dirty and clean water must be formulated as per the requirements of GN704.
  - A water balance study must be undertaken.
- Soil Erosion and Sedimentation
  - A service/maintenance plan must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment.
  - Dirty water trenches must be constructed around stockpile areas to capture all dirty water runoff and must be channelled to a dirty water containment structure.
  - Concurrent rehabilitation is encouraged during the operation of the mine to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.

8.2.5 Groundwater

8.2.5.1 Acid Base Accounting (ABA)

ABA was conducted by the Aquatico laboratory and used to confirm that the geology in the project area has minimal acid generating potential and such adequate buffering capacity that no Acid Rock Drainage (ARD) should form in any part of the mining process. Two geochemistry samples were taken in the project area as composites from the drill chips from boreholes. The two samples are of the Overburden and the Ore Reserve. The results of the ABA are indicated in the table below.

Table 8-1: Acid Base Accounting (ABA)

Aspect	Sample 1	Sample 2
Locality	Ore Reserve	Overburden
Sample type	Geochem	Geochem
Sampled date	14-May-2021	14-May-2021
pH paste (pH)	9.18	9.52
Total Sulphur (%)	0.025	0.02
Sulphide Sulphur (%)	0.008	0.009
Sulphate Sulphur (%)	0.017	0.011
Acid Potential AP (TS) (CaCO3 kg/t)	0.781	0.625
Acid Potential AP (SS) (CaCO3 kg/t)	-0.313	-0.313
Neutralization Potential NP (CaCO3 kg/t)	36	51.9
Net Neutralization Potential NNP (CaCO3 kg/t)	35.8	51.6
NP/AP (TS)	46.1	83
NP/AP (SS)	144	185

Acid Base Accounting (ABA) is a static test commonly conducted to determine the total amount of sulphur (sulphide sulphur + sulphate sulphur) present in a sample. The higher the sulphur content, the higher the potential to generate acid – more specifically sulphuric acid. This information is then used to determine the Neutralisation Potential (NP), Acid Potential (AP) and Net Neutralisation Potential (NNP).

The following criteria were used to assess the potential of each sample to generate acid:

- The difference between the neutralisation potential and acid potential is known as the net-neutralisation potential (NNP = NP – AP).
- Therefore, whenever the NNP is a negative value the acid potential exceeds the neutralisation potential, suggesting that water leaching through this material may potentially turn acidic; and
- The ratio of NP:AP is termed the Neutralising Potential Ratio (NPR).

The results in the table above indicate that the NNP is overwhelming positive and that the sulphur content is low, meaning that no acidic conditions are expected.

8.2.5.2 Waste Classification

The same two composite samples used for the ABA were also used for waste classification. For the purpose of the investigation a Total Concentration Test (TCT) and a Leachable Concentration Test (LCT) was conducted in May of 2021 by Aquatico Scientific and the aim was to chemically characterise the waste material that will be generated and stockpiled during the operational phase of the project. This is done by dissolving the sample in a strong acid (nitric acid-hydrochloric acid digestion) and then analysing the solution (ICP analysis). For the leachable concentration analysis, the sample is merely leached with distilled water and the resulting leachate analysed. The distilled water leach simulates the expected leachate quality when rainwater infiltrates through the material under natural conditions when rain water (or recharge) percolates through the material.

The results of the total concentration and leachable concentration analyses are provided in the tables below, respectively.

Table 8-2: Results of total concentration (TC) and Leachable concentration (LC) analyses

VARIABLE	Total Concentration Solids			Overburden	Ore Reserve	Leachable Concentrations - Distilled Water				Overburden	Ore Reserve
	Guideline Limits (mg/kg)					Guideline Limits (mg/l)					
	TCT0	TCT1	TCT2	Variable Concentration (mg/kg)		LCT 0	LCT 1	LCT 2	LCT3	Variable Concentration (mg/l)	
Paste pH (1:2) (pH Units)	-	-	-	9.52	9.18						
Total Cyanide as CN	14	10500	42000	<10.00	<10.00						
Redox	-	-	-	172	169						
Arsenic as As	5.8	500	2000	<5.80	<5.80	0.01	0.5	1	4	<0.010	<0.010
Boron as B	150	15000	60000	<150	<150	0.5	25	50	200	<0.500	<0.500
Barium as Ba	62.5	6250	25000	170	192	0.7	35	70	280	<0.700	<0.700
Cadmium as Cd	7.5	260	1040	<7.50	<7.50	0.003	0.15	0.3	1.2	<0.003	<0.003
Cobalt as Co	50	5000	20000	<50.0	<50.0	0.5	25	50	200	<0.400	<0.400
Chromium as Cr	46000	800000	-	<1000	<1000	0.1	5	10	40	<0.100	<0.100
Hexavalent chromium (Cr^{6+})						0.05	2.5	5	20	<0.020	<0.020
Copper as Cu	16	19500	78000	28.5	30.5	2	100	200	800	<1.00	<1.00
Mercury as Hg	0.93	160	640	<0.900	<0.900	0.006	0.3	0.6	2.4	<0.006	<0.006
Manganese as Mn	1000	25000	100000	<1000	<1000	0.5	25	50	200	<0.500	<0.500
Molybdenum as Mo	40	1000	4000	<10.0	10.7	0.07	3.5	7	28	<0.070	<0.070
Nickel as Ni	91	10600	42400	<50.0	51	0.07	3.5	7	28	<0.070	<0.070
Lead as Pb	20	1900	7600	<20.0	<20.0	0.01	0.5	1	4	<0.010	<0.010
Antimony as Sb	10	75	300	<10.0	<10.0	0.02	1	2	8	0.02	1
Selenium as Se	10	50	200	<10.0	<10.0	0.01	0.5	1	4	0.01	0.5
Vanadium as V	150	2680	10720	<100	<100	0.2	10	20	80	0.2	10
Zinc as Zn	240	160000	640000	<220	<220	5	250	500	2000	5	250
Moisture %	-	-	-	0	0						
Solid %	-	-	-	100	100						
Total Dissolved solids @ 180°C						1000	12500	25000	100000	1000	12500
Chloride as Cl						300	15000	30000	120000	300	15000
Sulphate (SO_4)						250	12500	25000	100000	250	12500
Nitrate (NO_3) as N						11	550	1100	4400	11	550
Fluoride as F						1.5	75	150	600	1.5	75
Total Cyanide as CN						0.07	3.5	7	28	0.07	3.5
pH @ 25°C						-	-	-	-	-	-

Neither of the samples exceeded any limit of the LCT. Both samples exceeded the TCT0 limits for barium and copper. According to the waste classification described above, both the overburden and ore reserve can be regarded as a Type 3, or low risk waste. The requirements of a waste disposal facility (e.g., tailings storage facility, waste rock dump, etc.) are determined by the degree of risk posed by the material that requires disposal. The requirements as stated in the National Norms and Standards for Disposal of Waste to Landfill (GN R. 636), based on the type of waste. It is concluded that a Class C (or GSB+) disposal facility would suffice for both the overburden and ore reserve.

8.2.5.3 Groundwater Levels

The pit floor only intersected the water table from year two of mining. The groundwater influx for Steamboat was simulated to increase to a maximum of ± 440 m3/d at mine closure. An area of approximately 460 000 m2 was simulated to be affected by the pit dewatering activities.

The simulated groundwater level impacts do not extend beyond the MRA area. The drawdown cone reached a maximum depth of 53 m and horizontal extent of about 720 m from the pit. The backfilled pit is expected to fill with water at approximately 210 years after mining ends. 100 years after mining has concluded, the drawdown will have recovered to within a meter of the original water level.

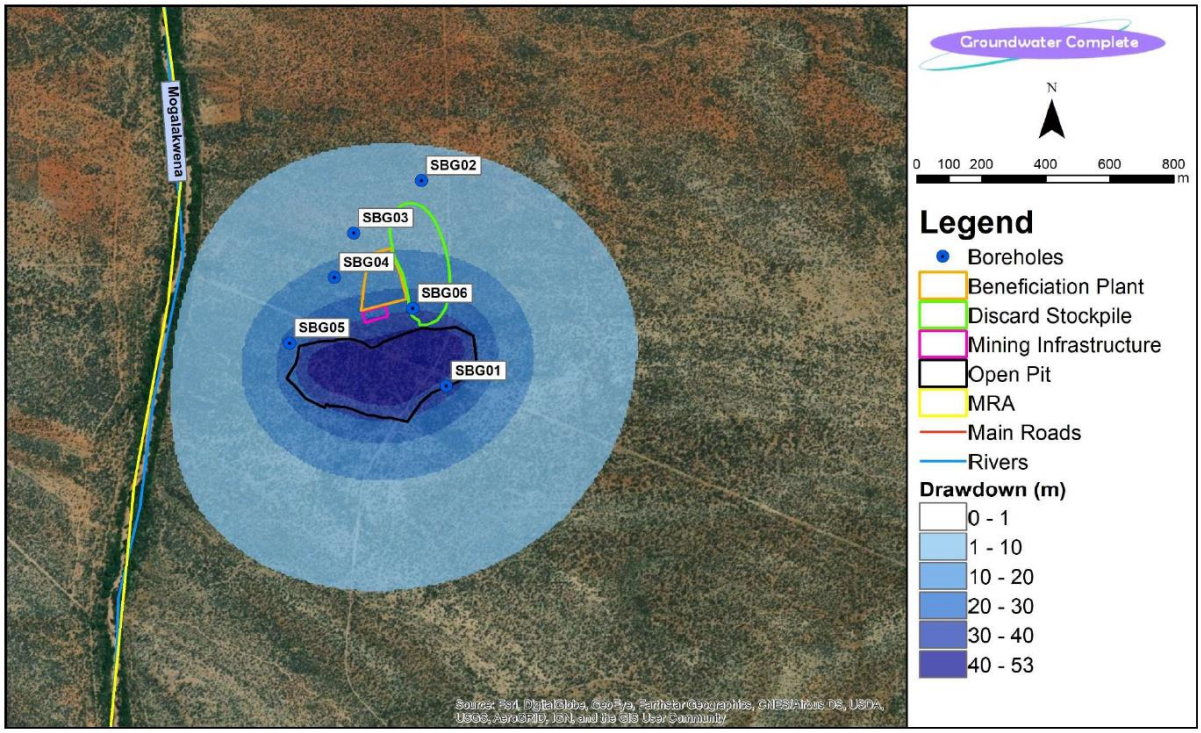


Table 8-3: Groundwater drawdown cone at mine closure

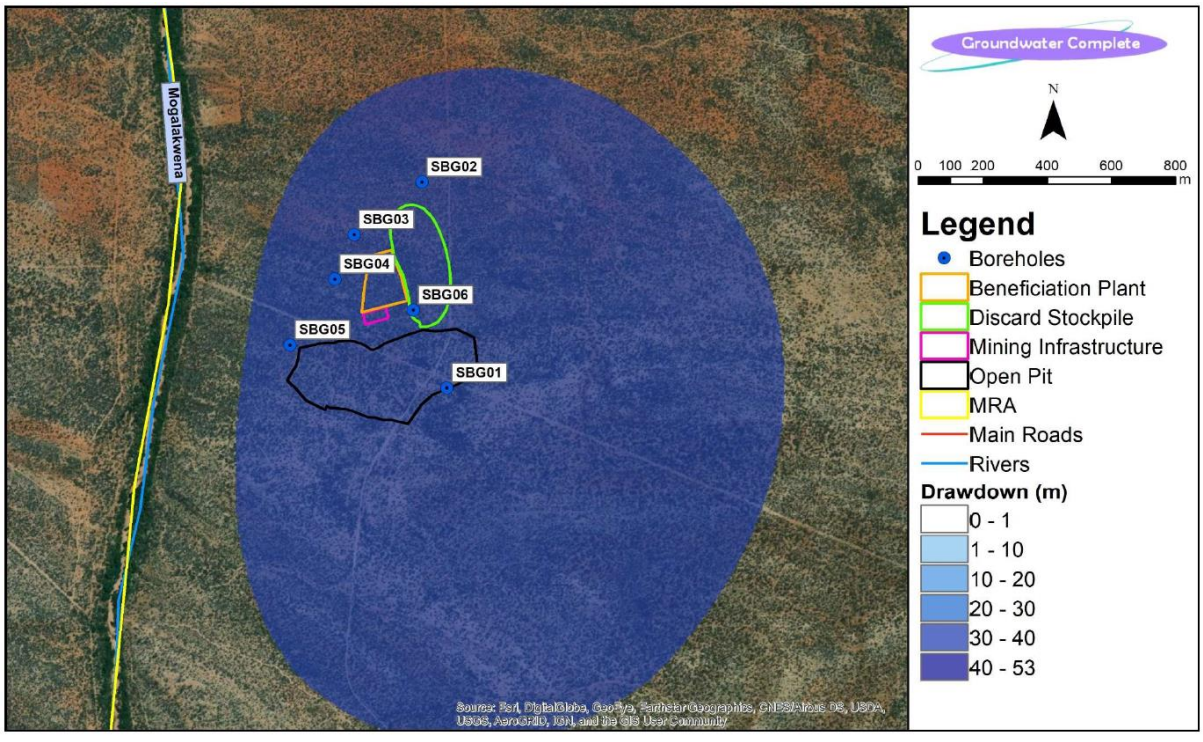


Table 8-4: Groundwater drawdown cone 50-years after mine closure

8.2.5.4 Groundwater Contamination

An evaluation of the project description revealed numerous potential source areas, which are listed and briefly discussed below.

Table 8-5: Groundwater Contaminant Sources

Source	Contaminant Risk	Comment
Mine Development		
Open Pit	Low	Impact on the groundwater only occurs through leachate formation from surface. The groundwater flow gradient is towards the pit and will remain so for nearly 2 centuries after closure – no contamination will thus affect downstream groundwater, even from the low-risk waste. Organic contaminants are usually the main pollutants of concern (e.g., oil, grease, diesel, petrol, hydraulic fluid, solvents, etc.).
Beneficiation Development		
Beneficiation Plant area	Low	Impact on the groundwater only occurs through leachate formation from surface. Impacts thus only occur as a result of rainfall recharge or when water is introduced in some form where leachate can form that seeps to the groundwater. The mined material proved to be a low-risk waste in die geochemical assessment.
Discard stockpile	Low	Effective recharge through waste rock dumps and stockpiles is much higher than the natural recharge of the area due to lower evaporation rates. Surface water run-off originating from these source areas, toe-seeps and seepage through the base could contaminate the groundwater if the seepage is of poor quality. Compared to the standard aboveground disposal of tailings material, the eventual in-pit disposal thereof is considered to be more environmentally friendly. The ore reserve as well as the overburden material proved to be a low-risk waste in die geochemical assessment.
Water and Waste Management Infrastructure	Low	These facilities are developed and constructed for the sole purpose of containing dirty/affected water and therefore minimising the risk of it contaminating the groundwater. Mismanagement of these facilities may however lead to spills and/or leakages that have the potential to contaminate the underlying groundwater.

The waste classification concluded that both the ore material and waste rock that will be generated by the planned mining and related activities are inert and can be classified as a Type 3 low risk waste. Most potential source areas listed in the table above therefore pose no real threat to the underlying aquifer in terms of impacts on groundwater quality, i.e. leachate generated by the activities/sources is expected to be of reasonably good quality in terms of the inorganic content.

Explosives will be used in the opencast mining process, which in all likelihood will be nitrate-based. Remnants of the explosives still contain high concentrations of nitrate adsorbed to the blasted rock material. Nitrate dissolves readily in water, resulting in nitrate enriched leachate being generated whenever water is available for dissolution (usually during and directly after a rainfall event). Waste rock dumps and stockpiles are therefore regarded as potential sources of nitrate contamination. Backfilling the waste rock to the pit after mining will result in prevention of any leachate effects (however minimal given the low-risk nature of the material) from the mine because the pit will remain a groundwater sink for nearly 200 years.

The simulated groundwater quality impacts do not extend beyond the MRA area. The simulated contamination plume reached a maximum distance from the sources of about 170m in the down-

gradient direction. The figures below indicate the modelled potential groundwater contamination at mine closure and 100 years post closure.

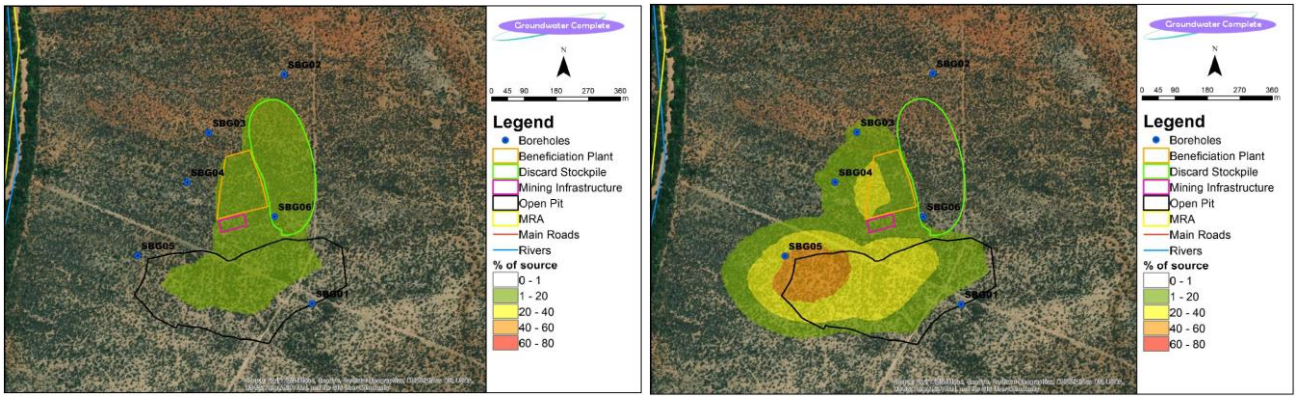


Table 8-6: Groundwater contamination plumes at mine closure and 100 years post closure

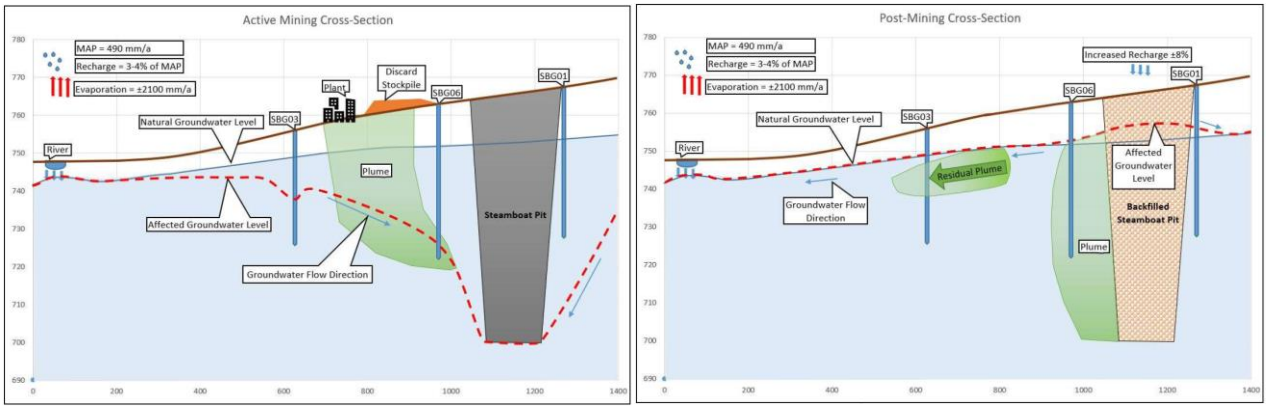


Table 8-7: Schematic view of impacts during and post mining

8.2.5.5 Impact Assessment

The following potential risks to groundwater are anticipated:

- Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.
- Handling of waste /Transport of material can cause spills that may infiltrate and contaminate the groundwater system.
- Lowering of groundwater levels due to Open Pit excavation
- Lowering of groundwater levels due to Groundwater abstraction
- Effect on groundwater quality due to leachate from stockpiles containing remnants nitrate-based explosives.
- Water retaining facilities designed & constructed to prevent any poor-quality water leachate entering the underlying aquifer.
- Effect on groundwater quality due to leachate formation from dirty surface areas
- The water level will recover in the backfilled void. Recharge will be higher than pre-mining and the eventual effect will be positive.
- Down gradient movement of residual contamination will continue for some time after closure.
- Migration of contamination away from rehabilitated opencast pit

Impact	Construction	Operational	Decommissioning	Closure
Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Yes	No	No	No
Handling of waste /Transport of material can cause spills that may infiltrate and contaminate the groundwater system.	Yes	No	No	No
Lowering of groundwater levels due to Open Pit excavation	No	Yes	No	No
Lowering of groundwater levels due to Groundwater abstraction	No	Yes	No	No
Effect on groundwater quality due to leachate from stockpiles containing remnants nitrate based explosives	No	Yes	No	No
Water retaining facilities designed & constructed to prevent any poor quality water leachate entering the underlying aquifer	No	Yes	No	No
Effect on groundwater quality due to leachate formation from dirty surface areas	No	Yes	No	No
The water level will recover in the backfilled void. Recharge will be higher than pre-mining and the eventual effect will be positive.	No	No	Yes	Yes
Down gradient movement of residual contamination will continue for some time after closure.	No	No	Yes	Yes
Migration of contamination away from rehabilitated opencast pit	No	No	Yes	Yes

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Site specific	Medium term	Low	High probability	Low	Low	Low
Beneficiation Development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Site specific	Medium term	Low	High probability	Low	Low	Low
Beneficiation Development	Handling of waste /Transport of material can cause spills that may infiltrate and contaminate the groundwater system.	Negative	Site specific	Medium term	Moderate	Medium probability	Low	Medium	Low
Mine development	Lowering of groundwater levels due to Open Pit excavation	Negative	Site specific	Medium term	High	Definite	Medium	Low	Medium
Beneficiation Development	Lowering of groundwater levels due to Groundwater abstraction	Negative	Site specific	Medium term	Low	Definite	Medium	Medium	Low
Beneficiation Development	Effect on groundwater quality due to leachate from stockpiles containing remnants nitrate based explosives	Negative	Site specific	Long term	Low	Low probability	Low	Low	Low

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Beneficiation Development	Water retaining facilities designed & constructed to prevent any poor quality water leachate entering the underlying aquifer	Positive	Site specific	Long term	Low	Definite	Medium	Low	Medium
Mine development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Site specific	Long term	Low	Low probability	Low	High	Low
Beneficiation Development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Site specific	Long term	Moderate	High probability	Medium	High	Low
Mine development	The water level will recover in the backfilled void. Recharge will be higher than pre-mining and the eventual effect will be positive.	Positive	Site specific	Permanent	Low	Definite	Medium	Low	Medium
Beneficiation Development	Down gradient movement of residual contamination will continue for some time after closure.	Negative	Site specific	Long term	Low	Medium probability	Low	Low	Low
Mine development	Migration of contamination away from rehabilitated opencast pit	Negative	Site specific	Permanent	Moderate	Medium probability	Medium	Low	Medium

8.2.5.6 Mitigation Measures

Potential mitigation measures have been identified:

- Waste should be stored/managed/contained in allocated waste areas. Spills should be cleaned up immediately. Domestic waste must either be stored in an approved waste site or removed by credible contractors.
- Boreholes should only be pumped at sustainable yields. More boreholes spread over a larger area and pumped at lower rates should decreased the drawdown effect.
- Stockpiles, plant footprint and the overburden dump should be kept as small as practically possible. Any runoff from these areas should be contained.
- All water and effluent retaining facilities should be lined with an impervious liner to prevent dirty water from reaching the underlying aquifer and contaminating the groundwater. Spills should be cleaned up immediately. Proper management and regular inspections for leakages.
- Surface areas below workshops and wash bays should be lined to prevent poor quality seepage from reaching the aquifer and contaminating the underlying groundwater. Surface areas should be bunded to prevent clean surface water runoff from being contaminated by dirty surface areas. Spills should be cleaned up immediately.
- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration. Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be constructed.

8.2.6 Air Quality

8.2.6.1 Roads and Stockpiles

It is expected that Particulate Matter will be the main pollutant due to either the movement of vehicles on site or the product transport on existing roads. The project area has a dry climate with low rainfall,

which increases the ambient air quality. In review of similar developments in the Capricorn District, and taking into consideration the size of the development it is expected that air pollution will be kept within the required limits.

8.2.6.2 Syngas Facility

The development is further than 1km from the nearest settlements. Information obtained from previous air quality studies conducted for the Syngas facilities found the following:

Air Quality Aspect	Model prediction (µg/m³)	NAAQS limits (µg/m³)
Particulate Matter (PM_{10})		
Daily (24-hour) average	0.23	75
Annual Average	0.02	40
Sulphur Dioxide (SO_2)		
1 hour average	14.1	350
Oxides of Nitrogen		
1 hour average	56.45	200
Annual average	2.80	40

Apart from lead (Pb) and Carbon Monoxide (CO) no ambient air quality standards have been set in South Africa for the metals and other pollutants with emission limits for Subcategory 8.1. Therefore, international guidelines have been used to assess the impact of the predicted concentrations on ambient air quality. The predicted ambient concentrations for all relevant pollutants are well within international standards.

Due to the low levels of ambient PM10 predicted to result from the facility and the limited spatial impact thereof, it was not deemed necessary to assess the cumulative PM concentrations due to surrounding activities combined with the proposed facility.

8.2.6.3 Impact Assessment

The following potential risks to air quality are anticipated:

- Increased of dust levels because of open pit excavation.
- Increased of dust levels because of hauling operations on stockpile.
- Increased of dust levels because of product transport on public roads.
- Increased Particulate Matter, Sulphur Dioxide, Oxides or Nitrogen from the Syngas facility

Impact	Construction	Operational	Decommissioning	Closure
Increased of dust levels because of open pit excavation & backfill	Yes	Yes	Yes	No
Increased of dust levels because of hauling operations on stockpile	Yes	Yes	No	No
Increased of dust levels because of product transport on public roads	Yes	Yes	No	No
Increased Particulate Matter, Sulphur Dioxide, Oxides or Nitrogen from the Syngas facility	Yes	Yes	No	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Increased of dust levels because of open pit excavation and backfill	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
Beneficiation Plant	Increased of dust levels because of hauling operations on stockpile	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
Beneficiation Plant	Increased of dust levels because of product transport on public roads	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
Beneficiation Plant	Increased Particulate Matter, Sulphur Dioxide, Oxides or Nitrogen from the Syngas facility	Negative	Site specific	Long term	Low	Low probability	Low	Medium	Low

8.2.6.4 Mitigation Measures

Potential mitigation measures have been identified:

- Set the speed limit for on-site hauling vehicles and other vehicles to 40 km/h, and off-site hauling vehicles to 60 km/h on unpaved roads. Actively enforce the speed limits specified.
- Dust suppression to be conducted on a regular basis. Chemical treatment of access roads to
- Minimise dust generation utilising water conservation strategies such as 'Dust-a-side'.
- Monitoring emissions from the Syngas facility to ensure air quality standards are not exceeded.

8.2.7 Ambient Noise

8.2.7.1 Discussion

The acceptable noise level in a rural residential area is 35dBA at night and 45dBA at daytime. It is accepted that noise levels in the study area is low due to its remoteness and isolation. It should be further noted that the nearest sensitive receptor is 2km from the project sites to the north, and sensitive receptors to the east and south more than 5km away. The wind direction is northeast to south west, therefore sound will be carried further to the south-west of the site, where sensitive receptors are 6.3km away.

The potential noise sources have been identified as:

- Transport activities to and around the proposed project
- Power generation activities using containerized gas turbine packages.

The level and character of the power generator noise during this phase is expected to be constant as it does not involve mobile equipment (that generates significant noises) movement around the site. Potential maximum noise levels generated by various mining equipment as well as the potential extent of these sounds are presented below:

Table 8-8: Noise generated at 2km from the source

Equipment Description	Equivalent (average) Sound Levels (dBA)	Noise Level at 2km distance considering equivalent (average) sound power emission levels
General noise	108.8	31.8
Bulldozer	114	37
Crushing plant (50 tons/h)	114.5	37.5

Equipment Description	Equivalent (average) Sound Levels (dBA)	Noise Level at 2km distance considering equivalent (average) sound power emission levels
Grader	110.9	33.9
Screening plant	105.5	28.5
Conveyor transfer	103.2	26.2
Drilling Machine	109.6	32.6
Dumper/Haul truck	115.9	38.9
Excavator	113.1	36.1
FEL - Bell L1806C	102.7	25.7
Water Dozer	113.8	36.8
Power generation unit	93	25.4

All the noise sources are below the day-time standard with some of the operating vehicles exceeding the night-time standard. It is expected with mitigation that noise levels would be within the acceptable standards within the Mining Right area. The significance of the noise impact is low.

8.2.7.2 Impact Assessment

The following potential risks to ambient noise are anticipated:

- Increased total noise levels in the area, changing existing ambient sound levels at receptors.

Impact	Construction	Operational	Decommissioning	Closure
Increased total noise levels in the area, changing existing ambient sound levels at receptors	Yes	Yes	Yes	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Local	Medium term	Low	Medium probability	Low	Medium	Low
Beneficiation Plant	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Local	Medium term	Low	Medium probability	Low	Medium	Low

8.2.7.3 Mitigation Measures

Potential mitigation measures have been identified:

- Machinery and vehicles can be fitted with silencers/mufflers to reduce noise. All staff/contractors on-site are required to wear the PPE. Identify sensitive receptors and conducted noise monitoring if required.
- Use of low-noise generation plant and equipment.
- All plant, equipment and vehicles are to be kept in good repair.
- Off-site hauling of the product should be limited to daylight hours.

8.2.8 Archaeological and Cultural Interest

8.2.8.1 Archaeological Sensitivity and Resources

The cultural landscape qualities of the region essentially consist of a rural setup. In this the human occupation is made up of a pre-colonial element consisting of limited Stone Age occupation and an

extensive Late Iron Age occupation. This was followed by a much later colonial farmer component. Population increases over time led to the establishment of a large number of rural villages.

During the survey the following sites, features or objects of cultural significance were identified:

- Stone Age artefacts, mostly dating to the Middle Stone Age occur in low numbers scattered in parts of the study area. The density of artefacts is less than 1/20m2 overall. The tools are mostly made from quartzite. The tools are very poorly made and also shows a lot of weathering.
- What seems to be a single grave, marked by a packed circle of stone and a small, different type of stone as headstone. It seems to be very old, and no other signs of habitation could be detected.
- A series of trenched and deep pits confined to a section where the open pit is planned. It is yet impossible to attribute a definite date to these excavations. Some of the trenches are also much overgrown with trees and shrubs, indicating that they are quite old. According to local community members, they have been playing here since they were very young, implying that the mining took place prior to that, making possibly older than 60 years. However, it is also stated that there were some explorations being done here in the late 1980s by Mintek and the South African Development Trust (Badenhorst 2019:126), although the extent of this exploration is not indicated.

8.2.8.2 Paleontological Sensitivity and Resources

Over areas totalling 40% of Southern Africa the 'hard rocks', from the oldest to the Quaternary (Qs), are concealed by normally unconformable deposits – principally sand, gravel, sandstone, and limestone. Some of these deposits date back well into the Tertiary, whereas others are still accumulating. Owing to the all-to-often lack of fossils and of rocks suitable for radiometric or palaeomagnetic dating, no clear-cut dividing line between the Tertiary and Quaternary successions could be established (Kent 1980). The alluvium sands were deposited by a river system and reworked by wind action (Snyman 1996).

Graphite occurs in gneiss in the eastern part of the Beit Bridge Complex. It formed during the metamorphism process of carbon rich shale.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity can generally be low to very high (SG 2.2 SAHRA APMHOB, 2012).

Table 8-9: Criteria used (Fossil Heritage Layer Browser/SAHRA) (1cB)

Rock Unit	Significance/vulnerability	Recommended Action
Quaternary (Qs)	Moderate	Desktop study
Limpopo Belt	Very Low	No action required

Fossils may be present in the Quaternary, but not in the Beit Bridge Complex. Inland quaternary deposits are much more extensive than marine deposits and are terrestrial, but usually unfossiliferous.

The Quaternary Formation may contain fossils. A very wide range of possible fossil remains, though these are often sparse, such as: mammalian bones and teeth, tortoise remains, ostrich eggshells, non-marine mollusc shells, ostracods, diatoms, and other micro fossil groups, trace fossils (e.g. calcretised termitaria, rhizoliths, burrows, vertebrate tracks), freshwater stromatolites, plant material such as peats, foliage, wood, pollens, within calc tufa. Stromatolite structures range from a centimetre to several tens of metres in size. The famous archaeological site of Mapungubwe is close by.

8.2.8.3 Impact Assessment

The following potential risks to ambient noise are anticipated:

- Impact on chance find stone tools.
- Impact on burial site
- Impact on historical/old mine features
- Impact on undetected burial sites or sub-surface heritage resources
- Impact on undetected sub-surface palaeontological resources

Impact	Construction	Operational	Decommissioning	Closure
Impact on chance find stone tools	No	No	No	No
Impact on burial site	No	No	No	No
Impact on historical/old mine features	Yes	No	No	No
Impact on undetected burial sites or sub-surface heritage resources	Yes	Yes	No	No
Impact on undetected sub-surface palaeontological resources	Yes	Yes	No	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Beneficiation Development	Impact on chance find stone tools	Negative	Site specific	Medium term	Low	Low probability	Low	Low	Low
Beneficiation Development	Impact on burial site	Negative	Site specific	Medium term	Low	Low probability	Low	Low	Low
Mine development	Impact on historical/old mine features	Negative	Site specific	Medium term	Low	Definite	Medium	Medium	Low
Mine development	Impact on undetected burial sites or sub-surface heritage resources	Negative	Site specific	Medium term	High	Medium probability	Medium	Low	Low to Medium
Mine development	Impact on undetected sub-surface palaeontological resources	Negative	Site specific	Medium term	High	Medium probability	Medium	Low	Low to Medium

8.2.8.4 Mitigation Measures

Potential mitigation measures have been identified:

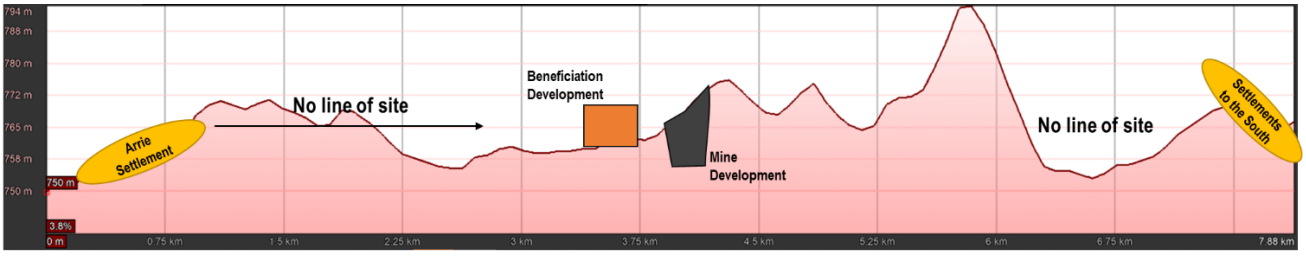
- Avoid the chance stone tools and burial site.
- Excavation by archaeological techniques and document the site (map and photograph) and analyse the recovered material to acceptable standards. This must be done by a suitably qualified archaeologist.

- If any archaeological artefacts are discovered upon excavations, construction must immediately cease, and reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- Phase 1 Palaeontological Impact Assessment: Field Study to be conducted prior to construction.
- If any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed, and a palaeontologist should be called in to determine proper mitigation measures.

8.2.9 Visual Aspects

8.2.9.1 Discussion

The topography of the area is undulating with some rocky outcrops to the east of the project area. The development will be at the foot and side of the rocky outcrop. Therefore, line of site from the north and south is eliminated by the topography. This is also the case from the east. Line of site from the west has lower topography and there is a possibility that the discard dump would be visible from the D1356. The road runs from north to south approximately 5km from the project area on the other side of the Mogalakwena river and is located on a higher elevation. The sectional diagrams provided below indicate the elevation and positions of infrastructure and surrounding features.



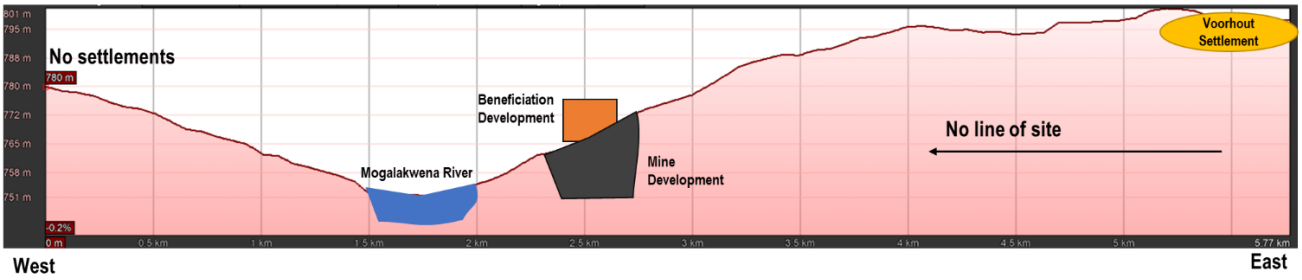


Table 8-10: Line of site from surrounding features

8.2.9.2 Impact Assessment

The following potential risk to visual aspects is anticipated:

- The visual intrusion of mining activities, impacting on the sense of place
- Impact due to night-time lighting

Impact	Construction	Operational	Decommissioning	Closure
The visual intrusion of mining activities, impacting on the sense of place	Yes	Yes	Yes	No

Impact due to night-time lighting	Yes	Yes	Yes	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine development	Visual intrusion of mining activities, impacting on the sense of place	Negative	Local	Long term	Low	Medium probability	Low	Medium	Low
Beneficiation Development	Visual intrusion of plant and stockpile activities, impacting on the sense of place	Negative	Local	Long term	Moderate	Medium probability	Medium	Medium	Low
Beneficiation Development	Impact due to night-time lighting	Negative	Local	Long term	Moderate	High probability	Medium	Medium	Low to Medium

Potential mitigation measures have been identified:

- The development footprint and disturbed areas are to be kept as small as possible and the areas cleared of natural vegetation must be kept to a minimum.
- The height of infrastructure and stockpiles should be kept as low as possible and should not exceed 10m.
- Infrastructure such as the stockpile must be shaped and rounded to blend in with the surrounding undulating landscape.
- Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings.
- Outdoor lighting must be strictly controlled.
- High light masts should be avoided. Any high lighting masts should be covered to reduce the glow.
- Lighting fixtures must be selected and placed so that they direct their light on the intended area only, to avoid light spill and offsite light trespass.
- Light sources must be shielded by physical barriers.
- The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces sky-glow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects and is associated with other human physiological issues.

8.2.10 Socio-economic Aspects

8.2.10.1 Discussion

The proposed projects will have a potential negative impact on land use although on a low level. The land is currently utilised for grazing but only 2% of the grazing land will be lost. The properties however already have a low grazing capacity, and this is placing strain on the local community, as not enough land is available.

The positive contributions from sustained employment and revenue generation from both the projects cumulatively will significantly outweigh the negative impacts over a period of 20 years. It should further

be noted that with mitigation and rehabilitation the area will be restored to grazing land and the negative impacts will therefore be negated to a certain extent.

8.2.10.2 Impact Assessment

The following potential risks and benefits to the socio-economic environment are anticipated:

- Conflict between job seekers and local communities
- Increase in social pathologies such as crime, safety, health, prostitution.
- Conflict between job seekers and local communities
- Pressure on community infrastructure and services
- Disruption of Movement activities
- Impact on land use and livelihoods from the reduction in the grazing area
- Participation of Local Communities in Employment Opportunities
- Participation of Local Communities in Skills Development
- Downscaling
- Participation of Local Communities in procurement Opportunities
- Downscaling of business opportunities
- Empowerment of the local community through ownership participation
- Community development from ownership participation

Impact	Construction	Operational	Decommissioning	Closure
Increase in available employment opportunities locally	Yes	Yes	Yes	No
Increase in skills development programmes and therefore skill levels of the local communities	Yes	Yes	Yes	No
Empowerment of local business through procurement and capacity building	Yes	Yes	Yes	Yes
Empowerment of local community through ownership participation	No	Yes	Yes	No
Impact on land use and livelihoods from reduction in grazing area	Yes	Yes	Yes	No
Influx of Job seekers and Population growth pressures	Yes	Yes	No	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine construction	Conflict between job seekers and local communities	Negative	Local	Short term	Moderate	High probability	Medium	High	Low
Beneficiation plant Construction	Conflict between job seekers and local communities	Negative	Local	Short term	Moderate	High probability	Medium	High	Low
Mine construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Short term	Moderate	Medium probability	Low	High	Low
Beneficiation plant Construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Short term	Moderate	Medium probability	Low	High	Low
Mine operations	Conflict between job seekers and local communities	Negative	Local	Medium term	Moderate	High probability	Medium	High	Low
Beneficiation plant Operations	Conflict between job seekers and local communities	Negative	Local	Medium term	Moderate	High probability	Medium	High	Low

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Medium term	Moderate	Medium probability	Medium	High	Low
Beneficiation plant Operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Medium term	Moderate	Medium probability	Medium	High	Low
Mine operations	Pressure on community infrastructure and services	Negative	Local	Medium term	Low	Medium probability	Low	High	Low
Beneficiation plant Operations	Pressure on community infrastructure and services	Negative	Local	Medium term	Low	Medium probability	Low	High	Low
Mine operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Site	Long term	Low	Definite	Medium	Medium	Low to Medium
Beneficiation plant Operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Site	Long term	Low	Definite	Medium	Medium	Low to Medium
Mine operations	Participation of Local Communities in Employment Opportunities	Positive	Local	Medium term	Low	Medium probability	Low	High	Medium
Beneficiation plant Operations	Participation of Local Communities in Employment Opportunities	Positive	Local	Medium term	Moderate	High probability	Medium	High	High
Mine operations	Participation of Local Communities in Skills Development	Positive	Local	Medium term	Low	Medium probability	Low	High	Medium
Beneficiation plant Operations	Participation of Local Communities in Skills Development	Positive	Local	Medium term	Moderate	High probability	Medium	High	High
Mine operations	Downscaling	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
Beneficiation plant Operations	Downscaling	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
Mine operations	Participation of Local Communities in procurement Opportunities	Positive	Local	Long term	Moderate	High probability	Medium	High	High
Beneficiation plant Operations	Participation of Local Communities in procurement Opportunities	Positive	Local	Long term	Moderate	High probability	Medium	High	High
Mine operations	Downscaling of business opportunities	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
Beneficiation plant Operations	Downscaling of business opportunities	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
Mine operations	Empowerment of the local community through ownership participation	Positive	Local	Long term	Moderate	Definite	Medium	High	High
Mine operations	Community development from ownership participation	Positive	Local	Long term	Moderate	Definite	Medium	High	High

8.2.10.3 Mitigation Measures

Potential mitigation measures have been identified:

- Priority employment from local communities with the development of recruitment procedures and utilizing the existing skills available from the local communities.
- Establishing early on skills development programmes in areas where most employment opportunities will be available such as operators and artisans.
- Implementation of bursary programme and practical skills programmes as part of the Social and Labour Plan.
- Establishment of a local labour recruitment committee to monitor recruitment procedures and results.

- Engage with Traditional Authority to manage and monitor site allocation to job seekers and/or employees in the local communities.
- Induction of contractors and workforce with regard to their code of conduct in the local communities.
- Traffic minimized through bus and combi services to transport workers to the project site.
- Low speed limits on access roads.
- Road crossings should be managed by signing and traffic management measures.
- Issues and Grievance Procedure available to local people to report bad driving or rules traversing.
- Demarcated areas where firewood can be collected that was cleared for the Construction Phase.
- Application of the Avoidance Principle by reducing the footprints of infrastructure where possible.
- Supporting the community in the increase of grazing capacity through seeding and debushing.
- Leasing of community land impacted by mining.
- Monitoring the impact on livestock.
- Source the maximum number of employees from the local area for temporary job opportunities.
- Implement skills development programmes in the areas where most job opportunities will be created, i.e., operators and drivers.
- Make available bursary opportunities to build skill capital in the region.
- Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people.
- Implement portable skills development programmes.
- Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods.
- Establish a future forum with representation from the workforce to discuss potential difficulties and solutions.
- Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment.
- Establish a database of local businesses, utilize this database to establish partnerships between local and larger service providers as well as locally preferred work packages.
- Consultation and Feedback on results on a regular basis.
- Implementation of capacity building programmes to minimize and mitigate the impact of mine downscaling and closure.
- Closure plan implementation.
- Transfer of the shares into a community trust properly established and representative of the Ga-Kibi Communities.
- Support to the Trust in management of the funds, selection of projects and implementation.
- Community feedback on the projects selected, implemented and completed.

8.2.11 Traffic

The following potential risk to traffic aspects is anticipated:

- Increased traffic on the Product Transport Route impacting on road safety and infrastructure.
- Disruption of daily living and movement patterns and safety of road users

Impact	Construction	Operational	Decommissioning	Closure
Disruption of daily living and movement patterns and safety of road users	Yes	Yes	No	No
Increased traffic on the Product Transport Route impacting on road safety and infrastructure	Yes	Yes	No	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine construction	Disruption of Movement activities	Negative	Local	Short term	Moderate	Medium probability	Low	Medium	Low
Beneficiation plant Construction	Disruption of Movement activities	Negative	Local	Short term	Moderate	Medium probability	Low	Medium	Low
Mine operations	Disruption of Movement activities	Negative	Local	Medium term	Moderate	Low probability	Low	Medium	Low
Beneficiation plant Operations	Disruption of Movement activities	Negative	Local	Medium term	Moderate	High probability	Medium	Medium	Low to Medium
Beneficiation plant Operations	Increased traffic on the Product Transport Route impacting on road safety and infrastructure	Negative	Regional	Medium term	Moderate	Definite	Medium	Medium	Low to Medium

Potential mitigation measures have been identified:

- Mitigation to control traffic and ensure safety such as speed limits as well as road signs.
- All heavy vehicles must be restricted to designated routes and not permitted on other roads.
- Off-site hauling of product should be limited to daylight hours.
- Set the speed limit for off-site hauling vehicles to 60 km/h on gravel roads and enforce the speed limits specified.
- Include speedbumps where appropriate to control the speed limits.
- Trucks transporting product will be covered, with tarpaulins, to minimise the generation of dust and the impact on ambient air quality. The covers/tarpaulin used to cover the transported material will be secured.
- Trucks will be weighed on site before departing to limit the risk of product spillage.

8.2.12 Blasting Aspects

8.2.12.1 Discussion

Rock blasting will be required to break down rock and the graphite resource. Blasting generates significant acoustic energy over a very short period of time and noise-sensitive receptors often raise blasting noises as a first concern. The blasting operation has the potential to yield secondary effects such as ground vibration, air blast, fly rock and fumes. These aspects could have a negative impact

on the surrounding areas depending on the levels generated. The potential impacts considered can be described as follows:

- Ground vibration: Levels greater than recommended limits may be damaging to structures. Different structures will also have different permitted levels. Ground vibration may cause damage if levels exceed the structures safe limit. People may experience ground vibration as perceptible at very low levels.
- Air blast: In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs is upsetting people.
- Fly Rock: Fly rock can be mitigated but the possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when the pit is located in close proximity of houses or structures or installations.

From similar projects the following is usually the case with blasting:

- Ground vibration levels may be disturbing (unpleasant) when blasting takes place within 3500m from residential houses (the unmitigated scenario). Ground vibration levels may be disturbing (unpleasant) when blasting takes place within 3500m from residential houses (the unmitigated scenario
- Ground vibration levels may pose a risk of damage to sensitive structures when blasting take place within 1600m from these structures (the unmitigated scenario). At this project there are no sensitive structures, boreholes or settlements within 1600m.
- Airblast levels, while clearly audible to surrounding receptors, will be less than 120 dB and no mitigation is required.
- An exclusion zone for safe blasting was established to be at least 500 m. There are no risks of fly rock to people or residential structures but blasting close to the mine infrastructure may result in fly rock damage and the rock fragments may pose a risk to livestock and herders. Controlled blasting methods must be implemented and the exclusion zone evacuated before a blast.

8.2.12.2 Impact Assessment

The following potential risk to visual aspects is anticipated:

- Ground vibration impact on humans and animals - safety and nuisance impacts.
- Potential for fly-rock, which could harm animals.

Impact	Construction	Operational	Decommissioning	Closure
Ground vibration impact on humans and animals - safety and nuisance impacts.	Yes	Yes	No	No
Potential for fly-rock, which could harm animals.	Yes	Yes	No	No

The impact assessment is rated as follows:

Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
Mine operations	Ground vibration impact on humans and animals - safety and nuisance impacts.	Negative	Site	Short term	Low	High probability	Low	Medium	Low
Mine operations	Potential for fly-rock, which could harm animals.	Negative	Site	Short term	Low	High probability	Low	Medium	Low

Potential mitigation measures have been identified:

- Innovative blasting techniques are to be employed in order to minimise ground and air vibrations and disturbances to minimise the impacts on surrounding faunal species.
- Mine to initiate a forum to inform the livestock owners about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast.
- Mine to erect blasting notice boards in the area (on the main access route from the district road to the mine) with blasting dates and times highlighted.
- Maintain an evacuation zone of 500m, establish an evacuation procedure with the affected parties prior to blasting.
- Blaster to keep full records of blast (blast design, timing, explosive mass per blast hole, stemming, subdrill, spacing, burden, etc.).

8.2.13 Cumulative Impact Assessment

Other development projects in the region are limited to agricultural development. No other mining or industrial development is planned or existing within a 5 km radius of the project area.

Cumulative impacts between the mine development and the beneficiation plant will be assessed during the Environmental Impact Assessment and may include any or all of the above-listed impacts.

8.2.14 The detail impact assessments are contained in the specialist reports attached as appendices and are not repeated here. Summary of Impacts and Risks

Table 8-11: Summary of the potential risks provides a summary list of the potential risks (and benefits) together with the significance, probability and duration of the impacts.

8.2.15 Summary of Impacts and Risks

Table 8-11: Summary of the potential risks

No	Specialist Area	Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
1	Geology	Mine development	Disturbance of natural geology	Negative	Site specific	Permanent	Moderate	Definite	Medium	Medium	Low to Medium
2	Topography	Mine development	Alteration of topography	Negative	Site specific	Permanent	Moderate	Definite	Medium	Medium	Low to Medium
3	Soils, Land use and Capability	Mine development	Loss of original soil depth and soil volume.	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium
4	Soils, Land use and Capability	Beneficiation Development	Loss of original soil depth and soil volume.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
5	Soils, Land use and Capability	Mine development	Loss of original fertility and organic carbon content.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
6	Soils, Land use and Capability	Beneficiation Development	Loss of original fertility and organic carbon content.	Negative	Site specific	Long term	Moderate	Definite	Medium	Medium	Low to Medium
7	Soils, Land use and Capability	Mine development	Soil compaction from heavy machinery	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium
8	Soils, Land use and Capability	Beneficiation Development	Soil compaction from heavy machinery	Negative	Site specific	Long term	High	Definite	Medium	Medium	Low to Medium
9	Soils, Land use and Capability	Mine development	Loss of grazing land	Negative	Site specific	Long term	Low	High probability	Medium	Low	Low to Medium
10	Soils, Land use and Capability	Beneficiation Development	Loss of grazing land	Negative	Site specific	Long term	Low	High probability	Medium	Low	Low to Medium
11	Soils, Land use and Capability	Mine development	Loss of animal production	Negative	Site specific	Long term	Low	High probability	Medium	Medium	Low
12	Soils, Land use and Capability	Beneficiation Development	Loss of animal production	Negative	Site specific	Long term	Low	High probability	Medium	Medium	Low
13	Terrestrial Ecology	Mine development	Loss of habitat and biodiversity	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
14	Terrestrial Ecology	Beneficiation Development	Loss of habitat and biodiversity	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
15	Terrestrial Ecology	Mine development	Loss of animal and plant species	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
16	Terrestrial Ecology	Beneficiation Development	Loss of animal and plant species	Negative	National	Medium term	Moderate	High probability	Medium	Very High	Low
17	Terrestrial Ecology	Mine development	Loss of medicinal species	Negative	Site specific	Short term	Low	Low probability	Low	Medium	Low
18	Terrestrial Ecology	Beneficiation Development	Loss of medicinal species	Negative	Site specific	Short term	Low	Low probability	Low	Medium	Low
19	Terrestrial Ecology	Mine development	Increased soil erosion	Negative	Local	Medium term	Moderate	Low probability	Low	Medium	Low
20	Terrestrial Ecology	Beneficiation Development	Increased soil erosion	Negative	Local	Medium term	Low	Low probability	Low	Medium	Low
21	Terrestrial Ecology	Mine development	Alien plant invasion	Negative	Site specific	Long term	High	Low probability	Low	Medium	Low
22	Terrestrial Ecology	Beneficiation Development	Alien plant invasion	Negative	Site specific	Long term	High	Low probability	Low	Medium	Low
23	Surface Water	Mine development	Water Quality Deterioration	Negative	Regional	Long term	Moderate	High probability	Medium	Very High	Low
24	Surface Water	Beneficiation Development	Water Quality Deterioration	Negative	Regional	Long term	High	Medium probability	Medium	Very High	Low

No	Specialist Area	Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
25	Surface Water	Mine development	Alteration of drainage and flow	Negative	Regional	Long term	High	High probability	Medium	High	Low to Medium
26	Surface Water	Beneficiation Development	Alteration of drainage and flow	Negative	Regional	Long term	High	Medium probability	Medium	High	Low
27	Surface Water	Mine development	Sedimentation	Negative	Regional	Long term	High	High probability	Medium	High	Low to Medium
28	Surface Water	Beneficiation Development	Sedimentation	Negative	Regional	Long term	High	Medium probability	Medium	Medium	Low to Medium
29	Groundwater	Mine development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Site specific	Medium term	Low	High probability	Low	Low	Low
30	Groundwater	Beneficiation Development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Site specific	Medium term	Low	High probability	Low	Low	Low
31	Groundwater	Beneficiation Development	Handling of waste /Transport of material can cause spills that may infiltrate and contaminate the groundwater system.	Negative	Site specific	Medium term	Moderate	Medium probability	Low	Medium	Low
32	Groundwater	Mine development	Lowering of groundwater levels due to Open Pit excavation	Negative	Site specific	Medium term	High	Definite	Medium	Low	Medium
33	Groundwater	Beneficiation Development	Lowering of groundwater levels due to Groundwater abstraction	Negative	Site specific	Medium term	Low	Definite	Medium	Medium	Low
34	Groundwater	Beneficiation Development	Effect on groundwater quality due to leachate from stockpiles containing remnants nitrate based explosives	Negative	Site specific	Long term	Low	Low probability	Low	Low	Low
35	Groundwater	Beneficiation Development	Water retaining facilities designed & constructed to prevent any poor quality water leachate entering the underlying aquifer	Positive	Site specific	Long term	Low	Definite	Medium	Low	Medium
36	Groundwater	Mine development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Site specific	Long term	Low	Low probability	Low	High	Low
37	Groundwater	Beneficiation Development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Site specific	Long term	Moderate	High probability	Medium	High	Low
38	Groundwater	Mine development	The water level will recover in the backfilled void. Recharge will be higher than pre-mining and the eventual effect will be positive.	Positive	Site specific	Permanent	Low	Definite	Medium	Low	Medium
39	Groundwater	Beneficiation Development	Down gradient movement of residual contamination will continue for some time after closure.	Negative	Site specific	Long term	Low	Medium probability	Low	Low	Low
40	Groundwater	Mine development	Migration of contamination away from rehabilitated opencast pit	Negative	Site specific	Permanent	Moderate	Medium probability	Medium	Low	Low to Medium

No	Specialist Area	Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
41	Air Quality	Mine development	Increased of dust levels because of open pit excavation and backfill	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
42	Air Quality	Beneficiation Plant	Increased of dust levels because of hauling operations on stockpile	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
43	Air Quality	Beneficiation Plant	Increased of dust levels because of product transport on public roads	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
44	Air Quality	Beneficiation Plant	Increased Particulate Matter, Sulphur Dioxide, Oxides or Nitrogen from the Syngas facility	Negative	Site specific	Long term	Moderate	High probability	Medium	Medium	Low to Medium
45	Noise	Mine development	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Local	Medium term	Low	Medium probability	Low	Medium	Low
46	Noise	Beneficiation Plant	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Local	Medium term	Low	Medium probability	Low	Medium	Low
47	Archaeological and Cultural Interest	Beneficiation Development	Impact on chance find stone tools	Negative	Site specific	Medium term	Low	Low probability	Low	Low	Low
48	Archaeological and Cultural Interest	Beneficiation Development	Impact on burial site	Negative	Site specific	Medium term	Low	Low probability	Low	Low	Low
49	Archaeological and Cultural Interest	Mine development	Impact on historical/old mine features	Negative	Site specific	Medium term	Low	Definite	Medium	Medium	Low
50	Archaeological and Cultural Interest	Mine development	Impact on undetected burial sites or sub-surface heritage resources	Negative	Site specific	Medium term	High	Medium probability	Medium	Low	Low to Medium
51	Archaeological and Cultural Interest	Mine development	Impact on undetected sub-surface palaeontological resources	Negative	Site specific	Medium term	High	Medium probability	Medium	Low	Low to Medium
52	Visual	Mine development	Visual intrusion of mining activities, impacting on the sense of place	Negative	Local	Long term	Low	Medium probability	Low	Medium	Low
53	Visual	Beneficiation Development	Visual intrusion of plant and stockpile activities, impacting on the sense of place	Negative	Local	Long term	Moderate	Medium probability	Medium	Medium	Low
54	Visual	Beneficiation Development	Impact due to night-time lighting	Negative	Local	Long term	Moderate	High probability	Medium	Medium	Low to Medium
55	Social	Mine construction	Conflict between job seekers and local communities	Negative	Local	Short term	Moderate	High probability	Medium	High	Low
56	Social	Beneficiation plant Construction	Conflict between job seekers and local communities	Negative	Local	Short term	Moderate	High probability	Medium	High	Low
57	Social	Mine construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Short term	Moderate	Medium probability	Low	High	Low
58	Social	Beneficiation plant Construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Short term	Moderate	Medium probability	Low	High	Low
59	Social	Mine operations	Conflict between job seekers and local communities	Negative	Local	Medium term	Moderate	High probability	Medium	High	Low
60	Social	Beneficiation plant Operations	Conflict between job seekers and local communities	Negative	Local	Medium term	Moderate	High probability	Medium	High	Low

No	Specialist Area	Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
61	Social	Mine operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Medium term	Moderate	Medium probability	Medium	High	Low
62	Social	Beneficiation plant Operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Local	Medium term	Moderate	Medium probability	Medium	High	Low
63	Social	Mine operations	Pressure on community infrastructure and services	Negative	Local	Medium term	Low	Medium probability	Low	High	Low
64	Social	Beneficiation plant Operations	Pressure on community infrastructure and services	Negative	Local	Medium term	Low	Medium probability	Low	High	Low
65	Traffic	Mine construction	Disruption of Movement activities	Negative	Local	Short term	Moderate	Medium probability	Low	Medium	Low
66	Traffic	Beneficiation plant Construction	Disruption of Movement activities	Negative	Local	Short term	Moderate	Medium probability	Low	Medium	Low
67	Traffic	Mine operations	Disruption of Movement activities	Negative	Local	Medium term	Moderate	Low probability	Low	Medium	Low
68	Traffic	Beneficiation plant Operations	Disruption of Movement activities	Negative	Local	Medium term	Moderate	High probability	Medium	Medium	Low to Medium
69	Traffic	Beneficiation plant Operations	Increased traffic on the Product Transport Route impacting on road safety and infrastructure	Negative	Regional	Medium term	Moderate	Definite	Medium	Medium	Low to Medium
70	Social	Mine operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Site	Long term	Low	Definite	Medium	Medium	Low to Medium
71	Social	Beneficiation plant Operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Site	Long term	Low	Definite	Medium	Medium	Low to Medium
72	Social	Mine operations	Participation of Local Communities in Employment Opportunities	Positive	Local	Medium term	Low	Medium probability	Low	High	Medium
73	Social	Beneficiation plant Operations	Participation of Local Communities in Employment Opportunities	Positive	Local	Medium term	Moderate	High probability	Medium	High	High
74	Social	Mine operations	Participation of Local Communities in Skills Development	Positive	Local	Medium term	Low	Medium probability	Low	High	Medium
75	Social	Beneficiation plant Operations	Participation of Local Communities in Skills Development	Positive	Local	Medium term	Moderate	High probability	Medium	High	High
76	Social	Mine operations	Downscaling	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
77	Social	Beneficiation plant Operations	Downscaling	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
78	Social	Mine operations	Participation of Local Communities in procurement Opportunities	Positive	Local	Long term	Moderate	High probability	Medium	High	High
79	Social	Beneficiation plant Operations	Participation of Local Communities in procurement Opportunities	Positive	Local	Long term	Moderate	High probability	Medium	High	High
80	Social	Mine operations	Downscaling of business opportunities	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
81	Social	Beneficiation plant Operations	Downscaling of business opportunities	Negative	Local	Medium term	High	Medium probability	Medium	High	Low
82	Social	Mine operations	Empowerment of the local community through ownership participation	Positive	Local	Long term	Moderate	Definite	Medium	High	High

No	Specialist Area	Activity	Potential Impact	Status	Extent	Duration	Magnitude	Probability	Significance without Mitigation	Mitigation Efficiency	Significance without Mitigation
83	Social	Mine operations	Community development from ownership participation	Positive	Local	Long term	Moderate	Definite	Medium	High	High
84	Blasting	Mine operations	Ground vibration impact on humans and animals - safety and nuisance impacts.	Negative	Site	Short term	Low	High probability	Low	Medium	Low
85	Blasting	Mine operations	Potential for fly-rock, which could harm animals.	Negative	Site	Short term	Low	High probability	Low	Medium	Low

8.3 Proposed Mitigation Measures and Level of Residual Risk

Table 8-12 lists the proposed mitigation measures that could be applied to reverse, reduce and mitigate the impacts. The residual risk level, after implementation of the mitigation measures, is also indicated.

Table 8-12: Proposed Mitigation Measures and Level of Residual Risk

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
1	Geology	Mine development	Disturbance of natural geology	Negative	Medium	Medium	No mitigation is possible for the changes in the geological profile however subsidence can be controlled/prevented. Compaction of overburden and discards placed in the bottom of the pits to limit the potential for subsidence on the rehabilitated open pit. Sterilisation of mineral resources can be mitigated by optimal infrastructure design. Rehabilitating the area as close to the pre-mining area as close as possible or reach an agreement for post-mining land use. The rehabilitated area must be vegetated with indigenous flora.	Low to Medium
2	Topography	Mine development	Alteration of topography	Negative	Medium	Medium		Low to Medium
3	Soils, Land use and Capability	Mine development	Loss of original soil depth and soil volume.	Negative	Medium	Medium	The available topsoil will be stripped prior to construction for final rehabilitation. A soil analysis will be performed prior to seeding (post-rehabilitation) and the soil fertility rectified (if necessary) to facilitate vigorous growth. Minimize affected grazing land Implement measures to improve current grazing capacity, i.e. seeding Develop a final land use plan and implementation programme as part of the closure plan, taking into account important issues such as ongoing operational and maintenance requirements and long-term responsibilities and ownership. Set final closure objectives and standards to ensure conformance to the final land use plan, the requirements of the IAPs and relevant environmental legislation.	Low to Medium
4	Soils, Land use and Capability	Beneficiation Development	Loss of original soil depth and soil volume.	Negative	Medium	Medium		Low to Medium
5	Soils, Land use and Capability	Mine development	Loss of original fertility and organic carbon content.	Negative	Medium	Medium		Low to Medium
6	Soils, Land use and Capability	Beneficiation Development	Loss of original fertility and organic carbon content.	Negative	Medium	Medium		Low to Medium
7	Soils, Land use and Capability	Mine development	Soil compaction from heavy machinery	Negative	Medium	Medium		Low to Medium
8	Soils, Land use and Capability	Beneficiation Development	Soil compaction from heavy machinery	Negative	Medium	Medium		Low to Medium
9	Soils, Land use and Capability	Mine development	Loss of grazing land	Negative	Medium	Low		Low to Medium
10	Soils, Land use and Capability	Beneficiation Development	Loss of grazing land	Negative	Medium	Low		Low to Medium

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
11	Soils, Land use and Capability	Mine development	Loss of animal production	Negative	Medium	Medium		Low
12	Soils, Land use and Capability	Beneficiation Development	Loss of animal production	Negative	Medium	Medium		Low
13	Terrestrial Ecology	Mine development	Loss of habitat and biodiversity	Negative	Medium	Very High	No development within unit 3 (Riverine area) is recommended. Any bulbous or succulent plant species encountered should be removed and temporarily planted in a suitable container and replanted in the area after mining has been completed. No unnecessary removal of plants must take place. Where vegetation needs to be "opened" to gain access, it is recommended that the herbaceous species are cut short rather than removing them. That will ensure that they regrow during the growing season and also protect the soil against erosion. The removal of indigenous woody species should be avoided as far as possible The topsoil should be stored adjacent to the mining area and must be used to restore the area after mining has ceased. All temporary stockpile areas, litter and dumped material and rubble, must be removed during and on completion of mining activities. Vegetation clearance should be restricted to the mining areas allowing remaining animals an opportunity to move away from the disturbance. No animals should be intentionally killed or destroyed, and poaching and hunting should not be permitted on the site. No hunting with firearms (shotguns, air rifles or pellet guns) or catapults should be permitted on the property as well as neighbouring areas. A Re-vegetation and Rehabilitation Manual should be prepared for the use of contractors, landscape architects and groundsmen to rehabilitate areas that became degraded due to mining activities. All alien vegetation should be eradicated within the study site and invasive species, as listed in this report should be given the highest priority. Where herbicides are used to clear vegetation, selective and biodegradable herbicides registered for the specific species should be applied to individual plants only.	Low
14	Terrestrial Ecology	Beneficiation Development	Loss of habitat and biodiversity	Negative	Medium	Very High		Low
15	Terrestrial Ecology	Mine development	Loss of animal and plant species	Negative	Medium	Very High		Low
16	Terrestrial Ecology	Beneficiation Development	Loss of animal and plant species	Negative	Medium	Very High		Low
17	Terrestrial Ecology	Mine development	Loss of medicinal species	Negative	Low	Medium		Low
18	Terrestrial Ecology	Beneficiation Development	Loss of medicinal species	Negative	Low	Medium		Low
19	Terrestrial Ecology	Mine development	Increased soil erosion	Negative	Low	Medium		Low
20	Terrestrial Ecology	Beneficiation Development	Increased soil erosion	Negative	Low	Medium		Low
21	Terrestrial Ecology	Mine development	Alien plant invasion	Negative	Low	Medium		Low
22	Terrestrial Ecology	Beneficiation Development	Alien plant invasion	Negative	Low	Medium		Low
23	Surface Water	Mine development	Water Quality Deterioration	Negative	Medium	Very High	Drip trays should be placed under all standing machinery. Oil recovered from any vehicle or machinery on-site should be collected, stored and disposed of by accredited vendors for recycling. Traffic and movement over stabilised areas should be controlled (minimised and kept to specific paths), and damage to stabilised areas should be repaired timeously. A water quality monitoring plan must be formulated before construction. A stormwater management plan that separates dirty and clean water must be developed.	Low
24	Surface Water	Beneficiation Development	Water Quality Deterioration	Negative	Medium	Very High		Low
25	Surface Water	Mine development	Alteration of drainage and flow	Negative	Medium	High	A construction work method statement must be compiled by the applicant/contractor for all activities and phases associated with the construction process.	Low to Medium
26	Surface Water	Beneficiation Development	Alteration of drainage and flow	Negative	Medium	High		Low

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
							A stormwater management plan that channels runoff and separate dirty and clean water must be formulated as per the requirements of GN704. A water balance study must be undertaken	
27	Surface Water	Mine development	Sedimentation	Negative	Medium	High	A service/maintenance plan must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment. Dirty water trenches must be constructed around stockpile areas to capture all dirty water runoff and must be channeled to a dirty water containment structure. Concurrent rehabilitation is encouraged during the operation of the mine to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff	Low to Medium
28	Surface Water	Beneficiation Development	Sedimentation	Negative	Medium	Medium		Low to Medium
29	Groundwater	Mine development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Low	Low	No mitigation required	Low
30	Groundwater	Beneficiation Development	Clearing of vegetation of topsoil from footprint areas can increase infiltration rates of water to the groundwater system, leading to a slight increase in groundwater levels.	Positive	Low	Low		Low
31	Groundwater	Beneficiation Development	Handling of waste /Transport of material can cause spills that may infiltrate and contaminate the groundwater system.	Negative	Low	Medium	Waste should be stored/managed/contained in allocated waste areas. Spills should be cleaned up immediately. Domestic waste must either be stored in an approved waste site or removed by credible contractors.	Low
32	Groundwater	Mine development	Lowering of groundwater levels due to Open Pit excavation	Negative	Medium	Low	No mitigation measures are available for when mining occurs below the local water table. Only by remaining above the water table can this impact be avoided.	Medium
33	Groundwater	Beneficiation Development	Lowering of groundwater levels due to Groundwater abstraction	Negative	Medium	Medium	Boreholes should only be pumped at sustainable yields. More boreholes spread over a larger area and pumped at lower rates should decreased the drawdown effect.	Low
34	Groundwater	Beneficiation Development	Effect on groundwater quality due to leachate from stockpiles containing remnants nitrate based explosives	Negative	Low	Low	Stockpiles, plant footprint and the overburden dump should be kept as small as practically possible. Any runoff from these areas should be contained	Low
35	Groundwater	Beneficiation Development	Water retaining facilities designed & constructed to prevent any poor quality water leachate entering the underlying aquifer	Positive	Medium	Low	All water and effluent retaining facilities should be lined with an impervious liner to prevent dirty water from reaching the underlying aquifer and contaminating the groundwater. Spills should be cleaned up immediately. Proper management and regular inspections for leakages.	Medium
36	Groundwater	Mine development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Low	High	Surface areas below workshops and wash bays should be lined to prevent poor quality seepage from reaching the aquifer and contaminating the underlying groundwater. Surface areas should be bunded to revent clean surface water runoff from being contaminated by dirty surface areas. Spills should be cleaned up immediately.	Low
37	Groundwater	Beneficiation Development	Effect on groundwater quality due to leachate formation from dirty surface areas	Negative	Medium	High		Low

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
38	Groundwater	Mine development	The water level will recover in the backfilled void. Recharge will be higher than pre-mining and the eventual effect will be positive.	Positive	Medium	Low	None necessary. The effect is positive. Recharge can, however, be further promoted by leaving the final surface as a slight depression and use the pit as source of water supply.	Medium
39	Groundwater	Beneficiation Development	Down gradient movement of residual contamination will continue for some time after closure.	Negative	Low	Low	Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration. Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be constructed.	Low
40	Groundwater	Mine development	Migration of contamination away from rehabilitated opencast pit	Negative	Medium	Low		Low to Medium
41	Air Quality	Mine development	Increased of dust levels because of open pit excavation and backfill	Negative	Medium	Medium	Set the speed limit for on-site hauling vehicles and other vehicles to 40 km/h, and off-site hauling vehicles to 60 km/h on unpaved roads. Actively enforce the speed limits specified. Dust suppression to be conducted on a regular basis. Chemical treatment of access roads to Minimise dust generation utilising water conservation strategies such as 'Dust-a-side'.	Low to Medium
42	Air Quality	Beneficiation Plant	Increased of dust levels because of hauling operations on stockpile	Negative	Medium	Medium		Low to Medium
43	Air Quality	Beneficiation Plant	Increased of dust levels because of product transport on public roads	Negative	Medium	Medium		Low to Medium
44	Air Quality	Beneficiation Plant	Increased Particulate Matter, Sulphur Dioxide, Oxides or Nitrogen from the Syngas facility	Negative	Medium	Medium	Monitoring emissions from the Syngas facility to ensure air quality standards are not exceeded	Low to Medium
45	Noise	Mine development	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Low	Medium	Machinery and vehicles can be fitted with silencers/mufflers to reduce noise. All staff/contractors on-site are required to wear the PPE. Identify sensitive receptors and conducted noise monitoring if required. Use of low-noise generation plant and equipment. All plant, equipment and vehicles are to be kept in good repair. Off-site hauling of the product should be limited to daylight hours.	Low
46	Noise	Beneficiation Plant	Increased total noise levels in the area, changing existing ambient sound levels at receptors	Negative	Low	Medium		Low
47	Archaeological and Cultural Interest	Beneficiation Development	Impact on chance find stone tools	Negative	Low	Low	Avoid the chance stone tools and burial site.	Low
48	Archaeological and Cultural Interest	Beneficiation Development	Impact on burial site	Negative	Low	Low		Low
49	Archaeological and Cultural Interest	Mine development	Impact on historical/old mine features	Negative	Medium	Medium	Excavation by archaeological techniques and document the site (map and photograph) and analyse the recovered material to acceptable standards. This must be done by a suitably qualified archaeologist.	Low
50	Archaeological and Cultural Interest	Mine development	Impact on undetected burial sites or sub-surface heritage resources	Negative	Medium	Low	If any archaeological artefacts are discovered upon excavations, construction must immediately cease, and reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	Low to Medium
51	Archaeological and Cultural Interest	Mine development	Impact on undetected sub-surface palaeontological resources	Negative	Medium	Low	Phase 1 Palaeontological Impact Assessment: Field Study to be conducted prior to construction If any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures.	Low to Medium
52	Visual	Mine development	Visual intrusion of mining activities, impacting on the sense of place	Negative	Low	Medium	The development footprint and disturbed areas are to be kept as small as possible and the areas cleared of natural vegetation must be kept to	Low

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
53	Visual	Beneficiation Development	Visual intrusion of plant and stockpile activities, impacting on the sense of place	Negative	Medium	Medium	a minimum. The height of infrastructure and stockpiles should be kept as low as possible and should not exceed 10m. Infrastructure such as the stockpile must be shaped and rounded to blend in with the surrounding undulating landscape. Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings.	Low
54	Visual	Beneficiation Development	Impact due to night-time lighting	Negative	Medium	Medium	Outdoor lighting must be strictly controlled. High light masts should be avoided. Any high lighting masts should be covered to reduce the glow. Lighting fixtures must be selected and placed so that they direct their light on the intended area only, to avoid light spill and offsite light trespass. Light sources must be shielded by physical barriers. The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces sky-glow and wildlife impacts. Bluish-white lighting is more likely to cause glare and attract insects and is associated with other human physiological issues.	Low to Medium
55	Social	Mine construction	Conflict between job seekers and local communities	Negative	Medium	High	Priority employment from local communities with the development of recruitment procedures and utilizing the existing skills available from the local communities Establishing early on skills development programmes in areas where most employment opportunities will be available such as operators and artisans Implementation of bursary programme and practical skills programmes as part of the Social and Labour Plan Establishment of a local labour recruitment committee to monitor recruitment procedures and results Engage with Traditional Authority to manage and monitor site allocation to job seekers and/or employees in the local communities Induction of contractors and workforce with regard to their code of conduct in the local communities	Low
56	Social	Beneficiation plant Construction	Conflict between job seekers and local communities	Negative	Medium	High		Low
57	Social	Mine construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Low	High		Low
58	Social	Beneficiation plant Construction	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Low	High		Low
59	Social	Mine operations	Conflict between job seekers and local communities	Negative	Medium	High		Low
60	Social	Beneficiation plant Operations	Conflict between job seekers and local communities	Negative	Medium	High		Low
61	Social	Mine operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Medium	High		Low
62	Social	Beneficiation plant Operations	Increase in social pathologies such as crime, safety, health, prostitution	Negative	Medium	High		Low
63	Social	Mine operations	Pressure on community infrastructure and services	Negative	Low	High		Low
64	Social	Beneficiation plant Operations	Pressure on community infrastructure and services	Negative	Low	High		Low
65	Traffic	Mine construction	Disruption of Movement activities	Negative	Low	Medium	Traffic minimized through bus and combi services to transport workers to the project site Low speed limits on access roads Road crossings should be managed by signing and traffic management	Low
66	Traffic	Beneficiation plant Construction	Disruption of Movement activities	Negative	Low	Medium		Low
67	Traffic	Mine operations	Disruption of Movement activities	Negative	Low	Medium		Low

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
68	Traffic	Beneficiation plant Operations	Disruption of Movement activities	Negative	Medium	Medium	measures Issues and Grievance Procedure available to local people to report bad driving or rules traversing	Low to Medium
69	Traffic	Beneficiation plant Operations	Increased traffic on the Product Transport Route impacting on road safety and infrastructure	Negative	Medium	Medium	Mitigation to control traffic and ensure safety such as speed limits as well as road signs. All heavy vehicles must be restricted to designated routes and not permitted on other roads. Off-site hauling of product should be limited to daylight hours. Set the speed limit for off-site hauling vehicles to 60 km/h on gravel roads and enforce the speed limits specified. Include speed-bumps where appropriate to control the speed limits. Trucks transporting product will be covered, with tarpaulins, to minimise the generation of dust and the impact on ambient air quality. The covers/tarpaulin used to cover the transported material will be secured. Trucks will be weighed on site before departing to limit the risk of product spillage.	Low to Medium
70	Social	Mine operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Medium	Medium	Demarcated areas where fire wood can be collected that was cleared for the Construction Phase Application of the Avoidance Principle by reducing the footprints of infrastructure where possible Supporting the community in the increase of grazing capacity through seeding and debushing Leasing of community land impacted by mining Monitoring the impact on livestock	Low to Medium
71	Social	Beneficiation plant Operations	Impact on land use and livelihoods from the reduction in the grazing area	Negative	Medium	Medium		Low to Medium
72	Social	Mine operations	Participation of Local Communities in Employment Opportunities	Positive	Low	High	Source the maximum number of employees from the local area for temporary job opportunities Implement skills development programmes in the areas where most job opportunities will be created, i.e. operators and drivers Make available bursary opportunities to build skill capital in the region Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people. Implement portable skills development programmes Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods Establish a future forum with representation from the workforce to discuss potential difficulties and solutions Implementation of programmes to minimize and mitigate the impact of downscaling and retrenchment	Medium
73	Social	Beneficiation plant Operations	Participation of Local Communities in Employment Opportunities	Positive	Medium	High		High
74	Social	Mine operations	Participation of Local Communities in Skills Development	Positive	Low	High		Medium
75	Social	Beneficiation plant Operations	Participation of Local Communities in Skills Development	Positive	Medium	High		High
76	Social	Mine operations	Downscaling	Negative	Medium	High		Low
77	Social	Beneficiation plant Operations	Downscaling	Negative	Medium	High		Low
78	Social	Mine operations	Participation of Local Communities in procurement Opportunities	Positive	Medium	High	Establish a database of local businesses, utilize this database to establish partnerships between local and larger service providers as well as locally preferred work packages Consultation and Feedback on results on a regular basis Implementation of capacity building programmes to minimize and	High
79	Social	Beneficiation plant Operations	Participation of Local Communities in procurement Opportunities	Positive	Medium	High		High
80	Social	Mine operations	Downscaling of business opportunities	Negative	Medium	High		Low

No	Specialist Area	Activity	Potential Impact	Status of impact	Significance without Mitigation	Mitigation Efficiency	Mitigation Measures	Significance without Mitigation
81	Social	Beneficiation plant Operations	Downscaling of business opportunities	Negative	Medium	High	mitigate the impact of mine downscaling and closure. Closure plan implementation	Low
82	Social	Mine operations	Empowerment of the local community through ownership participation	Positive	Medium	High	Transfer of the shares into a community trust properly established and representative of the Ga-Kibi Communities Support to the Trust in management of the funds, selection of projects and implementation Community feedback on the projects selected, implemented and completed.	High
83	Social	Mine operations	Community development from ownership participation	Positive	Medium	High		High
84	Blasting	Mine operations	Ground vibration impact on humans and animals - safety and nuisance impacts.	Negative	Low	Medium	Innovative blasting techniques are to be employed in order to minimise ground and air vibrations and disturbances to minimise the impacts on surrounding faunal species. Mine to initiate a forum to inform the livestock owners about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast. Mine to erect blasting notice boards in the area (on the main access route from the district road to the mine) with blasting dates and times highlighted. Maintain an evacuation zone of 500m, establish an evacuation procedure with the affected parties prior to blasting. Blaster to keep full records of blast (blast design, timing, explosive mass per blast hole, stemming, subdrill, spacing, burden, etc.).	Low
85	Blasting	Mine operations	Potential for fly-rock, which could harm animals.	Negative	Low	Medium		Low

8.4 Conclusion and Recommendations of Specialist Reports

Table 8-13: Specialist conclusions and recommendations

Aspect	Conclusion / Recommendation	Notes / Deviations from Recommendations
Groundwater	The Mogalakwena River is located 250m downgradient from the proposed project site and will therefore be considered to be a possible receptor of any contamination that may potentially originate from the project area. Average annual rainfall is approximately 490mm. Average annual evaporation is between 2000 and 2200mm. The hydrocensus/user survey was conducted on the properties surrounding Steamboat. A total of six user boreholes were located within the hydrocensus area. Additionally, water levels could be measured in six of the old exploration boreholes. Six new boreholes were drilled on the proposed Steamboat mining area specifically for geohydrological testing and sampling. The effective recharge in the Steamboat area is estimated to be in the order of 4% of MAP. The area is underlain by quaternary sediments and metamorphic rock of the Limpopo Mobile Belt. The maximum on-site water requirement at full production is around 3 l/s. Water for the project can be provided using boreholes SBG03, SBG04 and SBG05 but additional water may be required initially. Static groundwater level depth in the Steamboat area range between 15 and 35 mbs. The waste classification concluded that both the ore material and waste rock that will be generated by the planned mining and related activities are inert and can be classified as a Type 3 (low risk) waste. It is concluded that a Class C (or GSB+) disposal facility would suffice for both the ore reserve and waste rock. Both samples have sufficient buffering capacity (base potential) to neutralize the small amount of acid that may form. Most potential surface source areas (discard dump, plant area, stockpiles) therefore pose no real threat to the underlying aquifer in terms of impacts on groundwater quality, i.e. leachate generated by the activities/sources is expected to be of reasonably good quality in terms of the inorganic content. Pre-mining (baseline) groundwater from five of the monitoring boreholes is considered to be of poor quality with numerous exceedances of the South African National Standards (SANS 241:2015). All the boreholes' groundwater is unsuitable for human consumption, except for borehole SBG03. The aquifer underlying the project area achieved a score of 5 (Table 6-1) and is therefore regarded as having a medium vulnerability. The aquifer underlying the Steamboat area classifies as a minor aquifer system according to the Parsons system. The fractured rock aquifer underlying the project area scored a GQM rating of 4, which means that a medium level of protection is required. The numerical flow model shows that simulated groundwater level impacts do not extend beyond the Steamboat MRA. The drawdown cone reached a maximum depth of 53 m and horizontal extent of about 720 m from the pit. Full recovery of the water level in the pit is expected to occur about 200 years after mining ends. The simulated groundwater quality impacts do not extend beyond the MRA area. The simulated contamination plume reached a maximum distance from the sources of about 200m in the down-gradient direction at 100 years after closure. A groundwater monitoring protocol was proposed for the project. Diligent application of a groundwater monitoring protocol is crucial to verify, update and refine the estimations, predictions and conclusion made in this report. The groundwater monitoring program itself also needs to be reviewed and updated, expanded and/or refined if necessary if changes occur to the process and infrastructure simulated in this study or if anomalous results are measured that require additional information.	No deviation
Surface Water	Site-Wide Balance A site-wide water balance that considers extremes of climate, unsteady processing/production rates and storage within any aspect of the operation (such as would be required to fill process water dams prior to initial start-up or drawdown stored water through the dry season) is recommended for the mine. The main purposes of the water balance will be to estimate water volumes available for reclaim/dust suppression, excess water discharge requirements (if needed) and freshwater requirements (if needed) under average and extreme hydrological conditions. Additionally, it is recommended that a site-wide water balance model must accommodate the new and future expansion.	No deviation

Aspect	Conclusion / Recommendation	Notes / Deviations from Recommendations
	Water Quality A surface water quality monitoring program starting with an establishment of a baseline water quality must be undertaken. The water quality must be compared against the permissible guidelines provided by the DHSWS. Water quality monitoring must be undertaken at rivers in proximity as well as sediment ponds before discharge into the environment. Stormwater Management Plan A stormwater management plan consisting of detailed stormwater design is recommended: Sizing of channels and storage containment facilities must be undertaken during a detailed design; The detailed stormwater design plan should also take into account of the mine plant stormwater management; It is recommended that a pit water management system be put in place during the detailed design of the stormwater management plan; Peak flows and all detailed design criteria must be included in the stormwater management report; and The detailed designs of the channels should consider suitable erosion protection measures. This surface water study was undertaken by a suitably qualified, experienced, and independent Hydrologist. The potential impacts of the proposed activities on surface water receptors as well as the sensitivity of the surface water resources were assessed, along with a summary of mitigation measures. The baseline hydrology and floodline assessment informed the impact assessment. Floodlines for the 1:50- and 1:100-year recurrence intervals were determined for the Mogalakwena River draining adjacent to the project site. The local surface water resources are considered to be of high sensitivity. The proposed mine infrastructure is located outside of the 1:50- and 1:100-year floodlines and thus, the project is deemed safe and has a low impact on the surface water resources should all mitigation and rehabilitation measures be implemented. A monitoring programme is an essential tool to identify any risks of potential impacts as they arise and to assist in impact management plans by assessing if mitigation measures are operating effectively. Monitoring should be implemented throughout the life of the project. All measures implemented to mitigate impacts should be regularly reviewed as best practice and compliance with various licenses issued on site by authorities. The project can continue if all mitigation and monitoring measures are to be implemented.	
Heritage	Diphororo Development (Pty) Ltd was appointed to conduct the environmental impact assessment (EIA) for the proposed Steamboat Project. The project name, Steamboat Project, is related to the farm name “Steamboat”. Cuchron holds a valid Prospecting Right No LP/5/1/1/2/10321PR for Graphite over the farm's Steamboat 306MR and Inkom 305MR, covering an area of 1,453 hectares, situated along the Mogalakwena River in the Province of Limpopo. This report describes the methodology used, the limitations encountered, the heritage features that were identified and the recommendations and mitigation measures proposed relevant to this. The HIA consisted of a desktop study (archival sources, database survey, maps and aerial imagery) and a physical survey that included the interviewing of relevant people. It should be noted that the implementation of the mitigation measures is subject to SAHRA/PHRA’s approval. The cultural landscape qualities of the region essentially consist of a rural setup. In this the human occupation is made up of a pre-colonial element consisting of limited Stone Age occupation and an extensive Late Iron Age occupation. This was followed by a much later colonial farmer component. Population increase over time led to the establishment of a large number of rural villages. During the survey the following sites, features or objects of cultural significance were identified: 7.1.1: Stone Age artefacts, mostly dating to the Middle Stone Age occur in low numbers scattered in parts of the study area. The density of artefacts is less than 1/20m2 overall. The tools are mostly made from quartzite. The tools are very poorly made and also shows a lot of weathering. 7.3.1: What seems to be a single grave, marked by a packed circle of stone and a small, different type of stone as headstone. It seems to be very old and no other signs of habitation could be detected. 7.3.2: A series of trenched and deep pits confined to a section where the open pit is planned. It is as yet impossible to attribute a definite date to this excavations. Some of the trenches are also much overgrown with trees and shrubs, indicating that they are quite old. According to local community members, they have been playing here since they were very young, implying that the mining took place prior to that, making possibly older than 60 years. However, it is also stated that there were some exploration being done here in the late 1980s by Mintek and the South African Development Trust (Badenhorst 2019:126),	No deviation

Aspect	Conclusion / Recommendation	Notes / Deviations from Recommendations
	although the extent of this exploration is not indicated. From a heritage point of view, it is recommended that the proposed activities be allowed to continue on acceptance of the proposed mitigation measures and the conditions proposed below.	
Paleo	There is no objection (see Recommendation B) to the development, but it may be necessary to request a Phase 1 Palaeontological Impact Assessment: Field Study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is MODERATE. A Phase 2 Palaeontological Mitigation is also required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation or surface fossils or if fossils are found during prospecting, excavating or blasting. The Protocol for Chance Find and Management Plan is attached (Appendix 2) for the ECO. This project may benefit the economy, and social development of the community. Preferred choice: Only one Option is presented and possible (see Executive Summary). The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed and a palaeontologist should be called in to determine proper mitigation measures. No consultation with parties was necessary. This report must be submitted to SAHRA together with the Heritage Impact Assessment Report. All the land involved in the development was assessed and none of the property is unsuitable for development (see Recommendation B). All information needed for the Palaeontological Impact Assessment was provided by the Consultant. All technical information was provided by Diphororo Development (Pty) Ltd. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed. The following should be conserved: if any palaeontological material is exposed during clearing, digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures, especially for shallow caves. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment (fossils) and adjacent areas as well as for safety and security reasons.	No deviation
Biodiversity	Any development will have a negative effect on the natural ecosystem in particular the vegetation thereof. The vegetation of the areas where the proposed mining will take place will be destroyed. The purpose of any ecological assessment is to determine areas of high sensitivity and to provide guidelines to ensure that the proposed development is ecologically sensitive and to prevent unnecessary destruction of natural ecosystems. The vegetation of the study area (Limpopo Sweet Bushveld vegetation type - SVcb 19) is not regarded as a threatened ecosystem on a National basis, though the study area is regarded as a Critical Biodiversity Area on Provincial level. According to the Limpopo Conservation Plan 2 (LCPv2) (Desmond et al., 2013) the purpose of the plan is to develop the spatial component of the bioregional plan that facilitate biodiversity conservation and also inform natural resource management plans, land-use planning, environmental impact assessments and authorisations. Since the plan and associated maps are done on a relatively coarse scale it is important to note that it does not replace site assessments for Environmental Impact Assessment purposes and still requires specialist interpretation and assessment (Desmond et al., 2013). It is furthermore important to note that the classification of an ecosystem within a specific category is based on various aspects including, birds, vegetation, herpetological data, rivers, wetlands, birds, conservation areas etc. The vegetation of vegetation units 1 and 2 are degraded mostly due to grazing practices. This has caused the degradation of the herbaceous layer and provided (and still provides) the woody species the opportunity to germinate and increase in density. This has resulted in the woody layer becoming densified thereby preventing the establishment of the grasses. This has also resulted in the low to moderate erosion along the informal drainage channels since there is no more grasses and forbs to bind the soil. The proposed mining area is also small in relation the larger surrounding area. Although these units are classified as belonging to a CBA area on a Provincial level (and Least Threatened on a national Level), the site surveys indicate these units to be somewhat degraded with a moderate-low species richness and diversity. Thus from an ecosystem functioning point of view these units are regarded as having a medium ecological sensitivity The protected tree Boscia albitrunca is present in vegetation units 1 & 2. This tree is usually found in the drier parts of the country such as the study area. The	No deviation

Aspect	Conclusion / Recommendation	Notes / Deviations from Recommendations
	tree is regarded as a medium-sized tree that can grow up to 7m tall. It plays an important role in the ecosystem by providing food, shelter and shade to various animal and bird species. The tree also provides habitat for different herbaceous species to grow underneath its canopy. Humans use the roots of the tree to make porridge, while it is also used as a substitute for coffee in some areas. It is therefore important that these trees are not unnecessarily removed from the ecosystem. If single individuals of these species have to be removed, a permit from the Department of Agriculture, Fisheries and Forestry (Forestry Branch) and Nature Conservation will have to be obtained for this purpose. Only two medicinal plants were found within the study area. None of these species are threatened, while one is a pioneer weed that grows in degraded areas and disturbed riverbanks. No or red data plant species were identified in the study area. The alien plant species identified should be eradicated from the property.	
Soils, Land use and Capability	The entire site is natural vegetation and is used as grazing and browsing for livestock. From the vegetation status it is certain that the land has not been cultivated in the past and that it is virgin land. Rainfed crop production is not viable and is not practiced due to low rainfall and high summer temperatures. The growing season is in the summer and follows rain with a dry winter period during which little vegetative growth takes place. The grazing capacity for livestock of the natural veld is estimated at 12 hectares per large stock unit (LSU). Steamboat mining area is 27 hectares, which is sufficient grazing for 2 LSU. The northern part of the site is quaternary sands. They are reddish coloured with rocky outcrops where the schist outcrops. All the other soils are on schist, which is metamorphic rock and is the material in which the graphite is captured. Rocky outcrops occur in many places. Dominant soil forms found are Glenrosa, Mispah, Hutton and rock outcrops. Soil use capability on the mining area The land falls into the non-arable group; it is not suitable for cultivation and should be reserves for livestock and game. The land use capability is Class v, mainly due to soil depth, rockiness and climate. According to DALRRD the site is classified as 'low/moderate potential arable land'. Because of the rock outcrops and shallow soils, coupled with the climatic constraints, this is considered optimistic – dryland crop production on the Project Area is not feasible, unless it the land is irrigated. Sensitivity analysis A soil and climate evaluation found that the land is not arable and that the Screening Tool's designation of 'Medium' is not realistic. It should be 'Low'.	No deviation
Social	The proposed projects will have a potential negative impact on land use although on a low level. The land is currently utilised for grazing but only 2% of the grazing land will be lost. The properties however already have a low grazing capacity, and this is placing strain on the local community, as not enough land is available. The positive contributions from sustained employment and revenue generation from both the projects cumulatively will significantly outweigh the negative impacts over a period of 20 years. It should further be noted that with mitigation and rehabilitation the area will be restored to grazing land and the negative impacts will therefore be negated to a certain extent.	No deviation

8.5 Assumptions, Uncertainties and Knowledge Gaps

Table 8-14: Table on assumptions and limitations

Aspect	Assumptions	Limitations
Groundwater	The numerical groundwater model, despite all efforts and advances in software and algorithms, remains a very simplified representation of the very complex and heterogeneous interacting aquifer systems underlying the project area. The integrity of a numerical model depends strongly on the formulation of a sound conceptual model and the quality and quantity (distribution, length of records etc.) of input data. Nonetheless, a numerical model can still be used quite successfully to assess the effectiveness of various management and remediation options/techniques, especially if the shortcomings in information and assumptions made in the construction and calibration of the model are clearly listed and kept in mind during modelling. The main purpose is thus not to try and predict what the exact groundwater level or concentration of a certain element will be at a certain position at a specific moment in future. The heterogeneity of the natural groundwater system, especially the secondary fractured rock aquifer environment underlying the project area, is simply too great to accurately incorporate and simulate accurately in the model. The purpose is therefore to rather evaluate what the relative magnitude or contribution of certain impacts or different pollution sources will be on the larger groundwater regime and then to determine which remediation options would have the most beneficial effects. Although relatively good borehole coverage occurs in many parts of the modelled area, the significant heterogeneity of the aquifer still makes the assigning of representative geohydrological flow or contaminant transport parameters to the entire model grid problematic. No detailed structural geological information was available at the time of submission of this report, therefore modelling (i.e. updating of the model) should be an ongoing process as new information becomes available over time.	Although the borehole yields provided were calculated with tested and proven techniques, test duration was too short to apply for long term sustainable yield determination.
Surface Water	In line with the development of the floodlines, the following assumptions were made: The topographic data used is of sufficient accuracy and coverage to enable hydraulic modelling at a suitable level of detail; The Manning's 'n' value used is considered suitable for use in all the modelled storm events (1:50 and 1:100-year events), as well as in representing both the channel and floodplain; Levees have been added to confine the modelling to the observed channels; Steady-state hydraulic modelling was undertaken, which assumes the flow is continuous at the peak rate: and, The latest layout of the proposed mine was used	The surveyed data (Contour data) provided did not cover the entire floodplain of Mogalakwena River. A such, the NASADEM was used for modelling purposes. The floodlines are therefore indicative floodlines and are deemed sufficient for planning purposes. For detailed mine infrastructure design, these should be updated using site wide surveyed data.
Heritage	No assumptions	During the site visit, the high and dense vegetation that covered the project area limited ground visibility very much, even to the point of making the determination of buffer zones around identified sites impossible.
Social	This study was carried out with the information available to the specialists at the time of executing the study, within the available timeframe and budget. The sources consulted are not exhaustive and additional information which might strengthen arguments or contradict information in this report might exist. The specialists did endeavor to take an evidence-based approach in the compilation of this report and did not intentionally exclude scientific information relevant to the assessment. It is assumed that a business case has been produced by the Applicant which has assessed the need for the project as	No limitations

Aspect	Assumptions	Limitations
	well as the financial sustainability. This SIA has therefore not evaluated these aspects of the project. Areas that might yield socio-economic sensitivities have been identified through a desktop study utilising available Mapping, Orthophotos and Google Earth™. The areas that have been marked are the sensitive areas visible to the socioeconomic specialists at the time of the study, which are in close proximity to the proposed project location under investigation The 2011 Census is the most current source of official statistics and this has been used for generating a baseline profile of the study area. It should be noted that this data may now be out of date to some degree and may no longer accurately reflect the current socio-economic profile. Assessment of the impact on sense of place is based on the specialist's opinion as sense of place is a very personal experience, and is not easily measurable.	

9 ENVIRONMENTAL IMPACT STATEMENT

9.1 Proposed Impact Management Outcomes

The environmental and social management objectives and impact management outcomes are presented in the table below.

Table 9-1: Proposed management objectives an outcomes for the Steamboat Project

Aspect	Management Objectives	Impact Management Outcomes (Performance Target)
Land Capability	To re-instate suitable grazing capabilities over the reclaimed portions of the mine site	Development of a Rehabilitation, Decommissioning and Closure Plan Establishment of a self-sustaining, grazing land capability over the reclaimed areas
Ecology	Minimise impact on the biodiversity habitat in the area	Limit the clearance of vegetation and topsoil to 27 ha (disturbed footprint) Implementation of a Rescue and Relocation Plan Implementation of an AIP Control Plan
	To re-establish an appropriate mix of grassland and other native flora species in the reclaimed areas to enable the natural re-instatement of biodiversity over time	Establishment of a sustainable vegetation cover to facilitate the final grazing land capability requirements
Water Resources	Prevent erosion and downstream siltation	Implement SWMP to separate clean & dirty water
	Limit the impact of the groundwater quality and yields	Groundwater monitoring demonstrates that the surrounding groundwater users are not impacted in terms of quality or yield Implementation of compensation strategy if the above cannot be demonstrated
Air Quality	Limit the risk of dust exposure to the general public	Adhere to Air Quality Standards Dust fallout < 600 mg/m2 /day on MRA boundary PM10 (24-hour) < 75 µg/m3 on MRA boundary
Noise	Limit the noise impact on sensitive receptors	Rural noise level at daytime of 45 dB and night time of 35 dB at the settlements Increase in ambient noise levels (on MRA boundary) < 7 dB
Heritage/Palaeontology	Prevent as far as possible any impact on heritage and palaeontological material or mitigate such an impact if it cannot be avoided	No damage to heritage and palaeontological material without the necessary investigations and permits
Post-mining Land Use	Establish a post-mining land use that will sustain rural agricultural activities once mining is concluded, whilst providing an acceptable overall	Define, in consultation with all IAPs, the final (post-closure) land use for the mining area, including mining areas, surface and water management infrastructure, roads and powerlines

Aspect	Management Objectives	Impact Management Outcomes (Performance Target)
	aesthetic appearance aligned to the surrounding landscape.	Development of a Rehabilitation, Decommissioning and Closure Plan
Local Community (G-Kibi communities)	Prevent vehicle and pedestrian accidents due to increase in traffic	Implementation of road upgrades and safety measures where the product transport road pass through settlements No fatal accidents
	Maximise social benefits (employment, procurement, etc.) to local communities	Percentage of local employment set at 70% (SLP)
	Identify and establish livelihood retention projects to create off mine livelihoods during and post mining	Successful implementation of Social and Labour Plan
	Equip employees with portable skills that can be used in other sectors post-mining	Successful implementation of Social and Labour Plan
	Support and build capacity of communities to participate in the ownership and management of the mine	Participation of community representatives on the Cuchron Board of Directors

Appropriate monitoring should be implemented to ensure compliance with the objectives and outcomes as proposed.

9.2 Aspects for Inclusion as Conditions of Authorisation

It is essential that all the mitigation measures as listed in the table above be implemented. The following are considered critical to minimise the negative impacts associated with the proposed activities:

9.2.1 Pre-Construction Activities (Planning and Design)

- Transfer of the shares into a community trust properly established and representative of the Ga-Kibi Communities
- Leasing of community land impacted by mining
- Establish a database of local people with information on qualifications and skills, utilize this database to develop skills plans and recruit local people. Priority employment from local communities with the development of recruitment procedures and utilizing the existing skills available from the local communities
- Establishing early on skills development programmes in areas where most employment opportunities will be available such as operators and artisans
- Implementation of bursary programme and practical skills programmes as part of the Social and Labour Plan
- Establish a database of local businesses, utilize this database to establish partnerships between local and larger service providers as well as locally preferred work packages
- Any bulbous or succulent plant species encountered should be removed and temporarily planted in a suitable container and replanted in the area after mining has been completed. No unnecessary removal of plants must take place.
- A water quality monitoring plan must be formulated before construction.

- A stormwater management plan that separates dirty and clean water must be developed.
- A construction work method statement must be compiled by the applicant/contractor for all activities and phases associated with the construction process.
- A stormwater management plan that channels runoff and separate dirty and clean water must be formulated as per the requirements of GN704.
- A water balance study must be undertaken
- All water and effluent retaining facilities should be lined with an impervious liner to prevent dirty water from reaching the underlying aquifer and contaminating the groundwater. Spills should be cleaned up immediately. Proper management and regular inspections for leakages.
- Excavation of the old mine site by archaeological techniques and document the site (map and photograph) and analyse the recovered material to acceptable standards. This must be done by a suitably qualified archaeologist.
- Phase 1 Palaeontological Impact Assessment: Field Study to be conducted prior to construction
- Avoid the chance stone tools and burial site.
- The height of infrastructure and stockpiles should be designed and kept as low as possible and should not exceed 10m.

9.2.2 Construction Phase

- Establishment of a local labour recruitment committee to monitor recruitment procedures and results. Engage with Traditional Authority to manage and monitor site allocation to job seekers and/or employees in the local communities. Source the maximum number of employees from the local area for temporary job opportunities
- Induction of contractors and workforce with regard to their code of conduct in the local communities
- The development footprint and disturbed areas are to be kept as small as possible and the areas cleared of natural vegetation must be kept to a minimum. Minimize affected grazing land. Application of the Avoidance Principle by reducing the footprints of infrastructure where possible
- Demarcated areas where firewood can be collected that was cleared for the Construction Phase
- Supporting the community in the increase of grazing capacity through seeding and debushing. Monitoring the impact on livestock
- Vegetation clearance should be restricted to the mining areas allowing remaining animals an opportunity to move away from the disturbance. No development within unit 3 (Riverine area) is recommended.
- The available topsoil will be stripped prior to construction for final rehabilitation. The topsoil should be stored adjacent to the mining area and must be used to restore the area after mining has ceased.

- Where vegetation needs to be “opened” to gain access, it is recommended that the herbaceous species are cut short rather than removing them. That will ensure that they regrow during the growing season and also protect the soil against erosion. The removal of indigenous woody species should be avoided as far as possible.
- No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site. No hunting with firearms (shotguns, air rifles or pellet guns) or catapults should be permitted on the property as well as neighbouring areas.
- Drip trays should be placed under all standing machinery. Oil recovered from any vehicle or machinery on-site should be collected, stored and disposed of by accredited vendors for recycling.
- Dirty water trenches must be constructed around stockpile areas to capture all dirty water runoff and must be channelled to a dirty water containment structure.
- Waste should be stored/managed/contained in allocated waste areas. Spills should be cleaned up immediately. Domestic waste must either be stored in an approved waste site or removed by credible contractors.
- If any archaeological artefacts are discovered upon excavations, construction must immediately cease, and reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- If any palaeontological material is exposed during clearing, digging, excavating, drilling, or blasting SAHRA must be notified. All construction activities must be stopped, a 30 m no-go barrier constructed, and a palaeontologist should be called in to determine proper mitigation measures.
- Infrastructure such as the stockpile must be shaped and rounded to blend in with the surrounding undulating landscape.
- Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings."
- Outdoor lighting must be strictly controlled, and where possible directional lighting must be installed. Lighting fixtures must be selected and placed so that they direct their light on the intended area only, to avoid light spill and offsite light trespass. High light masts should be avoided. Any high lighting masts should be covered to reduce the glow. Light sources must be shielded by physical barriers.
- Traffic minimized through bus and combi services to transport workers to the project site. Low speed limits on access roads. Road crossings should be managed by signing and traffic management measures. Mitigation to control traffic and ensure safety such as speed limits as well as road signs. All heavy vehicles must be restricted to designated routes and not permitted on other roads.
- Off-site hauling of product should be limited to daylight hours. Set the speed limit for off-site hauling vehicles to 60 km/h on gravel roads and enforce the speed limits specified. Include speedbumps where appropriate to control the speed limits.
- Trucks transporting product will be covered, with tarpaulins, to minimise the generation of dust and the impact on ambient air quality. The covers/tarpaulin used to cover the

transported material will be secured. Trucks will be weighed on site before departing to limit the risk of product spillage.

9.2.3 Operational Phase

- Support to the Trust in management of the funds, selection of projects and implementation
- Community feedback on the projects selected, implemented and completed."
- Issues and Grievance Procedure available to local people to report issues.
- Implement skills development programmes in the areas where most job opportunities will be created, i.e. operators and drivers
- Make available bursary opportunities to build skill capital in the region.
- Implement portable skills development programmes.
- Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods.
- Stockpiles, plant footprint and the overburden dump should be kept as small as practically possible. Any runoff from these areas should be contained.
- All alien vegetation should be eradicated within the study site and invasive species, as listed in this report should be given the highest priority. Where herbicides are used to clear vegetation, selective and biodegradable herbicides registered for the specific species should be applied to individual plants only.
- Boreholes should only be pumped at sustainable yields. More boreholes spread over a larger area and pumped at lower rates should decreased the drawdown effect.
- Surface areas below workshops and wash bays should be lined to prevent poor quality seepage from reaching the aquifer and contaminating the underlying groundwater. Surface areas should be bunded to prevent clean surface water runoff from being contaminated by dirty surface areas. Spills should be cleaned up immediately.
- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration. Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be constructed.
- Set the speed limit for on-site hauling vehicles and other vehicles to 40 km/h, and off-site hauling vehicles to 60 km/h on unpaved roads. Actively enforce the speed limits specified.
- Dust suppression to be conducted on a regular basis. Chemical treatment of access roads to minimise dust generation utilising water conservation strategies such as ‘Dust-a-side’.
- Monitoring emissions from the Syngas facility to ensure air quality standards are not exceeded.
- Machinery and vehicles can be fitted with silencers/mufflers to reduce noise. All staff/contractors on-site are required to wear the PPE. Identify sensitive receptors and conducted noise monitoring if required. Use of low-noise generation plant and equipment. All plant, equipment and vehicles are to be kept in good repair.

- Off-site hauling of the product should be limited to daylight hours.
- A service/maintenance plan must be compiled and implemented. The plan must encompass procedures to minimise any impacts on the surrounding environment.
- Establish a future forum with representation from the workforce to discuss potential difficulties and solutions.
- Consultation and Feedback on results on a regular basis

9.2.4 Decommissioning and Closure Phase

- All temporary stockpile areas, litter and dumped material and rubble, must be removed during and on completion of mining activities.
- Rehabilitating the area as close to the pre-mining area as close as possible or reach an agreement for post-mining land use. The rehabilitated area must be vegetated with indigenous flora.
- Implement measures to improve current grazing capacity, i.e., seeding.
- Develop a final land use plan and implementation programme as part of the closure plan, taking into account important issues such as ongoing operational and maintenance requirements and long-term responsibilities and ownership.
- Set final closure objectives and standards to ensure conformance to the final land use plan, the requirements of the IAPs and relevant environmental legislation."
- A Re-vegetation and Rehabilitation Manual should be prepared for the use of contractors, landscape architects and groundsmen to rehabilitate areas that became degraded due to mining activities.
- Concurrent rehabilitation is encouraged during the operation of the mine to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.
- Implementation of capacity building programmes to minimize and mitigate the impact of mine downscaling and closure.
- Closure plan implementation

9.3 Reasoned Opinion as to whether the Activity should or should not be Authorised

To be concluded once comments are received on this Draft EIAR.

10 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

10.1 Impact on the Socio-Economic Conditions of any Directly Affected Party

Refer to Section 8.2.10 of this report.

10.2 Impact on any National Estate

Refer to Section 8.2.8 of this report.

10.3 Other Matters Required in terms of Sections 24(4)(A) and (B) of the Act

As indicated in Section 5.1 of this report, no alternatives site locations have been considered as mining can only be undertaken in areas where economically mineable resources occur. This area was established through extensive prospecting and geological modelling. Mine infrastructure and the Beneficiation Development infrastructure to support the projects has been laid out and engineered to best suit the topography and environmental features and is described in Section 2.2 of this report.

The only real alternative to the mine is the No-Go Option. The properties are utilised for livestock grazing. The land belongs to the state and allocated to the Ga-Kibi Traditional Community, and no structures are located on the properties. Based on the socio-economic assessment of the baseline activities, the community has 2996 large livestock units grazing on the properties utilised for own use and income generation. The size of the infrastructure is small, and only 2% of the total properties' extent will be affected. The main consequence of the No-Go Option is the loss of opportunity to develop a viable mineral resource and beneficiation opportunity with an estimated LOM of 20 years which has the potential for increased economic benefits on local, provincial and national level in terms of employment and the contribution to the GDP, as well as further economic opportunities downstream of the beneficiation plant in manufacturing.

Other socio-economic benefits that will be lost include:

- Skills development opportunities
- Community development through LED projects
- Local procurement and SMME opportunities
- Community ownership of mining

10.4 Financial Provision

Refer to Section 7 of the EMPr.

10.5 Time Period for EA

Environmental Authorisation is required for a minimum of 20 years.

10.6 Undertaking

10.6.1 Undertaking regarding correctness of information

I, Lizinda Dickson, herewith undertake that the information provided in the foregoing report is correct and that the comments and inputs from stakeholders and IAPs have been correctly recorded in the report.

Signature of EAP
Date: 13 July 2021

10.6.2 Undertaking regarding level of agreement

I, Lizinda Dickson, herewith undertake that the information provided in the foregoing report is correct and that the level of agreement with IAPs and stakeholders has been correctly recorded and reported herein.

Signature of EAP
Date: 13 July 2021

APPENDIX A: EAP CURRICULUM VITAE

APPENDIX C: MAPS

APPENDIX B: PUBLIC PARTICIPATION REPORT AND RECORDS

APPENDIX D: DEA SCREENING REPORT

APPENDIX E: SPECIALIST REPORTS

Appendix E1: Groundwater Assessment Report

Appendix E2: Surface Water / Hydrology Assessment Report

Appendix E3: Ecological and Biodiversity Assessment Report

Appendix E4: Soil, Land Use and Land Capability Assessment Report

Appendix E5: Social Impact Assessment Report

Appendix E6: Archaeological Assessment Report

Appendix E7: Palaeontological Assessment Report