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Applicant: Tholie Logistics (Pty) Ltd

DEVELOPMENT OF THE PROPOSED COMMISSIEKRAAL COAL MINE INCLUDING SUPPORT SERVICES AND ASSOCIATED INFRASTRUCTURE

ENVIRONMENTAL IMAPCT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

Submitted with due regard to

consultation with communities and interested and affected parties

as required in terms of Regulation 49 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002), and in accordance with the standard directive for the compilation thereof as published on the official website of the Department of Mineral Resources

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COMMISSIEKRAAL COAL MINE INCLUDING SUPPORT SERVICES AND ASSOCIATED INFRASTRUCTURE

EXECUTIVE SUMMARY

Introduction

Tholie Logistics (Pty) Ltd (Tholie Logistics), a junior South African coal exploration and mining company, is proposing to establish a new underground coal mine and related surface infrastructure to support a mining operation.

PROJECT LOCATION	
Province	KwaZulu-Natal (northern, close to the border with Mpumalanga)
District	Amajuba District Municipality
Local	eMadlangeni Local Municipality, Ward 1
Closest towns	28 km north of Utrecht, 36 km west of Paulpietersburg, 27 km east of Wakkerstroom
Topographical features	Undulating mountains of the Magidela mountain range and flatter grasslands which slope gently towards the Pandana River
Catchment	upper reaches of quaternary catchment W42A

Legal framework and process

Given that the project will be a mine and that it incorporates several listed environmental activities, the environmental assessment process and report was done and compiled in accordance with the requirements of the Mineral and Petroleum Resources Development Act, 28 of 2002 (MPRDA) and National Environmental Management Act, 107 of 1998 (NEMA) and the regulations there under. Other approvals/permits have been identified for the project and will be applied for at the required time.

SLR Consulting (Africa) Pty Ltd (SLR) is the independent firm of consultants that has been appointed by the applicant company to undertake the environmental impact assessment (EIA) and related processes. The EIA and EMP report presents the results of the EIA process and provides a detailed description of the project, presents the results of specialist investigations, identifies and assesses potential impacts and recommends mitigation measures should the project be approved. As part of the EIA process, a stakeholder engagement process was conducted using a range of direct and indirect consultation methods. A team of professional specialists were appointed by SLR to investigate potential issues associated with the development of the project. All issues, concerns and comments raised by interested and/or affected parties (IAPs) have been addressed in the EIA and EMP report. This is a **summary** of the EIA and EMP report for the project.

Overview of the project

The main aim of the project is to establish an underground coal mine. In broad terms the project includes underground mining accessed via a boxcut established in the side of the mountain, on-site crushing and screening, temporary stockpiling of coal, and transport off-site by truck to customers directly or via a regional railway siding. Various support infrastructure and services will be required for the project. Surface infrastructure is planned around the mine access boxcut in the north-eastern part of the farm. At closure, all infrastructure will be removed, the boxcut backfilled and the site rehabilitated back to natural environment/cattle farming with controlled grazing. Estimated project timelines and information on the project is provided below.

ESTIMATED PROJECT TIMELINES	
Start construction	Target date is 2017/2018 (subject to regulatory approval, economic considerations and funding)
Duration of construction	Site establishment – within a couple of weeks All earthworks, boxcut development and preparation for civil infrastructure – within six-months
Start operation	Once the box-cut has been established, mining of the coal seam can commence. Target date is within 6 months of construction commencing with a 1 year build up to full production.
Life of operation	Life of mine on current planning is scheduled for 20 years. The first 10 years based on indicated ore reserves while subsequent 10 years based on inferred ore resources. Further exploration, development and optimisation for the mine and ore processing is being investigated and will refine mine plan. The EIA and EMP report covers the 20 year life of mine.

PROJECT DATA THAT PROVIDES PERSPECTIVE ON THE SCALE OF THE PROJECT		
Site	Farm extent	2,461 ha
	Infrastructure footprint	±14.7 ha
	Access	Via upgraded farm access road
Mining	Target mineral	Coal within the Lower Gus Seam – average thickness of 2.6 m
	Mineable area	Approximately 2,000 ha
	Depth of minerals	Average of 72.5 m for first 10 years, then 150 m for next 10 years
	Mining rate	Approx. 480,000 tons per annum per production section
	Crush and screen plant	Capacity: 1 million tons run-of-mine per month – no processing on-site
	Product	Coal of export and Eskom quality
	Waste	Only overburden/waste rock produced by development of boxcut – used for surface infrastructure platform and roads – expected to comprise soil, subsoil, overburden and hard rock.
Resource use	Water demand	Approx. 12,500 m^3 per month at peak (via recycled water generated in the underground mine, with any make-up/potable water requirements sourced from on-site drilled boreholes)
	Power demand (operational)	5.5 MVA from on-site generators temporarily until Eskom supply is installed (new powerline to site will form part of a separate EIA)
Human resources	Staff: construction	Approx. 160
	Staff: operational	Approx. 200 over a 2 shift system
	Times: construction	6 days a week (no Sundays), 1 day-time shift per day
	Times: operational	5 days a week, 2 shifts per day with a day-time shift only on Saturdays (off times and Sunday: critical maintenance only)
	Times: coal transport	6 days a week, daylight hours
	Housing	Temporary on-site camp during construction (if required). No housing on site during operations
Revenue generation	Capital investment	Approx. R428 million
	Annual turnover	Approx. R300 to R400 million

Summary of impacts

Potential impacts associated with the project were identified by SLR in consultation with IAPs, regulatory authorities, specialist consultants and Tholie Logistics. The range of environmental issues considered in the EIA was given specific context and focus through consultation with authorities and IAPs. All identified impacts are considered in a cumulative manner such that the impacts of the current baseline conditions on and surrounding the site and those potentially associated with the project are discussed and assessed together. A summary of the potential impacts (as per Section 8 of the EIA and EMP report), associated with the chosen alternatives (as per Section 3 of the EIA and EMP report), in the unmitigated and mitigated scenarios is provided in the table below. The assessment of the project presents the potential for significant impacts to occur on the bio-physical, cultural and socio-economic environments in the unmitigated scenario.

TABULATED SUMMARY OF POTENTIAL IMPACTS			
Section	**Potential impact**	**Significance of impacts**[1]	
		Unmitigated	**Mitigated**
Topography	Hazardous excavations	High	Low
Soils and land capabilities	Loss of soil resources and associated natural land capabilities	Medium	Low
Biodiversity	Physical loss of biodiversity	High	Medium to Low[2]
	General disturbance of biodiversity	High	Medium to Low[2]
	Loss or disturbance of aquatic ecosystems	High	Medium
Water	Loss of water affecting third party users	High	Medium to Low[2]
	Contamination of water	High	Medium to Low[2]
Air quality	Increase in air pollution	High	Medium to Low[2]
Noise	Increase in disturbing noise levels	High	Medium to Low[2]
Visual	Negative landscape and visual impact	High	Medium
Land use	Impact on surrounding land uses	High	Medium to low[2]
	Blasting hazards	High	Low
	Project-related road use and traffic – reduced road conditions	High	Low
	Project-related road use and traffic – safety related aspects	High	Medium
Heritage (and cultural)	Destruction of heritage resources	High	Low
	Disturbance (indirect) of heritage resources	Medium	Low
Socio-economic impacts	Loss of mineral resources through sterilisation	Negligible	
	Economic impact (positive and negative)	Medium+	Medium+
	Inward migration and social ills	High	Low
	Relocation	High	Low

Notes: [1] Ratings are negative unless otherwise indicated
[2] Mitigated rating depends on effectiveness of mitigation measures

In most instances, impacts are easily managed and the post mitigation significance can be reduced to low. This is mainly due to the reduced footprint of surface infrastructure (approximately 14.7 ha of the total farm area of 2,461 ha) and the decision by the applicant to sell all material mined (i.e. no processing plant on site) and to focus on underground coal resources only. The proposed mitigation measures are also not difficult to implement and are known to be reliable. The impacts of the project that are difficult to mitigate prior to closure are the visual impacts.

Due to the sensitivities of the natural environment and/or presence of homesteads within the study area, some impacts require careful monitoring to check that mitigation measures are effective and to ensure that additional measures are implemented if required. These include physical loss and general disturbance of terrestrial and aquatic ecosystems; loss of water supply affecting third party users; contamination of water (at closure due to possible decant); safety-related aspects associated with public roads; and air pollution and noise disturbance at identified receptors in close proximity to the surface infrastructure area and/or haulage route along gravel roads. Key mitigation measures include:

- For water related issues: verification of water users within the predicted impact zone, appropriate design of river crossings, preventing/containing pollution through appropriate design of facilities, ongoing review of water use and management on site, sustainable use of boreholes for water supply, use of suitable techniques to minimise groundwater inflows underground and management interventions to minimise the risk of water contamination post closure (may include management of water levels within the mine void, suitable engineering designs for treatment of decant), treatment of discharge water (where required) to agreed standards, monitoring and additional corrective actions if mine-related loss occurs
- For biodiversity related issues: implement above measures to mitigate impacts on water resources, limit the footprint and restrict activities, plan for the preservation, cultivation and re-use of plant species in rehabilitation initiatives, conduct search, rescue and relocation of key fauna species, conduct a desktop reserve determination, establish a nursery to support rehabilitation initiatives, rehabilitation trials during operations and bio-monitoring
- For road related issues: investigate an alternative access point to the site to minimise impacts on the school, establishing a permanent mine access road of suitable standard, consultation with the roads department of any required road improvements on the D699, limiting coal transport activities to day-time only, and monitoring the project's use of public roads from a safety perspective
- For air pollution and/or noise disturbance: relocate homesteads within 500m of the surface infrastructure area, restricting construction to daylight hours only, operating so as to achieve specified control efficiencies, establishing noise screens/acoustic barriers (where required), using alternative reverse alarms, air quality and noise monitoring and a grievance mechanism

In the case of people related impacts, the assessment focused on third parties only and did not assess health and safety impacts on workers because the assumption was made that these aspects are separately regulated by health and safety legislation, policies and standards.

The project is expected to generate significant economic benefits when compared to alternative land uses for the project site. Nearby communities are expected to benefit both directly and indirectly. Direct economic benefits will be derived from wages, taxes and profits on a local and/or national scale. Indirect economic benefits will be derived from the procurement of goods and services and the increased spending power of employees. The overall benefits of the project to the local and national economies are positive. These positive socio-economic impacts could be greatly enhanced through a socio-economic investment programme that focuses on skills development, learnership programmes and local economic development initiatives that have a social and/or biodiversity focus.

Conclusion

Given the findings of this study, it is possible for Tholie Logistics to develop the mine with significant positive economic impacts (including secondary positive social impacts) and medium or medium to low impact on the environment on condition that the mine is operated in a responsible manner, recommendations contained in this report are implemented and where monitoring indicates an area of concern (if applicable), corrective actions are implemented without delay.

COMMISSIEKRAAL COAL MINE INCLUDING SUPPORT SERVICES AND ASSOCIATED INFRASTRUCTURE

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ACCRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used in this report.

Acronyms / Abbreviations	Definition
%	Percentage
Al	Aluminium
ARV	Anti-Retroviral
ABA	Acid-base accounting
ASAPA	Association for Southern African Professional Archaeologist
BID	Background information document
Ca	Calcium
$Ca\text{-}HCO_3$	Calcium-bicarbonate
CO	Carbon monoxide
CO_2	Carbon dioxide
CWP	Community Work Programme
DEA	Department of Environmental Affairs
DRDLR	Department of Rural Development and Land Reform
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
DAFF	Department of Forestry and Fisheries
EAP	Environmental Assessment Practitioners
EAPSA	Environmental assessment practitioner of Southern Africa
EIA	Environmental impact assessment
EMP	Environmental management programme
Fe	Iron (Fe)
GDP	Gross Domestic Profit
GVA	Gross Value Added
GIS	Geographical Information Systems
Ha	Hectare
HGV	Heavy Goods Vehicle
HSRC	Human Sciences Research Council
IAPs	Interested and/or affected parties
IBA	Important Bird Area
IDP	Integrated Development Plan
K	Potassium
km^2	Square kilometres
LOM	Life of mine
LPG	Liquefied petroleum gas
$L_{Aeq,T}$	*continuous noise level over the measurement period – used as the ambient noise level*
L_{A90}	*the noise level exceeded for 90% of the measurement period*
L_{Amax}	*maximum noise level during the measurement period.*
L_d	*Day level*
L_n	*Night level*
m	Meters
mamsl	meters above mean sea level
m/s	meters per second
m^2	Square meter

Acronyms / Abbreviations	**Definition**
m^3	Cubic meter
MAR	Mean annual runoff
mamsl	metres above mean sea level
mbgl	Metres below ground level
Mg	Magnesium
Mn	Manganese
$Mg\text{-}HCO_3$	Magnesium-bicarbonate
mm	millimetres
Mn	Manganese
MRA	Mining right Application
MPRDA	Mineral and Petroleum Resources Development Act
N	Nitrogen
NAAQS	National Ambient Air Quality Standards
Na	Sodium (Na)
NDP	National Development Plan
NEMA	National Environmental Management Act
NO_2	Nitrous oxide
Non-PAG	Non-potentially acid generating
NWA	National Water Ac
^{O}C	Degrees Celsius
$PM_{2.5}$	Particulate matter with a fraction smaller than 10µm (microns)
PM_{10}	Particulate matter with a fraction smaller than 2.5µm (microns)
PrSciNat	Registered professional in natural science
ROM	Run-of-mine
SACNSP	South African Council for Natural Scientific Professionals
SANDCR	South African national dust control regulations
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SLR	SLR Consulting
SAS	Scientific Aquatic Services
SDF	Spatial Development Plan
SO_2	Sulphur dioxide
SO_4	Sulphate (SO_4)
TDS	Total dissolved solids
TSF	Tailings storage facility
TSP	Total suspended particles
US EPA	United States Environmental Protection Agency
WARMS	Water Use Authorisation and Registration Management System

COMMISSIEKRAAL COAL MINE INCLUDING SUPPORT SERVICES AND ASSOCIATED INFRASTRUCTURE

1 INTRODUCTION AND LEGAL FRAMEWORK

Introduction

Tholie Logistics (Pty) Ltd (Tholie Logistics), a junior South African coal exploration and mining company, holds the prospecting right (No. KZN 30/5/1/1/2/155PR) for coal over the farm Commissiekraal 90HT, located approximately 28 km north of Utrecht and 36 km west of Paulpietersburg in the eMadlangeni Local Municipality and the Amajuba District Municipality, KwaZulu-Natal (Figure 1).

Tholie Logistics is proposing to establish a new underground coal mine and related surface infrastructure to support a mining operation. At this stage in project planning, surface infrastructure will be located around the mine access area in the north-eastern part of the project site (Figure 2). In broad terms the project includes underground mining accessed via a boxcut, on-site crushing and screening, temporary stockpiling of coal ore, and transport off-site by truck to customers directly or via a regional railway siding. Various support infrastructure and services will be required for the project. The Commissiekraal farm covers an area of approximately 2,461 ha. The total footprint of surface infrastructure is approximately 14.7 hectares (ha). Access to the site will be provided by upgrading and extending the existing farm access road.

The environmental assessment process must be conducted in terms of both the Mineral and Petroleum Resources Development Act, 28 of 2002 and the National Environmental Management Act (NEMA), 107 of 1998. Both laws apply because the project is a mine and it incorporates a number of listed/identified activities in terms of the NEMA. Aspects of the project will also require a water use license in terms of the National Water Act (NWA), 36 of 1998.

Decisions required and legal framework

<u>Primary approvals</u>

Prior to the commencement of the project, environmental authorisation is required from key government departments. These include:

- Environmental authorisation from the Kwa-Zulu Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) in terms of the National Environmental Management Act, 107 of 1998 (NEMA). The project is being undertaken in terms of the 2010 EIA regulations as the application for environmental authorisation was submitted prior to 8 December 2014. The project incorporates several listed environmental activities (refer to Section 3.5).
- An environmental decision from the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Development Act (MPRDA), 28 of 2002 in the form of an approved environmental impact assessment (EIA) and environmental management programme (EMP) report.

FIGURE 1: REGIONAL SETTING OF THE PROJECT AREA

FIGURE 2: LOCAL SETTING OF THE PROJECT AREA

This report is the environmental impact assessment (EIA) (Section 1) and environmental management programme (EMP) (Section 2) for the project. Given the legal framework above, this report has been compiled to meet the requirements of the EIA Regulations and MPRDA Regulations. To assist with cross-referencing in the report, the chapter numbering in the EMP section follows on from the chapter numbering in the EIA section.

In terms of Regulation 543 of the 2010 EIA Regulations, Table 1 provides a guide to the relevant sections where the information is contained.

TABLE 1: REQUIREMENTS FOR EIA AND EMP REPORTS

Environmental Regulation 385	**Section in report**
Environmental impact assessment (EIA)	
Description of the property and location of the activity on the property	2.3.1 and 2.4
Details of the person who compiled the EIA, and his/her expertise	Introduction
Details on the public involvement process including –compliance with the PSS, IAP database, issues table, additional comments/objections	11, Appendix A, Appendix B, Appendix C and Appendix D
Comment on the need and desirability of the proposed activity(ies) in the context of alternatives	Introduction
Description and comparative assessment of alternatives identified during the EIA	9
Description of proposed activity(ies)	3
A description of the environment that may be affected by the activity	2
Methodology used to determine impact significance	8.3
Summary of findings and recommendations of specialist reports	Throughout document
Description of environmental issues, assessment of significance, and extent to which these can be mitigated	8
Assessment to include: cumulative impacts, nature, extent, duration, probability, reversibility of resource loss, mitigation	8
Assumptions, uncertainties and knowledge gaps	12
Provide an authorisation opinion – with possible conditions	28
Environmental impact statement – summary of key findings and comparative assessment of the positive and negative implications of the activity and alternatives	28
Specialist reports as appendices	See appendices
Environmental management programme/plan (EMP)	
Details of the person who compiled the EMP, and his/her expertise	Introduction
Detailed description of the activity aspects covered in the EMP	3
Details on the management/mitigation measures from planning and design stages through to closure (where relevant)	8 and 20
Time frames for implementation where appropriate	20
Identification of responsible persons for implementation	20

Secondary approvals / permits

Secondary approvals/permits needed for the project are listed below. In this regard, there are other approvals that are required prior to construction and/or commissioning of the mining and related activities. This list does not cover occupational health and safety legislation requirements.

- A water use licence or a general authorisation from the Department of Water and Sanitation (DWS) in terms of the National Water Act (NWA), 36 of 1998. This will include application for exemption from Regulation 704 of 4 June 1999. Water uses could include taking water from a resource (dewatering and water supply), storing water (in a pollution control dam, water supply tanks, service water tanks), impeding or diverting the flow of water in a watercourse, engaging in a stream flow reduction activity (for monitoring purposes), altering the bed, banks, course or characteristics of a watercourse, discharging waste or water containing waste into a water resource (if required for water management), discharging of waste (if required for coal stockpiles), removing/ discharging/ disposing of water found underground (dewatering). This application and supporting documentation will be compiled at the end of the EIA process once the relevant project detail is available.
- All dams with both a wall greater than 5m and a capacity of 50 000m^3 must be registered as safety risk dams with DWS in terms of the National Water Act, 36 of 1998.
- Prior to operating the sewage plant, Tholie Logistics or its contractor will obtain a registration of both the sewage plant and the required personnel from DWS in terms of Regulation 2834 of 27 December 1965.
- Prior to upgrading any roads or intersections, the necessary approval will be obtained from the relevant Department of Roads and Transport in terms of the relevant Provincial Road Ordinance.
- Prior to damaging or removing heritage resources such as graves or historical remains, permissions are required in terms of the National Heritage Act, 25 of 1999, the Ordinance on Exhumations, 12 of 1980, and/or the Human Tissues Act, 65 of 1983.
- Prior to removing or damaging any protected plant species, the necessary permits will be obtained from DWA in terms of the National Forests Act, 84 of 1998.
- Prior to storage, handling, transportation and disposal of explosives the relevant licenses and written permissions are required in terms of the Explosives Act, 25 of 1956, and the Mine Health and Safety Act, 29 of 1996, as amended.
- If and when applicable, re-zoning of the project site from agricultural to mining in terms of legislation relevant at the time.

EIA approach and process

A summary of the approach and key steps in the combined EIA process and corresponding activities are outlined in Table 2.

TABLE 2: EIA PROCESS

Objectives	Corresponding activities
Pre-application phase (May 2013 and August 2014)	
• Gather information relevant to the project site to inform any application processes	• Initial social scan of the project area conducted by SLR (May 2013) • Focussed biodiversity workshop (12 August 2014)
Project initiation and application phase (November 2014 to January 2015)	
• Notify the decision making authority of the project • Initiate the environmental impact assessment process	• Mining right application submitted by Tholie Logistics to DMR on 18 November 2014. Application accepted on 29 January 2015 • NEMA application for listed activities submitted to DEDTEA on 18 November 2014. Application accepted on 5 December 2014
Scoping phase (March – June 2015)	
• Identify interested and/or affected parties (IAPs) and involve them in the scoping process through information sharing • Identify potential environmental issues associated with the proposed project • Consider alternatives. • Identify any fatal flaws • Determine the terms of reference for the EIA	• Notify IAPs of the project and environmental assessment process (social scans, distribution of BIDs, newspaper advertisements, telephone calls and site notices) • Submission of initial scoping report to DMR (to meet timeframes outlined in the mining right acceptance letter) (11 March 2015) • Public scoping meetings with stakeholder groups (26 March 2015) • Distribute scoping report to IAPs and other regulatory authorities for review (10 April 2015) (40 day review period) • At the same time submit a copy of the scoping report to DEDTEA • Record comments (in writing) (April to June 2015) • Regulatory authority site visit (17 June 2015) • Forward scoping report including IAP review comments to DEDTEA for review (18 June 2015) • Forward updated scoping report including IAP comments to the DMR (18 June 2015) • At the same time notify IAPs of the availability of the final scoping report
Detailed specialist investigations (October 2014 to October 2015)	
• Describe the affected environment • Define potential impacts • Give management and monitoring recommendations	• Investigations by appointed specialists (see Table 3) of issues identified during the scoping stage including investigations into alternatives
EIA and EMP phase (July 2015 to early 2016)	
• Assessment of potential environmental impacts • Design requirements and management and mitigation measures • Receive decisions on application	• Compilation of the EIA and EMP report • Distribute the EIA and EMP report to IAPs, DMR and other regulatory authorities for review (mid October 2015) • At the same time submit a copy of the EIA and EMP report to DEDTEA • Feedback meetings with IAPs (early November 2015) • Record comments (October to December 2015) • Forward EIA and EMP report including IAP comments to DEDTEA for review and decision making (mid December 2015) • Notify all registered IAPs of the decisions and appeal procedures (expected during the first quarter of 2016)

EIA team

SLR Consulting (Africa) (Pty) Ltd (SLR) is the independent firm of consultants that has been appointed by the Tholie Logistics to undertake the environmental assessment and related processes. Alex Pheiffer (project manager) has a Master's Degree in Environmental Management and approximately 14 years of relevant experience and is registered with the South African Council for Natural Scientific Professions (SACNSP) as a professional natural scientist (PrSciNat) (Environmental Management). Brandon Stobart (reviewer) has 17 years of relevant experience and is certified as an Environmental Assessment Practitioner (EAP) with the Interim Certification Board of Environmental Assessment Practitioners of South Africa (EAPSA).

Neither Alex, Brandon nor SLR has any interest in the project other than fair payment for consulting services rendered as part of the environmental assessment process.

The environmental project team comprises SLR environmental assessment practitioners, specialist consultants and the technical project team (Table 3).

TABLE 3: PROJECT TEAM

Name	Designation	Tasks and roles	Company
Environmental impact assessment and public involvement team			
Alex Pheiffer	Project manager	Management of the assessment process, stakeholder engagement and report compilation	SLR
William Berry	Project administrators		
Natasha Daly			
Ntsako Baloyi			
Brandon Stobart	Project reviewer	Report and process review	
Specialist environmental assessment consultant team			
Mariné Pienaar	Soil and land use specialist	Soil, land use and land capability study	TerraAfrica
Stephen van Staden and Emile van der Westhuizen	Ecological specialists	Terrestrial and aquatic ecological study	Scientific Aquatic Services
Luke Wiles	Hydrologist	Surface water study	Highlands Hydro
Paul Klimczak	Hydrologist	Climatic water balance study	SLR
Martin Holland	Hydrogeologist	Groundwater study	Dellta-H
Darren Lafon-Anthony	Noise specialist	Noise study	SLR
Tom Green, Joanna Read and Sarah Richards	Traffic specialists	Traffic study	SLR
Dr Julius Pistorius	Heritage specialist	Heritage study	Dr Julius Pistorius
Professor Marion Bamford	Paleontological specialist	Paleontological desktop study	BPI for Paleontological Research
Steve van Niekerk	Engineer	Closure cost estimate	SLR
Jenny Ellerton and Terry Harch	Hydrologist	Geochemical analysis	SLR and Solution H+
Hanlie Liebenberg-Enslin and Natasha Greese	Air quality specialists	Air quality study	Airshed Planning Professionals
Zama Khumalo and Liza van der Merwe	Social specialists	Social study	SLR
Werner Neethling	Economist	Economic assessment	Mercury Financial consultants

Name	Designation	Tasks and roles	Company
Client Technical project team			
Heye Daun	Project Manager	Technical input	Bright Resources
Eugene de Villiers	Mine specialist	Mine works programme and technical input	ECMA
Mosidi Mphahlele	Social and labour plan specialist	Social and labour plan	Mphahlele Wessels and Associates

Contact details for responsible parties

Details of the applicant are provided in the table below.

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Tholie Logistics (Pty) Ltd (Tholie Logistics) was originally formed by Mrs Tholie Cibane to apply for and develop coal prospecting rights in northern KwaZulu-Natal. Tholie Logistics entered into a strategic partnership agreement whereby financial and technical partners in the form of the Bright Group and some other individuals were introduced to the company during the years 2008 to 2010. During 2012 some additional assets were introduced to append a neighbouring prospecting right, thereby consolidating the prospecting area. In the same year, Tholie Logistics underwent a series of organisational changes in order to set the company up for optimal management, administration and funding, and to prepare them for the planned mining right application (MRA) over its project area, once the prospecting had advanced sufficiently. Tholie Logistics is now a sole operating entity.

Project Motivation (Need and Desirability)

Based on the exploration work conducted on the farm Commissiekraal 90 HT, Tholie Logistics found a feasible ore body that it believes is worth developing. Tholie Logistics will produce Eskom and export quality coal to suit market demand. The anticipated market prices in the medium and long-term are considered to be favourable for project development. The project is anticipated to create approximately 200 operational jobs, having a positive impact on both indirect businesses and employment.

On the 20th of October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. The key components are listed and discussed below:

- Securing ecological sustainable development and use of natural resources
- Promoting justifiable economic and social development.

Securing ecological sustainable development and use of natural resources

A full suite of detailed studies on the environment were conducted for the proposed project. Key findings are summarised in the relevant baseline sections and indicate sensitivities within the mining right application area related to biodiversity, land use including residential areas, water quality and flow. The proposed mine plan has taken all identified sensitives into account and adjusted the project plan as follows:

- Underground mining is proposed in order to minimise surface disturbance and avoid diverting the Pandana River even though the open pit option would be the preferred alternative from an economic perspective
- Surface infrastructure has been limited to the less sensitive transformed grassland habitat
- Infrastructure will be kept out of the wetland and river buffer zones, with the exception of the mine access road which must cross various non-perennial watercourses. However these watercourse crossings will be constructed in a manner that they do not impede normal flow conditions
- The proposed project excludes on-site coal washing in order to minimise surface disturbance and pollution sources related to a discard dump that would remain in perpetuity
- Specific management measures have been developed in order to minimise surface disturbance and associated impacts on natural resources and people within the zone of influence.

The findings of the full suite of specialist studies found that the potential impacts associated with the current mine plan as outlined above can be mitigated to an acceptable level, assuming effective implementation of the management and mitigation measures. Specific management and mitigation measures are outlined in the EMP.

Promoting justifiable economic and social development

In terms of planning frameworks, the project is aligned with the following:

- Amajuba/Emadlangeni Integrated Development Plan (IDP) 2014/2015 – providing coal mining opportunities is one of the five project fields identified in the IDP
- Amajuba/Emadlangeni Draft Spatial Development Framework (SDF) 2012 – the SDF lists mining as one of the focus areas in their vision
- National Development Plan (NDP) – specifically identifies the need and importance of mining activities within South Africa.

A social and economic impact assessment study was conducted for the proposed project. The social impact assessment addressed potential impacts of inward migration such as:

- Potential establishment of informal settlements
- Increased pressure on shared community resources (water, energy, building materials) and services (sanitation, waste management, infrastructure)
- Increased pressure on health care capacities which are already limited
- Increase in social ills (including crime, poaching and prostitution)

- Disruption of existing social structures or change in social cohesion
- Introduction and/or spread of disease, most notably HIV/Aids and tuberculosis but also including communicable diseases, non-communicable and other sexually transmitted infections
- General threat to the safety and security of an area
- Increased trespassing on private farm land due to poor control of employees and contractors can lead to.

These potential social impacts were assessed as moderate in the unmitigated scenario, with mitigation reducing these to an acceptable level. Specific management and mitigation measures are outlined in the inward migration management plan provided in EMP.

A comparative land use assessment was undertaken by an economic specialist in order to meet the requirements of Regulation 50 of the MPRDA (Act no. 28 of 2002) (Appendix). Regulation 50 has two distinct components, the first being a straight analysis of the economic value of land between a mining project and the alternative land-use, and the second being an opinion on the sustainable development quality of the project relative to the alternative land-use. The results are as follows:

- Mining outweighs the current land use activities from an economic perspective (job creation, contribution to the economy)
- The project will be positive from a sustainability perspective.

SECTION 1 – ENVIRONMENTAL IMPACT ASSESSMENT

2 DESCRIPTION OF THE BASELINE ENVIRONMENT

This section provides a description of the current baseline conditions of the project site and surrounding areas within which the project will be undertaken. Each discussion provides a link to anticipated impacts and highlights the relevance of the information provided, identifies how data was collected (either by the specialist and/or SLR) to inform the baseline description, provides the results/outcomes of research and/or studies undertaken and concludes with the main findings as relevant to the impact assessment and management plan.

The environmental aspects are discussed as follows:

- baseline description of bio-physical environment (Section 1.1)
- baseline description of land uses, socio-economic conditions, heritage and cultural aspects (Section 1.3).

Key environmental aspects requiring protection or remediation are identified in Section 2.2. Maps showing environmental features on and off site are included in Section 2.4 and cross-referenced in the relevant baseline descriptions. A list of supporting specialist information used in the baseline description included in Section 2.5. Assumptions and uncertainties identified by the specialist studies are outlined in Section 12.

2.1 ON-SITE ENVIRONMENT (BIO-PHYSICAL) RELATIVE TO SURROUNDING ENVIRONMENT (BIO-PHYSICAL)

2.1.1 GEOLOGY BASELINE

The geology, geological processes and associated structural features and stratigraphy of a particular area influence the the type of soils present since the soils will be derived from the parent rock material (discussed further in Section 2.1.3), the presence and quality of groundwater and the movement of the groundwater in the rock strata (discussed further in 2.1.6), the presence of paleontological resources in the rock strata (discussed further in Section 2.3.3), and the presence of economical reserves (discussed further in Section 3. The potential for acid rock drainage and groundwater pollution is discussed in Section 4.3.

2.1.2 TOPOGRAPHY BASELINE

Introduction and relevance to project

The topography of a particular area will determine the following factors:

- the flow of surface water, and in many cases, also groundwater
- the depth of soils and the potential for soil erosion, for example, in the case of steep slopes
- the type of land use, for example flat plains are more conducive to crop farming

- the aesthetic appearance of the area.

The topography can also influence climatic factors such as wind speeds and direction, for example, wind will be channelled in between mountains and along valleys.

Project-related activities have the potential to alter the topography of the site through the establishment of surface infrastructure and mining method chosen. Depending on the design and layout of the project, this in turn could result in changes to drainage patterns, landforms which could prove hazardous to people and animals, as well as changes to the visual character. As a baseline, this section provides an understanding of the topographical features relevant to the project site and surrounding area from which to measure potential change.

Data collection

Data on topography was sourced by SLR through the studying of topographical GIS data, an aerial survey of the project area conducted by Tholie Logistics (March 2015), satellite imagery and observations made by the SLR and specialist team during site visits.

Results

The project area is comprised of undulating mountains of the Magidela mountain range and flatter grasslands which slope gently towards the Pandana River. The low mountains are separated from the undulating hills and low lands by a distinct escarpment, which crosses the area in a north - south direction, turning east - west near Wakkerstroom. The northern part of the farm is relatively flat and low-laying compared to the surrounding western and southern parts which are mountainous and therefore on a higher elevation than the northern flat stretch of land. The higher mountainous terrain lies at an altitude of between 2020 metres above mean sea level (mamsl) in the southern sections of the farm to 1620 mamsl in the central parts. The low laying areas lie at an altitude of between 1500 and 1440 mamsl. The Pandana River flows in a northerly direction through the centre of the Commissiekraal farm where it turns east towards the confluence with the Pongola River (Figure 3). The lowest point in the project area, at an approximate altitude of 1436 mamsl, is on the northern most boundary of the farm, in the Pandana River channel.

The steeper parts of the project area have an average gradient of 13%. The lower laying areas have an average gradient of 3%. Limited activities (some disturbance due to agriculture) have taken place on site and in the surrounding area to alter the natural topography.

Conclusion

Topographical characteristics vary across the project area. Project infrastructure has been positioned near the base of the steeper mountainous topography to allow for as direct as possible access to the ore body. Due to the gradient of the project site it will be necessary to establish a platform for surface infrastructure.

The topographical data of the project area has been used to determine the behaviour of surface water and floods which in turn has been used to inform the project's stormwater management plan. The design of project landforms and infrastructure should be such that any changes to topography result in stable topographic features which do not pose significant risk to third parties and limit impacts on the visual character of the area.

2.1.3 SOIL AND LAND CAPABILITY BASELINE

Introduction and link to anticipated impact

Soil is a vital component of life on earth. It supports a variety of life forms and plants and creates new soil by breaking down rocks and sand. Furthermore, soil characteristics determine the natural capability of land. Soil resources have the potential to be lost through physical disturbance, erosion by wind and water, and contamination. As a baseline, this information will be used to identify sensitive soil types, to guide the mine in the preservation of soil and rehabilitation of disturbed land and aid in informing an end land use for the project site.

Data collection

Information in this section was sourced from the soil and land capability specialist study (TerraAfrica, 2015) (Appendix E) and should be read with reference to Figure 4 and Figure 5.

Data collection was done through review of published reports and maps and verification of site specific data through field work and collection of soil samples for analysis work. Agricultural potential was determined through KwaZulu-Natal's Bioresource Units (BRUs). Further detail on the methodologies used is provided in the specialist report (Appendix E).

The Chamber of Mines Guideline document (Chamber of Mines 1991) was used to classify the soil units identified during the soil survey. The land capability of the study area was classified into four classes (wetland, arable land, grazing land and wilderness). A total study area of 411ha was investigated and mapped.

Results

<u>Soil forms and characteristics</u>

Sixteen different soil forms were identified within the study area (Figure 4), each of which is described below.

Champagne soil form (Ch) (4.36ha or 1% of the total study area)

The Champagne soil form is the only representative of organic soils in South Africa and is subdivided into four families. Rietfontein in which humified organic material is dominant and underlain by unconsolidated material is the family found on Commissiekraal. Soils of the Champagne form are only found in bottomland sites in the cool mountain regions. Unlike all other soil forms, these soils occupy disparate areas and never constitute a major soil spatially within the landscape. Organic soils are commonly associated with wetlands and their importance does not lie in the total area covered but in the particular ecological niche that they occupy being the region between that occupied by permanent free-standing water and the mineral soils upslope. They moderate stream flows, act as natural filters for sediment and pollutants and form a unique natural habitat for a range of fauna and flora.

Lusiki soil form (Lu) (7.1 ha or 1.73% of the study area)

The Lusiki soil forms consist of A horizon that has low base status, consists of freely drained topsoil horizons which have accumulated relatively large amounts of humified organic material in moist climates that are cool or cold and a B horizon that has a moderately to strongly developed sub-angular or angular blocky structure in the moist state. These soils can be used for the production of sugarcane, maize, forestry and vegetable crops although nutrient deficiencies and soil acidity are to be expected. These soils are also resistant to erosion. Under natural grassland the erosion risk is low because of both structural stability and plant cover.

Sweetwater soil form (Sr) (1.2 ha or 0.29% of the study area)

Soil of the Sweetwater form occurs on the boundary of the wetland areas identified in the study area. This form consists of a A-horizon which in the study area is 20 cm deep, has accumulated large volumes of organic matter and has very dark colours. The thinner horizons (typically 50 cm or more) occur at cooler, higher elevations further inland as in the case of the Commissiekraal site. This horizon is very well-drained. The B-horizon is multi-coloured and although clay accumulation has resulted in structure development, the structure of this horizon is not strong. The soils of the Sweetwater soil form are also part of the humic soils and can also be used for the production of sugarcane, maize, forestry and vegetable crops. Nutrient deficiencies and soil acidity are to be expected as in the case of the Lusiki soil form. These soils are also resistant to erosion, especially when under natural grassland.

Katspruit soil form (Ka) (6.05 ha or 1.47% of the study area)

The Katspruit soil form consists of an orthic A horizon and in this area on a non-calcareous G horizon and thus belonging to the Lammermoor family. The A horizon has a very dark greyish-brown colour with medium faint grey and/or olive mottles. The texture is a medium sandy loam. The G horizon is saturated with water for long periods and is dominated by grey, low chroma matrix colours often with blue or green tints. This soil form is associated with wetland land capability and usually indicates the presence of seasonal or permanent wetlands.

Longlands soil form (Lo) (10.3% or 2.51% of the study area)

The Longlands soil form consists of an orthic A horizon (30 cm) overlying an E horizon that is underlain by a soft plinthic B horizon. A fluctuating water table has resulted in the accumulation of ferric oxides sufficient to form a soft plinthic B horizon in the lower part of what would otherwise have been a thick E horizon. This soil form is therefore associated with wetland land capability. The Longlands soil form has a moderately high degree of weathering, depletion of bases and moderate acidity and a sandy loam texture. The soil needs lime and broad-spectrum fertilising for crop production but low buffer capacity will lead to rapid acidification if nitrogen is applied to generously. Groundwater vulnerability would be high in the case of pollution. Lateral discharge through the E and B horizons would result in the toe slope reception area being affected by a plume of polluted water. The soil on the study site belonging to the Longlands soil form has a depth of 120 cm and will thus not present problems with rooting depth and periodic waterlogging for crops like maize. Plinthic soil is not regarded as being a good choice for forest plantations because of poor internal drainage.

Constantia soil form (Ct) (81.6 ha or 19.89% of the study area)

The Constantia soil form consists of an orthic A horizon, overlaying an E horizon which is underlain by a yellow-brown apedal B horizon. The E horizon is a greyish horizon which is usually paler in colour as the overlying topsoil or the horizon which underlies it. The yellow-brown apedal B horizon has structure that is weaker than moderate blocky or prismatic in the moist state. A podzolic character is absent beneath the yellow-brown apedal B horizon which place the Constantia soil form found on the study site in the Potberg family. Soils of the Constantia soil form are deep and generally highly suited to cultivation.

Avalon soil form (Av) (14.17 ha or 3.45% of the study area)

The Avalon soil form consists of an orthic A horizon (35 cm deep on the Commiesiekraal site) on a yellow-brown apedal B horizon overlying a red-mottled, soft plinthic B at a depth of about 1 metre. The yellow-brown apedal B horizon has structure that is weaker than moderate blocky or prismatic in the moist state.

Avalon soil has usually a loamy texture with moderate organic matter status and is well drained. It is usually acidic and extremely low in bases. Phosphate status is low and P sorption capacity is moderate to high. Dolomitic lime would be needed to achieve good crop yields and fertilizer containing Zn would also be advisable. The soil is highly suited to dryland crop production, subject to appropriate chemical amelioration.

Glencoe soil form (Gc) (52.5 ha or 12.77% of the study area)

The Glencoe soil form consists of an orthic A horizon, overlying a yellow brown apedal B horizon on a hard plinthic B. The Glencoe soil form differs from Avalon form only on the basis that the soft plinthic horizon of the Avalon form is replaced by a hard plinthic horizon. Glencoe soil has a moderately high degree of weathering, depletion of bases and no significant acidity, sandy loam structure and a morphology which indicates a fluctuating water table. Available phosphorous (P) is very low. The soil is suited to dryland crop production if the plinthic layer is deeper than 60 cm and appropriate fertilization is applied.

Pinedene soil form (Pn) (34.47 ha or 8.39% of the study area)

The Pinedene soil form consists of an orthic A horizon overlying a yellow-brown apedal B horizon that is underlain by unspecified material with signs of wetness. The Pinedene soil form has a moderately high degree of weathering, depletion of bases and moderate acidity and a sandy loam texture. Dolomitic lime would be needed to achieve good crop yields. The soil is suited to dryland crop production, subject to appropriate chemical amelioration.

Griffin soil form (Gf) (2.95 ha or 0.8% of the study area)

The Griffin soil form consists of an orthic A horizon, overlying a yellow brown apedal B horizon on a red apedal B. The Griffen soil form is one of the apedal oxidic soils of which the tillage is much easier and erosion less prevalent than with many other soil groups. The oxides provide a micro-aggregating effect which reduces the dispersive nature of fine particles. In high rainfall areas the more leached apedal forms may be deficient in a number of nutrients (base cations and even trace elements such as zinc and boron). Subsoil acidity is also a problem in summer rainfall areas. With the application of lime or gypsum to rectify the pH and appropriate chemical amelioration good crop yields can be achieved.

Magwa soil form (Ma) (1.14 ha or 0.28% of the study area)

The Magwa form consists of a humic A horizon on a yellow-brown apedal B horizon. The yellow-brown, luvic B horizon, contains kaolinite, aluminous chlorite and mica. Acidity, exchangeable aluminium and buffer capacity are substantial, especially in the topsoil. The buffer capacity and high water holding capacity are associated with the high organic matter content. Despite the high water retention the well aggregated structure of the soil causes it to drain freely and be well aerated. Plant nutritional problems are likely to occur mainly because of the extremely low reserve of exchangeable bases while some trace element deficiencies may also be expected. Because of the low clay content it would be important to use this soil in such a way as to ensure the conservation of organic matter.

Sepane soil form (Se) (6.26 ha or 1.53% of the study area)

The Sepane form has a coarse sandy clay loam, overlying a pedocutanic B horizon, underlain by unconsolidated material with signs of wetness. Soils of the Sepane soil form can be productively used under irrigation but have extractable P and Zinc levels are markedly deficient. Being a duplex soil it is also very susceptible to hard setting (soils that set to a hard structureless mass during drying and are thereafter impossible to cultivate) and erosion. On the positive side neither salinity, nor sodicity are predominant.

Valsrivier / Valswater soil form (Va) (0.75 ha or 0.18% of the study area)

The Valsrivier soil form is also a duplex soil and very similar to Sepane. This profile consists of a deep clay loam, formed in gneissic colluvium, containing nodules of secondary lime in the B horizon and showing no evidence of wetness at depth. The B-horizon have become enriched in clay by illuviation (a pedogenic process which involves downward movement of fine materials by, and deposition from, water to give rise to cutanic character) and that have developed moderate or strong blocky character. Neither salinity nor sodicity are prevalent. Zinc levels are markedly deficient and extractable P is also very low. Such soils can be productively used under irrigation but the duplex nature means that artificial drainage would have to be taken into consideration. Hard setting and erodibility are two physical conditions to be taken into consideration when stockpiling topsoil during mining activities. The texture of this soil is likely to intensify physical problems such as hard setting and erodibility and makes duplex soils less amendable to use.

Tukulu soil form (Tu) (174.56 ha or 42.47% of the study area)

The Tukulu soil form consists of an orthic A horizon, overlying a neocutanic B horizon on unspecified material with signs of wetness. Soils of the Tukulu soil form are deep and generally highly suited to cultivation. It has signs of wetness beneath the neocutanic horizon which may require careful management in irrigated soils but which generally favours dryland farming with deeper rooted crops.

Nomanci soil form (No) (7.11 ha or 1.73% of the study area)

The Nomanci soil form consists of a humic A horizon, overlying a lithocutanic B horizon. More than 70% by volume of the lithocutanic B horizon is freshly or partly weathered parent bedrock with at least a hard consistence in the dry, moist and wet states. Nomanci soils are environmentally robust in that they can be subjected to a good deal of physical and chemical abuse without markedly eroding or deteriorating. Physical attributes of humic soils and the climatic circumstances on this site make it near ideal for forestry.

Mispah soil form (Ms) (3.47 ha or 0.84% of the study area)

These shallow, rocky soils are dominated by rock or saprolite (weathered rock). These soils have a very shallow (as shallow as 0.10 m) layer of soil on hard rock. The orthic A-horizon of this lithic soil group is unsuitable for annual cropping or forage plants (poor rooting medium since the low total available moisture causes the soil to be drought prone). These topsoils are not ideal for rehabilitation purposes for they are too shallow and/or too rocky to strip. Topsoil stripping and stockpiling of the ‘shallow’ soils should only be attempted where the surface is not too rocky.

Clovelly form (Cv) (2.81 ha or 0.68 % of the total study area)

The Clovelly soil forms consist of a sandy -loam orthic A horizon on a well-drained yellow-brown apedal B horizon overlying unspecified material where limited pedogenesis has taken place. Soil depths of the Clovelly profiles surveyed on site was deeper than 1500 mm. Manganese concretions were observed in less than 5 % of the profile from 1500 mm. Clovelly soils with no restrictions shallower than 500mm are generally good for crop production. The high quality orthic A and yellow-brown apedal B-horizons make it a suitable soil form for annual crop production.

Soil chemistry and fertility

The pH of the analysed soil samples in the study area ranges from 4.07 (extremely acid) to 4.58 (very strongly acid). For successful crop production, a pH of between 5.8 and 7.5 is optimum and crops produced in soils with lower pH may suffer aluminium (Al) toxicities if toxic levels of Al are present. The pH of the soil can be improved by the addition of dolomitic lime or gypsum. However, this process is costly and adds to production costs of crops. Phosphorus levels were as low as expected for natural veld conditions and in soils which are strongly acid (ranging between 1 mg/kg and 2 mg/kg P). The calcium and magnesium levels are marginally deficient at some sampling points but the potassium levels are higher than what is adequate for crop plants but is not considered as toxic and the balance between these three cations could be corrected with chemical fertilizer.

The soil chemistry of the samples analysed indicate that soil at the project site has the chemical suitability for crop production since the addition of dolomitic lime or gypsum to improve low pH is standard practice in most crop production areas. Intensive annual crop production would however require proper fertilization as soil nutrients should be balanced and will get depleted. No serious soil chemical issues such as soil salinity or sodicity occur on site.

Agricultural potential

The study site falls within bioresource unit BRU Yd3. Veld ecotopes identified during the survey are described in Table 4. More than 50 % of the soil ecotopes encountered were well-drained profiles (Symbol A) with an effective rooting depth greater than 200 mm. There were also poorly drained soil forms and soil forms typically associated with wetlands. There was no evidence of crop production on the subject property during the site visit. Although soils of the well-drained soil forms (Symbol A) would be highly suitable for crop production and the average annual rainfall of 1000 mm is sufficient for the successful production of different crops, the slope of the land in many parts is greater than 12 % which is not suitable for crop production because of the danger of soil erosion. Small pieces of crop lands do occur near rural settlements.

TABLE 4: SUMMARY OF SOIL ECOTOPES WITHIN THE STUDY SITE

Soil type	**Symbol**	**Soil forms**
Well-drained soil forms (Depth > 200 mm)	A	Constantia, Pinedene, Avalon, Griffin, Shortlands, Oakleaf, Tukulu, Glencoe
	S	Mispah
Duplex and Plinthic soil forms	D	Valsrivier, Longlands, Sepane
Poorly drained soil forms	P	Katspruit, Sweetwater, Lusiki
Vlei and wet soil forms	V	Champagne

Land capability

Following the classification system discussed above, the soil and land types identified in the study area could all be classified into three different land capability classes:

- Deeper soils (Symbol A) have arable land capability and could also have been suitable for irrigated crop production should irrigation water be available.
- Soils within the Symbol S have grazing land capability due to the slopes being greater than 12 % (danger of erosion) and restricted soil depth (Mispah soil form) (should only be grazed at very low livestock density).
- Duplex and plinthic soils (Symbol D) usually have grazing and partly arable capability. These soils are easily erodible and many are hard setting which can greatly impede tillage when the soil is too dry. The soils have poor drainage which renders them only marginal for the production of most crops besides vegetables and grazing, except where the overlying apedal B horizon occurs with sufficient depth. The Longlands soil form has a depth of 120 cm and will thus not present problems with rooting depth and periodic waterlogging for crops like maize. Plinthic soil is not regarded as being a good choice for forest plantations because of poor internal drainage.
- Areas in the valley bottoms (Symbol P and V) have wetland land capability.

Conclusion

The surface infrastructure footprint will mainly disturb one soil form with arable land capability. The mine access road will cross a number of soil forms along its route. Some of these soils are more sensitive. This baseline has been used to inform the soil (conservation and use) management plan to be used for the project. Given the current natural land capabilities within the project area, the post closure land capability should be natural environment/cattle farming with controlled grazing. This is similar to the current land uses on site.

2.1.4 BIODIVERSITY BASELINE

Introduction and relevance to the project

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems is as follows:

- Soil formation and fertility maintenance
- Primary production through photosynthesis, as the supportive foundation for all life
- Provision of food and fuel
- Provision of shelter and building materials
- Regulation of water flows and water quality
- Regulation and purification of atmospheric gases
- Moderation of climate and weather
- Control of pests and diseases
- Maintenance of genetic resources (key for medicines, crop, and livestock breeding).

To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data collection

Information in this section was sourced from the biodiversity specialist study (SAS, 2015) and should be read with reference to Figure 6 to Figure 11.

Prior to the fieldwork, data collection was done through desktop assessments of most current aerial images, available published reports, plant and animal lists and maps. Field investigations for terrestrial surveys were then undertaken during April 2013, December 2013 and February 2014 to verify and supplement desktop data collected. The timing of the fieldwork was aimed at coinciding with the flowering times of most plants expected to occur in the study area. Caught faunal specimens were identified through reference to literature and input from expert specialists. The floristic importance of each vegetation community identified was determined using a flora index.

The aquatic assessment included a survey of general habitat integrity, habitat conditions for aquatic macro-invertebrates as well as aquatic macro-invertebrate and fish community integrity. The aquatic surveys were undertaken in April 2013, February 2014 and June 2015. A health assessment was conducted using the following indices at key points along the Pandana and Sibabe Rivers (the Pandane stream and Sibabe River both form tributaries of the Pongolo River and this assessment point served as a reference point) (refer to Figure 10) (SAS, 2015):

- Riparian Vegetation Response Assessment Index (VEGRAI)
- Invertebrate Habitat Assessment (IHAS)
- Intermediate Habitat Assessment (IHIA)
- South African Scoring System 5 (SASS5)
- Macro-Invertebrate Response Assessment Index (MIRAI)
- Fish Response Assessment Index (FRAI).

Wetlands were delineated using the Department of Water Affairs and Forestry (DWAF) method in 2005.

Further detail on the methodologies used is provided in the specialist report.

Results – National Biodiversity Guidelines

There are various recently developed national guidelines that have an impact on the mining right application area. These are described below.

National Protected Area Expansion Strategy

The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. It deals with land-based and marine protected areas across all of South Africa's territory (SANBI BGIS).

According to the NPAES, a small portion of the mining right application area falls within the delineated moist escarpment grasslands focus area. NPAES focus areas are for land-based protected area expansion. Focus areas are large, intact and un-fragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. No surface infrastructure will be located within this area but underground mining (>200m below surface) will extend to the edge of the farm boundary where this area is located (Figure 6).

<u>Mining and Biodiversity Guidelines</u>

The DEA, DMR, Chamber of Mines, South African Mining and Biodiversity Forum, and SANBI published the Mining and Biodiversity Guideline in 2013. This guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects and where biodiversity may limit the potential for mining. The guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view, as well as the implications for mining. These categories include (DEA *et al*, 2013):

- Legally Protected Areas
- Highest Biodiversity Importance
- High Biodiversity Importance
- Moderate Biodiversity Importance.

According to the Mining Biodiversity Guidelines, the south western and northern sections of the mining right application area fall within an area considered to be of Highest Biodiversity Importance. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive necessary authorisations. Apart from a section of the mine access road where it follows an existing gravel farm track, no surface infrastructure is located within this area. Underground mining is planned within this area.

Areas within the remainder of the application area fall within isolated areas considered to be of Moderate Biodiversity Importance (refer to Figure 6). Moderate Biodiversity Importance areas are typically associated with ecological support areas and vulnerable ecosystems. These areas pose a moderate risk to mining. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations. The mine access road, a portion of the surface infrastructure area, and underground mining sections fall within these areas.

National List of Threatened Terrestrial Ecosystems for South Africa

The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value (SANBI, BGIS). According to the National List of Threatened Terrestrial Ecosystems (2011) the mining right application area contains sections of the remaining extent of the vulnerable Paulpietersburg Moist Grassland and Northern Afrotemperate Forest vegetation types (refer to Figure 6). The mine access road, a portion of the surface infrastructure area, and underground mining sections fall within these areas.

Formally and informally protected areas

According to the South African Protected Area Database (SAPAD) completed in 2014, the mining right application area is not located within a formal or informal protected area or within a national park. However, the Pongola Bush Protected Environment is located approximately 10km north of the application area, along with several other formally and informally protected areas on a wider scale (refer to Figure 7). Additionally, the proposed Elandsberg Protected Environment is located on the south-western, north-western and north-eastern boundaries of the application area (refer to Figure 7). The plan is for the proposed Elandsberg Protected Environment to form part of the upper Pongola biodiversity stewardship initiative being developed by SANBI and the World Wildlife Fund (WWF).

Fish Fresh Water Ecosystem Priority Area

The western border of the project area falls within a Fish Fresh Water Ecosystem Priority Area (FishFEPA) (Figure 8). River FEPAs achieve biodiversity targets for river ecosystems and threatened fish species, and were identified in rivers that are currently in a good condition. Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources. The remainder of the project area falls within a Fish Support Area (FSA), which is regarded as important in terms of a fish sanctuary for threatened fish species. The occurrence of protected *Chiloglanis* fish species in the streams is highly possible.

National Freshwater Ecosystem Priority Area

The SANBI Wetland Inventory (2006) and National Freshwater Ecosystem Priority Areas (NFEPA) (2011) databases define wetland or river systems of ecological importance. Although three NFEPA wetlands occur within the mining right application area (Figure 6), it should be noted that none of these wetlands are considered by the NFEPA database as important with regards to biodiversity conservation.

No RAMSAR wetlands occur and no wetlands occur within 500 m of an IUCN threatened frog point locality (SAS, 2015).

Results - Regional Biodiversity Guidelines

There are various recently developed regional guidelines that have an impact on the mining right application area. These are described below.

KwaZulu-Natal Land-Use Categories

The KwaZulu-Natal (KZN) Land Cover Dataset is a single, contiguous land-cover dataset covering the entire KZN Province that has been generated from multi-date SPOT2/4 imagery acquired primarily in 2005 (and updated in 2008), and represents the final KZN Province Land-Cover product. It is used to monitor development and derive useful conservation plans. According to the KZN Land Cover Dataset the land cover of the mining right application area is categorised as a combination of irrigated and dryland cropfields, plantations, grassland, dense bush, bushland, grassland/bush clump mix, degraded grassland, wetlands, dams and freshwater systems (SANBI BGIS).

KwaZulu Natal Terrestrial Biodiversity Priority Areas

According to the KwaZulu-Natal Terrestrial Conservation Plan (Figure 9) the application area contains areas specified as Biodiversity Priority Areas 1 (Critical Biodiversity Areas (CBAs) 1 Mandatory) and Biodiversity Priority Areas 3 (CBA 3 Optimal) (refer to Figure 9). The CBA 1 Mandatory areas are based on the conservation plan (C-Plan) Irreplaceability analyses. CBA 1 units represent the only localities for which the conservation targets for one or more of the biodiversity features contained within the unit can be achieved i.e. there are no alternative sites available. CBA 3 units reflect areas that together with CBA 1s and CBA 2s, collectively reflect the minimal reserve design required to meet the Systematic Conservation Plans targets. The remaining area is referred to as Biodiversity areas. Important species are still located within these units and should be accounted for in an EIA process. Surface infrastructure and the majority of the underground mining area is located within the Biodiversity area unit.

Important Bird Areas (IBA)

The application area falls within the Grasslands IBA (IBA SA125) which extends across three provinces, namely KwaZulu-Natal, Mpumalanga and the Free State. This large IBA covers several catchments, containing many perennial rivers and wetlands. These habitat units combined with the grasslands within the IBA provide suitable habitat to many Crane and grassland specialist species. Grasslands throughout southern Africa are indicated to be under severe pressure as a result of habitat transformation from agriculture and mining. As a result, many habitat specialist species are being displaced and as a result are being compressed into increasingly diminishing suitable habitat. The result of this is an increase in competition for resources and breeding habitat, leading to intra-specific species competition, with a net loss of overall species numbers. As such, mining developments and placement of mining infrastructure needs to be increasingly scrutinized, ensuring that sensitive habitats are being conserved whilst suitably managing the increasing demand for natural resources.

Kwa-Zulu Natal Freshwater Systematic Conservation Plan

The mining right application area falls within a freshwater catchment earmarked for conservation in terms of the Kwa-Zulu Natal Freshwater Systematic Conservation Plan (2007). Earmarked areas are optimal biodiversity areas required to meet biodiversity targets.

Results - Flora

National vegetation types

The proposed mining area falls within the Grassland Biome, and within the Mesic Highveld Grassland Bioregion (Mucina & Rutherford, 2006 as cited in SAS, 2015).

Regionally, the proposed mining area falls within the Wakkerstrooom Motane Grassland, Paulpietersburg Moist Grassland and the Northern Afrotemperate Forest Vegetation Types. A summary of these national vegetation types is provided below with further detail included in the specialist report (SAS, 2015):

- Wakkerstrooom Motane Grassland occurs in the Kwa-Zulu Natal and Mpumapalnga Provinces, and is considered Least Threatened. Vegetation is predominantly short montane grasslands on plateaus and the relatively flat areas, with short forest and thickets occurring along steep, mainly east facing slopes and drainage areas.
- Paulpietersburg Moist Grassland occurs in the Kwa-Zulu Natal and Mpumapalnga Provinces, and is considered Vulnerable. This vegetation type is characterised by tall closed grassland rich in forbs evergreen woody vegetation is characteristic on rocky outcrops.
- Northern Afrotemperate Forest occurs in the Free State, Kwa-Zulu Natal and Mpumapalnga, North West, Gauteng and Limpopo Provinces, and is considered Least Threatened. This vegetation type is found as small patches in kloofs and on sub-ridge scarps at high altitudes (1 500 – 1 900 metres above mean sea level (mamsl)). These forests are usually species poor.

Habitat units and ecological sensitivity

Four broad habitat units were identified on the basis of vegetation structure, floristic composition and position in the landscape (Figure 10). A summary of the key aspects of the habitat units is discussed below with further detail included in the specialist report (SAS, 2015).

Habitat Unit 1: Wetland and Riparian Habitat

- Various wetland and riparian features (Pandana River) identified that comprised of wetland types such as valley bottom wetlands, riparian zones and seepage wetlands
- The ecological condition of these wetlands varies from excellent in the high altitude grasslands and Afrotemperate forests, to moderately transformed in the lower altitude areas where crop cultivation, dam and weir construction and alien floral invasion have transformed the hydrological and geomorphological aspects of the wetlands. This habitat unit provides niche habitat for a high diversity of floral and faunal species and acts as a very important network of migratory corridors for faunal species

- Classed as B/C using the Vegetation Index Score (VIS) – largely natural/moderately modified. This habitat is therefore considered to be of high ecological sensitivity
- Alien invasion levels are generally low, except for sections of the Pandana River where in some cases *Acacia mearnsii* (Black wattle) has completely replaced the riparian vegetation.
- Various species of gladiolus and orchids from the genus *Gladiolus, Habenaria, Eulophia, Satyrium* and *Disa* were encountered in wetland areas during fieldwork and are protected under the Kwa-Zulu Natal Nature Conservation Management Amendment Act (Act 5 of 1999)
- *Podocarpus falcatus* and *Podocarpus latifolius* (yellow wood trees) and *Itex mitis* (African holly) occur along within the Afrotemparate forest riparian zone along high altitudes and rivers and are protected under the National Forests Act (Act 84 of 1998)
- Additional protected species encountered include *Cyathea dregei* (Rough tree fern), *Panicum tricholaenoides* (Blousaad soetgras) and *Corcium nigrescens* (Knoppiesdoring) which are seasonal (not permanent) zone species.

Habitat Unit 2: Montane Grassland Habitat:

- This habitat unit comprises high-altitude grassland associated with Paulpietersburg Moist Grassland and Wakkerstroom Montane Grassland and was encountered in high altitude areas (1 600 mamsl and above)
- This habitat unit has generally high ecological functioning and overall high levels of habitat integrity, especially in the higher altitude areas and is mostly undisturbed, apart from isolated areas where homesteads and cattle kraals occur. This habitat provides intact habitat for a high diversity of floral and faunal species and contributes towards faunal migratory connectivity in the area.
- Classed as B using the VIS – largely natural. This habitat is therefore considered to be of high ecological sensitivity
- Forb diversity is high, while the graminoid layer was characterised by mostly climax species. Woody clumps comprised of *Leucosidea sericea* (Ouhout) and *Widdringtonia nodiflora* (Mountain cedar) occur in higher altitude areas
- Very few alien and invasive species occur in this habitat unit and the floral habitat and community structure is intact
- Protected species include *Corcium nigrescens* (Knoppiesdoring), *Eucomix autumnalis* (Autumn pineapple flower), *Glatonia candicans* (Summer hyacinth**)**, *Cyathea dregei* (Rough tree fern), Protea subvestita (protea), *Monsonia attenuata* (Teebossie), orchids of the Disa, *Satyrium* and *Habenaria* genuses as well as gladiolus species.

Habitat Unit 3: Northern Afrotemperate Forest Habitat:

- This habitat type occurs in ravines, kloofs and forest patches in higher altitude areas within the mining right application area
- This habitat unit has generally high ecological functioning and overall high levels of habitat integrity, especially in the more remote areas and is in a mostly undisturbed condition. This habitat unit

provides intact habitat for a high diversity of floral and faunal species and contributes towards faunal migratory connectivity and cover within the area.

- Classed as B using the VIS – largely natural. This habitat is therefore considered to have high ecological sensitivity
- Floral diversity is generally low, however very little habitat disturbance has occurred here, apart from isolated patches of deforestation and infestation by *Acacia mearnsii* (Black wattle).
- *Podocarpus falcatus* and *Podocarpus latifolius* (yellow wood trees), *Itex mitis* (African holly) and *Pittosporum viridiflorum* (Cheesewood) occur in this habitat unit and are protected under the National Forests Act (Act 84 of 1998) and Kwa-Zulu Natal Nature Conservation Management Amendment Act (Act 5 of 1999)

Habitat Unit 4: Transformed Grassland Habitat:

- This habitat unit comprises lower-altitude grassland which would most likely have been historically associated with the Paulpietersberg Moise Grassland
- Secondary grassland areas have been transformed by current and historic agricultural activities such as grazing and pastures, alien floral invasion and edge effects from homesteads, rural settlements, roads and vegetation clearing. This has led to the alteration of the floral community structure and establishment of a sub-climax grass community
- Ecological functioning was found to be moderately low in most areas of this habitat type; however the species composition of this habitat is still moderately representative of the vegetation type in which it occurs
- Classed as C using the VIS – moderately modified. This habitat unit is therefore considered to be of moderate ecological sensitivity
- Various species of gladiolus and orchids from the genus *Gladiolus, Habenaria, Eulophia, Satyrium* and *Disa* are scattered throughout this habitat unit and are protected under the Kwa-Zulu Natal Nature Conservation Management Amendment Act (Act 5 of 1999).

<u>Species of conservation concern</u>

In addition to the protected species listed in the section above, twenty additional protected species are likely to occur in the mining right application area, especially within the Montane Grassland, Northern Afrotemperate Forest and Wetland and Riparian Habitat Units. These species range from near threatened to critically rare and endangered according to the Red Data plant list. A few examples include *Protea parvula* (Dainty Sugarbush) which is near threatened, *Sandersonia aurantiaca* (Christmas bells) which is declining, *Lotononis dichiloides Sond.* (Hairy Lotononis) which is critically rare, and *Asparagus fractiflexus (Oberm.*) (Asparagus fern) which is endangered according to the Red Data plant list.

<u>Medicinal plant species</u>

Medicinal plants are not necessarily indigenous species, in fact many are regarded as alien invasive weeds. The following medicinal plants were identified during fieldwork (SAS, 2015):

- *Rapanea melanophloeos* (Cape Beech)
- *Eucomis autumnalis* (Pineapple flower)
- *Scillia nervosa* (Squill)
- *Podocarpus falcatus* (Outeniqua yellow wood)
- *Pittosporum viridiflorum* (cheesewood)
- *Rothmannia capensis* (Wild gardenia).

Alien and invasive plant species

A low diversity of alien species occurs within the mining right application area; however there are dense stands of *Acacia mearnsii* (Black wattle) in sections of the Pandana River which in some instances have completely replaced the riparian vegetation. Other alien species found include:

- *Populus x canescens* (Grey poplar) (Eurasian origin) – Category 2 weed
- *Bidens pilosa* (Common blackjack) (South American origin)
- *Bidens Formosa* (Cosmos) (Central American origin)
- *Tagetes minuta* (Tall khakiweed) (South American origin)
- *Verbena tenuisecta* (Purple top) (South American origin)
- *Asclepias fruticosa* (Shrubby milkweed) (Indigenous weed).

Results – Vertebrate Fauna

The mining right application area is considered have moderate importance with regards to faunal species of conservation concern within the region. Ten species of conservation concern are likely to occur here, with five of these confirmed to occur. These species are likely to inhabit the wetland, aftrotemperate forest and montane grassland habitats, with some bird species utilising the secondary grasslands for foraging and breeding purposes. These species are discussed in the sections below.

Mammals

Fourteen species were identified during fieldwork. These species are all categorised as Least Concern by the IUCN, with the exception of the Samango Monkey which is Vulnerable. This species is endemic to South Africa and has no dispersal between sub-populations, which makes it a high risk species in terms of habitat loss and disturbance. Other species of conservation concern that are likely to occur within the mining right application area include *Chrysospalax villosus* (Rough haired golden mole) which is listed as Vulnerable by the IUCN and *Mystromys albicaudatus* (White-tailed mouse) which is Endangered (SAS, 2015).

Avifauna

The mining right application area is considered sensitive in terms of avifaunal habitat for habitat, foraging and breeding. The following Vulnerable species were found during fieldwork (SAS, 2015):

- *Sagittarius serpentarius* (Secretary bird)
- *Anthropoides paradiseus* (Blue Crane)

- *Balearica regulorum* (Grey Crowned Cranes)
- *Geronticus calvus* (Southern Bald Ibis)

<u>Amphibians</u>

15 amphibian species have been recorded previously in the area as part of the South African Frog Atlas Project, three of which were found during fieldwork. The mining right application area is considered sensitive in terms of amphibian habitat for habitat, foraging and breeding. All of these species are listed as Least Concern by the IUCN. *Pyxicpephalus adspersus* (Giant Bullfrog) and *Hemisus guttatus* (spotted shovel-nose frog) may occur within the mining right application area, both of which are listed as Vulnerable.

<u>Reptiles</u>

Three reptile species were identified during fieldwork, one which is listed as Least Concern and two species not yet assessed by IUCN. Other common species are expected to occur within the mining right application area. *Homoroselaps dorsalis* (Striped harlequin snake) may occur here and is listed as Near Threatened. It is considered likely that the mining right application area is capable of supporting a fairly abundant and diverse range of reptile species.

Results – Invertebrate Fauna

SAS conducted a general assessment with the purpose of identifying common species and taxa in the project area. Various butterflies, termites, fish moths, flies, grass hoppers, crickets, locusts, bees, wasps, beetles, praying mantis, millipede, centipede, bugs and stick insects were observed, however none of these invertebrates are species of conservation concern (SAS, 2015). Two spider species were identified during fieldwork however neither of these are protected species. However the rocky ridges are considered sensitive in terms of providing arachnid habitat.

Results – River System

The mining right application area falls within the Escarpment Mountains Aquatic Ecoregion and is located within the W42A quaternary catchment. Various wetlands, drainage lines and streams are located throughout the mining right application area. The perennial Pandana River runs through the centre of the project area (refer to Figure 11). The Pandana River is classified as a Class A (unmodified, natural) river in terms of the South African River Health Programme. This river is however classed as not free flowing and not a flagship river.

The Ecological Importance and Sensitivity (EIS), Present Ecological Management Class (PEMC) and Desired Ecological Management Class (DEMC) for the quaternary catchment is summarised in Table 5, along with more recent information on the sub-quaternary catchment sourced from the DWS Resource Quality Information Services database.

TABLE 5: QUATERNARY AND SUB-QUATERNARY CATCHMENT INFORMATION (SAS, 2015)

Quaternary catchment (QC) level – Kleynhans (1999)					
QC	**Resource**	**Ecological Importance and Sensitivity Category**	**Default Ecological Manageme nt Class**	**Present Ecological Status Category**	**Best attainable Ecological Management Class**
W42A	Pongolo	High	B	A	A

Sub-quaternary catchment reach (SQR) level – DWS PES/EIS database					
SQR	**Resource**	**Present Ecological State (PES)**	**Ecological Importance (EI)**	**Ecological Sensitivity (ES)**	**Ecological Category based on median PES and highest of EI or ES means**
W42A-02261	Pongolo	C	High	Very high	A
W42A-02328	Pandane	C	High	Very high	A

The results of the river health assessment for the Pandana and sibabe Rivers indicates that despite the fairly limited community diversity, the aquatic resources of the area are of high aquatic Ecological Importance and Sensitivity. This is largely due to the project area being located adjacent to conservancies/protected areas and recreational/tourism areas. In addition, sampling indicated healthy populations of the near threatened Phongolo rock catlet (*C. emarginatus*), although this is not listed by the IUCN. The sensitivity of all aquatic ecosystems is provided in Figure 11.

Results – Wetlands

Wetland types in the mining right application area include transitional rivers, valley bottom wetlands, lower foothill river and bench wetlands.

Three wetland features are listed by the National Freshwater Ecosystem Priority Area (NFEPA). The largest of which is a bench wetland feature located in the western section of the mining right application area (refer to Figure 11). The two other wetland features include a small slope wetland feature to the south and small valley floor wetland to the north. The condition of these wetlands range from Category AB for wetlands in good or natural conditions as applicable to the large bench wetland to the west and the small slope wetland to the south, to Z3 which are critically modified as applicable to the small valley floor wetland to the north (refer to Figure 11).

The large bench wetland feature is ranked 2 according to general importance, i.e. the majority of its area is within a sub-quaternary catchment that has sightings or breeding areas for threated Wattled Cranes (*Bugeranus caranculatus*), Grey Crowned Cranes (*Balearica regulorum*) and Blue Cranes (*Anthropoides paradiseus*), or it was identified by experts at the regional review workshops as containing wetlands of exceptional biodiversity importance. The large bench feature in the west is therefore considered to be of high conservation importance. The small slope feature to the south is considered to be of some conservation importance due to its natural condition and because it is listed as a Working for Wetlands site.

Wetland functioning and service provision was assessed for the wetland features identified within the mining right application area (refer to Figure 11). The main findings are as follows (SAS, 2015):

- All the features lie within a moderately high class of ecological service provision
- The majority of the features are important in terms of flood attenuation, streamflow regulation and nutrient assimilation
- The features play the most important role in terms of biodiversity maintenance, as several protected floral and faunal species are associated with the wetlands
- The features are situated within the upper catchment of the Pongolo River, which is an important river in terms of water supply for agricultural purposes, and are therefore also important in terms of water supply.

In terms of present ecological status (PES) and wetland environmental importance and sensitivity the wetland features are considered to be of high to very high sensitivity.

Conclusion

The mining right application area lies within highly sensitive terrestrial and aquatic biodiversity areas which offer habitat to several protected and threatened species. In addition, the mining right application area covers threatened ecosystems, critical biodiversity areas, highest and moderate biodiversity importance areas in terms of the mining and biodiversity guidelines, an important birding area, an NPAES focus area, and is situated adjacent to the proposed Elandsberg Protected Environment. Surface infrastructure has been located outside of the more sensitive areas, as far as possible. Management and mitigation measures will be required to maintain the areas not directly affected by the establishment of surface infrastructure.

2.1.5 HYDROLOGY BASELINE

Introduction and relevance to project

Surface water resources include rivers, non-perennial drainage lines and paths of preferential flow of stormwater runoff. Project-related activities have the potential to alter the drainage of surface water through the establishment of infrastructure and/or result in the contamination of the surface water resources through seepage and/or spillage of project-related materials. Key to understanding the hydrology of the site is the climatic conditions of the site. As a baseline, this section provides an understanding of the climate (rainfall, temperature and evaporation) of the area, hydrological catchments that could be affected by the project and the status of surface water features in the project area.

Data collection

The information in this section was sourced mainly from the specialist hydrology (Highlands Hydrology 2015) (Appendix G) and groundwater (Delta H, 2015) (Appendix H) studies with input from the aquatic specialist study (SAS, 2015) (Appendix F) and should be read with reference to Figure 3 and Figure 12.

No on-site weather station is present. The nearest station is the Elim weather station (SAWS station 0407745 W), located 1.2km west of the project area, operated by the South African Weather Services (SAWS). The relevant climatic data was sourced as follows:

- monthly rainfall data was sourced from the Elim station
- monthly evaporation data was sourced from the Department of Water and Sanitation (DWS) gauge (V3E005) approximately 36km west of the project area
- rainfall depths were sourced from the Design Rainfall Estimation Software for South Africa (Smithers and Schulze technique) (further detail is provided in the hydrology report)
- temperature data was sourced from WorldClim datasets.

Data used in determining the surface water characteristics of the study area included topographical data (see Section 2.1.2), climatic data (as discussed above) and field observations by the specialists. Flow velocity at two points in the Pandana River was measured during a single sampling run using a Velocity Head Plate (VHP) every 200 mm across the channel downstream of the project site.

An investigation into pre-mining surface water quality was conducted as part of the hydrocensus carried out by Delta H (2015). Further detail is provided in Section 2.1.6.

In terms of hydrological calculations:

- The mean annual runoff (MAR) for the catchments associated with the project was estimated using rainfall-runoff response parameters from WR2005 and WR2012. The rainfall-runoff response of the catchment was assumed to be the same as the regional rainfall-runoff response as determined for the quaternary catchment in which the project site falls (W42A).
- Flood peaks were calculated using a primary topographic dataset which was interpolated into a Digital Elevation Model with a 5m cell size (further detail provided in the hydrology report).

Results

Climatic data

The regional climate is characterised by moderate summers followed by cold winters and moderate to extremely heavy frost in winter. The mean annual rainfall varies between 800 and 1500 mm. The annual average rainfall is approximately 1089mm, mainly occurring as a result of thunderstorms between October and April, peaking in January. The regional average midday temperatures for Utrecht range from 18.7°C in June to 26.1°C in January. The regional average daily minimum temperature is about 14°C in January and in July it is roughly 3°C.

Near to the project site, the average monthly rainfall record at Elim ranges between 5mm (in June) and 210mm (in January) per annum with an annual record of 1089mm (Table 6). Evaporation ranges from 82mm (in June) to 174mm (in December) with an annual evaporation of 1592mm. Generally speaking, evaporation greatly exceeds rainfall in the area both on a monthly and annual basis. The more significant rains occur in summer. Temperatures in the region tend to be cool to mild (Table 6), ranging from 19 to 28 °C (maximum) and -1 to 11 °C (minimum), with average temperatures between 9°C and 18°C.

TABLE 6: RAINFALL, EVAPORATION AND TEMPERATURE DATA

Month	Rainfall*	Evaporation (S-Pan) #	Temperature (°C)		
	Mean monthly (mm)	Mean monthly (mm)	Average maximum	Average minimum	Average
Jan	210	163	28	11	18
Feb	142	143	28	10	18
Mar	109	135	26	9	17
Apr	78	108	26	4	14
May	28	96	24	3	12
Jun	5	82	19	0	10
Jul	6	89	19	-1	9
Aug	23	118	23	0	11
Sep	54	158	25	2	14
Oct	103	160	26	4	14
Nov	141	165	28	5	17
Dec	190	174	28	9	17
Annual	**1089**	**1592**	**-**	**-**	**-**

** Sourced from Elim weather station* *# Sourced from WS gauge (V3E005) weather station*

Maximum 24-hour rainfall depths for various recurrence intervals were used for all hydrological calculations (Table 7).

TABLE 7: 24 HOUR STORM DEPTHS

Return period	Rainfall depth (24 hour)	
	RLMA (Smithers / Schulze)	TR102
2	93	74
5	122	103
10	143	125
20	163	148
50	191	183
100	213	212
200	235	244

Surface drainage

The project site falls within the upper reaches of quaternary catchment W42A, which lies immediately east of the regional water divide between the Thukela River catchment and the Usutu-, Pongola and Mhlatuze River catchment. As a result the site falls along the western edge of the Usutu to Mhlathuze Water Management Area which drains in a general eastward direction. There are numerous non-perennial tributaries of the perennial Pandana River throughout the project site (refer to Figure 3). The

Pandana River flows in a northerly direction through the centre of the project area where it eventually turns east towards the confluence with the Phongolo River, approximately 17km downstream. The Phongolo River ultimately flows into the Phongolopoort Dam approximately 147km downstream of the project site.

There are two non-perennial streams located either side of the surface infrastructure area (refer to Figure 3). The site consequently drains in both an easterly and westerly direction, defined according to the position of the non-perennial's watershed. Rainfall will enter either of these non-perennial streams, flowing towards the north before joining the Pandana River outside of the mining right application boundary.

There is little development in the areas surrounding the project site and in the upslope area from the site, with only a few plots of subsistence farming noted. It can therefore be concluded that the natural drainage of the site is largely unaltered.

Affected catchments including mean annual runoff

Using the WR2005 quaternary catchments dataset, and an estimated 0.15km^2 for the project site, it is estimated that the mean annual runoff (MAR) generated from the site accounts for approximately 0.044 million m^3 of the quaternary catchments 116.3 million m^3 MAR. This is equivalent to 0.038% of the total MAR for the quaternary catchment.

Surface water flow

The selected sampling site is characterised by cobble-dominated riffle within a fairly incised channel which would allow volume under higher flows to be easily calculated. Readings of 29.07 litres per second and 29.97 litres per second were recorded, giving an average measured flow of 29.5 litres per second.

As part of the groundwater study, groundwater contribution to baseflow was modelled to understand this parameter. Based on the modelling results, the groundwater contribution is 59 % of the surface flow measured (). It must be noted that the modelling results is averaged over the year and seasonally it will fluctuate according to the wet and dry season.

TABLE 8: GROUNDWATER CONTRIBUTION TO THE UPPER SECTIONS OF THE PANDANA RIVER

	Average Recharge	**Low Recharge**	**High Recharge**
	m^3/a [L/s]	**m^3/a [L/s]**	**m^3/a [L/s]**
Pre-mining baseline	545 061 [17.3]	378 137 [12.0]	690 923 [21.9]

Floodlines

The depth of flooding in the Pandana River reaches a maximum of 5m. The two tributaries adjacent to the surface infrastructure site exhibit less flooding with depths under 1m associated with the western tributary where flood waters are able to spread out more over the floodplain (Figure 12). The eastern tributary exhibits deeper flooding associated with a more constrained floodplain. The difference between the 1:50 and 1:100 year events is limited by the topography of the floodplains which rise quickly enough to constrain the spread of flood waters. The only infrastructure that falls within the 1:100 year floodline is the access road which is positioned over the floodplain to the west of the project site.

Water quality

Pre-mining surface water quality was determined as part of the hydrocensus undertaken by Delta H (2015). Overall, the ambient water quality for the site is characterised as very good and of potable quality (Section 2.1.6).

Surface water use

Water use for domestic supply and livestock watering within the site and immediately downstream is via the river. Shallow hand dug wells are also developed by the local community near to the river system. The use of springs on site is considered as part of the groundwater system. It has been identified by IAPs that the project area and surrounds are seen as a key water production area for downstream surface water users. The major downstream waster use is expected to be irrigation and livestock watering with the addition of water for domestic supply.

Conclusion

Surface water features on the site include numerous non-perennial tributaries of the perennial Pandana River. Water use for domestic supply and livestock watering within the site is via the river. Surface water quality in the project area is characterised as very good and of potable quality. The project design should avoid the non-perennial and perennial watercourses as far as possible and include measures for the containment of dirty water runoff from the site.

2.1.6 GROUNDWATER BASELINE

Introduction and relevance to the project

Groundwater is a valuable resource and is defined as water which is located beneath the ground surface in rock pore spaces and in the fractures of lithologic formations. Understanding the geology and structural features of the area provides a basis from which to understand the occurrence of groundwater resources and flow paths. Project-related activities such as the development of the underground mine, coal stockpiling and the handling and storage of hazardous materials have the potential to result in the loss of groundwater resources, both to the environment and third party users, through dewatering and pollution. As a baseline, this section provides an understanding of the current groundwater conditions (quality, quantity and use) and the potential for dewatering cones of depression and pollution plumes to occur as a result of project-related activities.

Data collection

The information in this section was sourced from the groundwater study (Delta H, 2015) (Appendix H).

A desktop study of available information and studies was undertaken to gain a better understanding of the geology and geohydrology of the area. This included Groundwater Resources Information (GRA II) Project (DWAF, 2006) and review of regional datasets maintained by the DWS.

A project-specific hydrocensus was undertaken in May 2015 to identify existing groundwater users and to establish the baseline water quality conditions of both groundwater and surface water. The hydrocensus focussed on a 5km radius and included points up to 11km of the project site. Forty-five sites were visited comprising 12 surface water points, seven exploration core holes, 21 springs, three hand pumps and one borehole. Of these 11 surface water points, three boreholes (including hand pumps) and three springs were sampled for chemical analyses. Specific sampling sites included downstream of the Kemplust and Makatees Kop historical mine areas to give context to issues raised by IAPs.

In addition, five boreholes were drilled to characterise the aquifer conditions on the site and inform the potential for water supply options. The siting and drilling of these boreholes was done using geophysics. The geophysics was also used to identify potential structural features in the geology. Further detail on the methodologies used is provided in the specialist report.

Results

Regional geology and structural features

The Commiesiekraal site is dominated by the Karoo Supergroup sediments comprising of shale, mudstone, sandstone, dolerite and coal of the Vryheid Formation. Just south of the proposed mining area the Vryheid Formation is overlain by similar rocks of the Volksrust Formation and Normandien Formation (Figure 13). The sediments of the Karoo Supergroup were intruded by doleritic magma from a southerly direction to form thick sills and dykes. In general, the higher lying elevated hills are characterised by resistant / hard, slightly weathered to un-weathered dolerite sills covering the softer / less resistant, weathering prone sedimentary rocks of the Vryheid Formation (e.g. sandstone and siltstones) that usually form deep valleys or depressions when exposed in areas not covered by interconnected dolerite sills and dykes. The springs in the area are due to groundwater flowing in the interbedded sedimentary rock (aquifers) covered and/or underlain by aquitards (dolerite) forming distinct surface discharge points / spring lines. Most of these springs form tributaries that flow into the main river systems. Quaternary sands (alluvium) are observed across the central and northern extents of the study area and are associated with the deposition of sands alongside the Pandana and Phongolo Rivers (DeltaH, 2015).

Dolerite sills and dykes are abundant and are known to cause substantial displacements in strata. A dolerite sill overlies a large part of the coal-bearing sequence but is more prominent towards the south-east of the proposed underground mine workings (Figure 14) (DeltaH, 2015, adapted from Copper Leaf, 2013). The area is dominated by northeast-southwest trending structures which can manifest as faults, dolerite dykes and fracture zones. Based on the Digby Gold (2013) report, dolerite was observed on site as thin (<15 m thick) dykes and thick (100 m thick) dykes and numerous thin (<5 m thin) sills have been observed in core logs.

<u>Groundwater zones (aquifers) on site</u>

Regionally, the aquifer is characterised as an unconfined, intergranular and fractured rock aquifer. Typical boreholes yields expected in the intrusive dolerite rocks vary between 0.1 and 0.5 L/s and in the sedimentary Vryheid Formation vary between 0.5 and 2.0 L/s. Water strikes are mostly encountered in fractured rock however weathering at the contact between the sandstone and shale within the Formation also yields groundwater. The groundwater yield potential is considered to be low. In the northern KwaZulu-Natal coal fields, three superimposed aquifer systems have been defined, namely the upper weathered Karoo, the fractured Karoo and the fractured pre-Karoo aquifer below the Ecca sediments.

Locally, the following aquifer systems underlie the project area (Figure 15)):

- Localised perched aquifers (< 10 mbgl)
- Weathered Karoo aquifer associated with the weathered zone (5 to 20 mbgl)
- Fractured Karoo aquifer (10 mbgl to 100 mbgl).

The localised perched aquifer systems sit within the colluvium or on weathered sandstone/dolerite. Associated water levels due to infiltrating rainwater perched on (shallow) low permeability layers are generally shallow, with lateral flow on the layer potentially feeding seasonal hillside seeps and springs.

The shallow weathered Karoo aquifer system comprises of an intergranular, water table (unconfined) aquifer that is likely to be hydraulically connected to surface drainages. The average water level is around 10 mbgl, while the depth of weathering reaches less than 20 mbgl on site and is better developed lower down the hillslope towards the Pandana Valley. An average hydraulic conductivity of 0.05 m/d was determined for the aquifer system overlying the mine voids. Vertical infiltration of water in the weathered aquifer is typically limited by impermeable (or semi-permeable) layers of sediments below the weathered zone, with subsequent lateral movement following topographical gradients. From drilling results it was evident that water strikes were associated with the contact (base of weathering/transitional zone) between the weathered sandstones and potentially less permeable shales. From the diagnostic drawdown curves it was evident that once these discrete fractures are dewatered a marked increase in drawdown and decrease in transmissivity becomes apparent. The water quality is good due to direct rainfall recharge and dynamic groundwater flow through the unconfined aquifer in weathered sediments, which also makes it vulnerable to pollution. The aquifer discharges via springs and baseflow in the area of interest.

The deeper, fractured Karoo aquifer system is characterised as a secondary, semi-confined aquifer. The average water level is around 28 m and hydraulic conductivity is between 1E-4 and 2E-3 m/d. Higher conductivities are expected along (but not across) coal seams and dyke/sill contacts or major faults. Generally the sandstone and coal layers are normally reasonable aquifers, while the shales and intruded dolerite sill's serves as aquitards. In the southern mining area drilling (MCK17) confirmed thick (~50 m) dolerite sills which form an aquiclude and constricts vertical percolation of groundwater.

Groundwater flow is governed by secondary porosities like faults, fractures, joints, bedding planes or other geological contacts, while the rock matrix itself is considered impermeable. Not all secondary structures are water bearing. While fractured Karoo aquifers have typically a low hydraulic conductivity (<0.001 m/d), they are highly heterogeneous with yields ranging from 0.1 to 2 L/sec. Higher yields are typically associated with higher hydraulic conductivities along shallow coal seams (±0.1 m/d) and at dyke/sill contacts. The contact zones of dolerite dykes and sills with the host rock provide preferential flow paths, while the dolerite itself is rather impermeable or semi-permeable. This setting promotes groundwater flow along, but not across the dykes or sills. Based on the exploration drilling at Commisiekraal water was found in medium to coarse sandstone as well as at lithological contacts (sandstone-shale), suggesting that the groundwater flow is therefore considered predominantly down-dip (horizontal) with local variations due to (sub-vertical) fracture intersections.

<u>Groundwater levels, use and flow</u>

Water levels range from 2.6 mbgl to 36 mbgl with an average of 16 mbgl. The water levels show a very good correlation between absolute surface and groundwater table elevations. Even with the mountainous terrain or ridges the water tables are relatively close to the land surface.

In terms of surface-groundwater interaction both shallow perched and deeper weathered/fractured aquifers may contribute to surface water bodies (baseflow) though it is most likely limited to the rainy season. Groundwater perched on low permeability material in the weathered zone or in colluvium may be a source of water to hillside seeps and springs. Springs appear to be associated with the dolerite sill that is present at higher altitudes in the project area. The springs are considered to be fed by water bodies perched on the dolerite (sills). However, groundwater on horizontal and semi-horizontal contacts between different rock types may also be a source for springs. Many of these springs are seasonal and reduced flows are expected in the dry season. This mimicry of groundwater flows and levels to terrain entails that regional groundwater discharge areas would primarily be located in valley bottoms. As a result both the shallow and deeper aquifer mimic the topography and groundwater flows from higher lying ground towards lower lying ground and drainage systems (natural streams).

Due to the low groundwater potential of the underlying aquifers in the region, groundwater use is limited to domestic water supply and feedlots. Limited water supply occurs from borehole abstraction (apart from the hand pumps installed at schools). Usage of groundwater via capturing of spring discharges is more common. Springs mark the termination of the underground flow path and capturing of spring discharges for domestic or livestock watering purposes can for all practical purposes be seen as groundwater use. Based on a review of available data it appears that there are no registered groundwater users in the Water Use Authorisation and Registration Management System (WARMS) of the Department of Water and Sanitation (DWS) within the vicinity of the Project.

Groundwater quality

With reference to Table 9, the water samples were compared to the SANS 241, WHO and IFC water quality standard guidelines as well as the Department of Water Affairs and Forestry guidelines for Aquatic Ecosystems. Overall, the ambient background water quality for the site is characterised as very good and of potable quality. Note that the trace elements (parameters) not listed in Table 9 were either below the analytical limit of detection or the concentration levels did not trigger major health risks.

Based on the results of the hydrocensus, groundwater and surface water has a relatively low mineralisation with electrical conductivities of approximately 120 mS/m and a pH of approximately 7.5. Excluding the Makatees Kop samples all of the major ions analysed in the groundwater and surface water samples are within drinking water limits. With the exception of the Makatees Kop samples, the elevated trace elements and metals (i.e. aluminium, iron, manganese, nickel and lead) appear to be natural in nature. For example the elevated concentrations of iron (Fe) and aluminium (Al) observed from the two springs (ADF375 and Spring 11) can be attributed to the host rock lithologies. These elements as well as manganese (Mn) are often naturally elevated in groundwater within lithological units of the Karroo Super group.

Some of the extremely elevated concentrations indicated in Table 9 can be attributed to anthropogenic activities, for example the elevated Fe concentrations indicate iron oxidation related to the dissolution of ferrous borehole components. Similarly high Fe concentrations (including Al and Mn) were observed for the newly drilled monitoring borehole (CK-BH3). However, this could relate to the very low permeability of the aquifer and the borehole was sampled towards the end of the pumping test which resulted in a disturbance of the filter pack. This increased (excessive) turbidity (> 4000 observed) can radically alter analytical results for water samples, causing spurious increases in analysed metal concentrations. This is particularly true for iron, aluminum, calcium, magnesium and manganese.

The groundwater samples (including the springs) collected during the hydrocensus are characteristic of freshly recharged groundwater, which has had limited time to equilibrate with the aquifer material along its flow path. The dominant magnesium-bicarbonate ($Mg-HCO_3$) and ($Ca-HCO_3$) calcium-bicarbonate water facies is a result of the rainwater chemistry, limited weathering reactions and CO_2 equilibrium with the atmosphere via the soil vapour to form a dominant bicarbonate anion. However, the groundwater samples from the core holes MCK07 and MCK11 are characterised by a more sodium rich ion dominance.

The Makatees Kop 1 sample shows a pH of 2.7 as well as elevated sulphate and EC levels, which can be associated with acid mine drainage from the abandoned mine workings. The Makatees Kop samples from downstream of the abandoned workings are highly mineralized with sulphate values ranging from 520 to 2050 mg/l. Sulphate can be regarded as a conservative determinant that doesn't undergo retardation or significant degradation in the aquifer and is often used as an indicator of mining related contamination. The Kemps Lust samples show a neutral pH and sulphate levels below the analytical limit of detection.

Conclusion

Due to the reliance on groundwater for anthropogenic (via springs) and ecological uses as well as with the potential for loss and/or pollution through project activities, planning for mitigation measures is a key factor for the project. The parameters, status and classification of groundwater resources on site have provided input into the modelling of potential groundwater impacts.

TABLE 9: WATER QUALITY RESULTS

SiteName	SiteType	Date	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	MALK CaCO3/L	Cl mg/l	SO4 mg/l	N_Amonia mg/l	Al mg/l	Fe mg/l	Mn mg/l	Ni mg/l	Pb mg/l
CGW 1	Borehole	07/05/2015	7.0	9.4	70.0	5.7	2.9	4.0	1.1	36.0	6.0	<5	0.30	0.39	33.61	0.24	0.35	<0.010
MCK 07	Corehole	07/05/2017	7.0	19.6	90.0	11.9	3.3	16.4	2.0	104.0	<5	<5	3.30	0.40	17.80	0.43	0.16	<0.010
MCK 11	Corehole	07/05/2018	7.3	12.6	62.0	4.4	<2	19.1	2.5	68.0	<5	<5	0.50	1.03	18.23	0.12	0.18	<0.010
MCK 14	Corehole	07/05/2019	7.1	15.9	122.0	14.3	2.5	14.1	1.2	92.0	<5	<5	<0.2	1.17	4.54	1.55	0.06	0.01
ADHF354	Handpump	08/05/2015	8.1	31.3	154.0	27.2	3.3	20.0	<1.0	144.0	<5	<5	<0.2	<0.100	0.64	0.08	0.01	<0.010
ADHF372	Handpump	08/05/2015	7.4	6.9	60.0	4.5	<2	4.5	1.0	32.0	<5	<5	<0.2	<0.100	1.07	0.05	0.01	<0.010
ADHF357	Spring	08/05/2015	7.4	7.9	74.0	5.8	3.7	2.3	<1.0	32.0	<5	<5	<0.2	0.25	0.17	<0.025	<0.010	<0.010
ADHF371	Spring	09/05/2015	7.3	5.3	22.0	3.2	2.0	3.4	<1.0	24.0	<5	<5	<0.2	2.66	1.23	0.13	<0.010	<0.010
ADHF375	Spring	08/05/2015	7.2	6.4	56.0	4.7	2.5	2.4	<1.0	28.0	<5	<5	<0.2	0.15	0.15	<0.025	<0.010	<0.010
ADHF363	Surface Water	09/05/2015	7.4	7.8	56.0	5.7	3.3	3.1	<1.0	36.0	<5	<5	<0.2	<0.100	0.18	<0.025	<0.010	<0.010
ADHF382	Surface Water	08/05/2015	7.5	5.6	46.0	3.3	<2	3.3	1.2	20.0	<5	<5	<0.2	<0.100	0.30	<0.025	<0.010	<0.010
Bivane river	Surface Water	06/05/2015	7.5	4.2	30.0	2.9	1.7	2.1	<1.0	20.0	<5	<5	<0.2	<0.100	0.19	<0.025	<0.010	<0.010
Kempslust	Surface Water	08/05/2015	7.4	4.6	32.0	2.8	<2	2.6	<1.0	16.0	<5	<5	<0.2	<0.100	0.11	<0.025	<0.010	<0.010
Lower Pandana	Surface Water	06/05/2015	7.3	7.5	54.0	5.2	2.8	3.5	<1.0	32.0	<5	<5	<0.2	0.12	0.28	<0.025	<0.010	<0.010
Lower Sibabe	Surface Water	06/05/2015	7.3	7.4	50.0	5.3	3.0	3.2	<1.0	32.0	<5	<5	<0.2	<0.100	0.09	<0.025	<0.010	<0.010
Pandana Downstream	Surface Water	06/05/2015	7.4	6.6	54.0	4.4	2.3	3.2	<1.0	32.0	<5	<5	<0.2	0.19	0.39	<0.025	<0.010	<0.010
Spring 11	Surface Water	06/05/2015	7.4	9.2	40.0	6.5	5.4	3.0	<1.0	44.0	<5	<5	<0.2	2.61	2.34	0.05	0.02	<0.010
Tributary Pandana	Surface Water	06/05/2015	7.5	4.4	36.0	2.5	<2	2.7	<1.0	20.0	<5	<5	<0.2	0.20	0.29	<0.025	<0.010	<0.010
Upper Pandana	Surface Water	06/05/2015	7.4	6.9	38.0	4.3	1.7	3.7	<1.0	24.0	<5	<5	<0.2	0.26	0.17	<0.025	<0.010	<0.010
Upper Sibabe	Surface Water	06/05/2015	7.4	6.9	46.0	4.9	2.7	3.0	<1.0	32.0	<5	<5	<0.2	<0.100	0.08	<0.025	<0.010	<0.010
Makateeskop3 (L2-river)	Surface Water	27/05/2015	7.4	107.0	852.0	114.0	46.0	41.0	2.4	100.0	6.0	520.0	<0.2	0.12	0.23	0.26	<0.010	<0.010
Makateeskop2 (L2-borehole)	Borehole	27/05/2015	7.4	56.8	434.0	48.0	29.0	17.0	1.2	40.0	10.0	226.0	<0.2	<0.100	<0.025	<0.025	<0.010	<0.010
Makateeskop1 (L2-stream)	Spring	27/05/2015	2.7	322.0	2984.0	371.0	109.0	34.0	6.8	<5	5.0	2050.0	2.90	35.00	56.00	19.00	0.80	<0.010
CK-BH1	New Borehole	26/05/2015	7.5	13.2	102.0	18.0	13.0	6.0	4.2	80.0	<5	<5	<0.2	8.59	23.00	0.49	0.18	0.03
CK-BH2	New Borehole	26/05/2015	7.2	6.0	42.0	14.0	9.0	4.0	5.3	28.0	<5	7.0	<0.2	7.93	14.00	0.52	0.14	0.04
CK-BH3	New Borehole	27/05/2015	8.0	24.6	200.0	13.0	5.0	39.0	4.1	140.0	<5	6.0	0.40	5.93	21.00	0.32	0.15	0.02
CK-BH4	New Borehole	27/05/2015	7.8	13.7	130.0	12.0	6.0	7.0	1.0	72.0	<5	<5	<0.2	<0.100	0.27	0.05	<0.010	<0.010
CK-BH5	New Borehole	27/05/2015	7.6	19.3	154.0	16.0	7.0	12.0	<1.0	104.0	<5	<5	<0.2	<0.100	0.33	0.11	<0.010	<0.010
Makateeskop1 (L2-stream)	Spring	10/09/2015	2.7	302.0	3036.0	341.0	129.0	51.0	5.3	<5	<5	2049.0	3.3	28	44	21	0.891	<0.010
Makateeskop3 (L2-river)	Surface Water	10/09/2015	6.70	114	946	136.0	51.0	39.0	5.7	80	8.0	582.0	<0.2	0.171	0.166	0.34	0.027	<0.010
Kempslust (Re-Sample)	Surface Water	10/09/2015	7.3	5.5	58.0	3.0	2.0	4.0	1.0	20.0	<5	<5	0.20	0.37	0.31	<0.025	<0.010	<0.010
SANS 241-1 (2011) (*2006)			5 - 9.7	170	1200	150*	70*	200	-	-	300	250/500	0.05	1.5	0.3	0.3 / 2	0.07	0.01
WHO 2011			-	-	-	-	-	50	-	-	-		0.05	-	0.9*	-	0.07	0.01
IFC 2007			6 - 9	-	-	-	-	-	-	-	-	-	-	-	-	2	0.5	0.2
DWAF, 1991 (Aquatic)			<0.5 & >0.5%	-	>15%	-	-	-	-	-	-	-	≤0.007	≤0.005	>10%	≤0.18	-	≤0.0002

2.1.7 AIR QUALITY BASELINE

Introduction and relevance to the project

Identification of existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. Meteorological characteristics of a site govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance to nearby receptors. Potential receptors in the area include private farmsteads, rural homesteads, the Luthilunye School and the natural environment (see Section 2.3). As a baseline, this section provides a description of the climatic environment as it relates to air dispersion and aims to identify existing ambient air concentrations that may be impacted by project emissions.

Data collection

Information in this section was sourced from the air specialist study included in (Airshed 2015) (Appendix I).

In the absence of on-site meteorological data, simulated data for a period between 2012 and 2014 was used. The MM5 (short for Fifth-Generation Penn State/NCAR Mesoscale Model) is a regional mesoscale model used for creating weather forecasts and climate projections. No ambient dust fallout or PM_{10} monitoring is available for the area. Further detail on the methodologies used is included in the specialist report.

Results

Wind data and atmospheric stability indices

The predominant wind directions in the project area are from the west, east-north-east and north-east (Figure 16). Less frequent winds occur from the north westerly and south westerly sectors. During the day, more frequent winds at higher wind speeds occurred from the east-north-easterly and north-easterly sectors with almost 5.4% calm conditions. Night-time airflow had less frequent winds from the east-north-easterly and north-easterly sectors and at lower wind speeds with winds most frequently occurring from the westerly sectors. The percentage calm conditions decreased to 2.7%.

Autumn and winter reflect the average prevailing wind direction as from the west (Figure 16). Summer and spring reflect the average prevailing wind direction as from the east-north-east and north-east.

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. During daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth’s surface. Night-times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds and lower dilution potential.

Given the project site's meteorological conditions and diurnal variations in atmospheric stability as calculated from modelled MM5 data, the highest ground level concentrations or near ground level releases from non-wind dependent sources would occur during weak wind speeds and stable (night-time) atmospheric conditions.

Emission sources and pollutant types

Land use in the region includes agriculture, primary livestock grazing with minor dryland crops, forestry, conservation, tourism and residential. Expected sources of atmospheric emissions are discussed below.

Miscellaneous fugitive dust sources

Fugitive dust emissions may occur as a result of vehicle entrained dust from local unpaved roads, and wind erosion from open or sparsely vegetated areas. The extent of particulate emissions from the main roads will depend on the number of vehicles using the roads and on the silt loading on the roadways. Factors affecting fugitive emissions include the extent, nature and duration of road-use activity and the moisture and silt content of soils. The quantity of wind-blown dust is similarly a function of the wind speed, the extent of exposed areas and the moisture and silt content of such areas.

Vehicle tailpipe emissions

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary pollutants are those that are formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. The significant primary pollutants emitted by vehicles include CO_2, CO, hydrocarbons (HCs), SO_2, NO_x, DPM and Pb. Secondary pollutants include NO_2, photochemical oxidants (e.g. ozone), HCs, sulphur acid, sulphates, nitric acid, nitric acid and nitrate aerosols. Hydrocarbons emitted include benzene, 1.2-butadiene, aldehydes and polycyclic aromatic hydrocarbons (PAH). Benzene represents an aromatic HC present in petrol, with 85% to 90% of benzene emissions emanating from the exhaust and the remainder from evaporative losses. Vehicle tailpipe emissions are localised sources and unlikely to impact far-field.

Household fuel burning

Energy use within the residential sector is given as falling within three main categories, namely: (i) traditional - consisting of wood, dung and bagasse, (ii) transitional - consisting of coal, paraffin and liquefied petroleum gas (LPG), and (iii) modern - consisting of electricity (increasingly this includes the use of renewable energy). The typical universal trend is given as being from (i) through (ii) to (iii).

Biomass burning

Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity fires may therefore represent a source of combustion-related emissions.

Biomass burning is an incomplete combustion process, with CO, methane and NO_2 gases being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen (N_2), 10% is left is the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds. The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content. In addition to the impact of biomass burning within the vicinity of the project, long-range transported emissions from this source can further be expected to impact on the air quality. It is impossible to control this source of atmospheric pollution loading however it should be noted as part of the background or baseline condition before considering the impacts of other local sources.

Agriculture

Particulate matter is the main pollutant of concern from agricultural activities as particulate emissions are derived from windblown dust, burning crop residue, and dust entrainment as a result of vehicles travelling along dirt roads. In addition, pollen grains, mould spores and plant and insect parts from agricultural activities all contribute to the particulate load. Should chemicals be used for crop spraying, they would typically result in odiferous emissions. Crop residue burning is an additional source of particulate emissions and other toxins

<u>Available ambient air data</u>

No ambient air quality data is available for the project area. Pre-development pollutant concentrations and dustfall rates are expected to be low due to the remoteness of the project area and the lack of large scale agricultural, mining and industrial activities.

Conclusion

The project is located within a region where influences on existing ambient air concentrations are limited. The project has the potential to alter this if not managed correctly. Understanding the availability of data and the potential ambient air quality has assisted in developing an air-related management plan and monitoring programme for the mine.

2.1.8 NOISE BASELINE

Introduction and relevance to project

Noise generating activities associated with the project may cause an increase in ambient noise levels in and around the site. This may cause a disturbance to nearby receptors. Potential receptors in the area include private farmsteads, rural homesteads, the Luthilunye School and the natural environment (see Section 2.3). As a baseline, this section provides an understanding of existing conditions in the area from which to measure changes as a result of project-related noise.

Data collection

Information was sourced from the noise specialist study (SLR 2015) (Appendix J).

To quantify the current day and night ambient noise levels, noise monitoring was undertaken at two sampling points near to the project site (L1 and L2 on Figure 17) and one east of the project site and along the haulage route (L3 on Figure 17). The monitoring was conducted for both day and night. Meteorological conditions and the location of sampling points were taken into consideration when determining ambient noise levels. Methodologies used are detailed in the specialist report.

Results

Baseline survey results are presented in the table below.

Monitor Point	Ambient noise				Comments
	Period	$L_{Aeq,T}$	L_{A90}	L_{Amax}	
L1 – Luthilunye School Area	Day-time	49.1	36.3	78.6	Adjacent to the D699 district road and access road to Commissiekraal Farm. Daytime noise climate comprised very occasional vehicle movements along district road, pedestrians walking along district road and accessing school/settlement, and wind in nearby trees. Wind speeds quite high, above 5.0ms^{-1} for majority of survey period. At night-time no activity in area except monitoring staff and wind in nearby trees. Wind speeds had subsided.
	Night-time	34.7	27.8	57.7	
L2 – Commissiekraal Farm Area	Day-time	37.2	30.1	58.0	Along access road to Commissiekraal Farm. Daytime noise climate comprised of wind in the long grass, occasional movements of the monitoring staff, and one occurrence of a propeller aircraft in the distance. No traffic movements during the survey period. Wind speeds were quite high, above 5.0ms^{-1} for the majority of the survey period. At night-time was no activity in the area except the monitoring staff and wind moving the long grass. Wind speeds had subsided.
	Night-time	36.1	31.0	52.4	
L3 – Area east of project site, along D699	Day-time	35.2	28.7	62.7	Adjacent to gravel farm road to east of project site. Daytime noise climate comprised livestock in adjacent field and wind in long grass. No traffic movements during monitoring period. The wind speed was again quite high, being above 5.0ms^{-1} for most of survey period. At night-time there was no activity in the area except the monitoring staff and wind in the tall grass. Wind speeds had subsided.
	Night-time	29.6	27.3	59.6	

Notes: $L_{Aeq,T}$ – continuous noise level over the measurement period – used as the ambient noise level
L_{A90} – the noise level exceeded for 90% of the measurement period
L_{Amax} – maximum noise level during the measurement period.

SANS 10103:2008 Guidelines		Day (L_d)	Night (L_n)
SANS 10103 Typical levels	Rural Districts	45	35
	Suburban little traffic	50	40
	Urban	55	45

Notes: L_d – day level *L_n – night level*

Conclusion

The project area is located in a typically rural area. The local roads carry very little traffic. The noise environment can be described as quiet. The ambient noise level rating adopted for the project for all residential locations and schools, based on the specialist recommendations, is 45dB (day-time level) and 35dB (night-time level).

2.1.9 VISUAL ASPECTS BASELINE

Introduction and relevance to project

Project-related activities have the potential to alter the landscape character of the site and surrounding area through the establishment of both temporary (surface infrastructure) and permanent (boxcut) infrastructure. As a baseline, this section provides an understanding of the visual aspects (such as landscape character, sense of place, scenic quality, and sensitive views) of the project area against which to measure potential change as a result of project infrastructure and activities.

Data collection

Data on the visual resource was collected by SLR from 1:50 000 topographical maps, the aerial survey conducted by Tholie Logistics, site observations and photos taken of the study area. This data was then evaluated qualitatively to provide a description of the visual resource.

Results

In describing the visual landscape a number of factors are considered, including landscape character, sense of place, scenic quality, and sensitive views. These are discussed further below.

The project area lies at the edge of a mountainous area characterised by grasslands that are dominated by short bunch grasses, forest patches and perennial and non-perennial drainage lines. Forest patches occur mainly on the cooler and moister south facing slopes along the escarpment. Livestock, small scale agriculture, and associated rural settlements are typical of the region. Man-made structures within the area are limited to the roads, powerlines, telephone lines, farmsteads, rural homesteads, schools and tourism based accommodation.

Central to the visual character of an area are the concepts of sense of place and scenic quality. Sense of place is informed by the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area which lend that area its uniqueness and distinctiveness. The scenic quality of the project site and surrounding area is linked to the type of landscapes that occur within an area. In this regard the scenic quality associated with landscapes in the project area can range from high to low as follows:

- High – these include natural features such as the higher lying mountains (on- and off-site), the Pandana River (on- and off-site) and associated riparian vegetation and non-perennial drainage systems (on- and off-site)
- Moderate – these include the agricultural activities (on- and off-site), farmsteads and rural homesteads (on- and off-site) and Luthilunye primary school (off-site)
- Low – these include man made features and structures including roads, low voltage powerlines and telephone lines.

The overall study area has a high visual resource value with sections, such as the agricultural fields and homesteads that display a moderate visual resource value. Due to the overall high visual resource value of the study area and that no other mining or industrial activities occur within the area, the study area is expected to be sensitive to a change in the landscape. The result of the natural setting associated with the project area and surroundings is a landscape with a fairly strong sense of place.

Depending on the sensitivity of viewers, sensitive views of the project could be from tourists travelling along local roads, rural homesteads within and adjacent to the project site and along the haulage route and the Luthilunye school. Given the change in type of activity known to the area, the sensitivity of visual receptor sites is expected to be high.

Conclusion

The area can be described as an open undisturbed natural grassland system with limited intrusion of man-made features. The overall high visual resource of the area influences the activities and sense of place experienced by surrounding land uses. Planning for the construction, operation and rehabilitation of the site needs to take the visual character of the area into account so as to limit the intrusion as far as practically possible.

2.1.10 TRAFFIC BASELINE

Introduction and relevance to project

Traffic from mining developments has the potential to affect the capacity of existing road networks as well as result in noise, air quality and public road safety issues. This section provides an overview of the current road network, conditions and road use. Understanding the layout, use and conditions of transport systems relevant to the project site provides a basis for understanding a change as a result of project contributions.

Data collection

Information was sourced from the traffic specialist study (SLR 2015) (Appendix N). The study comprised sourcing relevant data from a site inspection of the existing road network, traffic counts, calculations and reference to relevant traffic impact assessment guideline documents.

The site investigation, undertaken on 11 to 12 June 2013 included:

- a visual inspection of the site, site access track, haulage route and location of likely rail siding point
- a general review of other roads near to the study area
- traffic count surveys at the P40/R33 and R33/P221 intersections (on 12 June 2013) – traffic levels on the P40 and D699 were observed to be very low and not sufficient to provide an adequate sample of baseline data
- confirmation of site details and surroundings from the site landowner.

Methodologies used are detailed in the specialist report.

Results

There is a network of gravel and surfaced district/regional roads providing access to the project area (Figure 18). The Commissiekraal farm is accessed via a gravel track of varying width (no greater than 5 m wide) and joins the D699 district road. This gravel track provides access to the farmstead with a number of secondary gravel tracks providing access to a number of rural homesteads within the farm. The D699 road provides a link west towards Wakkerstroom, south towards Utrecht and east towards Paulpietersburg. Intersections and sections of road relevant to the project were investigated by the traffic specialist. An overview of the relevant intersections and road sections is given in Table 11.

Traffic counts were conducted at the R33/P221 and R33/P40 intersections and along the corresponding link roads (Table 10). It can be seen that the more heavily trafficked roads are those of the R33 and the P221. The P221 was observed to have 30% heavy goods vehicle (HGV) making up the two-way flow of traffic, while the R33 was observed to have between 13% and 21% HGVs. At the R33/P40 intersection, traffic flows were low with all vehicles recorded as HGVs. This would imply that the traffic movements associated with the existing plantations accessed from the P40 make up most, in not all of the traffic observed. There is a significant difference between flows on the more rural roads (P40) in comparison to the main roads in the area (R33 and P221).

The flows observed along the western end of the P40 and the D699 were minimal and therefore considered to be too low to provide accurate traffic data for the same time periods. Although no traffic data is available, the flows along these roads are considered by the specialist to be negligible.

TABLE 10: TRAFFIC COUNTS AT RELEVANT INTERSECTIONS AND ROAD LINKS (SLR 2015)

Road Link	One Way Flow			Two Way Flow	
	Direction	**Total**	**% HGV**	**Total**	**% HGV**
R33 Hogg Street	Northbound	115	24.3	181	21.0
	Southbound	66	15.2		
R33 West of Paulpietersburg	Westbound	41	9.8	103	13.6
	Eastbound	62	16.1		
P221 South of Paulpietersburg	Southbound	26	23.1	80	30.0
	Northbound	54	33.3		
R33 North of P40 Intersection	Northbound	76	21.1	104	19.2
	Southbound	28	14.3		
R33 South of P40 Intersection	Southbound	24	0.0	96	16.7
	Northbound	72	22.2		
P40	Westbound	4	100.0	8	50.0

TABLE 11: ROAD CHARACTERISTICS RELEVANT TO THE PROJECT (SLR 2015)

Relevant road section	Photo of road section / intersection	Road width (m)	Surface	Speed limit	Comments [Points of interest (POI) shown on Figure 18]
Site access track		Approximately 4m	Dirt track	Likely restricted due to nature of road surface	Follows natural surrounding landform Culvert crossing at Pandana River (illustrated) (POI1)
D699/Site Access Track Intersection		Intersection	Dirt track (site access) to gravel (D699)	Intersection	Laid out for purposes of agricultural vehicles and other associated traffic (POI2). Visibility at intersection is good for vehicles wishing to emerge onto D699 A school is located on the north side of the D699 with access directly onto the road and bus parking on the south side Roadside ditch runs alongside D699 with culvert provided at point of crossing of site access track
D699	  	Generally 6-7m	Gravel	100 km/h	Follows the surrounding landform and provides a link south towards Utrecht Reasonable condition for its status with some rutting and failure of road surface (top photo) Forward visibility is generally good but reduces in places where road alignment alters with horizontal bends or changes in gradient Roadside ditches and culverts of varying standard for drainage Road crosses the Pandana River via a concrete road bridge (middle photo) – structure shows signs of failure in support elements on downstream side, potentially as a result of water flow in wet season (POI3) In some parts through some steep gradients, road crosses a valley (bottom photo) (POI4) Road passes through a plantation, with access to a lumber yard provided on the northern side, and evidence of roadside collection of lumber material within verges on both sides of the road (POI5). From the lumber access east, the road is of a better maintained condition and is clearly used by timber traffic.

Relevant road section	Photo of road section / intersection	Road width (m)	Surface	Speed limit	Comments [Points of interest (POI) shown on Figure 18]
D699 / P40 Intersection		Intersection	Changes from gravel road to tarmac	Intersection	Priority intersection laid out to accommodate the movements of turning traffic, including HGV traffic – P40 is major arm, and D699 minor arm (POI6) Visibility at intersection is good in both directions. P40 has roadside ditch on northern side, which is culverted beneath the D699 road side Two primary schools present within vicinity of intersection and as such there are associated pedestrian movements on the D699 and P40
P40		Varying but generally 7m	Tarmac	100 km/h	Follows surrounding landform Reasonable condition for its status with some failure of road surface (at one section) Provides a link east towards the regional road R33 and the town of Paulpietersburg
P40 / R33 Intersection		Intersection	Tarmac	Intersection	Priority intersection accommodating ghost islanding for a central right turn lane from the R33 into the P40 (POI7). Laid out to accommodate the movements of turning traffic, including HGV traffic.
R33		7m	Tarmac	100km/h reducing to 60km/h upon entering Paulpietersburg	Operates as a strategic link road, locally linking Paulpietersburg with Vryheid to the south of the study area. Is of a good standard
R33 / P221 Intersection, Paulpietersburg		Intersection	Tarmac	Intersection	Priority intersection laid out to accommodate turning movements of vehicles (POI8) At intersection, R33 continues north to Paulpietersburg, with P221 providing a link south to Vryheid Observed to operate satisfactorily Road surface in reasonable condition with some evidence of wear and tear and general weather damage

The traffic specialist has concluded that the roads within the study area accommodate only a small proportion of their available capacity; the level of existing service indicates between 75% (on more developed roads and intersections such as the R33/P221) and in excess of 85% available capacity (on roads and intersections such as the R33/P40). Given the very low flows expected on the D699 it can be assumed that suitable capacity is available. It is important to note that defining the available capacity of a road or intersection only takes into account the geometry (layout) of the road and does not consider road condition.

Four schools were noted along the proposed haulage route (Section 2.3.1). There are no formal pedestrian facilities within the study area, and pedestrians were observed to walk, generally, in the middle of the road. Despite the very lightly trafficked roads, and some of the users being very young, it was noted that pedestrians are cautious when vehicles pass by and move to the side of the road in good time.

Conclusion

As can be expected in a rural area, traffic volumes in close proximity to the project site are very low. Further afield, towards towns such as Paulpietersburg, traffic volumes are notably higher and the number of HGV increases. The characteristics and condition of the transport network varies between the site and Paulpietersburg. Vulnerable road users have also been identified along the route. Changes to the road use, road network or designs of traffic management measures will need to take the above into account and consider both road condition and safety-related issues.

2.2 ENVIRONMENTAL ASPECTS WHICH MAY REQUIRE PROTECTION OR REMEDIATION

Environmental aspects both on the site applied for and in the surrounding area which may require protection or remediation during the life of the project are listed below. This list is based on the concise descriptions provided in Sections 2.1 and 2.3.

- Drainage patterns on site after closure
- Stripped and stockpiled soils
- In-situ soils and land capabilities (not disturbed by project infrastructure)
- Biodiversity (not disturbed by project infrastructure)
- Groundwater resources
- Ambient air qualities
- Noise environment
- Visual and landscape quality
- Surrounding land uses and socio-economic conditions (localised)
- Heritage (and cultural) resources (not disturbed by project infrastructure).

2.3 LAND USES, CULTURAL AND HERITAGE ASPECTS AND INFRASTRUCTURE

A description of the specific land uses, cultural and heritage aspects and infrastructure on site and on neighbouring properties/farms is provided in this section. This section identifies whether or not there is potential for the socio-economic conditions of other parties to be affected by the proposed operations.

2.3.1 LAND USES

Introduction and relevance to project

Projects of this nature have the potential to influence current land uses both on the site (through loss) and in the surrounding areas (through direct or secondary positive and/or negative impacts). As a baseline, this section outlines existing land tenure including surface and prospecting/mining rights (both on the site and in the surrounding area), describes the land uses on site and in the surrounding area, and identifies third party service infrastructure. This section provides the context within which potential impacts on land uses and existing economic activity will be felt.

Data collection

Information was sourced from the land use study (TerraAfrica 2015) and information compiled by the SLR EIA team.

Surface right information was sourced by SLR through a deed search conducted in 2014. Information on existing prospecting/mineral rights was compiled with input from Tholie Logistics.

The collection of data by the land use specialist was done through site observations and by consulting related topographical maps and satellite images. Further detail on the methodologies used is included in the land use specialist report.

Information on the context of the area and the presence of infrastructure was compiled by SLR using information provided by the various specialist studies, observations during site visits and studying of aerial and satellite images.

Results –Surface rights and lawful occupiers

Surface rights on the farm Commissiekraal and immediately adjacent are held by private individuals and companies (Table 12 and
Table 13). These tables do not represent all interested and/or affected parties (IAPs) registered on the IAP database but does given an indication of land ownership on the site.

TABLE 12: SURFACE RIGHTS ON THE PROJECT SITE

Property description	Title deed number	Surface owner	Note in relation to project infrastructure
Commissiekraal 90 HT			
Portion 1	T8381/1995	Clement Lens	Alternative access route B, surface infrastructure
Portion 2	T32028/1988	Van Vos Lens Prop Developers CC	Underground mining
Portion 3 & 8	T18429/1981	Nicolaas Lens (deceased) C/o Christine Meyer	Underground mining
Portion 4	T8381/1995	Clement Lens	Underground mining
Portions 5 & 7	T19209/1981	Clement Lens	Underground mining
Portion 6	T19209/1981	Clement Lens	Mine access road, surface infrastructure, underground mining
Vredehof 17HT			
Portion 1	T13546/1978	Nortje Cecilia Johanna Myra (Beneficiaries: Memory Dawn Joss, Elvira Marcelle Slotow, Roy Bredenkamp, Melodie Anne Delaportas, EJ van Rooyen, N Westenberg, AJ Wessels, JW Wessels, MJ Wessels)	Alternative access route B

TABLE 13: SURFACE RIGHTS ADJACENT TO THE PROJECT AREA

Property description	Title deed number	Surface owner
Elandsnek 17063 HT	TBC *	Portion 0: To be confirmed (TBC) *
	T57873/2004	Portion 1: Kwantaba Boerdery Bk
	T33767/2014	Hiestermann Beleggings BK
	T40166/2008	Portion 3: Madola Trust-Trustees
	T40166/2008	Portion 4: Madola Trust-Trustees
Pivaans Waterval 267 HT	T33400/2010	Portion 0: Hiestermann Beleggings CC
	T8380/1995	Portion 1: Wynand David Van Vos Lens
	T1743/2003	Portion 2: Wild Rush Trading 36 PTY LTD
	TBC *	Portion 3: TBC *
	T33400/2010	Portion 4: Hiestermann Beleggings CC
	T33400/2010	Portion 5: Hiestermann Beleggings CC
	T33400/2010	Portion 6: Hiestermann Beleggings CC
	T8380/1995	Portion 7: Wynand David Van Vos Lens
Klipplaatdrift 120 HT	TBC *	Portion 0: TBC *
	T7163/1991	Portion 1: Haakdoornbult Landgoed CC
	T8380/1995	Portion 2: Wynand David Van Vos Lens
	T816/2003	Portion 3: Alderson Flitton Motors Brits
	T816/2003	Portion 4: Alderson Flitton Motors Brits
	T4435/1979	Portion 5: Wynand David Van Vos Lens
	T4435/1979	Portion 6: Wynand David Van Vos Lens
(Vredehof 17 HT) Vredehof 299 HU	TBC *	Portion 0: TBC *
	T14334/2014	Imfolozi Timbers Proprietary Limited
	T13546/1978	Portion 1: Nortje Cecilia Johanna Myra (Beneficiaries: Memory Dawn Joss, Elvira Marcelle Slotow, Roy Bredenkamp, Melodie Anne Delaportas, EJ van Rooyen, N Westenberg, AJ Wessels, JW

Property description	**Title deed number**	**Surface owner**
		Wessels, MJ Wessels)
	TBC *	Portion 2: TBC *
	TBC *	Portion 3: TBC *
	T1738/1925	Portion 4: Willem Pieter Duminy
Tiverton 20 HT	T3145/1961	Portion 0: Albre Lorraine Snijders
Rooipoort 97 HT	TBC *	Portion 0: TBC *
	T52056/2004	Portion 1: Mary Magdalena Martha Lens
	T14570/1997	Johannes Abraham Landman and Aletta Catharina Johanna Mahne
	T28407/2012	Portion 3: Michelle Landman
	T39439/2005	Portion 4: Johannes Abraham Landman
	T39439/2005	Portion 5: Johannes Abraham Landman
	T9140/1973	Portion 6: Johannes Abraham Landman
	T23183/2010	Portion 7: C H S H S Inv CC
	T9140/1973	Portion 8: Johannes Abraham Landman
	T9269/1996	Portion 9: Nicolaas Lens (deceased) C/o Christine Meyer
	T43526/2003	Portion 10: Stephanus Abraham Daniel Landman
Farm 17072 HT	TBC *	Portion 0: TBC *
	T46284/2000	Portion 1: Mondi Limited
	T3145/1961	Portion 2: Albre Lorraine Snijders
	T3145/1961	Portion 3: Albre Lorraine Snijders
	T19918/1997	Portion 4: Hugo Le Roux Joubert

*Notes: * The details of these properties were not available on Deed Search.*

The landowners (listed above) are the lawful occupiers of the land. It should be noted that there are several land tenant/rural settlements on the farm Commissiekraal 90 HT. Social scan results and community workers' records indicate approximately 26 households on the farm Commissiekraal 90 HT with an estimated population of around 197 people (MWA, April 2013).

SLR has consulted the DRDLR regarding the status of land claims on Portion 1 - 8 of the farm Commissiekraal 90 HT. In this regard, a response from the DRDLR was received on 16 May 2013. At that time it was indicated that there were claims for restitution in terms of the provisions of the Restitution of Land Rights Act, 22 of 1994 (as amended) lodged in respect of Portions 1 to 8 of the farm Commissiekraal 90 HT. The DRDLR noted that these properties fall under the Magidela Community Claim. Later communication, dated 17 March 2015, from the Department indicated that the claim had been withdrawn by the Acting Regional Land Claims Commissioner: KwaZulu-Natal in terms of the Court Order dated 8 February 2011.

Results – Mineral / Prospecting rights

Tholie Logistics holds the prospecting right (No. KZN 30/5/1/1/2/155PR) for coal over the farm Commissiekraal 90HT. Tholie Logistics submitted a mining right application at the end of 2014 for the farm Commissiekraal 90HT. The mining right application was accepted by the DMR on 29 January 2015. No other prospecting and/or mining rights are known to occur in the immediate vicinity of the project site.

Results - Land uses

To give context to the discussion below, the project area is located in a remote area of the KwaZulu-Natal Province. The main land use is agriculture, primarily livestock grazing with minor dryland crops and residential areas. Remnants of forestry/small scale plantation occur within the central region of the mining right application area. Surrounding land uses are similar to those occurring on site with the addition of conservation in the form of conservancies and protected areas, recreational/tourism facilities/areas associated with nearby towns and game farms, and community activities including schools. Further afield there are other mining operations at various stages of operation. These are discussed further below.

Agriculture

The dominant land use of the project area (as derived from the number of land user units that engage in this land use) is small-scale and subsistence farming around rural settlements. Small crop fields border households and are fenced. Outside of the fenced-off living unit, cattle, horses and donkeys were found grazing the fields and drinking water from surface water resources on site.

Cultivation of crop patches are mainly done by manual labour but one tractor was present that indicated that some land users may have access to more mechanised machinery. Wattle plantations are present in close proximity to these households and signs of deforestation by land users to gather wood as a source of energy, was evident. Signs of water-harvesting from the first 120cm of the soil was seen in several isolated spots. This technique was observed during the site visit and consists of holes being dug in the soil that fill up with water that can be transferred to smallish water tanks and transported to the households. In small patches around these water collection pits, signs of soil erosion were evident.

The other main activity on the Commissiekraal farm in close proximity to the project site, is commercial cattle farming with fenced-off paddocks and cattle handling facilities. The livestock and property belongs to the Lens family. In addition to cattle grazing, perennial grasses are grown on a small cultivated area on the lower lying level areas to make hay for over-wintering livestock since the sourveld has low palatability and digestibility during the winter months. Historically, some of these fields as well as areas now under natural vegetation were used for crop production. However, during an interview with Mr Lens, it was established that the transport cost of harvested grains to the nearest grain silo, significantly reduces the profitability of crop production on the farm. The land is generally well managed and no signs of serious historical or present land degradation were observed.

Further away from the project site are areas under plantation forestry (Eucalyptus and Pinus spp.)

Residential

Parts of the study area are used for residential purposes, i.e. private farmsteads and communal tenant/farm worker homesteads. These are scattered across the landscape. A typical land user unit of this nature consist of a house that is either built of earth materials sourced on site or a mixture of conventional bricks and earth materials. There are small outbuildings or huts in close proximity to the main house.

Recreational / tourism / conservation

The project area is surrounded by a number of protected areas that aim to preserve the high natural biodiversity present. These areas are suitable for the development of tourism facilities.

Recreational facilities associated with the towns of Utrecht, Wakkerstroom and Paulpietersburg include public recreational centres, bird watching activities as well as golf and trout fishing clubs. Various tourism resources in the area include the Balele Conservancy, the Wakkerstroom Wetlands and the Battlefields historical area.

Schools

Several schools occur within the greater area and along possible transport routes, namely:

- Luthilunye Primary School, north of the project site, near to the Commissiekraal farm access intersection with the D699
- Kwamagidela Secondary School, located west of the D699/P40 intersection
- Protes Primary School, located east of the D699/P40 intersection
- Ndabambi Primary School, located north west of the R33 / P40 Intersection.

There are children pedestrian movements associated with trips to these schools, from residential areas which are remote and spread throughout the area. There is no pedestrian provision on any of the roads within the study area, and observations by the traffic specialist show that pedestrians generally walkin the middle of the road.

Mining operations

Mining operations within a 30km radius of the project site include:

- the decommissioned Welgedacht Colliery (Utrecht and Umgala Sections), previously operated by Kangra – an investee company of the Shanduka Group
- the closed Geluk Mine - previously operated by Mashala Resources which has been acquired by Continental Coal Limited
- the closed Kemps Lust Mine (Glencore).

Conclusion

Land uses on and adjacent to the project site mainly comprise cattle farming. Some adjacent farms are being proposed as part of protected areas. These land use occur throughout the region. Further afield, there are areas under plantation forestry. There is the potential for these land uses to be impacted by the project to varying degrees. As some of these land uses contribute to the economy of the region together with mineral-related activities, care should be taken when planning the project to limit impacts on these land uses.

2.3.2 CULTURAL ASPECTS

Cultural aspects of the project area are discussed below as part of the heritage discussion.

2.3.3 HERITAGE (INCLUDING CULTURAL AND PALAEONTOLOGICAL) ASPECTS

Introduction and relevance to the project

Various natural and cultural assets collectively form the heritage. Heritage resources (cultural resources) include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources, as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

The project has the potential to disturb both the ground surface (through establishment of infrastructure) as well as soils and rock layers below the surface (through excavations for foundations and underground mining). In this regard, heritage and palaeontological resources could be disturbed or destroyed. As a baseline, this section identifies the presence of heritage (including cultural) and palaeontological resources and their conservation significance.

Data collection

Information in this section was sourced from the specialist heritage study (Pistorius 2015) (Appendix K) and specialist palaeontological study (Bamford, 2015) (Appendix L) and should be read with reference to Figure 19 and Figure 20.

Data collection for the heritage survey was conducted by an accredited specialist through review of available databases, published reports and maps; previous studies done in the region; and site specific field work. Further detail on the methodologies used is provided in the specialist report.

Data collection for the Palaeontological survey was done by an accredited specialist through the review of geological information and relevant palaeontological research.

Results: Heritage (including cultural) resources

Heritage resources include sites of archaeological, cultural or historical importance. The study identified the following types of resources on the farm Commissiekraal: residences with historical significance, cattle sheds and numerous graveyards and graves (outlined in Table 14 and illustrated in Figure 19).

TABLE 14: HERITAGE RESOURCES IDENTIFIED IN THE PROJECT AREA (PISTORIUS, 2015)

Site	Disturbed by project?	Comments	Level of significance
Historical houses: Colonial Remains			
Farmstead complex 01 HH01: Historical House WS01: Wagon shed CE01: Cattle enclosure	No	The farmstead complex is made up of a Historical house, Wagon shed and Cattle closure. This complex is the oldest of the two farmsteads identified within the project area.	Med-High Med-High Med-High
Farmstead complex 02 HH02: Historical House WS02: Wagon shed	No	The farmstead complex is made up of a Historical house and a Wagon shed.	Med-High Med-High
Historical houses: Indigenous Remains			
Homestead complex 01 H01:Home 01 H02: Home 02 H03: Home 03 CE03: Cattle enclosure	No	This homestead complex is made up of three dwellings.	Med-High Med-High Med-High Med-High
CE02: Cattle enclosure	No	This cattle enclosure was used to shelter stock. The single stoned wall is now disintegrated.	Med-High
Graves and graveyards			
Graveyard 01	No	This graveyard holds the remains of four individuals.	High
Graveyard 02	No	This graveyard holds the remains of eight individuals from the Nkosi family.	High
Graveyard 03	No	This graveyard holds the remains of seven individuals from the Tshoka clan.	High
Graveyard 04	No	This graveyard holds the remains of three individuals from the Ndaba family.	High
Graveyard 05	No	This graveyard holds the remains of two individuals from the Ndaba family.	High
Graveyard 06	No	This graveyard holds the remains of three unidentified individuals.	High
Graveyard 07	No	This graveyard holds the remains of three unidentified individuals.	High
Graveyard 08	No	This graveyard holds the remains of ten individuals located within the boundaries of the Lenunu family homestead.	High
Graveyard 09	No	This graveyard holds the remains of seventeen individuals located within the boundaries of the Zwane family homestead.	High
Graveyard 10	No	This graveyard holds the remains of an unknown number of individuals belonging to the Lenunu family homestead.	High
Graveyard 11	No	This graveyard holds the remains of three individuals located within the boundaries of the Zwane family homestead.	High
Graveyard 12	No	This graveyard holds the remains of two individuals whose identity is no longer remembered.	High
Graveyard 13	No	This graveyard holds the remains of an unknown number of unidentified individuals.	High

Site	Disturbed by project?	Comments	Level of significance
Graveyard 14	No	This historical graveyard, located in close proximity to Farmstead complex 02, contains the remains of seven individuals.	High
Graveyard 15	No	This graveyard, located on the boundary of graveyard 14 is considered to be an extension of graveyard 14 and contains the remains of two individuals who are believed to be an English soldier and a wandering "trekboer".	High
Graveyard 16	No	This graveyard holds the remains of a number of farmworkers who worked for the Lens family.	High
Graveyard 17	No	This graveyard holds the remains of three members of the van Vuuren family.	High
Graveyard 18	No	This graveyard holds the remains of thirteen members of the Mayisela clan.	High
Graveyard 19	No	This graveyard holds the remains of twelve members of the Phagati clan.	High
Graveyard 20	No	This graveyard holds the remains of four individuals located outside the boundaries of the Phagati family homestead.	High
Graveyard 21	No	This graveyard holds the remains of six individuals located outside the boundaries of the Phagati family homestead.	High
Graveyard 22	No	This graveyard holds the remains of twelve individuals located outside the boundaries of the Phagati family homestead.	High
Graveyard 23	No	This graveyard holds the remains of two individuals who were members of the Levunu family.	High
Graveyard 24	No	This graveyard holds the remains of three individuals.	High
Graveyard 25	No	This graveyard contains the remains of an unknown number of individuals belongs to members of the Ngema clan.	High
Graveyard 26	Yes	This graveyard holds the remains of seventeen individuals within the Ankonyane family homestead. This graveyard will be impacted by the proposed construction of onsite roads.	High
Graveyard 27	Yes	This graveyard holds the remains of two individuals within the Ankonyane family homestead. This graveyard will be impacted by the proposed crushing and screening infrastructure.	High
Graveyard 28	Yes	This graveyard holds the remains of two individuals buried outside the Ankonyane family homestead. This graveyard will be impacted by the proposed brake test ramp.	High
Graveyard 29	No	This single grave holds the remains of an unknown individual.	High
Grave 01	No	This single grave holds the remains of a member of the Mbatha family.	High
Grave 02	No	This single grave holds the remains of a member of the Mbatha family.	High
Grave 03	No	This single grave holds the remains of an unknown individual.	High
Grave 04	No	This single grave is located within the boundaries of an abandoned homestead.	High
Grave 05	No	This single grave is located within the boundaries of a demolished homestead.	High
Grave 06	No	This single grave holds the remains of an unknown individual.	High

Site	Disturbed by project?	Comments	Level of significance
Grave 07	No	This single grave holds the remains of an unknown individual.	High
Grave 08	No	This single grave holds the remains of an unknown individual.	High
Grave 09	No	This single grave is located within the homestead of the Tlhatshwayo family.	High
Grave 10	Yes	This single grave holds the remains of a member of the Ankonyane family. This grave will be impacted by the proposed crushing and screening infrastructure.	High

Results: Palaeontological resources

The main findings of the specialist study are summarised below, with further detail provided in the specialist report.

Coal is formed by the burial of peats and over time the compaction and alteration of the organic material caused by increasing temperatures and pressures. Coals, therefore, are the product of fossil plants but within the coal seams the plant material is unrecognizable. In the shales and mudstones closely associated with the coal seams it is possible to find fossilized wood, leaf impressions, insect impressions, cuticle and pollen. However, the distribution of the fossils is very patchy and unpredictable and vertebrate fossils very seldom occur with the plant fossils (Bamford, 2015).

The SAHRIS palaeosensitivity map for the site indicates red (very sensitive and very high probability of fossils occurring there), orange (high probability), green (moderate) and grey (insignificant to zero) areas of sensitivity (refer to Figure 20). However, there are no records of fossils plants from this area, most likely because the deposits are far below the surface. While it is possible that plant fossils occur in the proposed mining and infrastructure area they will not be detected until excavations are initiated (Bamford, 2015).

Conclusion

Heritage resources do occur in the project area. Three graveyards and a single grave will be disturbed by project-related infrastructure. These sites are important to the history and culture of South Africa and are protected by national and provincial legislation. Any disturbance of these sites requires the necessary permits and further assessment work.

In terms of palaeontological resources, there is potential for these resources to occur on site. However, these can only be detected once excavations are initiated.

2.3.4 INFRASTRUCTURE ON SITE AND ON SURROUNDING PROPERTIES

Introduction and relevance to project

Infrastructure is directly linked to the type of land uses occurring in the area (as described in detail in Section 2.3.1). Understanding the type of infrastructure present on site and in the surrounding area provides a basis from which to understand the economic activity of the area and the potential for damage or loss of structures through project-related activities.

Data collection

Data was collected through review of specialist reports, discussions with specialist consultants, input from IAPs during the stakeholder engagement process and site visits of the area by specialists and the EIA team.

Results

Infrastructure present on site and in the surrounding area is listed in Table 15. This table is intended to provide an overview of the type of infrastructure and/or property within the area and is not meant to be an exhaustive list of all structures. It should be noted that infrastructure on site and in the surrounding areas is very similar with variations in the size of farm units.

TABLE 15: INFRASTRUCTURE ON SITE AND IN THE SURROUNDING AREA

Aspect	On-site	Surrounding farms (including neighbouring farms) (up to 10km)
Residential	Farmsteads with associated outbuildings Rural homesteads	Farmsteads with associated outbuildings Rural homesteads Kemps Lust village
Roads	Gravel district D699 road Numerous gravel tracks	Gravel district D699 road Numerous gravel tracks
Water supply	Rivers, springs	Rivers, springs, hand pumped wells
Power supply	Low voltage power supply lines	Low voltage power supply lines
Communication	Telephone lines	Telephone lines
Agriculture	Agricultural fields Farms dams Remnants of forestry	Agricultural fields Farm dams Forestry
Heritage	Graves and a historical house	Graves, historical buildings
Historic exploration or mining	Exploration boreholes	Closed Kemps Lust mine
Tourism	-	Trout lodge
Community structures	-	Schools

Conclusion

Infrastructure occurs both on site and in the surrounding area which could be impacted on by project-related activities, either directly or indirectly.

2.3.5 SOCIO-ECONOMIC BASELINE

Introduction and relevance to project

Projects of this nature have the potential to influence various aspects of the socio-economic profile of a community. This baseline section describes the current social status of the region district, local and project site level thereby providing the context within which the operations' potential impacts will occur.

Data collection

Information in this section was sourced from the social specialist study (SLR, 2015) (Appendix M) as well as the project's Social and Labour Plan.

Baseline information is given for the district, local and project site level. In terms of understanding social conditions, the study focused on a 5 km radius of the mine site. Data was collected through review of available databases, field observations and consultation with stakeholders through informal meetings and telephonic discussions. Further detail on the methodologies used is included in the specialist report.

Results

<u>Regional context</u>

The project is located in the Emadlangeni Local Municipality under the Amajuba District Municipality. The Amajuba District is one of 11 districts of KwaZulu Natal. The district is largely rural in nature with the Newcastle Local Municipality area being the most urbanised. The Emadlangeni Local Municipality has the largest area under its control but the smallest population.

Emadlangeni Local Municipality comprises of four wards and has two main towns namely Utrecht and Grootvlei. The proposed mine is located in Ward 1 which is rural in nature with communities reliant on the natural environment for livelihoods.

<u>Governance structures</u>

Ward 1 of Emadlangeni Local Municipality has two traditional leaders with authority over land that is not privately owned. In addition to the traditional leadership, there is political leadership in the form of a ward councillor. The details of the different leadership are given in Table 16 below.

TABLE 16: TRADITIONAL AND POLITICAL LEADERSHIP FOR THE PROJECT AREA

Ward Number	Traditional Leader	Political Leader
Ward 1 (Emadlangeni Local Municipality)	Chief Mabaso (Ngundeni Traditional Council)	Councillor Phenyane
	Chief Nzima (Ndlamlenze Traditional Council)	

The mentioned chiefs for Ward 1 in Emadlangeni Local Municipality do not have legal authority over the Commissiekraal farm as it is privately owned. However, they are recognised by the community of

Commissiekraal as traditional leadership. The two traditional leaders belong to two different political parties but co-exist in harmony. Inkosi Mabaso is affiliated to the ANC and Inkosi Nzima to the IFP. The ward councillor is an ANC Councillor and chairs the predominantly IFP ward committee. According to the 2015 Emadlangeni Integrated Development Plan, there is a fairly good working relationship between the municipalities and the chiefs.

Population demographics

The local municipality is sparsely populated with a population density of 9 people per km^2. This is much lower than the district average of 67.7 people per km^2. Both the Amajuba and Emadlangeni District Municipality have a young population with 46% of the population under the age of 20. There are more females (52%) than males (48%) at a district level and slightly more males (51%) than females (49%) at the local level.

According to Amajuba and Emadlangeni's Integrated Development Plan, there has been a low population growth at the district and local municipalities between the year 2001 and 2011. The population growth rate for both was 6.7%. The low population growth has been attributed to the closure of mines in Utrecht during 2001-2011 which saw some people relocating out of the municipal area. Emadlangeni Local Municipality has predicted a low population growth rate for year 2015 to year 2020 which translates to an estimated 37113, the majority of this growth is attributed to new births.

Black Africans make up the majority (93%) of the population at both district and local level. The primary language spoken at district and local level is isiZulu followed by Afrikaans and then English.

Consultation with occupiers was undertaken by CopperLeaf in 2011 and Mphahlele Wessels & Associates in 2013. During consultation with the occupiers it was observed that a total of 26 households are on the farm with a population of approximately 197 people. The main language spoken in isiZulu.

Access to basic services

- ***Water***

Amajuba District Municipality is the service authority for the Emadlangeni Local Municipality with Uthukela Water as the Water Service Provider. At a district level, most households have yard connections with Newcastle Local Municipality having the most connections. Emadlangeni Local Municipality has the least yard connections of the three local municipalities under the jurisdiction of Amajuba District. Within Emadlangeni Local Municipality, Ward 1 has the least connections to piped water with 70% of households relying on rivers and springs. During a survey undertaken by Copper Leaf in 2011, it was confirmed that all households residing on the Farm Commissiekraal are reliant on the nearby stream for their domestic and agricultural water needs.

Emandlangeni Local Municipality is however planning to improve the municipality's access to piped water through the construction of the Emadlangeni Bulk Water Pipeline which will also service the Commissiekraal area.

- ***Sanitation***

The district municipality is responsible for service delivery in terms of sanitation. The use of pit latrines by households is still common at district and local level. Households within Ward 1 do not have access to sanitation facilities. During a SLR's site visit in July 2014, community members interviewed indicated that they make use of either pit latrines or nearby veld area.

- ***Energy***

At a district level, electricity is the main source of energy for cooking, lighting and heating with approximately 60% of households with access. At a local level approximately 48% of households have access and within Ward 1 only 10% of the households have access. The district and local municipality are the service providers for electricity for the respective communities. The majority of households within ward 1 (~85%) are reliant on wood for heating and cooking and candles for lighting. Wood is sourced from nearby abandoned plantations; the main area for Commissiekraal community is on Portion 1 of Farm Vredehof 17 HT.

In order to reduce reliance on wood as an energy source, the municipality is currently exploring the route of solar energy.

<u>Housing</u>

In line with the rural nature of the municipal area, a high percentage of Emadlangeni residents live in traditional dwellings or structures which comprise of mud walls with thatch roofing (Plate 1). Communities are largely responsible for building their own residential areas in the ward.

PLATE 1: TYPICAL HOUSEHOLD AT THE COMMISSIEKRAAL AREA

Health

- ***Available healthcare facilities***

The responsibility of healthcare at district and local level is administered by the Amajuba Health District. Regional and district healthcare facilities and services are available. Mobile clinics provide 8 hour services on weekdays. Most fixed clinics operate for 10 or 24 hours with gate clinics providing 8 hour service Monday to Sunday. Permanent healthcare facilities within Emadlangeni local municipality are based in Utrecht.

At the community level, access to healthcare facilities is limited as the area is serviced by two mobile clinics that come to the area twice a month on Thursdays. According to the Amajuba IDP 2014/2015, provision of healthcare facilities by the district municipality is limited by lack of funds. There are however plans to strengthen and expand the availability of mobile clinics. Mobile service clinics expansion will include increasing the frequency of mobile stopping point visits.

- ***HIV / AIDS***

According to a study conducted by the Human Sciences Research Council (HSRC) in 2012, KwaZulu-Natal has the highest HIV/AIDS prevalence in the country. However at the district level, the prevalence of HIV/AIDS has decreased from 46% in 2006 to 35.3% in 2011. This is has been attributed to ongoing HIV/AIDS prevention interventions at the district level. There has been an increase in the number of people accessing the Anti-Retroviral (ARV) treatment within the district municipality area. This has also been due to the implementation of ARV distribution programme at all clinics in Amajuba District including mobile clinics.

Education

- ***Facilities***

There are 256 schools at a district level with 49 of these schools falling under the Emadlangeni municipal area. There are more primary schools than secondary schools at both a district (175) and local (29) level. the nearest school to the Commissiekraal area is the Lithulunye Primary School which caters for Grades R to 9. There is only one secondary school which services Ward 1 and it is located 25 km east of the project site. There is a shortage of teachers in most of the schools in the area including Lithulunye Primary. Teachers at Lithulunye Primary use a multi-grade system of teaching which involves a teacher teaching more than one grade in a class at a time.

- ***Education levels***

According to 2011 census data, there are more people without schooling at a local level (14.3%) when compared to the district level (5.8%). The majority of the local (41.6%) and district (35.4%) population do not have any secondary education. Only 13.0% at local and 20.8% at district level have Grade 12. When consulting with the local community during the social scan, it was indicated that the community has a similar trend to that of the district and local level with less than 10 youth that wrote the 2014 exam for

Grade 12. These statistics indicate that the education levels are quite low with the majority of the population only having primary school level of education.

Employment

Approximately 25.8% (district) and 28.6% (local) of the labour force is employed. The unemployed persons are 16.6% at district and 17.23 at local level. Discouraged workers are those that stopped looking for work and they comprise 8.1% (district) and 10.69% (local level). There is high unemployment for the district and the local level. Limited education levels contribute to high unemployment rates. The majority of the population at district and local level is not economically active. This group is classified as persons who were neither employed nor unemployed and it comprises of full-time students, retired persons and homemakers who did not want to work.

Between 2001 and 2011 there was a 24% decrease in employment figures. According to the Emadlangeni IDP (2014/2015) the municipality attributes decrease in employment to the global credit crunch and mechanization. There were also a number of mines that closed during that period.

- ***Employment sectors***

The main employment sector at the district level is wholesale and trade industry with the community, social and personal service industry being the main sector at a local level. Within the Commissiekraal community area, the main sector for employment has been indicated as being the agricultural sector (working for Mr Lens and local plantations) and the Community Work Programme (CWP). The CWP is designed as an employment safety net. The purpose is to supplement people's existing livelihood strategies by offering a basic level of income security through work. Within Commissiekraal community, CPW activities include cleaning services along the municipal roads. According to the IDP, a total of 650 jobs were created through the Community Work Programme in 2012/13.

- ***Income levels***

Income level data was sourced from the district and local municipality's 2014/2015 IDP reports. At district level in 2011 about 70% of the population earned below R3 200 per month. Emadlangeni Local Municipality income levels are lower than the district with 34.5% of the population earning less than R1 600 a month and only 2.5% earning more than R25 000/month.

According to the IDP report a total of 13 760 people (40% of the local municipality's population) receive a government grant. The majority of the population in Emadlangeni Local Municipality is classified as indigent.

Economic activities

Economic data was obtained from the district and local municipality's IDP reports and from 2011 statistics.

The Amajuba District Municipality has the fourth highest Gross Domestic Product (GDP) amongst District Municipalities in the province. The dominant economic activities for the district municipality are concentrated within Newcastle Municipal Area. Although the mentioned municipality is performing well within the province of KwaZulu-Natal, a comparative assessment of Amajuba in relation to other districts economies that surrounds it demonstrates that it is significantly small. The size of the Amajuba District is relatively small in the provincial context and only contributes 3.5% of the province's Gross Value Added (GVA). This is due to its relatively small population. The district has the fourth highest (GVA) capital in the province. The Gross Value Added has been compared to that of the provincial economy, in order to identify the sectoral advantages of a given district:

- Manufacturing and Mining have a greater level of importance for the district than they do for the province
- Agriculture, Finance, Construction and Transport are relatively less important as compared to the province.

The other key sectors in terms of GVA contribution are the general government sector, wholesale and retail, finance and business services sector. GVA generated through general government services is in the order of approximately R1,8 billion, which contributes 17.6% to total GVA in 2010. This sector has experienced average annual real growth of 2.6% per annum. Just over 17% of GVA can be attributed to finance (6.9%) and business services (10.2%), which collectively.

At a local level, the primary economic activities are agriculture, mining and tourism. According to the Local Economic Development Plan, Emadlangeni does not have a pull factor in terms of economic activities. The Municipality is planning to stimulate the economy internally by focusing on organic vegetables, tourism, dairy farming, coal mining and infrastructure development.

The main economic activity in and around the Commissiekraal community is agriculture (farming of sheep and cattle, seed planting (soy and mealies)) and plantations especially along the transport route.

<u>Community safety</u>

The nearest police station that services the community is in Groenvlei which is approximately 21 km west of Commissiekraal. Based on conversations with the local community, the main criminal activities in the community include livestock theft, robberies and murder. During the consultation process, community members expressed concern with the increase in crime due to the introduction of the mine.

Conclusion

The project area is characterised by impoverished rural settlements with very little economic activity, low education levels and low skills base. Municipal service delivery is a challenge particularly in the rural areas where there is lack of and inadequate provision of essential services like piped water, refuse removal, sanitation and healthcare provision. The community is therefore highly reliant on the natural environment for livelihoods especially for water and energy sources.

The area generally has good agricultural soil and climate and has enjoyed a positive agricultural sector; however this has declined in the past recent years. Community members are involved in subsistence farming within their homesteads.

Any interventions that seek to alleviate poverty should consider reviving the agriculture sector and most importantly, the promotion and development of the small-scale farmers while maintaining the support for commercial farming. Priority should be given to education and skills development in order to ensure that community members benefit from employment opportunities. Other key priorities needs based on baseline social conditions include improved water supply, energy supply, teachers accommodation facilities and healthcare facilities.

2.4 MAPS SHOWING THE SPATIAL LOCALITY AND AERIAL EXTENT OF ENVIRONMENTAL FEATURES

Maps showing the spatial locality and aerial extent of all environmental, cultural/heritage, infrastructure and land use features identified on site and on the neighbouring properties and farms are included in the baseline description.

FIGURE 3: TOPOGRAPHICAL AND HYDROLOGICAL FEATURES OF THE STUDY AREA

FIGURE 4: SOIL FORMS FOUND WITHIN THE STUDY AREA

FIGURE 5: LAND CAPABILITY OF SOILS WITHIN THE STUDY AREA

FIGURE 6: BIODIVERSITY IMPORTANCE IN TERMS OF NATIONAL GUIDELINES

FIGURE 7: ADJACENT AND SURROUNDING PROTECTED AREAS

FIGURE 8: FISH IMPORTANCE IN TERMS OF NATIONAL GUIDELINES

FIGURE 9: BIODIVERSITY IMPORTANCE IN TERMS OF REGIONAL GUIDELINES

FIGURE 10: HABITAT UNITS AND SENSITIVITY

FIGURE 11: WETLANDS AND SENSITIVITY WITH BUFFER ZONES

FIGURE 12: SITE FLOODING AND RIVER BUFFERS

FIGURE 13: GEOLOGICAL MAP AND HYDROCENSUS OF THE STUDY AREA

FIGURE 14: LOCAL GEOLOGICAL SETTING ILLUSTRATING STRUCTURAL FEATURES

FIGURE 15: CONCEPTUALISATION OF THE KAROO AQUIFER AND THE DOLERITE SILLS AT THE PROJECT SITE

FIGURE 16: WIND ROSES FOR THE PROJECT SITE BASED ON MM5 DATA FOR 2012 TO 2014

FIGURE 17: LAND USES ON AND SURROUNDING THE PROJECT SITE

FIGURE 18: EXISTING ROAD NETWORK

FIGURE 19: HERITAGE (AND CULTURAL) RESOURCES

FIGURE 20: PALEOSENSITIVITY MAP

2.5 SUPPORTING DOCUMENTS

The following specialist studies are attached as appendices to this report:

- soils, land capability and land use study (Appendix E)
- biodiversity study (Appendix F)
- hydrological assessment (Appendix G)
- groundwater study (Appendix H)
- air quality study (Appendix I)
- noise study (Appendix J)
- Phase 1 heritage (and cultural) impact assessment (Appendix K)
- Phase 1 palaeontological study (Appendix L)
- social and economic studies (Appendix M)
- geochemical waste characterisation (Appendix O).

3 PROPOSED MINING OPERATION

OVERVIEW AND INTRODUCTION

The main aim of the project is to establish an underground coal mine at the Commissiekraal project site. In broad terms the project includes underground mining accessed via a boxcut, on-site crushing and screening, temporary stockpiling of run of mine and coal product, and transport off-site by truck to customers directly or via a regional railway siding. Various support infrastructure and services will be required for the project.

A conceptual study has been completed to inform the project plan for the purposes of the EIA. Estimated project timelines are detailed below (Table 17). Information that provides perspective on the scale of the project is presented in Table 18.

TABLE 17: ESTIMATED PROJECT TIMELINES

Aspect	Timing
Start construction	Target date is 2017/2018 (subject to regulatory approval, economic considerations and funding)
Duration of construction	Site establishment – within a couple of weeks All earthworks, boxcut development and preparation for civil infrastructure – within six-months
Start operation	Once the box-cut has been established, mining of the coal seam can commence. Target date is within 6 months of construction commencing with a 1 year build up to full production.
Life of operation	Life of mine on current planning is scheduled for 20 years. The first 10 years based on indicated ore reserves while subsequent 10 years based on inferred ore resources. Further exploration, development and optimisation for the mine and ore processing is being investigated and will refine mine plan. The EIA and EMP report covers the 20 year life of mine.

TABLE 18: PROJECT DATA THAT PROVIDES PERSPECTIVE ON THE SCALE OF THE PROJECT

Features		Details
Group	Specific	
Mining	Target mineral	Coal within the Lower Gus Seam – average thickness of 2.6 m
	Mineable area	Approximately 2,000 ha
	Depth of minerals	Average depth of 72.5 m below surface for first 10 years, then 150 m for next 10 years
	Rate	Approx. 480,000 tons per annum per production section
	Extent of area for infrastructure	±14.7ha
	Product	Coal of export quality
Resource use	Water demand	Approx. 12,500 m^3 per month
	Power demand (operational)	5.5 MVA
Employment	Staff: construction	Approx. 160
	Staff: operational	Approx. 200 over a 2 shift system
Revenue generation	Capital investment	Approx. R428 million
	Annual turnover	Approx. R300 to R400 million

3.1 MINERAL TO BE MINED

The target mineral to be mined is coal. The Gus seam and, in particular, the Lower Gus seam, is the target seam. In some areas where the parting between the seams is thin (<300mm), there may be an opportunity to mine both the Upper and Lower Gus seams together.

Despite its depth from surface the Gus seam is of economic interest because of its overall good coal qualities (ECMA, 2015). There are large lateral variations in the physical and chemical nature of the coal seams. The coal of the Lower Gus Seam has a low Ash (%) content which prevails in the lower part of the seam, where bright bands dominate over dull coal. The dry ash-free volatile matter content (DAFVOL) shows that not only bituminous (DAFVOL > 24%), but also devolatilised (DAFVOL between 16.5% and 24%) and potentially anthracitic coal (DAFVOL < 16.5%) exist in the project area. The low relative density and Ash (%) contents in the low DAFVOL areas indicate that the coal has not been burnt resulting in a high calorific value. The Upper Gus Seam is inferior in quality compared to the Lower Gus Seam. The classification into bituminous, devolatilised and anthracitic coal applies to the Upper Gus Seam in the same way as it does to the Lower Gus Seam (ECMA, 2015).

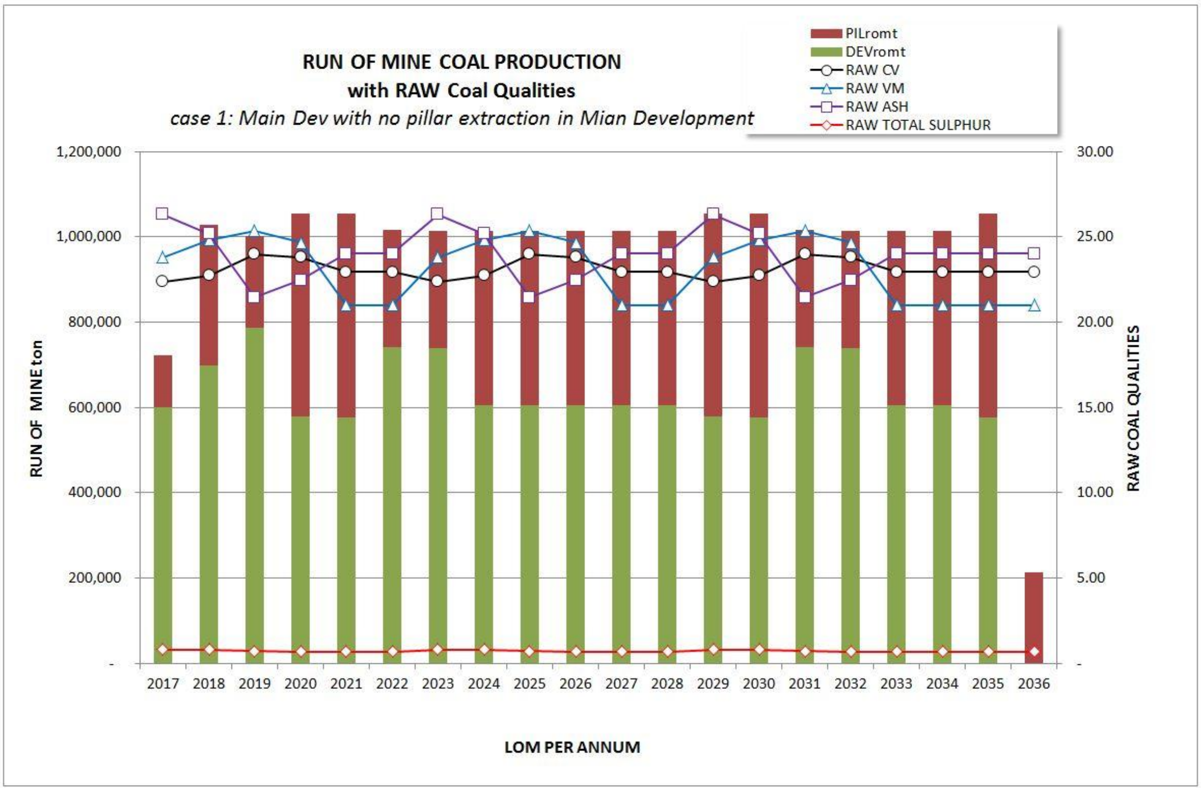


FIGURE 21: COAL QUALITIES IN THE PROJECT AREA

3.2 MINING METHOD TO BE EMPLOYED

3.2.1 MINING OPERATIONS – UNDERGROUND

This section should be read with reference to the conceptual process flow diagram (Figure 23), mine progression plan (Figure 22) and site layout drawings (Figure 24 – overall site layout, Figure 25 – adit and mining support infrastructure).

Due to the depth of the coal seam in the section of the project area that forms the subject of this EIA and EMP report, underground mining will be used to access the target coal seams.

The coal seam will be accessed through a boxcut. Access will be through a three-entrance boxcut directly into the Gus lower seam from the side of the mountain with fresh ventilation provided through two of the accesses and return ventilation fans. The mine development plan allows for the establishment of two continuous miner sections underground and one drill and blast section to mine through the anticipated dolerites and faults. The 20 year mine progression plan is illustrated in Figure 22.

The mining method selected to optimally exploit the Lower Gus resource is board pillar mining with continuous miners (i.e. pillar mining method), with partial or full pillar extraction (to be confirmed during a bankable feasibility study) on retreat and/or conventional drill and blast methods. Conventional drill and blast methods may be used until the mining conditions are confirmed to be suitable for continuous miners and until sufficient power supply is established from Eskom. In mechanised board and pillar mining, extraction is achieved by developing a series of roadways (boards) in the coal seam and connecting them by splits (cut-throughs) to form pillars. These pillars are left behind as part of the primary roof support system. In partial pillar extraction, every alternative pillar is left behind (checker board extraction) to support the overburden or the majority of pillars are extracted (stooping) to allow the roof to collapse in a controlled manner. It is expected that pillar extraction will not be done at depths less than 80m due to the pillar sizes. In the deeper mining area, if pillar extraction is undertaken there will be some subsidence within the mine but due to the depth it is unlikely that this subsidence will affect surface topography.

Coal will be transported via conveyor to the run-of-mine (ROM) stockpile (<5000 tonnes).

FIGURE 22: MINE PROGRESSION PLAN – YEAR 0 TO 20

3.2.2 CRUSHING, SCREENING AND PRODUCT HANDLING

No process plant is foreseen to be built on site at this stage and the current plan is to sell 100% of the mined coal directly to customers on a crush and screen raw quality basis. The crush and screen plant will either be diesel or electrical driven. The plant will have a capacity to process 1 million tons RoM per month.

The crush and screen plant design will consist of the following components:

- main boxcut conveyor to run-of-mine (RoM) stockpile (part of the mining section)
- RoM coal stockpile
- crushing and screening
- stockpiling of final crushed product (<15000 tonnes).

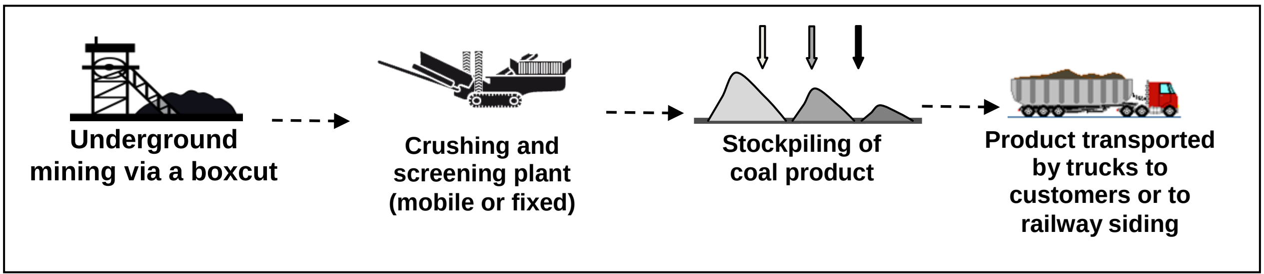


FIGURE 23: SCHEMATIC PROCESS FLOW DIAGRAM OF THE PROPOSED PROJECT

3.3 LIST OF MAIN ACTIONS/ACTIVITIES/PROCESSES ON SITE

Key activities that will take place on site during each phase (construction, operational, decommissioning, closure) of the project are listed in Table 19 below. For the purposes of this report, in broad terms, construction is the phase in which the adit is developed and mine infrastructure is established, operational covers the production phase of the mine, decommissioning is when production has ceased, infrastructure is being removed and the site rehabilitated in line with a closure plan and the closure phase refers to the period of time when maintenance and aftercare of rehabilitated areas and facilities is required to ensure closure objectives are met.

This table reflects the chosen preferred alternative. Alternatives considered in the development of the project plan are discussed in Section 3.8

TABLE 19: LIST OF PROJECT ACTIONS / ACTIVITIES / PROCESSES

*Note: * Activity continues until infrastructure can be removed or alternative end use identified*

Main activity/process	Sub-activities	Construction	Operation	Decommissioning	Closure
Exploration	Drilling of boreholes	On-going	On-going		
To refine ore reserves.	Collection of samples and analysis off-site	As required	As required		
Site preparation	Selective clearing of vegetation in line with biodiversity management plan	On-going			
	Removal of existing structures (if present)	On-going			
	Establishing the construction contractor's facilities and security fencing	At start of phase			
Earthworks	Stripping and stockpiling of soil resources in line with the soil management programme	On-going	For maintenance		
Earthworks on site relate mainly to the moving of soil and rock.	Bulldozing and grubbing activities	On-going	For maintenance		
	Developing boxcut (including blasting if required)	On-going			
	Overburden handling and stockpiling prior to use	On-going			
	Establishing the operation platform (including foundation excavations, compaction)	On-going			
	Establishing stormwater controls (channels, berms, dam) as per stormwater management plan (see Section 3.7.5)	At start of phase			
Civil works	General building activities and erection of structures	On-going	For maintenance		
Civil works on site relate mainly to any steel and concrete work.	Use of scaffolding and cranes	On-going	For maintenance		
	Concrete work including culverts	On-going	For maintenance		
	Steel work (including grinding and welding)	On-going	For maintenance		
	Installation of cables/lines and pipelines (process)	On-going	For maintenance		
Road building and upgrading	Upgrading and maintaining mine access road	At start of phase	For maintenance	For maintenance	
	Establishing and maintaining internal service roads	On-going	For maintenance	For maintenance	
	Upgrading and maintaining gravel haulage route (D699) (where required)	At start of phase	For maintenance		
Underground mining	Cutting of coal ore		On-going		
(see Section 3.2.1)	Drilling and blasting (only for dolerites and dykes)		As required		
	Loading and conveying to surface		On-going		
	Ventilation		On-going	On-going*	
Dewatering	Dewatering of the underground mine		On-going	If required for water management	If required for water management

Main activity/process	Sub-activities	Construction	Operation	Decommissioning	Closure
Crushing, screening and product handling (see Section 3.2.2)	Conveying coal to RoM stockpile		On-going		
	Materials handling and storage		On-going		
	Dry crushing and screening		On-going		
	Product handling and loading		On-going		
Power supply and use (see Section 3.7.4)	Source from on-site farm supply and/or generators	On-going			
	Source from on-site generators and/or Eskom supply		On-going	On-going*	
	Distribution throughout operation		On-going	On-going*	
	Power generation for domestic power requirements	On-going	On-going	On-going*	
Water supply and use (see Section 3.7.5)	Sourcing water from on-site	At start of phase On-going	On-going	On-going*	
	Storage of clean water on site	On-going	On-going	On-going*	
Stormwater management (see Section 3.7.5)	Diversion of clean water	On-going	On-going	On-going*	
	Collection of dirty water using channels, berms	On-going	On-going	On-going*	
	Storage of dirty water for re-use	On-going	On-going	On-going*	
Process water management	Recycling of water back into process	On-going	On-going	On-going*	
Transport systems (see Section 3.7.3)	Use of access point to the site	On-going	On-going	On-going	On-going, limited
	Transport of staff to and from site (using buses and private cars)	On-going	On-going	On-going – tapering down	Limited
	Transport of supplies, services and waste removal (using trucks and vans)	On-going	On-going	On-going – tapering down	Limited
	Vehicles/machinery movement within site boundary	On-going	On-going	On-going – tapering down	Limited
	Pumping water (clean and dirty) within the site boundary		On-going	On-going*	
Non-mineralised (general and industrial hazardous) waste management (see Section 3.7.8)	Collection of general and hazardous waste on site	On-going	On-going	On-going	Limited
	Separation of oil and water at wash bays	On-going	On-going	On-going*	
	Temporary storage of general and hazardous waste within dedicated demarcated containers/areas	On-going	On-going	On-going	
	Sorting of general and hazardous waste for re-use and/or recycling purposes	On-going	On-going	On-going	
	Removal of waste by contractor for recycling, re-use and/or final disposal at permitted waste disposal facilities	On-going	On-going	On-going	Limited
	Use of portable sanitation and change houses	On-going			
	Use of sanitation / ablution facilities and change houses		On-going	On-going*	

Main activity/process	Sub-activities	Construction	Operation	Decommissioning	Closure
	Treatment of sewage sludge at a dedicated sewage treatment plant		On-going	On-going*	
	Re-use of treated sewage sludge in the rehabilitation of disturbed areas (if permitted)			On-going	
Site support services	Operating office(s) and on-site training/induction facilities	On-going	On-going	On-going	
	Operating staff medical station	On-going	On-going	On-going	
	Parking of vehicles, buses	On-going	On-going	On-going*	Limited*
Storage and maintenance services/ facilities	Washing of machinery and vehicles (washbays)	On-going	On-going	On-going	
	Servicing machinery and vehicles (workshops)	On-going	On-going	On-going	
	Storage (stores, tanks) and handling of explosives, supplies, consumables and lubricants	On-going	On-going		
Housing	On-site housing camp	If required			
Site/contract management	Appointment of contractors and workers – off site	At start of phase and on-going		At start of phase	
	Site management (monitoring, inspections, maintenance of facilities, security, access control)	On-going	On-going	On-going	As required
	Environmental awareness training, emergency response	On-going	On-going	On-going	As required
	On-going rehabilitation of facilities/disturbed areas	Where possible	Where possible	Where possible	
	Implementing and maintaining management plans	On-going	On-going	On-going	As required
Demolition $ *unless alternative end land use is identified during the detailed closure planning*	Removing construction contractor's area (if not incorporated into plant footprint)	At end of phase			
	Dismantling and demolition of infrastructure		For maintenance	On-going$	
	Removal of equipment		For maintenance	On-going$	
	Removal of foundations			On-going$	
Rehabilitation $ *unless alternative end land use is identified during the detailed closure planning*	Backfilling of boxcut			On-going	
	Replacing soil resources in line with soil management plan		As required	On-going	
	Slope stabilisation	On-going	On-going	On-going	
	Re-vegetation and landscaping of disturbed areas and in line with biodiversity management plan	Where possible	Where possible	On-going	
	Restoration of natural drainage patterns as far as practically possible and where required			On-going	
	Initiation of aftercare and maintenance			At end of phase	
Maintenance and aftercare	Monitoring, maintenance and repair of facilities and rehabilitated areas				As required

3.4 PLAN SHOWING LOCATION AND EXTENT OF OPERATIONS

3.4.1 SITE LAYOUT PLANS

Site layouts for the project include an overall site layout showing the full extent of the application area (Figure 24), and a zoomed in plan of the adit and mining support area (Figure 25).

3.4.2 SITE FACILITIES DURING CONSTRUCTION

Temporary construction facilities will be established on site during the initial development of the mine (Figure 24). This area will be fenced and will incorporate some or all of the following:

- contractor's laydown areas
- workshops, stores, washbays, fuel handling and storage area, offices, ablution facilities
- handling and storage area for construction materials (paints, solvents, oils, grease) and wastes
- water management infrastructure
- generators for temporary power supply
- temporary access roads
- drill rigs for geotechnical drilling
- explosive store
- portable air compressors for the establishment of the decline shaft

These facilities would either be removed at the end of the construction phase or incorporated into the layout of the operational mine.

3.4.3 SITE FACILITIES DURING THE OPERATIONAL PHASE

The facilities proposed on site for the operational phase is provided below (Figure 24 and Figure 25).

- a boxcut access for personnel, material and ore
- ventilation fans
- detonator and explosives store
- crushing and screening plant
- run of mine (ROM) and product (coal) stockpile areas
- soil stockpile area
- water management infrastructure including clean and dirty stormwater berms, channels, pollution control dam
- sewage treatment plant
- workshops, stores and washbay
- fuel storage and refuelling facilities
- change houses and ablution facilities
- on-site staff medical station

- administration offices
- parking
- non-mineralised waste storage and handling
- mine access road and internal service roads
- conveyor
- substation and power distribution network
- security access, fencing and lighting
- infrastructure for communication – telephone lines if available or data satellite dish.

FIGURE 24: SURFACE INFRASTRUCTURE LAYOUT (OVERALL SITE LAYOUT)

FIGURE 25: ADIT AND MINING SUPPORT INFRASTRUCTURE

3.5 LISTED ACTIVITIES IN TERMS OF EIA REGULATIONS (NEMA AND NEM:WA)

The NEMA application for the project was submitted in terms of the 2010 EIA Regulations. Since the submission of the application, the NEMA EIA regulations have been revised. In this regard, a review of the activities included in the application submitted to DEDTEA and the amended activities as per the 2014 EIA Listing Notices are outlined in the table below (Table 20). This table has been refined during the course of the EIA. Where activities are no longer applicable this has been noted. These activities have been incorporated into the list of project activities as presented in the project description.

TABLE 20: NEMA LISTED ACTIVITIES RELEVANT TO THE PROJECT (2010 VS 2014 EIA LISTING NOTICES)

2010 EIA Regulations		2014 EIA Regulations		Applicability to the project
Activity Number	**Activity description**	**Activity Number**	**Activity description**	
Notice 544, 18 June 2010		**Notice 983, 4 December 2014**		
11	The construction of: (iii) bridges; (iv) dams; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more; where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	12	The development of: (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (x) buildings exceeding 100 square metres in size or (xi) infrastructure or structures covering with a physical footprint of 100 square metres or more; where such development occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse.	Culvert and bridge related facilities along the access road could cover an area greater than $100m^2$ and would be located within a watercourse or within 32m of a watercourse.
12	The construction of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010	13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 of Notice 545 of 2010	The project will require the establishment of water storage dams (most likely a pollution control dam, a service water dam and a potable water tank). None of these facilities will have a capacity of 50 000 cubic metres and therefore this activity is no longer deemed applicable.
18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from: (i) a watercourse.	19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from: (i) a watercourse.	The project will require the establishment of culverts across perennial and non-perennial watercourses.
22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 metres or, (ii) where no reserve exists where the road is wider than 8 metres	24	The development of (ii) a road with a reserve wider than 13,5 metres or, where no reserve exists where the road is wider than 8 metres	The project will require the establishment of haul roads within the project area that will be 10m wide. The access roads to the project site will be approximately 8-9m wide.
~~*28*~~	~~*The expansion of or changes to existing facilities for any process or activity where such expansion or changes to will result in the need for a permit or license in terms of national or provincial legislation governing the release of emissions or pollution.*~~	~~*34*~~	~~*The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution*~~	*No existing facilities will be used or expanded and therefore this activity is no longer applicable.*

2010 EIA Regulations		**2014 EIA Regulations**		**Applicability to the project**
Activity Number	**Activity description**	**Activity Number**	**Activity description**	
39	The expansion of (iii) bridges within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	48	The expansion of (iii) bridges where the bridge is expanded by 100 square metres or more in size where such expansion occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse.	Access to the project site will be via an upgraded and lengthened existing gravel farm access road. Existing culverts/bridges along the access road including new culverts/bridges will will be reqired to cater for mine related traffic.
~~40~~	~~The expansion of (iii) buildings by more than 50 square metres; or (iv) infrastructure by more than 50 square metres where such expansion occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, but excluding where such expansion will occur behind the development setback line.~~	~~49~~	~~The expansion of (iii) buildings by more than 100 square metres; or (iv) infrastructure and structures where the physical footprint is expanded by 100 square metres or more where such expansion occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse.~~	*No existing facilities will be used or expanded and therefore this activity is no longer applicable.*
~~41~~	~~The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more~~	~~50~~	~~The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more~~	*No existing facilities will be used or expanded and therefore this activity is no longer applicable.*
47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	The project will require the upgrade and widening of existing farm gravel roads in order to gain access to the site.
Notice 545, 18 June 2010		**Notice 984, 4 December 2014**		
5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. R.544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.	6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	The storage of run of mine and crushed ore (product) may require a water use license. This will be determined as part of the water use licensing process.

2010 EIA Regulations		2014 EIA Regulations		Applicability to the project
Activity Number	**Activity description**	**Activity Number**	**Activity description**	
15	Physical alteration of undeveloped land to industrial (mining) use where the total area to be transformed is 20 hectares or more	15	The clearance of an area of 20 hectares or more of indigenous vegetation	The surface infrastructure footprint and new sections of the access road will cover an area of approximately 20ha.
19	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.	16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.	The pollution control facilities at the project site will likely exceed a dam wall height of 5m.
-	-	17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource.	The project requires a mining right.
-	-	19	The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource.	On-going prospecting activities will be undertaken to inform the mining plan.
-	-	21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including crushing and screening.	Crushing and screening is a component of the project.
Notice 546, 18 June 2010		**Notice 985, 4 December 2014**		
2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres	2	The development of reservoirs for bulk water supply with a capacity of more than 250 cubic metres	Pollution control dams located at the project site will exceed a capacity of 250 cubic metres. These facilities will intersect the following: • Areas of moderate biodiversity importance in accordance to the Mining and Biodiversity Guidelines • Vulnerable ecosystems according to the National Threatened Ecosystems database

2010 EIA Regulations		2014 EIA Regulations		Applicability to the project
Activity Number	**Activity description**	**Activity Number**	**Activity description**	
4	The construction of a road wider than 4 metres with a reserve less than 13.5 meters	4	The development of a road wider than 4 metres with a reserve less than 13.5 meters	The project will require the establishment of haul roads within the project area that will be 10m wide. The access road to the mine will be approximately 8-9m wide. The access road and/or haul roads will intersect the following: • Critical Biodiversity Areas in accordance to the Kwa-Zulu Natal C-Plan • Areas of moderate and highest biodiversity importance in accordance to the Mining and Biodiversity Guidelines • Wetlands according to the National Freshwater Ecosystem Priority Areas • Vulnerable ecosystems according to the National Threatened Ecosystems database
10	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres	10	The development of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres	A diesel storage facility with a capacity of $80m^3$ will be required at the mine site. The diesel storage facility could be located within: • Areas of moderate biodiversity importance in accordance to the Mining and Biodiversity Guidelines • Vulnerable ecosystems according to the National Threatened Ecosystems database
14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation	12	The clearance of an area of 300 square metres or more of indigenous vegetation	The project will require the disturbance of more than 300 square metres of indigenous vegetation

2010 EIA Regulations		2014 EIA Regulations		Applicability to the project
Activity Number	**Activity description**	**Activity Number**	**Activity description**	
16	The construction of: (iii) bridges with a footprint exceeding 10 square metres in size; or (iv) infrastructure covering 10 square metres in size or more where such construction occurs within a watercourse or within 32 metres of a watercourse measured from the edge of a watercourse.	14	The development of: (iii) bridges exceeding 10 square metres in size; or (xii) infrastructure with a physical footprint of 10 square metres or more where such development occurs within a watercourse or within 32 metres of a watercourse measured from the edge of a watercourse	Access to the project site will be by means of surrounding existing farm gravel roads. The access road and any bridges or culverts will intersect the following: • Critical Biodiversity Areas in accordance to the Kwa-Zulu Natal C-Plan • Areas of highest biodiversity importance in accordance to the Mining and Biodiversity Guidelines • Wetlands according to the National Freshwater Ecosystem Priority Areas • Vulnerable ecosystems according to the National Threatened Ecosystems database
-	-	23	The expansion of (iii) bridges where the bridge is expanded by 10 square metres or more in size or (xii) infrastructure with a physical footprint of 10 square metres or more where such development occurs within a watercourse or within 32 metres of a watercourse measured from the edge of a watercourse	
~~19~~	~~The widening of a road by more than 4 metres or the lengthening of a road by more than 1 kilometre~~	~~-~~	~~-~~	Activity no longer exists and is no longer applicable.

3.6 INDICATION OF PHASES AND TIMEFRAMES ASSOCIATED WITH THE MAIN ACTIONS / ACTIVITIES / PROCESSES

An indication of the phases and estimated timeframes in relation to the main actions, activities or processes and infrastructure is provided in Table 19 above.

3.7 ADDITIONAL INFORMATION

Additional information providing context and/or detail to actions, activities and/or processes outlined in Table 19 is included in the sections below. Project alternatives considered in the development of the project plan as presented in this EIA are outlined in Section 3.8.

3.7.1 ONGOING EXPLORATION

Exploration will take place during the life of mine to upgrade the mineral resource as well as to assist with detailed mine planning going forward. Exploration activities will include drilling of boreholes and collection of samples for off-site analysis. No exploration will take place within water courses or wetlands.

3.7.2 OPERATING TIMES

The anticipated operating times are outlined below (Table 21).

TABLE 21: OPERATING TIMES

Activities	Operating hours and shifts
Site establishment and boxcut development	6 days a week (no Sundays) 1 day-time shift per day
Mining operations	10 hrs per shift, 2 shifts per day, 5 days a week On Saturdays, day shift only Off times and Sunday: critical maintenance only
Surface operations	10 hrs per shift, 2 shifts per day, 5 days a week On Saturdays, day shift only Off times and Sunday: critical maintenance only
Transportation operation	Daylight hours, 6 days a week

3.7.3 SITE ACCESS AND TRANSPORT MECHANISMS

3.7.3.1 Road access to the site

There is a network of gravel and surfaced district/regional roads and an existing gravel farm road providing access to the project site. Within the Commissiekraal farm there is a network of gravel tracks providing access to a number of rural homesteads. This network of roads will be used for transporting workers, materials and product.

Temporary access will be gained via the existing farm access road initially but the strategy is to establish a permanent access road early during construction for construction vehicles to access the site. The permanent access road on the farm Comissiekraal will include:

- an upgraded intersection on the D699
- a widened access road (approximately 8 to 9m wide)
- extension of between 1.5 and 2km of existing gravel track
- upgrading of the Pandana River crossing
- provision for culverts along its route
- gravel surfacing.

The final design will require approval from the Department of Roads and will inform the final layout of the access road and intersection.

3.7.3.2 Internal service roads

Internal roads will be established to link project related infrastructure (Figure 25). Roads will be gravel and likely built with the hard material from the boxcut excavation. Roads will have a width of 10m to cater for larger vehicles.

3.7.3.3 Construction transport mechanisms

An outline of the transport mechanisms to be used for the project and an estimate of the number of trips are given in Table 22.

TABLE 22: ESTIMATED CONSTRUCTION PHASE TRAFFIC

Items to be transported		**Transport mechanism**	**No. of two way trips**	**Most likely route**
Group	**Specific**			
Staff and contractors	Skilled, semi-skilled and unskilled	Private vehicles	24 per day	Expected to be from Paulpietersburg, Piet Retief, Utrecht, Wakkerstroom
		Buses	6 per day	
Delivery and waste removal vehicles	Construction materials, fuel, waste	30 to 40-tonne truck	6 per week	
	Mining and plant equipment	Flatbed trucks	4 per week	
		Abnormal loads	20 over 18 months (10 loads)	Escorted
Within the site operation	Overburden material	Front end loader	Within the boundaries of the site	Internal service roads

3.7.3.4 Operational transport mechanisms

An outline of the transport mechanisms to be used for the project and an estimate of the number of trips are given in Table 23.

TABLE 23: ESTIMATED OPERATIONAL PHASE TRAFFIC

Items to be transported		Transport mechanism	No. of two-way trips	Most likely route
Group	**Specific**			
Staff, contractors	Skilled, semi-skilled and unskilled	Private vehicles, LGV	80 per day (40 per shift) 8 per day (visitors)	Expected to be from Paulpietersburg, Piet Retief, Utrecht, Wakkerstroom
		Buses	8 per day (4 per shift)	
Delivery and waste removal vehicles	Supplies, diesel, spares, waste, equipment	10 to 40-tonne truck	2 per day	
Within the site operation	Ore	Conveyors	Within the boundaries of the site	Conveyor to RoM stockpile
Product	Coal	34-tonne truck	188 per day (94 coal loads)	Along the D699, P40, R33, P221 directly to buyers or to a regional siding (possibly Paulpietersburg)

3.7.4 POWER SUPPLY AND USE

Power will be required during the construction and operational phases of the mine. During construction power will be sourced from the existing farm supply and/or diesel driven generators (assumed capacity of <80KVA). The farm has an installed domestic supply. Power for the operational phase will be sourced from on-site generators temporarily until an Eskom supply is installed. Approximately 5.5 MVA of power will be required for the operational phase. Power distribution within the site will be via 33kV or less lines. The installation and permitting of any new powerline lines to site will form part of a separate EIA.

Tholie Logistics is considering alternative power sources for domestic power requirements such as solar panels and/or solar water geysers. The installed capacity of these facilities is likely to be <1MW.

3.7.5 WATER SUPPLY, USE AND MANAGEMENT

Water management facilities for the control of storm water and for pollution prevention such as a water supply reservoir, pollution control dam and clean and dirty storm water controls will be designed to meet the requirements of relevant legislation. Recycling dirty/process water will be a priority. Make up water requirements for both process and potable water will be sourced on site from drilled boreholes.

3.7.5.1 Potable and make-up water supply

Water during construction is needed for dust suppression and domestic use. Approximately 843 m^3/month of potable water will be sourced from on-site boreholes. Rainfall and runoff collected in the pollution control dam and treated sewage effluent (once this is built) will be used for dust suppression.

During the operational phase, water will be required for the offices and change houses, wash bays, dust suppression as well as for the mining operation. Water removed from underground during dewatering activities, rainfall and runoff contained in compliance with Regulation 704 and treated sewage effluent will be used. According to the conceptual site wide water balance, these water sources will satisfy the mine water requirements and no make-up water will be needed. Potable water demand is expected to be 40 150 litres per day at full production. Potable water will be sourced on site from drilled boreholes.

3.7.5.2 Water balance

A site wide water balance model has been prepared to understand flows within the mine's operational water circuit during average dry seasons and average wet seasons during different phases of the project. The full report is provided in Appendix Q.

The water balance is steady state and no consideration is given to changes in flows resulting from progressive development of infrastructure, variations in climate or changes in production rate, or storage (e.g. start-up water).

To demonstrate how variations in groundwater inflows and operational water requirements will impact upon the water balance, three scenarios are presented for the average annual, wet and dry conditions:

- Year 0 – before underground mining commences and only surface infrastructure is in place and operational
- Year 4 – during initial years of mining before underground workings reach the Pandana River and operational water requirements are the same as above
- Life of Mine – during latter stages of mining when underground workings reach full extent and operational water requirements reach their maximum.

Water sources (inflows) were taken as:

- Groundwater ingress into the underground workings
- Stormwater collected from dirty catchment and conveyed to the PCD
- Direct rainfall into the PCD
- Makeup and potable water from boreholes.

Water sinks (losses) were taken as:

- Evaporation from the PCD
- Water usage underground (continuous miners, roof bolters, feeder breaker, conveyor drive and sprays)
- Dust suppression
- Potable water consumption
- Discharge to environment (to be treated if required).

The specific input parameters used for the water balance are provided in the water balance report. The water balances show little variation between wet and dry season, as would be expected given that the infrastructure at surface which will be climatically influenced is relatively small in footprint (Plate 2 to Plate 5). Groundwater inflow to the underground mine workings is the most significant aspect of the water circuit. During initial stages of the mine, when groundwater inflows are negligible the operation will require a small amount of makeup water (likely to be borehole water) during the dry season to satisfy operational water requirements i.e. the mine is water negative. However as the underground workings progress groundwater inflows quickly exceed the mine's water requirements i.e. the mine becomes water positive, and there is a requirement to discharge excess water. The excess water could range from 16 931 m^3/month in year 4 to 53 173 m^3/month at full production. Once operational dewatering volumes and water consumption information becomes available, the water balance should be updated.

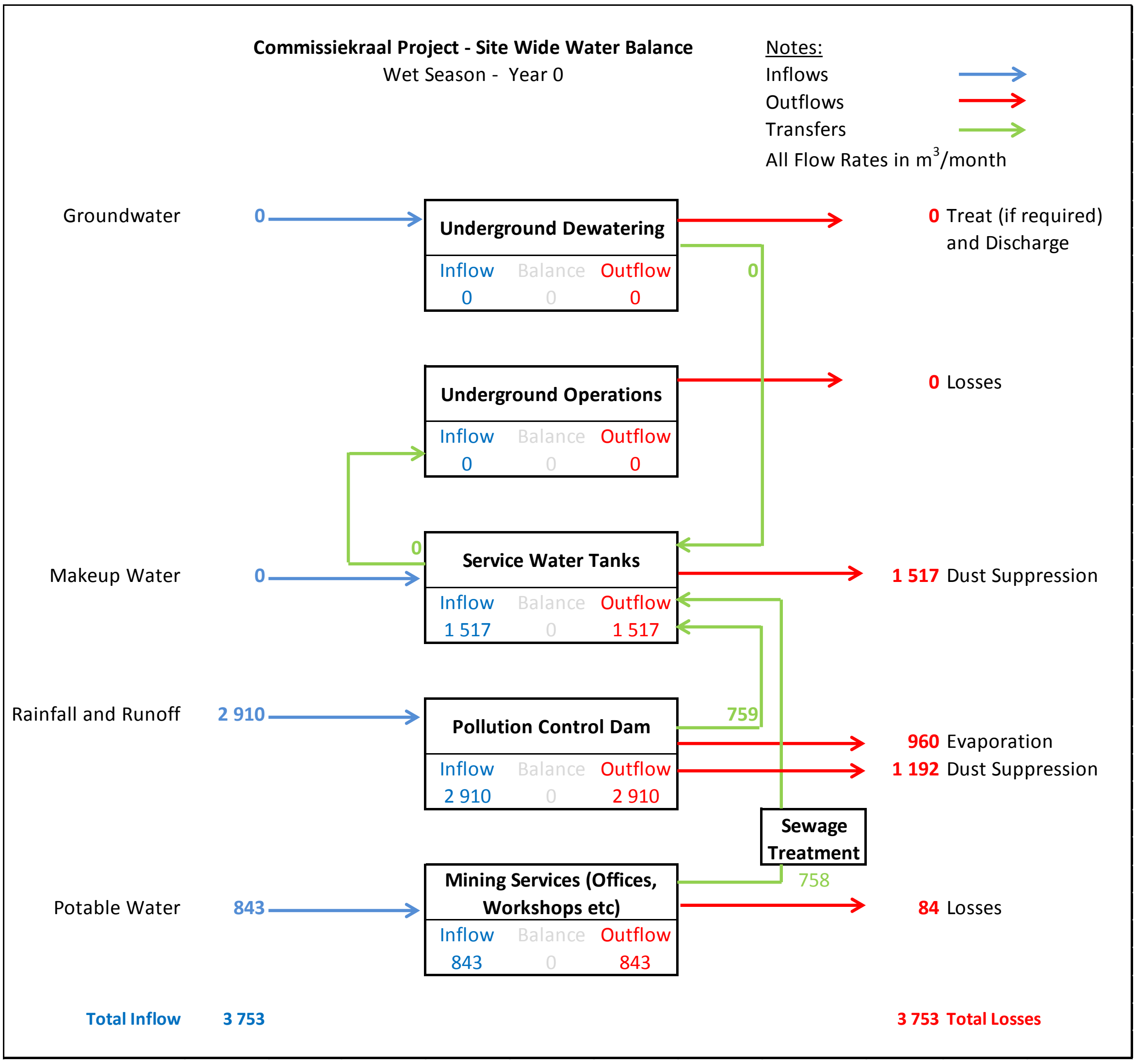


PLATE 2: WATER BALANCE - YEAR 0, WET SEASON

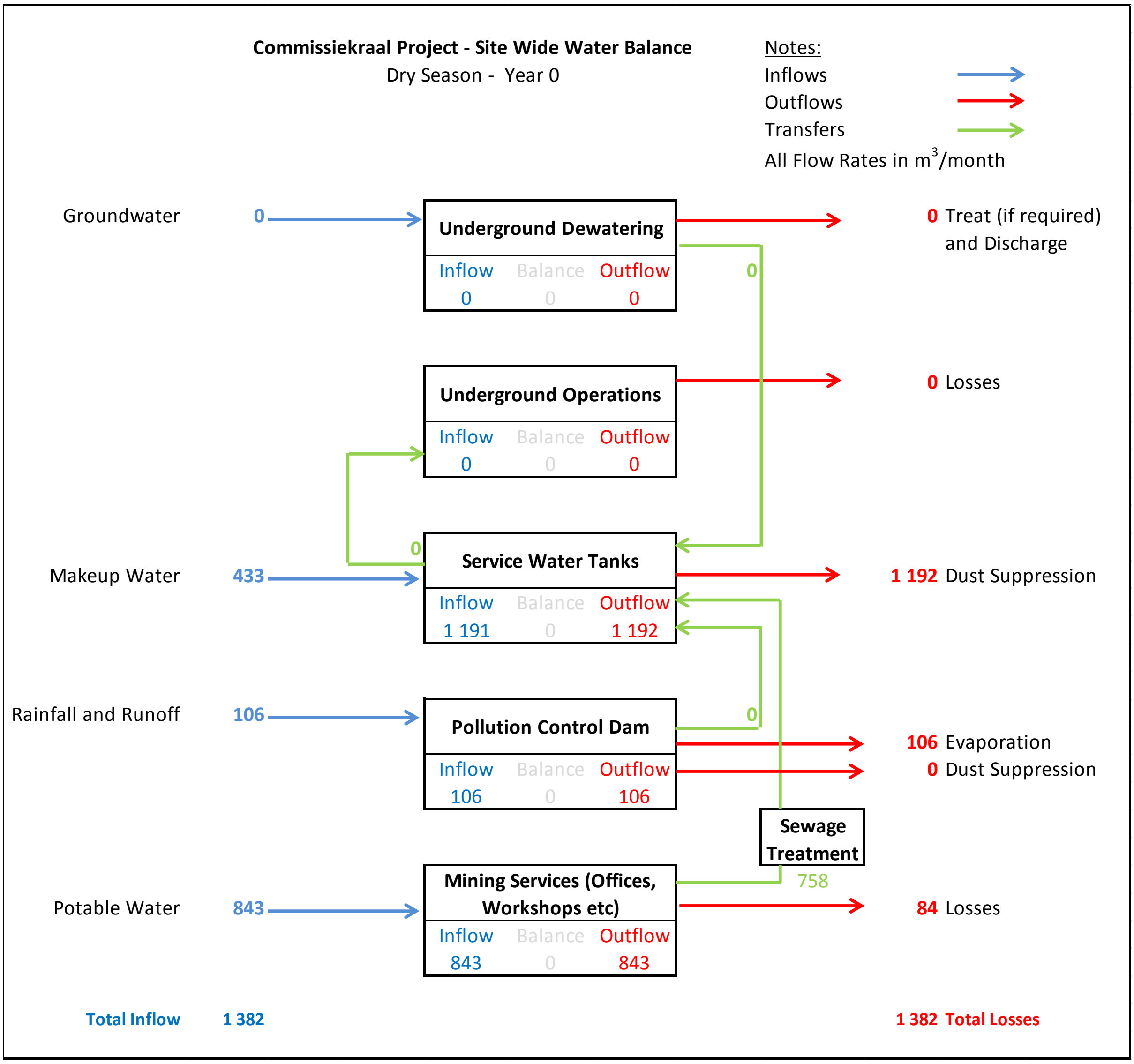


PLATE 3: WATER BALANCE - YEAR 0, DRY SEASON

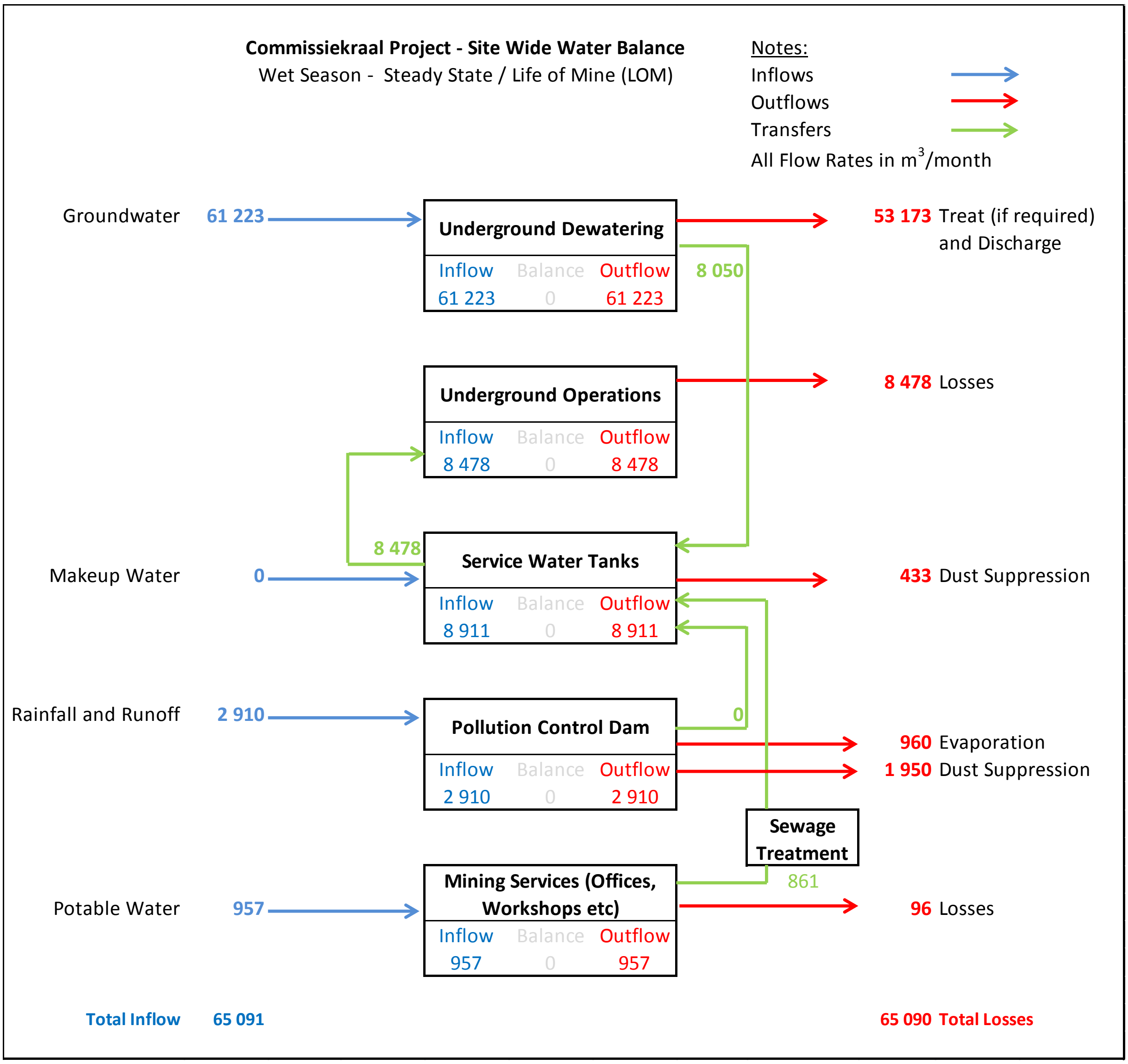


PLATE 4: WATER BALANCE – LIFE OF MINE, WET SEASON

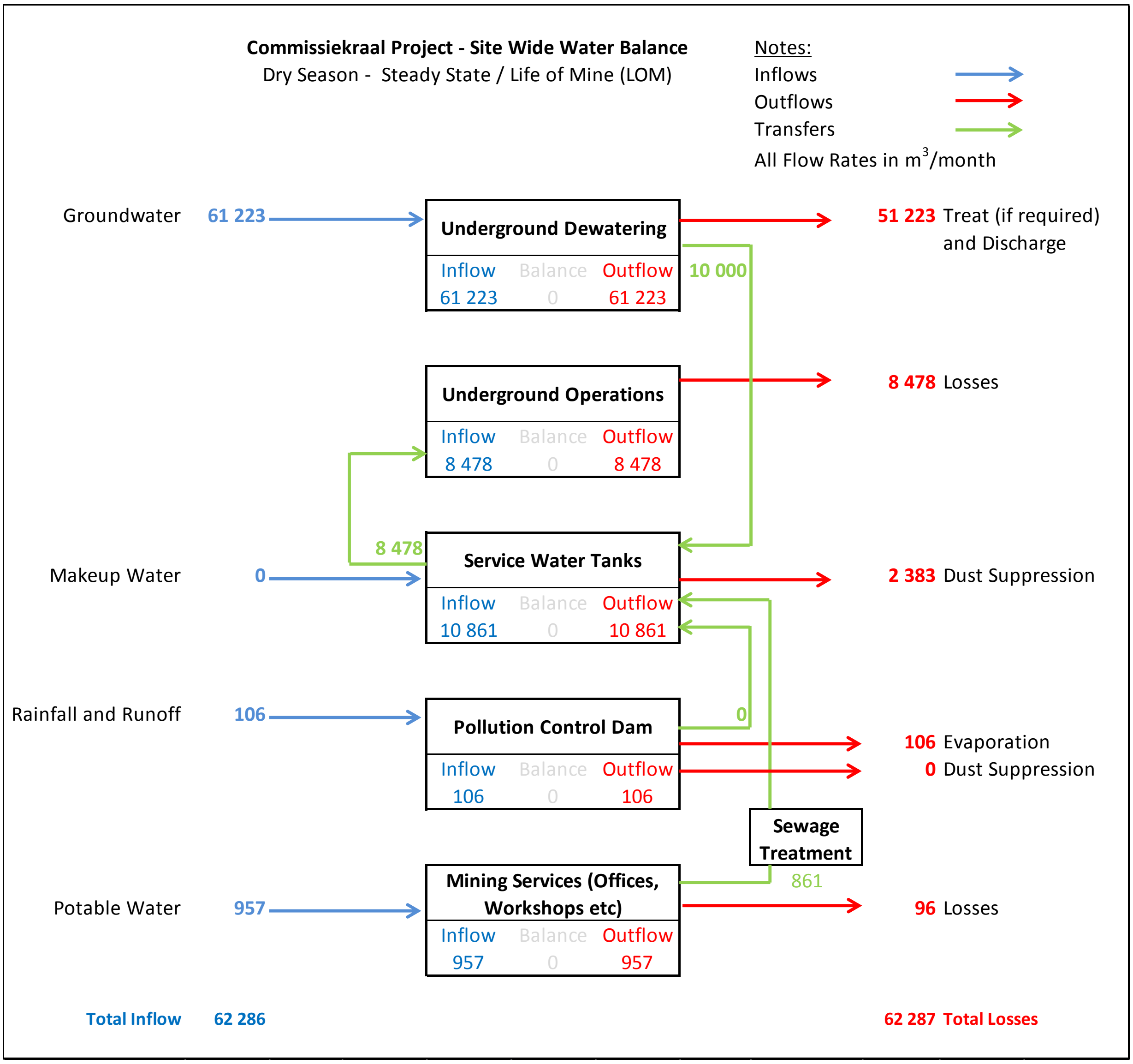


PLATE 5: WATER BALANCE – LIFE OF MINE, DRY SEASON

3.7.5.3 Water holding facilities

Water holding facilities needed for the project include a central pollution control dam (PCD) for process water and dirty storm water. The details of the facility are provided in Table 24.

TABLE 24: DETAILS OF POLLUTION CONTROL DAM

Feature	Detail
Capacity	PCD: minimum volume – 7600m^3; recommended volume – 12000m^3 The PCD will be designed in line with the requirements of R704 i.e. allow for a freeboard of at least 0.8m.
Topsoil stripping	Topsoil within the dam footprint areas will be stripped and stockpiled in accordance with the soil management plan.
Lining	Single liner to all dams comprising: HDPE liner, overlying 150mm compacted clay liner. Leakage detection system to intercept leak in HDPE liner.
Drown prevention facilities	4 manilla ropes in each corner of dam for humans. 2 life rings.
Settling facility	A silt trap will be required upstream of the dam.
Emergency spillway	The dam will have a spillway of adequate width to ensure controlled spilling during extreme storm events (greater than 1:50year).
Monitoring and maintenance	De-silting (either mechanically or hydraulically using slurry pumps) of silt traps will be required occasionally.
Contingency plans	In the event that leakage is detected, the dam should be emptied. Once the cause for the leakage is located in the empty dam, the leak must be repaired and tested prior to filling with water. In the event that the downstream borehole monitoring indicates possible pollution, the incidence should be investigated by a specialist to identify: • possible leakage from pipelines; • possible undetected liner leakage; • possible alternative source of pollution; and • appropriate action should be implemented to prevent further pollution and if necessary, clean up the existing plume.

3.7.5.4 Water treatment facilities

Excess water will likely be generated from dewatering activities. This water will need to be treated to a level specified by the DWS. According to the water balance this excess water could range from 16 931 m^3/month in year 4 to 53 173 m^3/month at full production. In addition, should decant be proven to negatively impact on downstream water users, a pump and treatment scheme will be implemented. These discharge water uses will need to be authorised in terms of the National Water Act, Act 36 of 1998. The actual treatment to be applied will be dependent on the quality of water to be treated and the effluent quality requirements to be specified by DWS.

3.7.5.5 Water management system including storm water

Water management facilities for the control of storm water and for pollution prevention such as pollution control dams, clean and dirty storm water controls and stream crossings will be designed to meet the requirements of relevant legislation. Recycling dirty/process water will be a priority.

The clean and dirty water systems on site will be designed (where relevant), implemented and managed in accordance with the provisions of Regulation 704, 4 June 1999 (Regulation 704) for water management on mines. In this regard (see Figure 24 and the specialist study attached in Appendix G):

- clean water will be diverted around infrastructure site by means of a diversion berm – the berm will be in place for the life of mine
- dirty water runoff will be contained within the dirty water system by means of diversion berms and storm water earth channels – these diversion facilities will be in place for the life of mine
- in general, the footprint of all dirty areas will be minimised by isolating these areas from clean water run off using bunds, canals and berms
- water in the dirty area will be directed via berms and channels to the pollution control dam
- water from the PCD will be re-used in the operations and/or discharged in line with a water use license
- the pollution control dam will be sized to prevent spillage more than once in 50 years in accordance with Regulation 704.

3.7.6 DISTURBANCE OF WATER COURSES

A number of non-perennial streams drain the Commissiekraal farm towards the Pandana River. Project-related infrastructure has been placed outside of the 100 m offset from the centre of the drainage line as far as possible except for the mine access road.

3.7.7 DUST MANAGEMENT

Suppression of dust within the mining operation and along the access road is planned to be predominately controlled by spraying of water. The use of appropriate specialised commercial dust suppression products will be investigated to reduce water consumption.

3.7.8 NON-MINERALISED WASTE MANAGEMENT

The types of wastes that will be generated by the project are summarised in Table 25. The method for handling and storage of the wastes is included in the table. The waste management practises for the project are included in

Table 26. It is estimated that less than 20m^3 of general waste and less than 35m^3 of hazardous waste will be generated by the project. No on-site landfill (waste disposal) facilities are planned.

TABLE 25: DOMESTIC AND INDUSTRIAL SOLID WASTES

Waste Type	Method of temporary storage on site	Options for re-use / recycling
Medical waste	Designated sealed containers in covered store	-
Scrap metal	Open air scrap yard and salvage yard	Recycled through a scrap dealer
Building rubble and redundant concrete	Open air scrap yard	Re-used on site for rehabilitation
Used oil and lubricants	Drums in bunded store/collecting sump	Recycled through a contractor

Waste Type	Method of temporary storage on site	Options for re-use / recycling
Polluted soil from accidental spills	In-situ remediation or collection in designated container for off site disposal	
Packaging for hazard material	Sealed containers in bunded store	-
Construction material off cuts	Designated skip	Recycled through a contractor
Chemicals/chemical contaminated containers and material (detergents, paint, solvent containers)	Sealed containers in bunded store	-
Vehicle parts	Open air scrap yard	Recycled through a scrap dealer
General industrial, non-hazardous waste	Designated skip	Sorted on site for removal by various contractors – recycled where possible
General domestic, non-hazardous waste (packaging, office waste)	Designated skip	
Sewage waste	Container or Drying beds and then used for rehabilitation	Removed by contractor or Used for on-site rehabilitation

TABLE 26: WASTE MANAGEMENT PRACTICES FOR DOMESTIC AND INDUSTRIAL WASTE

Items to be considered		Intentions
General	**Specific**	
Classification and record keeping	General	The waste management procedure for the mine will cover the storage, handling and transportation of waste to and from the mine. The mine will ensure that the contractor's responsible are made aware of these procedures.
	Waste opportunity analysis	In line with DWEA's strategy to eliminate waste streams in the longer term, the mine will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.
	Classification	Wastes (except those listed in Annexure 1 of the new Waste Regulations) will be classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation. Waste will be re-classified every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors.
	Safety data sheets	The mine will maintain, where required in terms of the Regulations, the safety data sheets for hazardous waste (prepared in accordance with SANS 10234).
	Inventory of wastes produced	The mine will keep an accurate and up to date record of the management of the waste they generate, which records must reflect: • the classification of the wastes; • the quantity of each waste generated, expressed in tons or cubic metres per month; • the quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of; and • by whom the waste was managed.
	Labelling and inventory of waste produced	Any container or storage impoundment holding waste must be labelled, or where labelling is not possible, records must be kept, reflecting: • the date on which waste was first placed in the container; • the date on which waste was placed in the container for the last time when the container was filled, closed, sealed or covered; • the dates when, and quantities of, waste added and waste removed from containers or storage impoundments, if relevant; • the specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations, 2012; and • the classification of the waste in terms of Regulation 4 once it has been completed (if required).
	Disposal record	Written evidence of safe disposal of waste will be kept.
	Record keeping	Records will be retained for a period of at least 5 years and will be made available to the Department on request.

Items to be considered		Intentions
General	**Specific**	
Waste management	Collection points	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.
	Laydown/ salvage areas	During decommissioning and closure, lay down areas for re-usable non-hazardous materials will be established.
	General waste	Will be stored in designated skips and removed by an approved contractor for disposal at a licensed facility.
	Scrap metal and building rubble	Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other waste. The scrap metal will be collected in a designated area for scrap metal. It will be sold to scrap dealers. Building rubble will be used to backfill the boxcut.
	Hazardous wastes	Medical waste, explosives packaging, used chemicals and chemical containers will be temporarily stored in sealed containers in a bunded store before removal by an approved waste contractor and disposal in a licenced facility.
	Oil and grease	Oil and grease will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection. An approved subcontractor will remove oil from site.
	Any soil polluted by a spill	If remediation of the soil *in situ* is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.
	Dried sewage sludge and screenings from the sewage plant	The first option is to make use of the sludge as part of the fertilising medium for re-vegetation of disturbed areas. Any excess sludge will be removed from site with the screenings as hazardous waste and disposed at a licensed facility.
	Mixing of wastes	Waste will not be mixed or treated where this would reduce the potential for re-use, recycling or recovery; or result in treatment that is not controlled and not permanent. Waste may be blended or pre-treated to enable potential for re-use, recycling, recovery or treatment; or reduce the risk associated with the management of the waste.
Disposal	Off site waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities. For general waste the nearest site is Newcastle. For hazardous waste the closest permitted site is at Holfontein.
		Unless collected by the municipality, the mine must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Waste Act prior to the disposal of the waste to landfill.
		Unless collected by the municipality, the mine must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Waste Act.
Waste transport	Contractor	A qualified waste management subcontractor will undertake the waste transport. The contractor will provide an inventory of each load collected and of proof of disposal at a licensed facility.
Banned practices	Long-term stockpiling of waste	Stockpiling of waste is a temporary measure. Waste stockpiling sites must have an impervious floor, be bunded and have a drainage system for collection and containment of water on the site.
	Burying of waste	No wastes will be buried on site.
	Burning of waste	Waste may only be burned in legally approved incinerators.

3.7.9 OVERBURDEN AND WASTE ROCK

At this stage in project planning, no waste rock dumps are planned for the project. Overburden/waste rock produced by the development of the boxcut (approximately 85,000m^3) will be used to develop the platform for surface infrastructure where required and establish roads. The overburden is expected to comprise soil, subsoil, overburden and hard rock.

3.7.10 SEWAGE TREATMENT

A sewage treatment plant is planned for the project. The proposed plant will be designed with an annual throughput capacity of 6000m^3 (based on an anticipated peak of 200 workers). The plant will likely be a package biological activated sludge media plant. Sewerage will drain via gravity to the treatment plant. The final design of the plant will be determined during the definitive feasibility study and will include measures for preventing pollution of soil, air (odour) and water resources.

Treated effluent will be used for dust suppression. Effluent will be treated to meet discharge standards. Sewage sludge will either be used for on-site rehabilitation of disturbed areas if the sludge is declassified and its use licensed or alternatively, disposed of off-site at a permitted facility.

Mobile enclosed portable toilets will be placed at the construction site until such time as the ablution facilities and sewage treatment plant are operational. The enclosed chemical toilets will be cleaned and serviced twice a week by a contractor. Sufficient toilets will be placed on site to cater for workers.

3.7.11 ADDITIONAL SUPPORT FACILITIES AND SERVICES

In addition to the abovementioned core infrastructure and activities, the support services and facilities include the following (Figure 25):

- detenotaor and explosives stores
- workshop and wash bay equipped with oil traps – used for servicing, washing and general maintenance of vehicles and equipment
- cable workshop and stone dust store
- fuel storage (approximately 80,000 litres) and refuelling bay – within impermeable and bunded area with sufficient capacity to contain 110% of total spilled materials. All spilled materials must drain to sumps with oil traps that must also be equipped to allow collection and removal of spilled substances as per SANS 10089-1:2003
- oil and other lubricants delivered and stored in 210l drums in a dedicated store – within impermeable and bunded area with sufficient capacity to contain 110% of total spilled materials
- laydown areas
- temporary non mineralised waste storage and handling facilities before re-use or collection and removal
- change room with ablution facilities for employees
- on-site staff medical station for the primary treatment of injuries and illness including an ambulance for emergency situations
- bus off-loading and loading area with parking
- security checkpoint at main gate
- weighbridge
- security fencing around and lighting (with masts) within the infrastructure site for security and safety reasons

- infrastructure for communication – telephone lines if available or data satellite dish.
- light vehicle and LDV parking areas
- offices with employee training and induction facilities.

Most facilities or structures are likely to be of a portable nature.

3.7.12 WORKFORCE AND HOUSING

At this stage it is expected that the construction workforce will peak at 160 people and the operational workforce at approximately 200 people. Labour will be recruited locally as far as possible (where skill sets and training allow). Where highly skilled labour is required, this will be sourced from nearby towns or nationally.

Construction contractors will likely be responsible for housing their workers off site and providing the required facilities and services for transporting workers to site. If required, a temporary housing camp may be established on site for the construction phase. The camp will be located within the footprint of the surface infrastructure area.

No on site housing facilities are planned for the operational phase. The mine's policy will be to provide permanent employees with housing allowances. Any contractors will be responsible for housing their workers off site and providing the required facilities and services for transporting workers to site. The mine will consider means to ensure that the allowance is spent on accommodation that meets acceptable standards through management of housing loans and provision of transport for its employees. A formal employment and housing policy will be developed for this issue.

3.7.13 CONCEPTUAL REHABILITATION PLAN

Rehabilitation is an integral part of mining operations and should be well planned from the outset. This section provides a conceptual closure and rehabilitation plan for the project. This plan outlines the objectives and principles of closure, as well as the details involved in the rehabilitation of the project.

3.7.13.1 Closure principles and objectives

A list of environmental aspects that describe the pre-mining environment as informed by the baseline description are listed in Section 15. This list serves to guide the setting of environmental objectives for mine closure.

The scope of the rehabilitation plan for any project is defined in terms of a proposed post closure land use which in turn leads to the definition of the rehabilitation and closure objectives and the standards against which rehabilitation and closure success are to be measured. The proposed post closure land use objectives for the project site is natural environment/cattle farming with controlled grazing land use. Only the water dam would remain at closure (if required for water management). The objective for this area is wilderness land.

Therefore the more specific objectives of rehabilitation and closure for the project are to:

- restore as much as possible of the project area to a condition consistent with the pre-determined post closure land use objective – assumed at this stage to be natural environment /cattle farming with controlled grazing land use
- ensure area is left in a condition which poses an acceptable level of risk to public health and safety
- reduce as far as is practicably possible the need for post closure intervention, either in the form of monitoring or ongoing remedial works.

The standards against which the success of rehabilitation and closure of the mine will be determined have yet to be formulated in detail but should, as a minimum, comply with the requirements of South African Law and the company's Environmental Policy.

3.7.13.2 Rehabilitation guidelines

Activities that will take place on site during the decommissioning and closure phase to support rehabilitation of the site are listed in Table 19.

Where practical, rehabilitation will take place during the construction and operational phases. Rehabilitated areas will be monitored for a minimum period of five years, and managed where necessary so as to ensure the objective of restoring the land to it pre-mining land use capability. This issue will be revisited as part of the detailed closure planning for the project.

Availability of topsoil is important for successful rehabilitation since it supports plant growth and fauna community as well as the structural integrity of the soil. Management of soil resources during all phases of the project in line with the site-specific soil management plan is therefore critical. Soil needs be replaced in its natural location and/or restored to its potential use. The rehabilitation plan will take into consideration the requirements of the soil, biodiversity and visual management plans.

The approach outlined below will be adopted.

- All **coal stockpiles** will be removed from site and the footprints rehabilitated
- The **crush and screen plant** together with most support infrastructure and services will be deconstructed. Equipment and structures will be sold where economic, otherwise it will be removed from site as waste
- The **entrance to the underground mine** will be sealed and the **boxcut** backfilled and rehabilitated in a manner that it presents a land form that has similar safety attributes to the

natural land forms in the area. In this regard, structures will be stable, protected from flood damage and steep slopes will be contoured.

- The **pollution control dam** will be retained in operation for water treatment, if required.

Only vegetation indigenous to the area should be used for rehabilitation / landscaping purposes.

3.7.13.3 Application for closure

At the required time, the mine will apply for a closure application in terms of relevant legislation (MPRDA and/or NEMA). This process will also involve other regulatory authorities and IAPs in a similar fashion to the involvement of people during the EIA process. A detailed closure plan will be compiled to determine specific closure strategies and action plans taking regulatory, environmental, social, economic and sustainable development principles into account.

3.7.13.4 On-going water treatment

The groundwater modelling and analyses conducted as part of this EIA have identified that water inflows in the underground mine are likely to decant at closure and depending on the quality may need to be treated before it can be released. The quality of water and volume that may require treatment will need to be determined using monitoring data collected during the operational phase of the mine. This data will be used to determine the design of a water treatment plant or to consider alternate methods of disposal of excess water. The mine is committed to provide on-going treatment of decant water arising from the operations, in order to protect water resources.

3.8 ALTERNATIVES CONSIDERED

This section describes land use or development alternatives, alternative means of carrying out the operation, and the consequences of not proceeding with the proposed operation.

The main project alternatives to be considered include:

- alternative land use
- the “no-go” alternative
- project alternatives – infrastructure, underground mining methods, power supply, water supply and access routes.

3.8.1 LAND USE ALTERNATIVES

In accordance with the current land use in the vicinity of the project, the project site could, as an alternative to the project, be used for grazing, cultivation or conservation. SLR is aware of initiatives by conservation groups and agencies to declare areas surrounding the project site for conservation and protection.

When considering the post rehabilitation land use alternatives, the only option considered to date is rehabilitation back to the current land use capability. Land use alternatives are assessed in Section 5.

3.8.2 LAND DEVELOPMENTS WHICH MAY BE AFFECTED BY THE PROPOSED PROJECT

This section provides a list and description of land developments identified by the community or IAPs that are in progress and which may be affected by the project.

At this stage in the process, SLR is not aware of any land developments that may be affected by the project. During a focussed workshop with biodiversity stakeholders, SLR was made aware of initiatives by conservation groups and agencies to declare areas surrounding the project site for conservation and protection, however no plans relate to the actual Commissiekraal Farm at this stage.

3.8.3 IAP PROPOSALS TO ADJUST PROJECT PLAN

This section provides an indication of proposals made in the consultation process to adjust the operational plans of the mine to accommodate the needs of the community, landowners and IAPs.

Comments received to date have indicated that there is a general opposition by landowners, farmers and conservation groups in the area to the project being developed. The project team have specifically considered the biodiversity sensitivity and water supply significance of the project area and immediate surrounds. In this regard the proposed mine plan involves underground mining to minimise surface disturbance and avoid diverting the Pandana River even though the open pit option would be the preferred alternative from an economic perspective. The proposed project also excludes on-site coal washing in order to minimise surface disturbance and pollution sources related to the discard dump that would remain in perpetuity.

3.8.4 THE “NO-GO” OPTION

The assessment of this option requires a comparison between the options of proceeding with the project with that of not proceeding with the project.

The economic benefits of proceeding with the project are assessed in Section 8.2.18. It is however noted that there are negative environmental and social impacts associated with the proposed project. These impacts have been assessed with specialist input in both the unmitigated and mitigated scenarios. These assessments have found that all potential negative environmental and social impacts can be mitigated to an acceptable level assuming that management and mitigation measures are effectively implemented.

The “no-go” alterative would entail a status quo in which none of the potential negative environmental and social impacts associated with the proposed project would occur, however none of the socio-economic benefits discussed above would be realised either.

3.8.5 Project Plan

3.8.5.1 Mine access and infrastructure alternatives

At this stage in project planning, surface infrastructure will be located around the mine access area in the north-eastern part of the project site (Figure 2). The mine access site selected is in the middle of the north-eastern sub-outcrop area of the planned mineable resource. This mine access and infrastructure site was selected by the technical project team taking into consideration the practical requirements for developing a mine access on seam. As described in the biodiversity baseline, surface infrastructure has been limited to the less sensitive areas and will be established in transformed grassland habitat.

3.8.5.2 Mining method

Two options were considered when accessing the ore body, namely open pit and underground mining. Both mining methods are possible in the project area as the ore body outcrops on surface, which would allow for opencast mining, and extends to an average depth of approximately 150 m, which would allow for underground mining.

Table 27 below provides a comparison of opencast and underground mining methods at the project site. Furthermore, a rating has been applied to each criterion that has been considered whereby 1 is the most preferable and 5 is the least preferable. Due to the sensitive environmental features on site, it is clear that underground mining is the preferred option despite the negative economic implications from the applicant’s perspective. Tholie Logistics is committed to responsible mining and would like to limit the impact of the mine as far as practically possible. As such, Tholie Logistics is prepared to forgo some of the mine-related profits and has chosen to abandon the coal reserves close to surface and focus on the underground coal reserves only.

With regards to the underground mining method, two options were considered by the applicant, namely the Continuous Miner method and the conventional Drill and Blast method. Continuous Miners have a higher productivity than the conventional Drill and Blast method, however it requires more capital. The Continuous Miner method is also severely impacted upon when mining into dolerite intrusions. Drill and Blast methods are more labour intensive and therefore operating costs are higher than Continuous Miner methods, but provide other advantages such as manoeuvrability in geologically difficult areas. The preferred underground mining method will be determined during the detailed design phase.

TABLE 27: COMPARISON OF OPENCAST AND UNDERGROUND MINING METHODS

Criteria	Rating	Discussion	Rating	Discussion
Opencast mining			Underground mining	
Biodiversity	5	Open cast mining would require mining through the perennial Pandana River and various wetland features. This would result in flow and quality deterioration in the river systems. These surface water resources are considered highly sensitive. In addition a significant portion of vulnerable terrestrial ecosystem would be destroyed. Both the terrestrial and aquatic ecosystems provide habitat for fauna and flora of conservation importance, including various protected species. It is also unlikely that these ecosystems could be fully restored after closure even if the open pit is backfilled. It is also likely that decant from the open pit would continue to impact on water quality after closure and in this way continue to impact on biodiversity. This decant contamination impact will apply to both the open pit and underground mine alternatives.	2	The location of mine related surface infrastructure was specifically chosen to avoid the most sensitive areas on site, avoid mining within the river and minimise surface disturbance. Surface infrastructure associated with underground mining would be restricted to 20 hectares of transformed grassland. While the dewatering cone associated with the underground mining is likely to impact on surface water resources by reducing the baseflow contribution, which will ultimately impact on biodiversity, this impact will be limited to the life of the mine. Post-closure, it is expected that decant from the underground mine would continue to impact on water quality after closure and in this way continue to impact on biodiversity. This decant contamination impact will apply to both the open pit and underground mine alternatives.
Land use	5	The surface disturbance and associated loss of current land uses of the mine would be significantly greater with the establishment of an open pit when compared to underground mining.	2	Surface disturbance and loss of current land uses will be limited to support infrastructure and be far smaller in extent when compared to open pit mining.
Groundwater impacts	5	Potential impacts associated with open pit mining include dewatering and contamination of groundwater resources through the presence of overburden stockpiles which could generate poor quality seepage. Both open pit and underground alternatives would include coal stockpiles which also have the potential to generate poor quality seepage. Post-closure, it is expected that decant from the open pit would impact on the quality of shallow groundwater resources. This decant contamination impact will apply to both the open pit and underground mine alternatives.	3	Potential impacts associated with underground mining include dewatering and contamination of groundwater resources. No overburden stockpiles will be required as material generated during portal development will be used as fill material and mining will be conducted on seam underground. In this way the potential water pollution sources are minimised. Both open pit and underground alternatives would include coal stockpiles which also have the potential to generate poor quality seepage. Post-closure, it is expected that decant from the open pit would impact on the quality of shallow groundwater resources. This decant contamination impact will apply to both the open pit and underground mine alternatives.
Surface water impacts	5	Open pit mining could have a significant impact on surface water resources. Potential impacts include: <u>Alteration of natural drainage patterns</u>: This would be a significant impact as the perennial Pandana River would need to be diverted. Furthermore, dirty areas, which are designed with containment facilities to prevent pollution, would include the entire pit area which could result in a significant loss of water to the catchment. <u>Contamination of surface water resources:</u> Water quality in the Pandana River is very good and water is used by both community members on site as well as numerous downstream users. The	2	The potential surface water impacts associated with underground mining are noticeably less when compared to opencast mining. Potential impacts include: <u>Alteration of natural drainage patterns</u>: The location of mine related surface infrastructure was specifically chosen as it avoids the watercourses on site as far as possible. With reference to site layout plan the bulk of surface infrastructure is located between two non-perennial tributaries of the Pandana River, out of the 1:100 year floodline. The only infrastructure located in the 1:100 year floodline is the access road where it crosses watercourses. Furthermore, dirty areas are restricted to the area

Criteria	Rating	Discussion	Rating	Discussion
Opencast mining			Underground mining	
		river systems also support sensitive aquatic ecosystems with protected biota. Contamination is possible during all phases of the mining operation due to accidental spills and leaks and seepage from overburden stockpiles. Post-closure, it is expected that decant from the open pit once filled would continue to impact on water quality. This decant contamination impact will apply to both the open pit and underground mine alternatives.		of surface disturbance (20 hectares) and therefore the loss of water to the catchment is expected to be minimal. Contamination of surface water resources: Contamination is possible during all phases of the mining operation due to accidental spills and leaks but no overburden stockpiles will be required as material generated during portal development will be sued as fill material and mining will be conducted on seam underground. In this way the potential water pollution sources are minimised. Surface infrastructure has been positioned to avoid watercourses on site as far as possible, which would reduce the potential for the impact occurring. Post-closure, it is expected that decant from the open pit once filled would continue to impact on water quality. This decant contamination impact will apply to both the open pit and underground mine alternatives.
Visual impacts	5	The visual impacts associated with open pit mining can be significant, particularly in areas that are relatively undisturbed as in the case of the project area. Potential impacts relate to denuded areas, overburden stockpiles, dust plumes and transport mechanisms (including vehicles and routes).	2	Visual impacts associated with underground mining are significantly less when compared to opencast mining as most infrastructure is located below surface. Visual impacts will largely be limited to the areas associated with the boxcut, crushing and screening plant and transport routes.
Economic considerations	1	Opencast mining allows for quick access to the ore body, which results in prompt profitability for a mine.	5	Underground mining requires the establishment of a boxcut and shaft system which is time consuming and capital intensive. Furthermore, support services such as air and water need to be supplied to the underground workings. In order to create safe working conditions for mine employees pillars need to remain in place to provide support and prevent the collapse of the material between the underground workings and surface. As such, ore reserves located in these pillars would not be extracted as part of the mining operations which decreases the amount of product produced by the mine.
Conclusion	**26**	**Opencast mining is the least preferred option.**	**16**	**Underground mining is the preferred option.**

3.8.5.3 Processing method

Two options were considered with regards to mineral processing at the Commissiekraal Coal Mine, namely on- and off- site processing. On-site processing would require the establishment of a wash plant with an associated discard dump of poor quality coal which would remain in perpetuity. Due to the sensitive environmental features on site, Tholie Logistics has chosen the option of off-site processing. This decision will impact the profitability of the mine, however the applicant is committed to responsible mining and would like to limit the impact of the mine as far as practically possible.

Table 28 below provides a comparison of establishing on-site and off-site mineral processing facilities. Furthermore, a rating has been applied to each criterion that has been considered whereby 1 is the most preferable and 5 is the least preferable.

3.8.5.4 Power supply alternatives

The mine will require a 5.5 MVA power supply. Power will be sourced from on-site generators temporarily until an Eskom supply is installed. No other feasible alternatives exist. Tholie Logistics will however try to use alternative power sources for domestic power requirements such as solar panels and/or solar water geysers.

3.8.5.5 Water supply alternatives

The mine will reuse all water removed from underground and contained in compliance with Regulation 704. A small amount of make-up water (433 m^3/month) will however be required during the dry season in the construction phase according to the conceptual site wide water balance. In addition, potable water will be required for all project phases until closure.

No potable or make-up water is available from the Utrecht Municipality. Therefore all make-up and potable water will be sourced form springs or boreholes on site. It has been confirmed that groundwater resources have sufficient yield to provide for these water requirements. Abstracted water to be used for potable use will be treated to drinking water standards if required. These water uses will need to be authorised in terms of the National Water Act, Act 36 of 1998.

3.8.5.6 Access route alternatives

Two access road options were considered during the scoping phase, however one was discarded due to landowner objection. The selected option is shown on the site layout plan.

TABLE 28: COMPARISON OF ON-SITE AND OFF-SITE MINERAL PROCESSING

Criteria	Rating	Discussion	Criteria	Rating	Discussion
Off-site coal washing			On-site coal washing		
Biodiversity	2	The surface infrastructure and area of disturbance is limited by exporting coal for washing off-site. No additional water pollution sources which could impact on aquatic ecosystem health would be established if coal is exported for washing off-site.	Biodiversity	5	The establishment of a wash plant would increase the surface infrastructure and area of disturbance marginally. However a discard dump of significant size would be required to dispose of poor quality coal that could not be sold. This would result in the clearance of a significant amount of biodiversity which comprises threatened ecosystems. In addition, the wash plant and discard dump represent significant additional sources of surface and shallow groundwater pollution which could negatively impact on aquatic ecosystem health.
Land use	2	The area of disturbance and associated loss of current land use is limited by exporting coal for washing off-site.	Land use	5	The establishment of a wash plant and associated discard dump of significant size would result in a larger surface disturbance area in which the current land uses would be lost.
Groundwater impacts	1	No additional groundwater pollution sources would be established if coal is exported for washing off-site.	Groundwater impacts	5	The wash plant and discard dump would represent significant additional sources of shallow groundwater pollution. The discard dump would remain in perpetuity and represent a permanent groundwater pollution source.
Surface water impacts	1	No additional surface water pollution sources would be established if coal is exported for washing off-site.	Surface water impacts	5	The wash plant and discard dump would represent significant additional sources of surface water pollution. The discard dump would remain in perpetuity and represent a permanent surface water pollution source.
Visual impacts	1	No additional areas would need to be cleared for the wash plant and discard dump and no final land forms would remain if coal is exported for washing off-site.	Visual impacts	5	The establishment a discard dump of significant size would result in the clearance of a significant size and result in a visual impact. This discard dump would remain in perpetuity and represent a final landform with continued visual impact.
Economic considerations	5	Transport and off-site washing at a facility owned by a different entity will result in significant cost to the project.	Economic considerations	1	On-site coal washing is considered to be the favoured economic alternative and negates the need for transport of mined material and payment for toll treating by another entity.
Conclusion	**12**	**Off-site coal washing is preferred**	**Conclusion**	**26**	**On-site coal washing is least preferred.**

4 POTENTIAL IMPACTS ON THE BIO-PHYSICAL ENVIRONMENT

4.1 LIST OF POTENTIAL IMPACTS ON ENVIRONMENTAL ASPECTS

This section provides a list of potential impacts on environmental aspects (excluding social and cultural aspects – see Section 7) separately in respect of each of the main project actions / activities and processes including activities listed in the NEMA and NEM:WA EIA regulations. The potential impacts are presented for each of the project phases in tabular format (Table 29).

TABLE 29: LIST OF POTENTIAL IMPACTS AS THEY RELATE TO PROJECT ACTIONS / ACTIVITIES / PROCESSES (EXCLUDING SOCIAL AND CULTURAL)

Activity	Phase	Impacts (unmitigated)
Exploration	Construction Operation	Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Site preparation	Construction	Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Earthworks	Construction Operation	Hazardous structures / excavations Loss of soil resources and land capabilities General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Civil works	Construction Operation	Hazardous structures / excavations Loss of soil resources and land capabilities General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Increase in disturbing noise levels Negative landscape and visual impacts
Road building and upgradin	Construction Operation Decommissioning	Hazardous structures / excavations Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Underground mining	Operation Decommissioning	Hazardous structures / excavations Loss or disturbance to aquatic ecosystems Loss of water supply affecting third party users

Activity	Phase	Impacts (unmitigated)
		Contamination of water Increase in air pollution
Dewatering	Operation Decommissioning Closure	Loss or disturbance to aquatic ecosystems Loss of water supply affecting third party users Contamination of water
Crushing, screening and product handling	Operation	Hazardous structures / excavations General disturbance of terrestrial biodiversity Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Power supply and use	Construction Operation Decommissioning	Loss of soil resources and land capabilities General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Increase in disturbing noise levels
Water supply	Construction Operation Decommissioning	Loss or disturbance to aquatic ecosystems Loss of water supply affecting third party users
Stormwater management	Construction Operation Decommissioning	Hazardous structures / excavations Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Contamination of water
Process water management	Construction Operation Decommissioning	Hazardous structures / excavations Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Contamination of water
Transport systems	Construction Operation Decommissioning Closure (limited road)	Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Non-mineralised (general and industrial hazardous) waste management	Construction Operation Decommissioning Closure (limited)	Loss of soil resources and land capabilities General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Negative landscape and visual impacts
Site support services	Construction Operation Decommissioning Closure (limited)	General disturbance of terrestrial biodiversity Increase in disturbing noise levels Negative landscape and visual impacts
Storage and maintenance services/ facilities	Construction Operation Decommissioning	Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in disturbing noise levels Negative landscape and visual impacts

Activity	Phase	Impacts (unmitigated)
Housing	Construction	General disturbance of terrestrial biodiversity Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Site/contract management	Construction Operation Decommissioning Closure	Hazardous structures / excavations Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Loss of water supply affecting third party users Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Demolition	Construction (at end) Operation (as part of maintenance) Decommissioning	Hazardous structures / excavations Loss of soil resources and land capabilities Physical loss of terrestrial biodiversity General disturbance of terrestrial biodiversity Loss or disturbance to aquatic ecosystems Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Rehabilitation	Construction Operation Decommissioning	Hazardous structures / excavations General disturbance of terrestrial biodiversity Contamination of water Increase in air pollution Increase in disturbing noise levels Negative landscape and visual impacts
Maintenance and aftercare	Closure	General disturbance of terrestrial biodiversity Increase in air pollution Negative landscape and visual impacts

4.2 LIST OF POTENTIAL CUMULATIVE IMPACTS

Potential cumulative impacts associated with the project, were identified by considering the existing land uses together with the proposed mine development, and are outlined in Section 8.

4.3 POTENTIAL FOR ACID MINE DRAINAGE OR GROUNDWATER CONTAMINATION

Information was sourced from the mine works programme (ECMA August 2015), geochemistry study (SLR and Solution H+ 2015) (Appendix O) and groundwater specialist study (DeltaH 2015) (Appendix H).

4.3.1 GEOLOGY

Regional geology

The project area falls within the Utrecht Coalfield which lies in north-western KwaZulu Natal, south of the Highveld and Ermelo Coalfields and east of the Kliprivier Coalfield. The Utrecht Coalfield covers an area of approximately 6 000 km^2 extending from just north-east of Newcastle to Wakkerstroom in the north-west and Paulpietersburg in the north-east. The Utrecht Coalfield was cut-off from the Vryheid Coalfield to the east by erosion and from the Klipriver Coalfield by a high density dolerite intrusion (Figure 26). The coalfield was developed following the retreat of the Dwyka glaciers which deposited diamicitite that filled the Karoo Basin with sediments ascribed to deposition in shallow marine and fluviodeltaic environmental settings (ECMA, 2015). The site is dominated by the Karoo Supergroup sediments comprising shale, mudstone, sandstone, dolerite and coal of the Vryheid Formation. These sediments contain several economically exploitable coal seams developed within a primarily arenaceous sequence of grit, sandstone, siltstone and shale. Numerous coals seams are developed in this area, namely the Eland, Fritz, Alfred, Rider, Upper Gus, Lower Gus, Dundas and Coking Seams. The Gus Seams are the most significant of these seams (ECMA, 2015).

Local geology and coal seams

The coal seams within the project area may be defined as a multiple seam type. The project area hosts the complete succession of coal seams but of these only the Gus Seam is of economic interest (Figure 27). The Coking and Dundas seams at the base of the succession are not considered as being potentially economic due to their thin development. The Gus seam occurs between 20 and 400 m below surface dipping in a south-westerly direction.

The Lower Gus Seam is on average 2.6 m thick and is banded in nature. Over the project area the Lower Gus Seam is consistently overlain by a carbonaceous sandstone that ranges in thickness from 0.1 m to 5.6 m, and which forms the intra-seam parting that separates the Lower Gus Seam from the Upper Gus Seam. The inter-seam parting thickness ranges from more than 3 m in the south to being nearly absent in the north, where the Upper Gus and Lower Gus form one seam. The Upper Gus Seam has an average thickness of 0.6 m and consists of mostly dull, but also mixed banded coal. The classification into bituminous, devolatilised and anthracitic coal applies to the Upper Gus Seam in the same way as it does to the Lower Gus Seam. The coal seam sub-outcrops on the northern side of the mountain. Despite its depth from surface the Gus seam is of economic interest because of its overall good coal qualities (ECMA, 2015) (Section 3).

FIGURE 26: COAL FIELDS IN SOUTH AFRICA IN RELATION TO THE PROJECT SITE

FIGURE 27: GENERAL STRATIGRAPHY IN THE PROJECT AREA

4.3.2 GEOCHEMICAL TESTWORK

Project specific samples of core material from the 2014 drilling programme were used for geochemical analyses. Samples consisted of roof material (consisting of lithologies approximately 1m about the Upper Gus seam), parting material (consisting of the lithologies between the Upper and Lower Gus Seam) and floor material (consisting of lithologies approximately 1 m below the Lower Seam). All samples were subjected to acid-base accounting (ABA) test work to determine the potential for acid generation from the samples. With the exception of the coal samples, the roof, parting and floor material was subjected to mineralogy test work. Leach testing, to determine the potential for metal leaching, was conducted on the roof and floor material only. It is planned by the applicant to undertake additional leachate tests during the bankable feasibility study once additional core material is available.

Available geochemical characterisation and geochemical modelling was used to provide a preliminary prediction of post-closure mine drainage water quality.

Further detail on methodologies is included in the specialist report (Appendix O).

4.3.3 SUMMARY OF RESULTS

A summary of the results of the geochemical analysis are discussed below.

- ABA results shows a significant variability between samples, seven as non-potentially acid generating (non-PAG), four as inconclusive and four classified as potentially acid generating (PAG) (although one sample was considered short term due to the lower sulphur content).
- Coal samples were non-PAG (2 samples) or inconclusive (1 sample).
- The paste pH for all samples was neutral to alkaline indicating that there is little potential for the generation of short-term acidity.
- The crystalline mineralogy of the roof, floor and parting samples identified eight key minerals. The key minerals are consistent with the different lithological units at the site. The following mineralogy is present: calcite, chlorite, illite, kaolinite, lizardite, microcline, muscovite and quartz. Illite and kaolite can provide neutralising potential, but only at a low pH due to the dissolution behaviour of these minerals. No sulphide minerals were identified in any of the samples.
- The presence of calcite in most samples is significant as this is readily available to neutralise acid generated from pyrite oxidation. This is a natural acid mine drainage mitigation. However, calcite is readily soluble and can be dissolved through interaction of the lithology with water. This may reduce the availability of NP to offset acid generated from pyrite oxidation.
- The results suggest that acid generation is linked to minerology.
- The final pH of the leachates was higher than the initial pH 7, which indicates the presence of leachable alkalinity in the samples. The leach results reflect the calcite identified in the mineralogy test work.

- As a preliminary screening to identify potential chemicals of concern, the leachates were compared to drinking water quality and effluent standards. The following is noted:
  - pH is neutral to slightly alkaline
  - alkalinity can be leached from the samples
  - metals (arsenic, iron, antimony, selenium and fluoride) are leachable at source at levels above drinking water limits
  - notably no metals are leachable at effluent standards
- There appears to be no trend with regards to the leaching potential of elements and the acid generating potential or lithology.
- Post-closure mine drainage water quality: Modelled interaction of groundwater with the exposed coal and rock in the mine workings indicates pyrite oxidation resulting in elevated concentrations of sulphate (SO_4). The equilibrium model suggests that the neutralising potential of calcite and silicate minerals is sufficient to buffer pH at neutral. However, the concentrations of parameters such as calcium (Ca) and magnesium (Mg) increase significantly through interaction with coal and rock exposed in the workings. Based on the model results post-closure decant from the underground workings is estimated to have a neutral pH with elevated concentrations of Ca and Mg. The model results suggest a range of 1 500 mg/l to 3 000 mg/l sulphate. Model results suggest aluminium, iron and manganese concentrations are unlikely to be of concern.

4.3.4 OVERVIEW OF ASSESSMENT AND EVALUATION OF IMPACT

The results show a variation in acid generating potential. The acid generating potential is not linked to lithology but more likely linked to mineralogy. Coal is expected to be non-acid generating. The potential for acid generation in the underground workings will depend on the distribution of minerals, and the neutralisation potential of non-PAG material that can mitigate acid generation. If the sample set in the study is considered an indicator of bulk lithological properties associated with the Gus seam underground workings, then the workings are non-acid generating. However, much of the NP is attributed to calcite which is subject to dissolution on exposure in the workings. There is however potential for certain metals to leach at levels above water quality standards. The result of this study was taken into consideration in the groundwater specialist study. Potential pollution impacts are discussed and assessed in Chapter 8.

4.3.5 RECOMMENDATIONS MADE BY GEO-HYDROLOGY STUDY

The recommendations of the specialist study have been included as mitigation measures for the project.

5 ALTERNATIVE LAND USE OR DEVELOPMENT

5.1 DESCRIPTION OF ALTERNATIVE LAND USE OF THE AREA

The site is currently used for agriculture, primarily small-scale livestock farming and subsistence cropping, and residential use, however part of the Commissiekraal farm is used for commercial cattle and historically for crop farming (Lens family property). There is evidence of remnant forestry within the centre of the mining right application area. Immediately surrounding land uses include commercial cattle and crop farming (maize and soy beans), conservation including protected areas as well as community land uses.

As an alternative to the development of the mine, these land uses could continue or be developed on site. No other land uses are considered feasible at this stage.

5.2 MAIN FEATURES AND INFRASTRUCTURE RELATED TO ALTERNATIVE LAND USE / DEVELOPMENT

Potential features and infrastructure that could be associated with the alternative land use/development are listed below and fall within the type of infrastructure found in the surrounding area.

Feature / infrastructure	Description
Livestock farming	Introducing additional/new livestock to the farms Establishing watering holes and livestock handling facilities such as kraals
Accommodation / facilities	Building hunting or tourism-type accommodation facilities (such as campsites, self-catering units, and lodges) of varying scales. Building farm work / service staff accommodation and facilities
Roads	Gravel roads providing access around the farms for visitors and tourists
Water supply	Drilling and establishing additional boreholes and pipelines for water supply
Power supply	Establishing low voltage power supply lines to service accommodation units / facilities
Agriculture (Commercial crop farming or forestry)	Preparing and working agricultural fields Establishing water supply and irrigation networks

5.3 PLAN SHOWING LOCATION AND EXTENT OF ALTERNATIVE LAND USE / DEVELOPMENT

A plan showing the location and extent of the alternative land use / development is not possible to present at this stage as this would depend on the individual landowners preferences and financial situation.

6 POTENTIAL IMPACTS OF ALTERNATIVE LAND USE OR DEVELOPMENT

6.1 LIST OF POTENTIAL IMPACTS

Potential impacts, expected to occur as a result of the alternative land use / development described in Section 5 above, are listed below:

Feature / infrastructure	Potential impacts
Livestock farming	Increased pressure on veld resources Loss of soils through incorrect management Dust generation through over grazing causing insufficient vegetation cover Increased income and associated socio-economic benefits Increased pressure on water resources
Accommodation / facilities	Loss of natural vegetation Loss of soils through incorrect management Surface and/or groundwater pollution through unmanaged sanitation facilities Increased income and associated socio-economic benefits
Roads	Dust generation Accidents
Water supply	Increased pressure on water resources
Power supply	Negative impacts on bird species
Agriculture (Commercial crop farming or forestry)	Alteration of natural drainage patterns Surface and/or groundwater pollution through the use of fertilisers Dust generation from exposed areas Increased income and associated socio-economic benefits

6.2 LIST OF POTENTIAL CUMULATIVE IMPACTS

Potential cumulative impacts associated with the alternative land use, when compared to the existing land use on site and in the surrounding area, are expected to include:

- Soil erosion due to excessive grazing
- Loss of sensitive biodiversity areas and conservation important species due to livestock grazing, cropping and illegal harvesting of fauna and flora for food, firewood, medicinal purposes, etc.
- Dust generation due to excessive grazing and clearing of land for cropping or plantations
- Contamination of water resources due to a lack of sanitation facilities and use of fertilisers
- Damage to heritage resources
- Minor increase in noise levels
- Visual impact in the case of cleared areas for croplands.

7 POTENTIAL SOCIAL AND CULTURAL IMPACTS

7.1 LIST OF POTENTIAL IMPACTS ON SOCIO-ECONOMIC CONDITIONS OF THIRD PARTY LAND USE ACTIVITIES

Potential impacts on the socio-economic conditions of other parties land use activities both on site and in the surrounding area are discussed in detail in Section 8 and listed below. This list includes potential impacts on cultural and heritage resources (Section 7.3).

- Loss of land uses through impacts on the bio-physical environment
- Blasting hazards (limited)
- Project-related road use and traffic
- Destruction of heritage resources
- Disturbance (indirect) of heritage resources
- Loss of palaeontological resources
- Economic impacts (positive and negative)
- Informal settlements, safety, security and services and associated social ills
- Relocation

7.2 CULTURAL ASPECTS AND POTENTIAL IMPACTS THEREON

Cultural aspects are discussed as part of heritage discussion below.

7.3 HERITAGE FEATURES AND POTENTIAL IMPACTS THEREON

7.3.1 HERITAGE (AND CULTURAL) FEATURES

Heritage (and cultural) features on site include graveyards and historical remains (see Section 2.3.3 for further detail). Graveyards will be affected by the placement of surface infrastructure. In most instances the disturbance of graves is avoided where possible. However the position of the ore body makes the disturbance of the graveyards unavoidable. It is also possible that further heritage resources, such as unmarked graves, are uncovered during the development of the mine and site. This is expected to be unlikely but still possible.

Potential impacts on heritage (including cultural) features include the loss of these resources for future generations through physical destruction and/or disturbance (described further in Sections 8.2.14 and 8.2.15). These resources are protected by national legislation and require mitigation prior to any disturbance.

7.3.2 Palaeontological features

Coal is formed by the burial of peats and over time the compaction and alteration of the organic material caused by increasing temperatures and pressures. Coals, therefore, are the product of fossil plants but within the coal seams the plant material is unrecognizable. In the shales and mudstones closely associated with the coal seams it is possible to find fossilized wood, leaf impressions, insect impressions, cuticle and pollen. However, the distribution of the fossils is very patchy and unpredictable and vertebrate fossils very seldom occur with the plant fossils (Bamford, 2015).

The SAHRIS palaeosensitivity map for the site indicates red (very sensitive and very high probability of fossils occurring there), orange (high probability), green (moderate) and grey (insignificant to zero) areas of sensitivity (refer to Figure 20). However, there are no records of fossils plants from this area, most likely because the deposits are far below the surface. While it is possible that plant fossils occur in the proposed mining and infrastructure area they will not be detected until excavations are initiated (Bamford, 2015) (see Section 2.3.3 for further detail).

Potential impacts on Palaeontological resources include the loss of these resources for future generations through physical disturbance (described further in Section 8.2.14).

7.4 QUANTIFICATION OF IMPACT ON SOCIO-ECONOMIC CONDITIONS

Land use and socio-economic studies were undertaken for the project. Results from the studies informed the impact assessment described in Section 8. In this regard, it was identified that the proposed project has the potential to impact on surrounding land uses.

8 ASSESSMENT AND EVALUATION OF POTENTIAL IMPACTS

8.1 LIST OF EACH POTENTIAL IMPACT

Potential environmental impacts were identified by SLR in consultation with IAPs, regulatory authorities, specialist consultants and Tholie Logistics. The impacts are discussed under issue headings in this section. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area and those potentially associated with the project are discussed and assessed together.

Potential impacts identified for the project include:

- Injury or death to third parties and animals due to hazardous structures / excavations
- Loss of soil resources and associated natural land capabilities
- Physical loss of terrestrial biodiversity
- General disturbance of terrestrial biodiversity
- Loss or disturbance to aquatic ecosystems
- Loss of water supply affecting third party users
- Contamination of water
- Increase in air pollution
- Increase in disturbing noise levels
- Negative landscape and visual impacts
- Loss of current land uses
- Blasting damage
- Disturbance by project-related traffic
- Destruction of heritage (including cultural and palaeontological) resources
- Disturbance (indirect) of heritage resources
- Inward migration and associated social and health issues
- Resettlement of households
- Economics (positive and negative)

8.2 IMPACT RATING FOR EACH POTENTIAL IMPACT

The impact rating for each potential impact listed above (Section 8.1) is provided in the section below. The criteria used to rate each impact is outlined in Section 8.3. The potential impacts are rated with the assumption that **no mitigation measures** are applied and then again with mitigation. An indication of the phases in which the impact will occur is provided below and summarised in Section 8.4 together with the estimated timeframes for each rated impact.

TOPOGRAPHY

8.2.1 ISSUE: INJURY OR DEATH TO THIRD PARTIES AND ANIMALS DUE TO HAZARDOUS STRUCTURES / EXCAVATIONS

Introduction

Hazardous structures include all excavations, infrastructure or land forms into or off which third parties (non-mine personnel) and animals can fall and be harmed. Included in this category are facilities that can fail such as water dams and above ground workings that can subside due to insufficient support. At Commissiekraal, although pillar extraction may take place resulting in a controlled collapse, due to a restriction in depth at which pillar extraction will be done (if implemented) and the depth of the remaining section of the underground mine, it is unlikely that this subsidence will affect surface topography.

Hazardous excavations and infrastructure occur in all project phases from construction through operation to decommissioning and closure (see table below for further detail). In the construction and decommissioning phases these hazardous excavations and infrastructure are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term hazardous excavations and infrastructure. At closure the decline boxcut will be sealed and the boxcut backfilled.

Changes in drainage patterns due to surface subsidence are discussed in Section 8.2.6. Any related biodiversity impacts are discussed in Section 8.2.5.

<u>Link to mine phases and activities/infrastructure</u>

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Stormwater management Process water management Site/contract management Demolition	Exploration Earthworks* Road building and upgrading* Underground mining Crushing, screening, product handling Stormwater management Process water management Site/contract management Demolition* Rehabilitation	Road building and upgrading* Underground mining Stormwater management Process water management Site/contract management Demolition Rehabilitation	Maintenance and care (water dams, if needed)

** For maintenance*

Rating of impact

<u>Severity / nature</u>

In all project phases, most of the identified hazardous excavations and infrastructure present a potential risk of injury and/or death to both animals and third parties. In the unmitigated scenario this is a potential high severity. With management that focuses on security, access control, awareness and appropriate design, the severity reduces to low during all phases as mitigation measures can easily be implemented to minimise impacts.

Duration

In the context of this assessment, death or permanent injury to humans and animals is considered a long term, permanent impact, regardless of the project phase or the mitigation measures implemented.

Spatial scale / extent

For the most part, direct impacts (injury and/or death) will be limited to within the surface infrastructure boundary, but indirect impacts will extend to the communities to which the people / animals belong. This is applicable to all project phases.

Probability

In the case of third parties, in the unmitigated scenario, there is a high possibility that the hazardous excavations and infrastructure will present a risk to unaccompanied third parties and free-roaming animals on-site and downstream of pollution control dams during construction, operation and decommissioning. After closure, final landforms may present a risk to third parties depending on the effectiveness of rehabilitation measures and side wall stability at the boxcut. With mitigation as outlined below, the probability of the impact occurring is reduced.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In this regard, the significance of the mitigated impact will reduce to low for all phases due to a reduced severity and likelihood of the impact occurring.

Tabulated summary of the assessed impact

Management	Severity	Duration	Spatial scale	Consequence	Probability	Significance
All phases						
Unmitigated	**H**	**H**	**M**	**H**	**H**	**H**
Mitigated	**L**	**H**	**M**	**M**	**L**	**L**

Cumulative impacts

No cumulative impacts identified.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and included in the EMP (Section 20, Table 35).

Objectives

To prevent physical harm to third parties and animals from potentially hazardous excavations.

Mitigation measures

Design, construct and operate the boxcut, any stockpiles/facilities or dams in a manner that stability is a priority, the risk of failure (where applicable) is limited to acceptable levels and facilities have similar safety attributes to the natural land forms in the area.

Use security control measures in the form of manned access points, fencing, barriers and/or warning signs (in appropriate languages or illustrations) to keep people and animals away from both the surface infrastructure area and any hazardous excavations and infrastructure.

Undertake regular patrols of the fence perimeter to ensure no breach of security measures has taken place. Where required, maintenance of facilities will be done to re-instate the integrity of the security measures.

Rehabilitate the site in line with the conceptual closure and rehabilitation plan included in this report. In this regard, key components include removal of all infrastructure, backfilling of the boxcut and landscaping of the site to ensure stable topographical features.

Educate and train all workers (temporary and permanent) on the risks associated with hazardous excavations.

Undertake community awareness programmes to educate the community on project-related safety risks.

Undertake monitoring of water dams and unplanned surface subsidence in line with monitoring programme (Section 22).

Emergency situation

In case of injury or death due to hazardous excavations, the mine will implement its emergency response procedure (see Section 21).

SOIL AND LAND CAPABILITY

8.2.2 ISSUE: LOSS OF SOIL RESOURCES AND ASSOCIATED NATURAL LAND CAPABILITIES

Information based on soil specialist study (TerraAfrica 2015) (Appendix E).

Introduction

Soil is a valuable resource that supports a variety of ecological systems. The project has the potential to damage soil resources through physical disturbance and/or contamination. Contamination of soils also has the potential to enter both surface and groundwater resources (see Section 8.2.7). The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. This section therefore focuses directly on the potential for disturbance and contamination of the soil resource and the effect this has on land capability. Any potential direct impacts on soil will potentially have secondary impacts on the ecological systems that make use of the soil for survival.

The surface infrastructure will disturb approximately 14ha of soil resources with arable land capability. The mine access road will disturb soil that range from arable to wetland land capability. The site layout has aimed to place infrastructure in as close a proximity to each other as possible, governed by the position of the access to the underground mine.

There are a number of activities/infrastructure in all phases that have the potential to result in a loss of soils and associated land capabilities (see table below for further detail). In the construction and decommissioning phases these activities are temporary in nature, usually existing from a few weeks to a few months while the operational phase will present more long term activities. No additional impacts are expected during the closure phase, provided rehabilitation has occurred successfully. In rehabilitation, soil is critical to the rehabilitation of the mine site and its post-mining land use.

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Power supply and use Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Exploration Earthworks* Civil works* Road building and upgrading* Crushing, screening and product handling Power supply and use Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management Demolition* Rehabilitation	Road building and upgrading* Power supply and use Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Maintenance and aftercare

** For maintenance*

Rating of impact

Severity / nature

In the unmitigated scenario, physical disturbance (including contamination) of soil resources can result in a loss of soil functionality as an ecological driver (soil is the medium in which most vegetation grows) and may impact on the soils ability to sustain ecological systems post-project. In the case of erosion (through wind or water), the soils will be lost to the area of disturbance and in the case of compaction the soils functionality will firstly be compromised through a lack of rooting ability and aeration, and secondly the compacted soils are likely to erode because with less inherent functionality there will be little chance for the establishment of vegetation and other matter that naturally protects the soils from erosion. In the case of potential contamination, the use and handling of fuels, lubricants, other potential contaminants and poor waste management could result in a permanent loss of soil resources. Potential seepage and/or dirty runoff from coal stockpiles could alter the soil composition, negatively impacting on the chemistry of the soils such that current growth conditions are impaired. All aspects discussed above, will lead to a reduction and possibly a permanent loss of the natural capability of the soils if not managed. In the unmitigated scenario, the severity is moderate for all phases due to the relatively small area of disturbance. In the mitigated scenario, where topsoil is effectively managed and stored for rehabilitation activities, the severity is reduced to low.

Duration

In the unmitigated scenario the loss of soil and related functionality is long term and will continue after the life of the mine. In the mitigated scenario, the loss of resource can be avoided and/or reduced to the life of project. This is a medium duration.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impact on soils will be limited to the project area. This relates to a low spatial scale.

Consequence

In the unmitigated scenario the consequence is medium. In the mitigated scenario, the consequence reduces to medium because the severity, duration and spatial scale are reduced.

Probability

The probability of the impacts relating to soil loss occurring and resulting in a loss of land capability in the unmitigated scenario is definite (high). This reduces to low with the implementation of effective mitigation measures.

Significance

In the unmitigated scenario the significance is medium. Depending on the implementation of mitigation measures the significance will be reduced to somewhere between medium to low.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	M	H	M
Mitigated	L	M	L	L	L	L

Cumulative impacts

Over-grazing and use of land within the farm can contribute to cumulative impacts on soils and their natural land capability.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 36).

<u>Objectives</u>

- To strip and effectively store all soil resources that would otherwise be lost damaged or sterilised so that rehabilitation of the site for optimal post mine land use can occur.
- To prevent soil contamination.
- To minimise soil erosion from the area of disturbance.

<u>Mitigation measures</u>

Limit disturbance of soils to that identified in this EIA and EMP report.

Strip, store, maintain and replace soils in accordance with the specifications of the soil management plan detailed in Table 30.

Implement mitigation measures for water pollution prevention and stormwater control (Section 3).

Manage wastes in accordance with the waste management procedure described in Section 3.

TABLE 30: SITE SPECIFIC SOIL MANAGEMENT PLAN

Steps	Factors to consider	Detail
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities or infrastructure that are described in the EIA and EMP report, and where a clearly defined end rehabilitation use for the stripped soil has been identified.
Reference to biodiversity action plan		It is recommended that all vegetation be stripped and stored as part of the utilizable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted.
Protection of soils, where possible	Erosion control	Where water is discharged (i.e. end of clean stormwater controls, spillways of water dams), the mine will establish and maintain controls (such as gabions) which reduce the velocity and erosive energy of these waters.
	Off-road driving	Mine vehicles will keep to established mine roads. No unnecessary off-road driving will be allowed.

Steps	Factors to consider	Detail
Stripping and handling of soils	Utilisable soil (topsoil plus upper portion of subsoil)	A minimum of 80cm of utilisable soil will be stripped, where possible, unless the bedrock is less than this from surface.
	Handling	Soils will be handled in dry weather conditions as far as practically possible so as to cause as little compaction as possible. Utilizable soil will be handled and stockpiled separately from the lower subsoil and soft overburden.
Delineation of stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.
	Designation of the areas	Soil stockpiles will be clearly marked on the ground and on the site layout map to identify both the soil type and the intended area of rehabilitation.
Stockpile management	Vegetation establishment and erosion control	Rapid growth of vegetation on the soil stockpiles will be promoted (e.g. by means of watering or fertilisation) for soil stockpiles that will remain for more than 1 year and/or one rainy season. The purpose of this exercise will be to encourage vegetation growth on soil stockpiles and to combat erosion by water and wind.
	Stormwater controls	Stockpiles will be established with stormwater diversion berms to prevent run off erosion.
	Height and slope	Soil stockpiles height will be restricted to avoid compaction and damage to the underlying soils. In this regard, stockpile heights should be restricted to between 4 and 5 metres. For extra stability and erosion protection, the stockpiles may be benched.
	Waste	Only inert overburden will be placed on soil stockpiles if the vegetative growth is impractical or not viable. This will aid in protecting the stockpiles from wind and water erosion until the natural vegetative cover can take effect. No other waste material will be placed on the soil stockpiles.
	Movement on stockpiles	Equipment, human and animal movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
	Monitoring	Routine monitoring will take place in and around the stockpile areas.
Rehabilitation of disturbed land: restoration of land capability	Placement of soil	A minimum layer of 80cm of topsoil will be replaced on disturbed areas
		The utilisable soil will be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved end land use and will attain a free draining surface profile.
		If insufficient soil is present on site to rehabilitate disturbed areas and there is a need to import soil for rehabilitation purposes, this will be done in consultation with an appropriately qualified soil specialist.
	Fertilisation	A representative sampling of stripped soils will be analysed to determine the nutrient status of the soil. As a minimum the following elements will be tested for: EC, cation exchange capacity, pH, Ca, Mg, K, Na, P, Zn, clay% and organic carbon. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed or blown away and that erosion gulleys do not develop prior to vegetation establishment.
Pollution of soils	In situ remediation	If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bio-remediation. The acceptability of this option must be verified by an appropriate soils expert and by DWS, on a case by case basis, before it is implemented.
	Off site disposal	If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF 1998) and disposed at an appropriate, permitted, off-site waste facility.

Emergency situations

Major spillage incidents will be handled in accordance with the emergency response procedure (see Section 21).

BIODIVERSITY

Information in this section is based on the biodiversity specialist study (SAS 2015) (Appendix F).

8.2.3 ISSUE: PHYSICAL LOSS OF TERRESTRIAL BIODIVERSITY

Introduction

There are a number of activities/infrastructure in all phases that can impact directly on biodiversity in the following ways:

- loss of biodiversity (fauna and flora) within the surface infrastructure footprint area
- habitat fragmentation and associated reduced capacity for species movements
- destruction of breeding, foraging and nesting sites
- impoverishment and/or loss of important plant and animal species
- increase in alien invasive plant species.

It is in this context that impacts on biodiversity are assessed below. Secondary impacts on biodiversity associated with soil erosion, compaction and pollution, dust fallout and noise have been assessed, and will not be repeated below.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Construction of all surface infrastructure Rehabilitation	Exploration Underground mining Crushing, screening, product handling Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition* Rehabilitation	Decommissioning surface infrastucture Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Maintenance and after care

Rating of impact

Severity / nature

The mining right application area lies within highly sensitive terrestrial biodiversity areas which offer habitat to several protected and threatened species. In addition, the mining right application area covers threatened ecosystems, critical biodiversity areas, highest and moderate biodiversity importance areas in terms of the mining and biodiversity guidelines, an important birding area, an NPAES focus area, and is situated adjacent to the proposed Elandsberg Protected Environment.

The following is relevant with respect to planned surface infrastructure (refer to Figure 6 to Figure 10):

- Although the access road crosses high sensitivity wetland and riparian habitat; the bulk of surface infrastructure is located within secondary or transformed grasslands of moderate sensitivity
- The surface infrastructure is condensed into a small area on the north-eastern side of the mining right application area, which avoids the highly sensitive primary grassland and forest habitats
- A section of the access road traverses areas of highest biodiversity importance, with the bulk of surface infrastructure placed in areas considered to be of moderate biodiversity importance in terms of the Mining and Biodiversity Guidelines
- The bulk of the surface infrastructure will be located within vulnerable ecosystems in terms of the National List of Threatened Ecosystems
- None of the surface infrastructure will be located within the NPAES focus area, within formally or informally protected areas or within Critical Biodiversity Areas.

Given the discussion above, in the construction phase, where clearing activities take place, the unmitigated severity is rated high. During the operational phase, provided the footprints of the infrastructure components are not expanded, the physical loss of biodiversity should be limited. This also applies to the decommissioning phase. With mitigation, this impact could be mitigated to medium. At closure, biodiversity is expected to recover with effective rehabilitation measures.

Duration

The physical loss of biodiversity could have a long-term effect if unmitigated. Due to the relatively small scale of the infrastructure footprint this can be mitigated to a certain extent and so the duration reduces to medium in all phases.

Spatial scale / extent

The physical loss of biodiversity could affect the ecosystem beyond the site boundary because of the linkages between biodiversity components and areas. This is particularly true for fauna which may migrate on a periodic basis in search of food, water or breeding areas. This spatial scale cannot be significantly reduced with mitigation.

Consequence

The consequence has been rated as high for all project phases in the unmitigated scenario. With mitigation, the consequence is reduced to medium during construction, operation and decommissioning and low at closure.

Probability

In the unmitigated scenario the probability is considered to be high for all project phases. With mitigation the probability reduces to medium (construction, operation and decommissioning) where focus is placed on limiting the footprint of the site, reducing further loss of habitats, employee awareness and low at closure with the implementation of effective rehabilitation measures.

Significance

The unmitigated significance has been rated as high for all project phases. In the construction phase, operation, and decommissioning phases, with the implementation of mitigation measures, the significance can reduce to medium. Although the footprint of surface infrastructure is relatively small, the project site is located within a broader sensitive biodiversity area. At closure the mitigated significance can reduce to low with the implementation of effective rehabilitation measures.

Tabulated summary of assessed impact

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations, decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	L	M	M	L	L	L

Cumulative impacts

No cumulative impacts expected.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP.

Objectives

To prevent the unacceptable loss of biodiversity and related functionality through physical loss from project-related activities

Mitigation measures

The mine will develop and implement a biodiversity management plan, compiled in consultation with a biodiversity specialist. The key components of this plan will include:

- Project infrastructure, activities and related disturbance will be limited to those specifically identified and described in this EIA and EMP report
- Areas of disturbance will be clearly demarcated and movement by mine personnel and activities outside of the demarcated boundaries will be strictly prohibited
- Activities within 100 m of watercourses will be avoided except for the construction of stream crossings
- Vehicle movements to adhere to designated routes to limit mechanical damage to habitat and prevent the spread of alien species into the wild
- The removal of fauna and flora (plants and seeds) species of conservation importance will be conducted prior to disturbance by project infrastructure and activities. This will include planning for the preservation, cultivation and re-use of plant species in on-going rehabilitation and search, rescue and relocation of key fauna species. Relevant permits will be obtained prior to removing protected species. For each protected plant species that cannot be rescued or relocated, three plants will be propagated in a nursery to be established at the start of the construction phase
- Biomass from the clearing of the site will be used to create compost for the rehabilitation of disturbed areas
- Faunal migratory connectivity will be maintained especially with respect to wetland and riparian habitat. In this regard, stream crossings will be constructed in such a manner that these do not impede the flow of water
- An alien/invasive/weed management programme will be implemented throughout the mining right application area to control the spread of these plants onto and from disturbed areas. Care will be taken to prevent the encroachment of alien plant species into rehabilitated areas. This will continue for five years after rehabilitation and closure
- Fires will be strictly prohibited during all project phases
- Train workers (permanent and temporary) on the value of biodiversity and the need to conserve species and ecosystems. Include this in induction training as well as relevant follow-up training. Provide information to workers on locally occurring fauna and flora, the importance of conserving biodiversity, how best to conserve biodiversity etc.
- Vegetation harvesting will be strictly prohibited unless for medicinal purposes and agreed to by the SHE officer. No harvesting of protected species will be considered
- Faunal hunting, poaching, snaring or capturing will be strictly prohibited
- Inspections will include monitoring the overall mining right application area for illegal harvesting and evidence of poaching
- A nursery will be established in conjunction with a suitably qualified specialist where indigenous and endemic plants species will be propagated with a focus on using these plants for rehabilitation
- Rehabilitation trials will be initiated during the life of mine in order to determine the efficiency of rehabilitation methods and the suitability of floral species propagated in the nursery
- The nursery and rehabilitation plan will be continuously updated in accordance with the trial results to ensure that optimal rehabilitation methods are employed

- Rehabilitation measures must be continued for at least five years after closure
- Implement the biomonitoring programme outlined in Section 8.2.2.

Emergency situations

None identified.

8.2.4 ISSUE: GENERAL DISTURBANCE OF TERRESTRIAL BIODIVERSITY

Introduction

There is a number of activities/infrastructure in all phases (see table below further detail) that have the potential to disturb biodiversity, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long-term occurrences and the closure phase will present final land forms, such as the mine void which may have pollution potential through long term seepage and/or run-off.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Exploration Underground mining Crushing, screening, product handling Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Rehabilitation	Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Maintenance and aftercare

Severity / nature

As described in the section above, the mining right application area lies within highly sensitive terrestrial biodiversity areas which offer habitat to several protected and threatened species. Biodiversity has the potential to be disturbed in the following ways during all project phases:

- Lighting at the surface infrastructure area will attract insects at night. White light in particular attracts large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balance. Lighting can also affect the foraging patterns of nocturnal species such as owls and bats

- Excessive dust fallout may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation
- Noise and vibration may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities
- Road kills
- Blasting could harm species in the fly rock zone
- The presence of a water dam may lead to drowning of fauna
- Contamination of water and soil and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

The disturbance of biodiversity has been rated as having a high severity during all project phases. This can however be reduced to low with the implementation of management and mitigation measures.

Duration

In the event of death of a fauna or flora species, the duration of this impact would be long-term. Due to the relatively small scale of the infrastructure footprint this can be mitigated to a certain extent and so the duration reduces to medium in all phases.

Spatial scale / extent

The disturbance of biodiversity could affect the ecosystem beyond the site boundary because of the linkages between biodiversity components and areas. This is particularly true for animals which may migrate on a periodic basis in search of food, water or breeding areas. This spatial scale cannot be significantly reduced with mitigation.

Consequence

The consequence has been rated as high during all project phases; however this can be reduced to low with the implementation of management and mitigation measures.

Probability

The probability has been rated as high for all project phases because by nature, mining operations are intrusive. This can however be mitigated to moderate for construction, operations and decommissioning. The probability after closure can be mitigated to low because surface infrastructure will be removed and the area rehabilitated to meet a post closure land use objective of natural environment/cattle farming with controlled grazing.

Significance

The significance has been rated as high for all project phases. This can however be mitigated to moderate for construction, operations and decommissioning by reducing the severity and probability. The significance can be mitigated to low at closure because surface infrastructure will be removed and the area rehabilitated.

Tabulated summary of assessed impact

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	L	M	M	L	M	M
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	L	M	M	L	L	L

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP.

Objective

To prevent unacceptable disturbance of biodiversity and related ecosystem functionality

Actions

The following management and mitigation measures will be implemented during the construction, operation and decommissioning phases:

- The use of light will be kept to a minimum, and where it is required, yellow lighting will be used where possible. In addition to this vertebrates should be kept away from the illuminated areas with appropriate fencing where feasible
- Workers (permanent and temporary) will be trained on the value of biodiversity and the need to conserve the species and ecosystems, as well as fire control. This will be included in induction training as well as relevant follow-up training. Information will be provided to workers with basic information such as locally occurring fauna and flora, the importance of conserving biodiversity, how best to conserve biodiversity etc.
- There will be zero tolerance with respect to the killing or collecting of any biodiversity by anybody working for or on behalf of the mine
- Strict speed control measures will be implemented on access roads and vehicles will be restricted to travel on designated roads
- Alien plant species proliferation, which may affect floral and faunal diversity, will be controlled in accordance with legislation and in a manner that no additional loss of indigenous plant species occurs
- Soil erosion, which may affect floral and faunal diversity, will be controlled using berms, hessian curtains or soil traps and ensuring good vegetation cover

- Erosion berms will be installed in areas where soil disturbance will occur in the vicinity of watercourse crossings in order to prevent gully formation and siltation of the watercourses
- Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels
- All water dams will be fenced off to prevent access by larger animals
- Dust control measures will be implemented
- Surface and groundwater management measures will be implemented
- Soil pollution will be prevented and managed
- Blasting hazards will be managed
- Road safety measures will be implemented. A record of road kills and injuries will be kept in an effort to identify road safety hotspots. Additional management measures will be implemented at these hotspots if deemed necessary
- Implement the biomonitoring programme outlined in Section 22.

Emergency situations

Major spillage incidents will be handled in accordance with the Commissiekraal emergency response procedure.

Certain instances of injury to animals may be considered emergency situations. These will be managed in accordance with the Commissiekraal emergency response procedure.

8.2.5 ISSUE: LOSS OR DISTURBANCE OF AQUATIC ECOSYSTEMS

Introduction

There is a number of activities/infrastructure in all phases (see table below for further detail) that have the potential to result in a loss or disturbance of aquatic ecosystems and associated biodiversity, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long-term occurrences and the closure phase will present final land forms, such the mine void which may have pollution potential through long term seepage.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Power supply and use	Exploration Underground mining Crushing, screening, product handling Power supply and use Water supply and use	Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste	Maintenance and aftercare

Construction	Operational	Decommissioning	Closure
Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Rehabilitation	management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	

Severity / nature

The proposed mining right application area lies within sensitive aquatic biodiversity areas which offer habitat to several protected and threatened terrestrial species and a protected fish species. There are three wetland features listed by the National Freshwater Ecosystem Priority Area (NFEPA) and the western border of the project area falls within a Fish Fresh Water Ecosystem Priority Area (FishFEPA). However infrastructure has been placed outside of the 100 m buffer zones, with the exception of access road crossings. A large portion of the mining right application area will be undermined. Aquatic ecosystems are sensitive to flow and water quality changes.

In the unmitigated scenario, watercourse crossings could alter or impede the flow of water in the relevant watercourses. Soil erosion could result in sedimentation and pollution of these watercourses. Dewatering and pollution related impacts (see Section 8.2.6 and 8.2.4) can contribute to a loss and change in water available to support aquatic ecosystems. This in turn could place strain on aquatic ecosystems and result in deterioration in the health and services provided by these ecosystems. The biodiversity specialist has indicated that a reduction in flow of more than 15% could result in significant impacts on aquatic ecosystems, with associated biota becoming strained. The groundwater specialist modelled the potential loss of baseflow contribution to the river to be 8 l/s averaged for the life of mine. Based on the modelled predictions this exceeds the 15 % threshold specified by the biodiversity specialist. It should however be noted that river flow is also largely dependent on surface water run-off and interflow (stored and transported) in the vadose zone which will also contribute to the dilution of potential pollution impacts. To manage water generated on site, excess water will need to be discharged downstream of the dewatering cone of depression and could significantly mitigate the loss of water downstream if managed correctly. Treatment of this water to agreed standards would also mitigate pollution related impacts.

The quality and quantity impacts on the perennial Pandana River and its non-perennial tributaries on site will lead to the alteration or loss of wetland and riparian ecological and socio-cultural service provision. This impact is rated as high in the unmitigated scenario. With mitigation this could be reduced to low during construction as crossings will be designed and operated in a manner which prevents the alteration of flow patterns with footings being placed outside of the normal channel flow, and care being taken to prevent soil erosion and pollution impacts. During operation, decommissioning and closure the severity reduces to somewhere between moderate and low depending on verification of modelled results and the effectiveness of management and mitigation measures. Key mitigation measures include management of seepage from coal stockpiles, pumping water downstream into the Pandana should biodiversity show definite signs of strain from a loss of water and managing water levels after closure should decant be shown to negatively impact on the health of aquatic ecosystems.

Duration

Aquatic ecosystem health could take a long time to recover from significant impacts in the unmitigated scenario. With mitigation this could be reduced to moderate.

Spatial scale / extent

Aquatic ecosystem impacts could extend downstream in the Pandana River beyond the site boundary in the unmitigated scenario. This spatial scale cannot be significantly reduced with mitigation in any phase.

Consequence

The consequence has been rated as high during all project phases; however this can be reduced to low during construction and somewhere between moderate and low during operation, decommissioning and closure with the implementation of management and mitigation measures.

Probability

The probability has been rated as high for all project phases because by nature, mining operations are intrusive. This can however be mitigated to low for construction as measures can be implemented to ensure minimal disturbance to aquatic ecosystems. In the operation, decommissioning and closure phases the probability reduces to medium due to uncertainty related to the mitigation measures proposed. The key mitigation measures that require careful monitoring to ensure they are effective relate to the loss of water supply to ecosystems during operations and pollution impacts post closure.

Significance

The significance has been rated as high for all project phases. This can be mitigated to low during construction by reducing the severity, duration and probability. During operation, decommissioning and closure, the significance can be mitigated to moderate depending on the effectiveness of mitigation measures.

Tabulated summary of assessed impact

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction						
Unmitigated	H	H	M	H	H	H
Mitigated	L	M	M	L	L	L
Operations, decommissioning and closure						
Unmitigated	H	H	M	H	H	H
Mitigated	M to L	M	M	M to L	M	M

Conceptual description of proposed mitigation measures

Discussion of the management measures is provided below and in the EMP.

Objectives

To prevent the unacceptable loss of aquatic ecosystems and related functionality

Mitigation measures

Prior to construction:

- Conduct a desktop Reserve Determination to better understand potential health impacts on aquatic ecosystems and the volume of water that will need to be maintained in the river to maintain an acceptable level of health. This would take into account rainfall and runoff contributions to the river systems. Adjust mitigation measures if required
- Conduct toxicity tests on geochemical samples to better understand the potential health impacts on aquatic biota.

In addition the following management measures will be implemented during all phases:

- No prospecting will take place within watercourses or wetlands
- Project infrastructure, activities and related disturbance will be limited to those specifically identified and described in this EIA and EMP report
- Areas of disturbance will be clearly demarcated and movement by mine personnel and activities outside of the demarcated boundaries will be strictly prohibited
- Activities within 100 m of watercourses will be limited as far as practically possible
- Vehicle movements to adhere to designated routes to limit mechanical damage to habitat and prevent the spread of alien species into the wild
- Faunal migratory connectivity will be maintained especially with respect to wetland and riparian habitat. In this regard, stream crossings will be constructed in such a manner that these do not impede the flow of water
- An alien/invasive/weed management programme will be implemented throughout the mine right application area to control the spread of these plants onto and from disturbed areas. Care will be taken to prevent the encroachment of alien plant species into rehabilitated areas. This will continue for five years after rehabilitation and closure
- Fires will be strictly prohibited during all project phases

- Train workers (permanent and temporary) on the value of biodiversity and the need to conserve species and ecosystems. Include this in in induction training as well as relevant follow-up training.
- Vegetation harvesting will be strictly prohibited unless for medicinal purposes and agreed to by the environmental officer, in which case this will only be allowed outside of the surface infrastructure areas. No harvesting of protected species will be considered
- Faunal hunting, poaching, snaring or capturing will be strictly prohibited
- Implement the biomonitoring programme outlined in Section 22.

Emergency situations

None identified.

WATER RESOURCES (SURFACE AND GROUND WATER)

8.2.6 ISSUE: LOSS OF WATER SUPPLY AFFECTING THIRD PARTY USERS

Information based on the groundwater specialist study (DeltaH, 2015) (Appendix H) and the hydrology specialist study (Highlands Hudrology, 2015) (Appendix G).

Introduction

Surface water for domestic and livestock watering use on and surrounding the project site is sourced from rivers and hand dug wells. Although there is limited reliance on groundwater through borehole abstraction (apart from the hand pumps installed at schools), groundwater at the project site is sourced via springs and used for domestic supply and livestock watering. There is no alternative water supply to the project area. The project area and surrounds are seen as a key water production area for downstream surface water users.

With reference to the table below, the only activity that has the potential to negatively reduce the local groundwater level is dewatering of the underground mine (to ensure safe mining conditions). This could in turn reduce the baseflow contribution to surface water resources. The containment of rainfall falling within designated dirty areas in terms of the stormwater management plan can contribute to a loss of mean annual runoff (MAR) for the catchment by changing drainage patterns. No infrastructure will be placed within the 1:100 year floodline or 100 m from a watercourse, however the access road will cross various non-perennial streams. Water supply for the project will be sourced from boreholes drilled on site. Project related activities will commence during the construction and operational phases and continue for the life of mine. Project activities will cease during the decommissioning phase.

Potential impacts on biodiversity as a result of lowered groundwater levels affecting baseflow of river and related wetland systems are assessed in Section 8.2.5. This section therefore focuses on third party water users and associated land uses (livestock watering).

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
			Not applicable
Water supply Stormwater management	Water supply Dewatering Stormwater management	Water supply Dewatering (recovery) Stormwater management	-

Rating of impact

Severity / nature

During the construction, operation and decommissioning phases, rainfall and surface water run-off will be collected in all areas that have been designed as dirty in terms of the stormwater management plan in order to contain contaminated water and comply with Regulation 704. In terms of the mean annual runoff for the quaternary catchment (W42A), this will result in an estimated 0.038% reduction in runoff.

The project-specific water balance has indicated that a maximum of 1276 m^3/month (0.48 l/s) will be required as make-up water during construction in the dry season reducing to approximately 957 m^3/month (0.36 l/s) of potable water for domestic supply over the life of mine. Although specific modelling of the abstraction was not undertaken, site investigation work completed as part of the groundwater study indicated that two boreholes drilled on site can provide a sustainable supply of 0.8 l/s.

For the operational and post closure phases, the specialist groundwater study used a groundwater model to estimate underground inflows and to determine the extent of the drawdown cone of depression from active mining activities. The cone of dewatering due to mine inflows will capture groundwater, which would have otherwise contributed to spring discharges (in addition to surface runoff contribution) and baseflow of surface water resources. Based on the annual mining plans (Section 3) the following mine development stages were simulated (Figure 28):

- 4 years (section east of the Pandana River)
- 10 years (section underlying the Pandana River)
- 20 years life of mine (fully developed underground mine voids).

The groundwater model has predicted a drop in groundwater levels of between 2 and 25m during the first 10 years of mining, increasing to approximately 50m along a section of the Pandana River during the following 10 years of mining. Limited groundwater users (springs) are known to occur within the zone of influence. Springs outside of the cone of depression are unlikely to be affected due to the often localised perched aquifers that contribute to these springs. In terms of surface water resources, it is understood that groundwater contributes to baseflow throughout the upper Pandana River catchment via sub-surface seepage in the shallow weathered aquifer. The underlying mine workings provides potential for the Pandana River to lose water to the groundwater system. It should however be noted that the connection between a river and the underlying aquifer is dependent on numerous factors including river bed transmissivity, degree of ground content and silt deposition in bed sediments.

The modelled reduction in groundwater potentially contributing to the river over the life of mine is predicted at 8 l/s (litres per second) based on the average recharge scenario. Specialist work has indicated that the average groundwater contribution is 59 % of the surface flow measured. Although a reduction of baseflow is expected towards the Pandana River due to the underground mine, its flow is also largely dependent on surface water run-off and interflow (stored and transported) in the vadose zone. The severity of any losses downstream of the project site will be influenced by rainfall within the broader catchment.

During the operational phase, water removed from the underground workings will be used as process water as far as possible. Due to the predicted volume of inflows, the water balance shows an excess of water that cannot be used on the mine. According to the water balance this excess water could range from 16 931 m^3/month (approximately 6.4 l/s) in year 4 to 53 173 m^3/month (approximately 20 l/s) at full production. To manage this water on site, water will need to be discharged in line with a water use license. Depending on the quality, this water may need to be treated to meet DWS requirements prior to discharge to the perennial Pandana River. If managed correctly, the addition of this water could compensate for the loss of baseflow contribution to this river and, depending on the mining year, increase the flow in the Pandana River. The discharge of excess water will cease once dewatering activities cease.

Once mining stops, it is predicted that the groundwater levels within the mined out areas will slowly rebound after closure. Baseflow contributions to the surface water resources are therefore also expected to recover over time. Any active pumping and treating of groundwater to mitigate pollution impacts, if required, will influence the rate of recovery.

In the unmitigated scenario, the severity of a loss in water supply to spring users within the cone of depression and downstream surface water users due to a loss of baseflow contribution is high. With mitigation that focuses on providing an alternative supply to on-site water users and compensation for loss through controlled discharge should mine-related loss occur, the severity reduces to somewhere between medium and low depending on the verification of the modelled results and effectiveness of mitigation measures applied.

Duration

In the absence of any pump and treat mitigation requirements at closure, if required, the localised groundwater level is expected to recover to pre-mining conditions within 25 to 40 years after decommissioning of the dewatering activities. In the unmitigated scenario, this is a high duration. In the mitigated scenario, where compensation is provided for mine related loss and water levels recover long term, the duration of impacts reduces to within the life of the project. This is a low duration.

FIGURE 28: DEWATERING CONE OF DEPRESSION DURING THE OPERATIONAL PHASE

Spatial scale / extent

In the unmitigated scenario, the drawdown and related potential for impacts will mainly be within the mining right application area with the cone of depression extending a small area beyond the application boundary to the east. This is a medium spatial scale. With mitigation the spatial scale reduces to low.

Consequence

In the unmitigated scenario the consequence is high in all phases. In the mitigated scenario, the consequence reduces to somewhere between medium and low.

Probability

The probability of third party water users suffering a loss of water through the mine's dewatering activities is definite. With mitigation, the probability reduces to somewhere between medium and low depending on the verification of the modelled results and effectiveness of mitigation measures applied.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation the significance reduces to somewhere between medium and low.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M to L	L	M	M to L	M to L	M to L
Construction						
Insignificant						
Closure – not applicable						

Cumulative impacts

Although there is abstraction by local homesteads, significant cumulative impacts are not expected due to the assumed relatively low abstraction volumes by locals.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 39).

Objectives

To prevent the loss of water to third party users in the project area.

Mitigation measures

Prior to the commencement of the project, the mine will conduct a verification hydrocensus of all springs and water users within the potentially affected zone of dewatering to verify whether there are additional points to those that have already been identified as part of the project's hydrocensus survey.

The following management and mitigation measures will be implemented during construction, operation and decommissioning:

- Minimise the designated dirty areas in order to minimise the amount of surface runoff contained by the mine
- Design and construct access road river crossings in a manner which will not impede the flow of water in these watercourses
- Update and optimise the site wide water balance regularly in order to minimise the discharge of excess water
- Apply for the relevant water uses and comply with water use licence requirements with respect to dewatering and discharge of water
- If boreholes CK BH4 and 5 are used for water supply, limit pumping rates to 8 hours per day to ensure no significant drawdown occurs and that groundwater levels can recover to pre-abstraction levels
- Establish an environmental monitoring programme in order to monitor changes in groundwater levels, spring discharges and flow in the Pandana River. The gathered data should be reviewed annually to differentiate seasonal variations and general trends
- A continuous water balance for the mining operations should be developed using suitable measurement points and devices for expected flow rates, focussing especially on groundwater inflows into the underground mine workings
- The potential intersection of water bearing fractures by underground mining should be investigated using appropriate methods during the development of the mine (especially mining underneath the Pandana River). Associated risks and potential impacts of such intersections should be minimised by using suitable techniques such as pre-grouting
- The mine will set up and maintain a transient groundwater flow model showing changes in water levels as a result of its operations using water level data sourced from its monitoring programme. The model will be set up as soon as a hydrological year of data becomes available. This model will be maintained on an annual basis. If the model predictions change to those assessed and discussed in this report, additional mitigation measures will be implemented in consultation the authorities and an appropriately qualified specialist
- If mine-related loss in water supply occurs within the cone of depression, an alternative source of water supply should be provided for identified users.
- If flow monitoring and updated modelling predicts a significant decrease in water flow in the Pandana River as a result of dewatering activities, investigate and implement measures to minimise and/or mitigate for this loss. This may include pumping excess water downstream in the Pandana River.

Depending on the quality, this water will need to be treated to a level specified by the Department of Water and Sanitation.

Emergency situation

None identified.

8.2.7 ISSUE: CONTAMINATION OF WATER

Information based on the groundwater specialist study (DeltaH, 2015) (Appendix H) and the hydrology specialist study (Highlands Hydrology, 2015) (Appendix G).

Introduction

As outlined in Section 8.2.6, water is used for domestic water supply and livestock watering via springs (as groundwater), rivers and hand dug wells in close proximity to river systems. There is limited reliance on groundwater through borehole abstraction (apart from the hand pumps installed at schools).

With reference to the table below, there are a number of sources in all phases that have the potential to pollute water, particularly in the unmitigated scenario. Pollution events could be ongoing or recurring in nature, particularly in the unmitigated scenario. In the construction and decommissioning phases these potential pollution sources are temporary and diffuse in nature, usually existing for a few weeks to a few months. Even though the sources are temporary in nature, related potential pollution can be long term. The operational phase will present more long term potential sources such as coal stockpiles and the closure phase will present potential decant that may have the potential to pollute water resources through long term seepage and/or run-off.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management	Underground mining Dewatering Crushing, screening, product handling Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management	Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management	Decant Maintenance and care

Rating of impact

Severity / nature

During the unmitigated construction, operation and decommissioning phases, shallow groundwater, including areas of localised perched aquifers, and surface water could become contaminated by accidental spills and leaks through the incorrect handling and storage of potentially polluting substances on the site. These are generally diffuse pollution sources. The related severity is moderate due to the limited diffuse sources. This can be reduced to low with effective mitigation.

During the operational phase, in the unmitigated scenario, longer term potential sources of water contamination could include seepage from coal stockpiles and seepage of groundwater exposed to rock in the mine workings. In addition excess water from dewatering activities that cannot be used on the mine will need to be discharged. Geochemical testing conducted on coal, roof and floor material showed a variation in acid generating potential. The acid generating potential is not linked to lithology but more likely linked to mineralogy. The coal is expected to be non-acid generating. The potential for acid generation in the underground workings will depend on the distribution of minerals, and the neutralisation potential of non-PAG material that can mitigate acid generation. If the sample set in the study is considered an indicator of bulk lithological properties associated with the Gus seam underground workings, then the workings are non-acid generating. However, much of the neutralizing potential is attributed to calcite which is subject to dissolution on exposure in the workings. There is however potential for certain metals to leach at levels above water quality standards. Groundwater exposed underground could also contain blast residues.

Poor quality seepage into the shallow aquifer, including areas of localised perched aquifers, could impact on the quality of surface water resources through baseflow contribution. Some dilution will occur within the shallow aquifer and surface water resources, which are also fed by rainfall, however the degree of dilution is not known. Dewatering and the related cone of depression is expected to mitigate the migration of poor quality seepage during the operational phase, although discharge of excess water will likely be required (based on the conceptual water balance).

Poor water quality could result in health effects on downstream shallow groundwater and surface water users if consumed. The severity is therefore rated as high in the operational phase. Key mitigation will include further testwork to verify modelling results and to provide input on stockpile barrier requirements and treatment of excess water prior to discharge.

Post-closure, the main source of water contamination is decant once the mine void fills up. The groundwater model predicts that after closure the mine void will fill up and likely decant at the lowest topographical point. Decant could occur at the adit, daylight in springs if these are lower topographically than the adit, or seep into shallow groundwater which contributes to the baseflow of surface water resources. The post-closure mine drainage water quality was conceptually modelled and indicated that the neutralising potential of calcite and silicate minerals may be sufficient to buffer the pH at neutral, the concentrations of parameters such as calcium (Ca) and magnesium (Mg) could increase significantly through interaction with coal and rock exposed in the workings, a range of 1500 mg/l to 3000 mg/l sulphate (used as an indicator for modelling purposes) is expected and metal concentrations of aluminium, iron and manganese are unlikely to be of concern. In the unmitigated scenario, a pollution plume could reach shallow groundwater and baseflow to surface water resources at concentrations of between 150 mg/l to 1800 mg/l of sulphates (Figure 29). According to SANS 241, acute health effects can be experienced at 250 mg/l and chronic health effects from 600 mg/l. The pollution plume would however be diluted to some degree within the shallow groundwater and in the perennial Pandana River. Rainfall in the area is significant especially during the summer months and would further dilute concentrations by direct rainfall and runoff from surrounding natural areas. However the degree of dilution is not known. The severity is therefore rated as high in the unmitigated scenario. Key mitigation will be management of water levels in the underground mine and/or treatment of decant if the downstream water quality in the Pandana River and/or downstream shallow groundwater quality deteriorates to a point where it becomes unfit for use.

Duration

In both the unmitigated and mitigated scenarios, if human health impacts occur, these are potentially serious and long term in nature for all phases excluding the construction and decommissioning phases due to the limited diffuse sources. Although pollution impacts can be reversed through the implementation of pump and treat systems, the related health impacts, if they occur, may not be reversible, depending on the severity of impacts.

Spatial scale / extent

The spatial scale of the potential impact is directly related to the spatial scale of the dispersion of any groundwater pollution that in turn has the potential to reach surface water resources and impact on human health. Groundwater pollution is expected to be limited within the mine site in the construction and decommissioning phases as spills are not likely to involve large volumes. Spills and leaks can also be contained and remediated.

During the operational phase, seepage from the coal stockpiles has the potential to migrate off-site i.e. beyond the mine boundary. However, with mitigation this could be limited to within the site footprint.

Post closure the groundwater model has predicted that poor quality groundwater has the potential to migrate beyond the mining right application boundary due to potential interaction with surface water resources. This is a high spatial scale in the unmitigated scenario. With mitigation the pollution plume could be contained within the mine site.

Consequence

In the unmitigated scenario, the consequence of this potential impact is medium in the construction and decommissioning phases and high in all other project phases. With mitigation the severity and spatial scale can be reduced, which reduces the consequence in all project phases.

Probability

Without any mitigation the probability of off-site pollution from both diffuse and point sources is possible in all project phases. Whether this will result in human health impacts depends on the extent of the pollution plume, the concentration of the different pollution parameters, dilution factors, and the extent of exposure of humans to the pollution. It is unclear at this stage whether the pollution which is likely to reach downstream users would be of such poor quality that acute or chronic health effects are experienced. In the unmitigated scenario this has been rated as possible. With mitigation the probability should reduce to somewhere between medium and low depending on the verification of the modelled results and effectiveness of mitigation measures applied.

Significance

In the unmitigated scenario, the significance of potential impact is moderate for the construction, operation and decommissioning phases which can be reduced to low with mitigation. Post closure the unmitigated significance is rated as high and can be reduced to somewhere between moderate and low.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction and decommissioning.						
Unmitigated	M	M	M	M	M	M
Mitigated	L	L	L	L	L	L
Operation						
Unmitigated	H	H	M	H	M	M
Mitigated	M	H	L	M	L	L
Closure						
Unmitigated	H	H	H	H	M	H
Mitigated	M to L	H	L	M	M to L	M to L

Cumulative impacts

None identified.

FIGURE 29: POTENTIAL POST-CLOSURE DECANT PLUME IN THE SHALLOW AQUIFER

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 40).

Objectives

To prevent unacceptable water pollution related impacts.

Mitigation measures

Prior to construction, representative coal samples shall be subjected to leach testing to determine if a barrier system is required for the stockpiles. The stockpile designs must be approved by the Department of Water and Sanitation as part of the water use licence application process. In this respect the stockpile designs will be completed by an appropriately qualified person in line with regulatory requirements and including measures for containing spillages, seepage and/or dirty water runoff.

In addition to the measures outlined in Section 8.2.6, the following management measures will be implemented for the construction, operation and decommissioning phases:

- Limit the project footprint to that described in the EMP.
- Prevent pollution through construction, operation and maintenance of infrastructure and facilities as per design process.
- Vehicles and equipment will be serviced regularly according to a service plan and maintained such that the potential for leaks or spillages of polluting substances are limited.
- All vehicles and equipment servicing and maintenance activities will take place in workshops and washbays with impermeable floors, dirty water collection facilities and oil traps.
- All potentially polluting storage and handling facilities will be operated with containment facilities. In this regard, in all areas where hazardous materials (new and used), dirty water or non-mineralised wastes will be handled and temporarily stored, measures will be designed in a manner that the facilities do not contaminate the environment. In this regard, the storage method of all substances is to contain them in sealed containers/areas within impermeable surfaces, bunded areas and covered (where required) with sufficient capacity to contain 110% of total spilled materials. All spilled materials must drain to sumps with oil traps that must also be equipped to allow collection and removal of spilled substances as per the guidelines in SANS 10089-1:2003.
- The mine will implement good “house-keeping practices” which will include a non-mineralised waste management procedure as outlined in Section 3.
- Prevent pollution through education and training of workers (permanent and temporary) on how to handle and store potentially polluting substances, the importance of preserving water quality and how to deal with spills and leaks.
- Spillages will be cleaned up and disposed of in accordance with set procedures and immediately when they are detected in order to prevent contamination of water resources.
- Clean and dirty water systems will be designed and operated in accordance with Regulation 704 so as to prevent contamination of water. Any dirty water holding facilities will be designed, constructed and operated in accordance with the requirements of DWS as stipulated in the water licence. The

design of facilities will be undertaken by an appropriately qualified hydrologist and professional engineer and will include relevant liner and leakage detection systems.

- A monitoring programme will be implemented as outlined in Section 22 to monitor water quality at key points including springs. The monitoring data shall be compared with baseline water quality and reviewed annually to differentiate seasonal variations and general trends due to the mining activities. The gathered data shall also be used for annual updates of the flow and transport model to improve the confidence in the model predictions.
- The predicted rate of mine flooding and quality of decant shall be re-evaluated once more site-specific groundwater monitoring and geochemical data become available.
- Should mine related activities be proven to compromise the quality of third party water supplies, an alternative source of water supply of at least equivalent quality and quantity shall be provided for affected users.
- The mine boxcut shall be rehabilitated and hydraulically sealed after mine closure to limit the risk of water contamination.

The following management measures are specific to the post-closure phase:

- Should surface and groundwater monitoring show that there is a significant decrease in water quality downstream of the mine and resulting from the mining activities (poor quality seepage and decant from the mine void), the water level in the mine void shall be managed below critical levels to prevent further seepage into the weathered aquifer utilising suitable engineering designs (e.g. active pumping or passive dewatering of boxcut by drain systems).
- Any post-closure decant from the mine that is captured shall be treated to a standard to be agreed upon with the Department of Water and Sanitation before being released into the environment. In this respect authorisation must be obtained in terms of the National Water Act, Act 36 of 1998.

Emergency situation

Major spillage incidents that contaminate the environment will be handled in accordance with the mines emergency response procedure in Section 21.

AIR QUALITY

8.2.8 ISSUE: INCREASE IN AIR POLLUTION

Information based on air quality specialist study (Airshed 2015) (Appendix I).

Introduction

The main emissions associated with the project include particulate matter and limited gaseous emissions. Gaseous pollutants (such as sulphur dioxide, oxides of nitrogen, carbon monoxide, etc.) derived from vehicle exhausts are predicted to be low in comparison to particulate emissions. The assessment therefore focuses on particulate matter. Particulate matter includes inhalable particulate matter less than 10 and less than 2.5 microns in size (PM_{10} and $PM_{2.5}$, respectively) and larger total suspended particulates (TSP). The inhalable components of particulates can cause human health impacts at high concentrations over extended periods. Reduced air quality has the potential to increase the risk of acute and chronic respiratory conditions. The larger particulate component can cause dust nuisance impacts and affect animal and plant health at high fallout quantities over extended periods. In the case of animals, grazing on soiled vegetation over extended periods reduces teeth life which can reduce animal life expectancy. In the case of plants, soiling of vegetation can reduce growth and productivity and can lead to vegetation die-off.

The comparison of predicted pollutant concentrations to guidelines and standards facilitates a preliminary screening of potential impacts. The following set of health and nuisance evaluation criteria have been used (full details and references are provided in the specialist report – Appendix I):

- South African national ambient air quality standards (NAAQS) for daily PM_{10} (75 microgram/m^3) and annual PM_{10} (40 microgram/m^3).
- NAAQS daily for $PM_{2.5}$ (40 microgram/m^3) and annual $PM_{2.5}$ (20 microgram/m^3).
- South African national dust control regulations (SA NDCR) dust fallout limits and standards for residential (<600mg/m^2/day) and non-residential (<1200mg/m^2/day) areas (two within a year, non-sequential months).
- Assumed a limit of 400mg/m^2/day for vegetation based on a European study (in the absence of South African or international standards).

It should be noted that the compliance dates for the NAAQS $PM_{2.5}$ criteria listed above are from 1 January 2016 to 31 December 2029. These criteria have been used in this assessment.

With reference to the table below, there are a number of sources in all phases that have the potential to pollute the air in the unmitigated scenario. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term potential sources and the closure phase may present final land forms that could have the potential to pollute the air through long term wind erosion. This section focuses on human, animal and plant health impacts. Impacts related to: a) on-site activities and b) transport operations are assessed separately below.

Sensitive receptor points include homesteads (and associated land uses) on-site (within the mining right application area) and off-site farmhouses and homesteads (and associated land uses) located on neighbouring farms. The assessment assumes that the two homesteads within the surface infrastructure footprint will be relocated prior to construction.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Power supply and use Water supply and use Transport systems Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Exploration Earthworks* Civil works* Road building and upgrading* Underground mining (ventilation) Crushing, screening, product handling Power supply and use Water supply and use Transport systems Site support services Site/contract management Demolition* Rehabilitation	Road building and upgrading* Underground mining (ventilation only) Power supply and use Water supply and use Transport systems Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Transport systems Site/contract management Maintenance and care

** For maintenance*

Rating of impact

Severity / nature

The air specialist made use of a theoretical model to conservatively predict air quality impacts during the operational phase (for both on-site and haulage operations) and qualitatively described impacts from the construction, decommissioning and closure phases (for on-site operations). The specialist considered unmitigated (no mitigation measures applied) and design mitigated (which took into account planned mitigation measures) scenarios. In this regard, all project phases prior to closure present air pollution related impacts and the most significant phase is expected to be the operational phase. During the construction and decommissioning phases, the most significant sources are predicted to be exposed areas, soil handling, wind erosion from topsoil stockpiles and vehicle entrainment on unpaved on-site roads. The main contributing sources during the operational phase are predicted to be crushing and screening, the ventilation shaft, and vehicle entrainment on unpaved on-site roads. At closure, the sources will be limited to activities conducted during monitoring and maintenance checks.

A qualitative assessment of the construction, decommissioning and closure phases identified that activities during these periods would not result in higher off-site (beyond the mining right application area) ground level concentrations than the operational phase activities. The related severity is moderate unmitigated, reducing to low with mitigation.

For the operational phase, in the context of on-site activities, the specialist study has predicted that in the unmitigated scenario, there will be exceedances of the $PM_{2.5}$ and PM_{10} annual and daily limits at receptor points on-site and in some instances off-site to the east and north east of the surface infrastructure area. In the mitigated scenario, there are only exceedances of the daily PM_{10} limit just east of the farm boundary. The severity of potential impacts in the unmitigated operational scenario is rated as high for all relevant phases. In the mitigated scenario, the severity reduces to somewhere between medium and low.

In terms of dust fallout, the specialist study has predicted that in both the unmitigated and design mitigated operational phase, no exceedances of the SA NDCR for residential areas or European vegetation limit are expected at the nearest receptor points to surface infrastructure. Both the unmitigated and mitigated severity is low.

In the context of transport operations on the unpaved section of the route, the specialist study has predicted that in the unmitigated operational scenario there will be exceedances of both the $PM_{2.5}$ and PM_{10} annual and daily limits at receptor points along the route. This translates to a high severity in the unmitigated scenario. With mitigation that focuses on water suppression the severity is reduced.

Duration

In both the unmitigated and mitigated scenarios, if human, animal or plant health impacts occur these are potentially long term in nature.

Spatial scale

The spatial scale of the potential impact is directly related to the spatial scale of the dispersion of any air pollution that has the potential to cause human, animal and plant health impacts. In the unmitigated scenario, exceedances of human health screening limits and European vegetation limits are predicted to occur on-site, in some instances off-site to the east and north east of the surface infrastructure area and beyond the transport route. In the context of on-site activities, in the design mitigated scenario, the spatial extent reduces but exceedances just east of the farm boundary are still predicted. In the context of transport operations, the implementation of mitigation measures reduces the footprint of impacts significantly.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high, in all project phases. With the implementation of mitigation measures, the consequence reduces to medium for transport operations, and medium (construction and decommissioning) and medium to high (operations) for on-site activities.

Probability

The probability of off-site pollution is high. Whether this will result in human, animal or plant health and nuisance impacts depends on the extent of the pollution plume, the concentration of the different pollution components, and the exposure of receptors to exceedances of the relevant evaluation criteria.

In the unmitigated scenario, the probability is definite. In the design mitigated scenario, the probability reduces to low.

For animals and plants, impacts are possible in close proximity to sources.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With the implementation of mitigation measures, the significance is low for construction and decommissioning activities and somewhere between medium and low for operational activities depending on the receptor group and its proximity to the project site or haulage route.

Tabulated summary of the assessed impact – on-site activities

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, decommissioning and closure						
Unmitigated	M	H	M	H	H	H
Mitigated	L	H	L	M	L	L
Operational						
Unmitigated	H	H	M	H	H	H
Mitigated	M to L	H	M	H to M	L	M to L

Tabulated summary of the assessed impact – transport operations

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction and decommissioning						
Unmitigated	M	H	M	H	H	H
Mitigated	L	H	M	M	L	L
Operational						
Unmitigated	H	H	M	H	H	H
Mitigated	M to L	H	M	H to M	L	M to L
Closure – not applicable						

Cumulative impacts

No cumulative impacts identified.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 41).

Objectives

To prevent unacceptable air quality related pollution impacts.

Mitigation measures

Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan (Section 8.2.17).

All dust generating sources will be located as close as possible to each other and the centroid of activities around the boxcut. Unpaved roads will be kept to a minimum.

During the construction phase, disturbed areas will be kept to a minimum and exposed areas will remain moist through regular water spraying during dry windy periods.

An air quality management plan will be developed and implemented for the site, in consultation with an air quality specialist. The air quality management plan will include control measures such that as a minimum:

- 50% control efficiency is achieved through effective water sprays where vegetation is removed and construction activities take place
- 75% control efficiency is achieved through effective water sprays on unpaved roads or 90% control efficiency through application of dust suppressants
- 50% control efficiency is achieved through effective water sprays at the product stockpiles to minimise wind erosion
- 50% control efficiency is achieved through water sprays at all material handling points
- 50% control efficiency is achieved through water sprays at the crushing and screening.

Where possible, the mine will investigate alternative control measures that reduce its demand on water but maintain the same control efficiencies as outlined above.

Vehicle speeds will be limited on unpaved roads.

Coal trucks will be covered to prevent unnecessary generation of coal dust during transport.

Undertake monitoring in line with the air quality monitoring programme (Section 22). If monitoring data confirms that either the emissions or the ambient concentrations exceed the relevant standards then the mine will, in consultation with the relevant authorities, take steps to further reduce the emissions or ambient concentrations where possible.

Emergency situation

None identified.

AMBIENT NOISE

8.2.9 ISSUE: INCREASE IN DISTURBING NOISE LEVELS

Information based on noise specialist study (SLR 2015) (Appendix J).

Introduction

There are limited activities on site and in the area that contribute to current ambient noise levels. There are a range of construction, operation and decommissioning project activities that have the potential to generate noise (disturbance and nuisance) and cause related pollution at sensitive receptors (see table below for further detail). In the decommissioning phase, similar impacts to those predicted for the construction phase are expected. At closure it is unlikely that significant amounts of noise will be generated which would be perceptible beyond the site boundary.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
			Not applicable
Exploration Site preparation Earthworks Civil works Road building and upgrading Transport systems Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Exploration Earthworks* Civil works* Road building and upgrading* Underground mining Crushing, screening, product handling Transport systems Site support services Storage and maintenance services/ facilities Site/contract management Demolition* Rehabilitation	Road building and upgrading* Underground mining (ventilation only) Transport systems Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	-

** For maintenance*

The assessment below considers both the recommended noise rating levels for the project site [45db (night-time) and 35dB (day-time) as recommended by the noise specialist] as well as general noise disturbance which can be defined as an increase in ambient noise levels. Although the legal limit for an increase in ambient noise is 7 dB (national noise regulations), this should not be construed as the upper limit of acceptability. SANS 10103 identifies that an increase of 5 dB is considered a significant impact. Noise nuisance on the other hand is defined by SANS 10103 as any sound which disturbs, or impairs the convenience or peace of any person. Noise nuisance sources presented by the proposed project comprise surface blasting (if needed during construction), reverse alarms and hooters.

The assessment below focuses on day-time (all phases) and night-time (only operation) conditions and the potential human related noise impacts. No construction or coal transport activities will take place at night. The assessment assumes that the two homesteads within the surface infrastructure footprint will be relocated prior to construction. Potential impacts on biodiversity are discussed in Section 8.2.4.

Rating of impact

Severity / nature

Noise pollution will have different impacts on different receptors because some are very sensitive to noise and others are not. For example, mine workers in general do not expect an environment free of work related noise and so they will be less sensitive to environmental noise pollution at work. In contrast, farmsteads, homesteads and visitors (including tourists) to the area are likely to be sensitive to unnatural noises and so any change to ambient noise levels because of mine related noise will have a negative impact on them and their wilderness experience. Predicted impacts from activities on site and the use of road for transporting materials are discussed below.

In relation to potential receptors within the vicinity of the surface infrastructure area:

- In the unmitigated construction phase the noise specialist study has predicted that noise levels would not exceed the daytime noise rating limit at any of the identified receptors. In terms of an increase in ambient noise levels, the specialist study has predicted a daytime increase from baseline levels of between 6 and 8dB at the nearest receptor sites to the north, east and west of the surface infrastructure area. This translates to a high severity impact.
- In the unmitigated operational phase the noise specialist study has predicted that noise levels would exceed the daytime noise rating limit at the nearest receptor to the west and east. At night noise levels are predicted to exceed the night-time noise rating limit at receptors within 1.1km (to the west, north and east) and 600m (to the north) of the surface infrastructure area. In terms of an increase in ambient noise levels, the specialist study has predicted a daytime increase of between 9 and 12dB and a night-time increase of between 10 and 23dB at the nearest receptor sites to the north, east and west of the surface infrastructure area. This translates to a high severity impact, especially at night.

When considering nuisance noises, in all relevant phases, material handling and vehicle movement on site will make use, to varying degrees, of machinery with reverse alarms and hooters. Blasting-related noise during construction (if needed) is expected to have a significant impact in the quiet surroundings of the project site, even though the noise source will be intermittent. This translates to a high severity impact.

With mitigation, the severity can be reduced to medium or low depending on the mitigation measures implemented.

In relation to potential receptors along the haulage route:

- The noise specialist study has predicted that noise levels generated by traffic movements (and more specifically coal trucks) between the project site and the R33 would exceed the day-time noise rating limits within 50m of the haulage road. This translates to a moderate severity during the operational phase. Limited measures can be implemented to reduce potential impacts.

<u>Duration</u>

In the unmitigated scenario, the noise pollution impacts will continue until the closure phase of the mine. Whether noise impacts discussed above will have any secondary long term health effects, beyond the life of the project, is unknown. In this regard, it’s possible for noise induced stress and related health issues to be felt beyond closure. In the mitigated scenario, impacts can be reduced to the life of the project.

Spatial scale / extent

In both the unmitigated and mitigated scenario the noise impacts will extend beyond the surface infrastructure boundary.

Consequence

During the construction, operational and decommissioning phases, in the unmitigated scenario the consequence is high. This reduces to medium with the implementation of mitigation measures.

Probability

In the unmitigated scenario, the noise specialist study has predicted a definite impact at the nearest receptor sites to the surface infrastructure area and within 50m of the haulage route. With mitigation, depending on the effectiveness of mitigation measures applied, the probability reduces to somewhere between medium and low.

Significance

In all project phases, for all project activities, the unmitigated significance of potential impacts is high. With mitigation the significance reduces to somewhere between medium and low depending on the mitigation measures implemented.

Tabulated summary of assessed impact – for potential receptors within the vicinity of the surface infrastructure area

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M to L	M to L
Closure – not applicable						

Tabulated summary of assessed impact – for potential receptors along the haulage route

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation						
Unmitigated	M	H	M	H	H	H
Mitigated	M	M	M	M	M	M
Construction, decommissioning, closure – not applicable						

Cumulative impacts

No cumulative impacts identified.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 42).

Objective

To limit excessive noise pollution from project activities and facilities.

Mitigation measures

Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan (Section 8.2.17).

Restrict construction activities to daytime hours.

Ensure that all equipment and vehicles are kept in proper working order, and exhausts and silencers of diesel operated equipment are functioning correctly. An equipment and vehicle maintenance programme will be developed and implemented. Records will be kept for auditing purposes.

Ensure that the site access road and all internal service roads are kept clean and maintained in good state of repair to avoid unnecessary rattles, bangs and 'body-slap' on mine vehicles.

Noise reducing measures such as minimising drop heights when loading or unloading, no unnecessary engine revving, etc. will be investigated and implemented.

Equipment used intermittently will be shut down between operational periods.

Pumps, compressors and generators will be fitted with acoustic enclosures if required.

Soils stripped in the construction phase and overburden from the development of the boxcut will be stockpiled, as far as possible, in such a manner as to act as a noise screen between noise generating equipment and sensitive receptor sites (and in line with the soil management plan).

Acoustic screening of noise generating components of the operations will be investigated and implemented by the mine where feasible.

Potential receptors will be informed of the mine's construction blasting programme.

Transport of coal will be limited to daylight hours only.

Where possible and where occupational safety requirements allow, use alternative reverse alarms with a wide-band type alarm rather than conventional beeping type reverse alarms on trucks and earth-moving vehicles.

Educate and train workers on the noise impacts of their actions and ways in which to minimize noise generation.

Noise monitoring as detailed in Section 22 will be undertaken to verify the outcomes of the noise modelling and provide input into additional management measures, if required.

All registered complaints will be documented, investigated in a timeously manner and efforts made to address the area of concern where possible.

Emergency situations

None identified.

VISUAL ASPECTS

8.2.10 ISSUE: NEGATIVE LANDSCAPE AND VISUAL IMPACTS

Introduction

Mining projects have the ability to alter the visual character of an area through the establishment of surface infrastructure. Negative visual impacts will be caused by activities and infrastructure in all project phases (refer to the table below). The surface infrastructure relating to the project will however have a relatively small footprint. These activities will be visible, to varying degrees from varying distances around the project site. During construction, this will be influenced by the introduction of activities and removal of vegetation on site. During operation this will be influenced by the presence of infrastructure and stockpiles, and during decommissioning and closure by the closure objectives and effectiveness of rehabilitation measures. The more significant activities and structures are considered to be construction activities, the presence of operational infrastructure, coal stockpiles and night lighting needed for safety purposes.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Road building and upgrading Transport systems Site/contract management Rehabilitation	Exploration Earthworks* Civil works* Road building and upgrading* Crushing, screening, product handling Stormwater management Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management	Road building and upgrading* Stormwater management Transport systems Non-mineralised waste management Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Final land forms

Construction	Operational	Decommissioning	Closure
	Demolition* Rehabilitation		

* For maintenance

Rating of impact

Severity / nature

The severity of visual impacts is determined by assessing the change to the visual landscape. The visual landscape is that of an open grassland system with limited man-made intrusions. Key issues are: visual intrusion, visibility and visual exposure, and viewer sensitivity. Each of these is discussed below.

In the unmitigated scenario, the visual intrusion of the project will be high as mining activities are introduced into a natural environment, and will remain high for the life of the project as activities continue. At closure, the visual intrusion is expected to decrease as infrastructure is removed and the boxcut backfilled and rehabilitated. The visual intrusion of the project at night, from construction through to decommissioning, will be high in the unmitigated scenario given the current absence of significant artificial night lighting in the area. With the implementation of mitigation measures that focus on limiting disturbance, establishing visual screens, provide for focused use of lighting and effective rehabilitation of the site at closure, the visual intrusion of the project can be reduced to medium for all phases prior to closure and low at closure.

Visual exposure is the extent to which project infrastructure and activities will be visible. It follows that the closer the infrastructure and activities, the greater the visual exposure. In the unmitigated day scenario, views from sections of the D699 (used by residents and visitors/tourists) and from homesteads on- and to the north of the surface infrastructure area will present the greatest visual exposure (Figure 30). Homesteads to the east would have a moderate visual exposure. Visual exposure at night time due to the use of lighting in an otherwise rural environment is expected to be high. With mitigation, the visual exposure can be reduced to medium.

Sensitivity of receptors relates to the way in which people will view the visual intrusion. Near the project site, sensitive receptors are expected to include tourists travelling along the D699 and local residents, especially in the unmitigated scenario.

Given the above, the unmitigated severity is high. With mitigation, the severity can be reduced to medium.

Duration

In the unmitigated scenario, visual impacts will be experienced after the life of mine. In the mitigated scenario, visual impacts can be reversed with the implementation of effective rehabilitation measures. The duration can therefore be reduced to the life of the mine.

Spatial scale / extent

By using a viewshed analysis tool the spatial extent of impacts can be predicted (Figure 30). Due to the location of potential sensitive receptors, in both the unmitigated and mitigated scenarios, visual impacts will be experienced beyond the site boundary for all phases up until closure. At closure, mitigated impacts will be localised. At night, the visual exposure of the project is expected to be further. This is a medium spatial scale for all project phases except the mitigated closure phase where it reduces to low.

Consequence

In the unmitigated scenario the consequence is high. With mitigation, the consequence reduces to medium for all phases prior to closure and low at closure.

Probability

The probability of the visual impact occurring is high in the unmitigated scenario reducing to medium in the mitigated scenario for all phases prior to closure and low at closure. This is dependent on the effectiveness of rehabilitation measures.

Significance

The unmitigated significance is high. With the implementation of mitigation measures, the significance is reduced to medium for all phases prior to closure and low at closure.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning.						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	L	M	L	L	L	L

Cumulative impacts

No cumulative impacts identified.

FIGURE 30: VIEWSHED ANALYSIS OF THE PROJECT

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 43).

Objectives

To limit excessive visual impacts.

Mitigation measures

In the construction and operation phases, implement the following visual mitigation techniques:

- limit the clearing of vegetation
- limit the emission of visual air emission plumes (dust emissions)
- use visual screens including planted vegetation between the mine site and sensitive viewers – these screens should be as close as possible to the sensitive viewer
- limit use of lighting to what is absolutely necessary from a safety perspective and consider the use of downward directed light and/or motion sensors
- use colours that reflect natural colours of the surrounding landscape where possible
- undertake on-going rehabilitation of disturbed areas.

In the decommissioning phase implement a closure plan that involves the removal of infrastructure, unless an alternative end land-use is identified, backfilling of the boxcut and rehabilitation and re-vegetation of disturbed areas in a manner that achieves both landscape functionality and limits and/or enhances the long term visual impact.

At closure, manage rehabilitated areas through an aftercare and maintenance programme to limit and/or enhance the long term post closure visual impacts.

Emergency situations

None identified.

LAND USES

8.2.11 ISSUE: LOSS OF LAND USES

Information based on land use specialist study (TerraAfrica 2015) (Appendix).

Introduction

When considering impacts on land use, the land use specialist took into consideration the range of environmental impacts that could occur as a result of the project. With this in mind, the main activity that could have an impact on existing land uses is the development of the mine site as a whole (see table below). These activities will commence in the construction phase and continue for the current planned 20 year life of the mine. At closure, all surface infrastructure will be removed and the site rehabilitated. This section focuses on the potential loss and/or change of the land uses. Socio-economic related issues as a result of relocation are discussed separately. This section considers both current agricultural and residential uses and future conservation and/or tourism land uses.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site establishment	Operation of mining activities and surface infrastructure	Decommissioning of mining activities and surface infrastructure	Maintenance and care

Rating of impact

Severity / nature

The project site is located in an area where mining related activities are scarce and urban settlements are concentrated around the main towns of Piet Retief, Paul Pietersburg and Utrecht. The area is characterised by open natural grasslands where the main economic activity is agriculture (cattle farming and forestry). Large parts of the surrounding area form part of protected environments or nature reserves. In addition some farms adjacent to the mining right application area form part of a proposed protected area initiative (part of the upper Pongola biodiversity stewardship initiative being developed by SANBI and the World Wildlife Fund). Further afield tourism based activities and accommodation occur, the nearest of which is approximately 8km south of the mining right application area. In addition, there are a number of scattered rural settlements that rely on natural resources for water, energy and food. The availability of clean water and land for these land uses is identified to be the most important resource for sustainable land use. A loss of water (either through dewatering or pollution) and/or degradation of land (through disturbance or pollution) is expected to result in a loss and/or partial loss/change in land use depending on the proximity of land uses to mining activities. The further the land use the less the impacts will be felt.

Land uses within the surface infrastructure footprint and along new sections of the access road will be lost through the development of the mine. This is unavoidable should the project proceed. With mitigation that focuses on rehabilitation to pre-mining levels, the severity can be significantly reduced at closure. This rehabilitation will also support the potential for the future use of the farm for conservation purposes, if applicable.

During the construction, operation and decommissioning phases, a number of impacts of varying spatial scale and significance have been identified through the EIA process. The more significant receptor groups are expected to be the nearest homesteads and associated land uses to the surface infrastructure site and water users within predicted impact zones. To mitigate impacts on the nearest homesteads and related land uses to the surface infrastructure site, a 500m buffer has been planned. In the absence of this buffer, the cumulative severity of impacts on these homesteads and related land uses would be high.

With mitigation the severity is significantly reduced. To mitigate impacts on water users within the predicted impact zones, measures that focus on verifying modelling results and minimizing the loss have been included in the EMP. Mitigation measures also focus on limiting the footprint of disturbance or impact and therefore aim to support the use of the greater farm for conservation initiatives.

Duration

In the unmitigated scenario, and using a conservative approach, land use impacts could be experienced beyond the life of mine. With mitigation this should be reduced to the life of the project.

Spatial scale / extent

Based on the predictions by other specialists, it is identified that a cumulative project impact on land uses, when considering all relevant environmental aspects, has the potential to extend beyond the site boundary in both the unmitigated scenario and mitigated scenario, especially considering impacts associated with transport activities during the operational phase.

Consequence

In all phases, in the unmitigated scenario the consequence is high. With mitigation this reduces to somewhere between medium and low.

Probability

The probability of the land use impacts occurring is high in the unmitigated scenario, as this assumes that impacts associated with environmental aspects as assessed in this report are unmitigated. With mitigation the probability reduces to somewhere between medium and low depending on the proximity of land uses to mining activities and the effectiveness of mitigation measures to minimise impacts on various aspects of the environment.

Significance

In the unmitigated scenario, in all project phases, the significance of potential impacts is high. With mitigation the significance reduces to somewhere between medium and low as the severity, duration and probability can be reduced.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	M to L	M	M	M to L	M to L	M to L

Cumulative impacts

No cumulative impacts identified.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP.

Objective

To limit loss of land uses

Mitigation measures

Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan.

Effective implementation of all mitigation measures as outlined in this EMP report to reduce the overall impact on the environment and surrounding land-uses.

Emergency situations

None identified.

8.2.12 ISSUE: BLASTING DAMAGE

Introduction

The main activities that have the potential to cause blasting hazards is establishment of the boxcut entrance during construction and the use of drill and blast methods in sections of the underground mine (see table below for further detail). Establishment of the boxcut will only require approximately three blasts. Blasting will be required in the underground mine where drill and blast techniques are required.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
		Not applicable	Not applicable
Earthworks (Boxcut development)	Underground mining	-	-

Surface and near surface blasting activities have the potential to impact on people, animals and structures located in the vicinity of the operation. Blast hazards include ground vibration, airblast, fly rock, blast fumes and dust. Ground vibrations travel directly through the ground and have the potential to cause damage to surrounding structures. Airblasts result from the pressure released during the blast resulting in an air pressure pulse (wave), which travels away from the source and has the potential to damage surrounding structures. Fly rock is the release of pieces of rock over a distance and can be harmful to people and animals and damage structures and property. Blast fumes and dust, caused by the explosion, can be considered significant nuisance factors. The size of surface blasts will however be small. Ground vibrations and airblasts have the potential to cause nuisance to people and animals even if blasts occur within legal limits. As mining deepens the effect of blasting of surface reduces.

The impacts on air quality and noise have been assessed in Section 8.2.8 and 8.2.9, respectively. This section focuses on the impacts of ground vibration, airblast and flyrock, collectively, as they relate to people, biodiversity and associated land uses.

Rating of impact

Severity / nature

In the unmitigated scenario, although there is third party infrastructure and animals within 500m of the boxcut site, the scale of blasting activities is small and any damage or injury to third parties and/or their infrastructure it is considered to have a medium severity in the unmitigated scenario, which may be reduced to low in the mitigated scenario because the potential for blast related incidents is expected to decrease.

Duration

In both the unmitigated and mitigated scenarios, although the blasting hazards (ground vibrations, air blasts, fly rock) will be limited mainly to the construction phase, any injury or death to people and/or animals and damage to structures, plants and/or property will be felt beyond closure.

Spatial scale / extent

The spatial scale can extend beyond the mining right application boundary in the unmitigated scenario; however this should be reduced to within 500m of the blast site in the mitigated scenario.

Consequence

The consequence is high in the unmitigated and reduces to medium in the mitigated scenario.

Probability

There are five dwellings within 500m of the boxcut site. In the unmitigated scenario, the probability of injury or damage to third parties, animals or structures is possible. With mitigation the probably reduces to low.

Significance

In the unmitigated scenario the significance is high. With mitigation this can be reduced to low.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation						
Unmitigated	M	H	M	H	M	H
Mitigated	L	H	M	M	L	L
Decommissioning, closure – not applicable						

Cumulative impacts

No cumulative impacts identified.

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 20, Table 45).

Objective

To prevent blast related damage to third parties and infrastructure

Mitigation measures

Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan (refer to Section 8.2.17).

For surface and near surface blasts:

- Develop a blast design to determine the firing sequence, number of holes firing together and the combined charge mass per delay – take into consideration the presence of any sensitive structures or receptors and adjust design accordingly to minimise damage and impacts.
- Plan blast times to cause least disturbance to receptors and in particular the school situated at the mine access road entrance.
- Apply the following threshold criteria:
  - Contain fly rock within 500 m of each blast
  - For ground vibration: Peak particle velocity at the closest well-constructed third party structures is less than 12 mm/s
  - For air blast: < 130 dB at the closest well-constructed third party structures
- Mark, drill-off in the field and audit (once charging commences) the final approved blast design to ensure that all stages of the operation are proceeding as per the design. Correct any problem holes. Check the blast pattern, hole depths, charge mass per hole, final stemming lengths and the delay timing of the blast. Correct any unusual occurrences immediately, documented and note for future consideration.
- Keep detailed blast records and include:
  - Date, time and blast location
  - Unusual occurrences such as collapsing holes, runaway explosives, fumes, flyrock
  - Prevailing weather conditions, wind speed and direction.
- If fumes occur after a blast then keep the immediate vicinity of the blast area clear until these have dissipated – wind direction and conditions must also be kept in mind to ensure that the fumes do not impact further afield.
- Notify closest receptors and schools of blast schedule.
- Evacuate anyone located within the 500m of the blast zone including animals and people travelling on roads. For all required evacuations, sound an audible warning prior to each blast.

- Conduct monitoring in line with monitoring programme (Section 22).
- If monitoring indicates unacceptable impacts at receptors investigate and implement additional mitigation measures.
- Repair any damage to third party property caused by the mine's blasting activities.
- Comply with all relevant legislation in terms of handling, use, and transport of explosives.
- Document, investigate all registered complaints and address the area of concern where possible.

Emergency situations

If a person or animal is injured by fly rock this must be handled in accordance with the mine's emergency response procedure (Section 21).

8.2.13 ISSUE: DISTURBANCE BY PROJECT-RELATED TRAFFIC

Information based on traffic specialist study (SLR 2015) (Appendix N).

Introduction

The local network of roads providing access to the project site is rural in nature and used by the public including vulnerable groups such as children walking to school. Further afield, the roads are more regional in nature providing links between surrounding towns. As quantified in Section 3 in the project description, the project will cause a temporary increase in traffic volumes during the construction phase and a more long term increase during the operational phase. Traffic in the decommissioning phases will reduce to the extent that production related traffic ceases and would likely be similar to the construction phase. Traffic in the post closure phase will be limited. The impacts are therefore assessed for the first three phases.

An increased traffic on existing public road networks and introduction of mine-related trucks can result in an inconvenience to current road users, greater accidents (for people and animals) and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads.

The assessment below assumes that the most critical time period for traffic impacts is on a weekday between 14h00 and 15h00 when baseline traffic flows and the project's trips will be its greatest at 40 movements (two-way movements of 18 HGVs, 21 car movements and one bus). This period also coincides with the end of the school day thereby addressing vulnerable road users.

It is the view of the traffic specialist that project-related traffic will not change the level of service required on the network of public roads in the vicinity of the project. From a capacity perspective, no changes to the road network are required. This however does not consider the adequacy of the road conditions to accommodate a change in vehicle type. This section therefore focuses on both road conditions affecting third party road users and safety related impacts of third party road users. Due to the predicted difference in impacts related to: a) road condition and b) safety related impacts, these two aspects of the project are assessed separately below.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
			Not applicable
Exploration Road building and upgrading Transport systems Site/contract management	Exploration Road building and upgrading* Transport systems Site/contract management	Road building and upgrading* Transport systems	-

** For maintenance*

Rating of impact

Severity / nature

Project-related traffic has the potential to degrade roads due to the type of vehicles and/or result in serious injury and/or death to third parties during all relevant phases. Key aspects identified with input from the traffic and social specialists are listed below.

- There will be a significant increase in traffic volumes on the more rural roads (D699 and P40) and to a lesser extent on the more established roads (R33 and P221). The more significant increase will be during the operational phase.
- On the more rural roads (D699 and P40), project-related traffic introduces a significant number of heavy goods vehicles (HGV) (such as coal trucks) compared to the baseline. The only HGVs observed on these roads were timber related trucks.
- Four schools have been identified along the haulage route exposing vulnerable road users such as children to project-related traffic and the type of project vehicles.

In the unmitigated scenario, the project presents the potential for a decrease in road conditions and a number of traffic-related incidences with third party road users. The potential severity of reduced road conditions during the construction phase is medium and increases to high during operation due to the addition of coal trucks. The potential severity of any related injury or death of third party road users including pedestrians is high, regardless of the project phase. With implementation of mitigation measures as included below, the severity of potential impacts on road users due to road conditions will be minimised. In the context of road safety impacts, if an accident occurs resulting in permanent injury or death the severity will remain high in the mitigated scenario for all phases.

Duration

In the context of reduced road conditions, in the unmitigated scenario, potential impacts on third party road users would continue for the life of the project. With mitigation, this can be reduced to less that the life of the project.

With or without mitigation, in the context of safety related impacts, although project-related traffic incidences will cease at closure, injury or death of third parties is considered a permanent impact.

Spatial scale / extent

In the context of reduced road conditions, in both the unmitigated and mitigated scenarios, the potential impacts will be limited to the route used by project traffic. This is a medium spatial scale.

With or without mitigation, in the context of safety related impacts, if someone is injured or dies, the impact (including secondary socio-economic impacts) will extend beyond the project site regardless of the project phase in which the potential incident may occur.

Consequence

The consequence of unmitigated impacts is high for all phases. In the context of reduced road conditions, the consequence reduces to low in all phases. In the context of safety related impacts, the consequence remains high in the mitigated scenario.

Probability

The project presents the potential for reduced road conditions and/or a number of traffic-related incidences with third party road users, especially in the operational phase. During the construction and decommissioning phases, the volume of associated traffic when compared to the operation phase will be for a limited duration.

In the absence of any mitigation, the probability of reduced road conditions or incidences occurring resulting in severe injury or death of a third party is medium during construction and decommissioning and high during operations. Depending on the effective implementation of the mitigation measures, impacts from reduced road conditions can be significantly reduced. In the context of road safety impacts, in the mitigated scenario traffic-related incidences may still be possible during the operational phase, the potential for impacts occurring can be significantly reduced.

Significance

For both reduced road conditions and road safety impacts, during all assessed phases, the significance of impacts is high in the unmitigated scenario. With mitigation as outlined below, the significance of the mitigated impact reduces to low for road condition impacts and construction and decommissioning road safety impacts as the likelihood of this occurring is considered low. For the mitigated operational phases, the significance is rated medium as traffic-related incidences may still be possible during this phase.

Tabulated summary of the assessed impact – reduced road conditions

Management	Severity	Duration	Spatial scale	Consequence	Probability	Significance
Construction, decommissioning						
Unmitigated	**M**	**H**	**M**	**H**	**M**	**H**
Mitigated	**L**	**L**	**M**	**L**	**L**	**L**
Operational						
Unmitigated	**H**	**H**	**M**	**H**	**H**	**H**
Mitigated	**L**	**L**	**M**	**L**	**L**	**L**
Closure – not applicable						

Tabulated summary of the assessed impact – safety related aspects

Management	Severity	Duration	Spatial scale	Consequence	Probability	Significance
Construction, decommissioning						
Unmitigated	**H**	**H**	**M**	**H**	**M**	**H**
Mitigated	**H**	**H**	**M**	**H**	**L**	**L**
Operational						
Unmitigated	**H**	**H**	**M**	**H**	**H**	**H**
Mitigated	**H**	**H**	**M**	**H**	**M**	**M**
Closure – not applicable						

Cumulative impacts

For the majority of the D699, given the low traffic flows on the existing road network, no cumulatively impacts expected. Where project-related traffic intersects with timber related traffic, cumulative impacts on road conditions and the safety of road users could be expected.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 46).

<u>Objectives</u>

To reduce the potential for mine-related safety and vehicle related impacts on road users.

<u>Mitigation measures</u>

Detailed design drawings will be compiled and submitted to the various authorities for approval purposes, and where necessary the required way leaves will be obtained in order to conduct the required road improvements.

The mine will investigate establishing an alternative access point onto the D699 to minimise project-related interaction with the Luthilunye School. Should this be feasible, this alternative access will be established and used instead of using the existing farm access point.

The permanent mine access road on the farm Commissiekraal will be established at the start of construction and will include:

- an upgraded intersection on the D699 that allows for the turning movements of HGVs
- a widened access road (approximately 8 to 9m wide)

- extension of between 1.5 and 2km of existing gravel track
- upgrading of the Pandana River crossing
- provision for culverts along its route
- appropriate road drainage
- gravel surfacing.

Any road improvements along D699 road and at the D699/P40 intersection to address current road conditions (as recommended in the traffic specialist report) will be implemented in conjunction with the relevant Roads Department during the construction phase.

Initiate discussions with the relevant road authority to set up a maintenance plan to maintain the relevant sections of the D699 and P40 on which heavy vehicle movement is anticipated. Ensure plan includes initial investigations on quality and lifespan of roads trucks will travel.

Traffic and information signs and lighting will be provided where relevant in consultation with the Roads Department.

Transport of any abnormal heavy loads will be co-ordinated with the relevant roads department.

Transport of any hazardous substances will comply with Hazchem requirements.

The mine will ensure that all equipment is kept in proper working order, and exhausts and silencers of diesel operated equipment are functioning correctly.

Investigate a school bus service for relevant schools in the vicinity of the D699 and P40 to minimise safety risks on school children.

Train employees and create employee awareness on basic road safety behaviour. In addition, include in contracts a commitment that contractors will conform to the same behaviour as employees.

Undertake community awareness programmes to educate the community on project-related safety risks.

The mine will monitor and evaluate its use of the relevant road intersections and road sections on an annual basis as part of its risk and safety management practices (see Section 22).

Emergency situation

Any road accident involving or caused by project related traffic will be handled in accordance with the emergency response procedure (see Section 21).

HERITAGE (AND CULTURAL)

8.2.14 ISSUE: DESTRUCTION OF HERITAGE (INCLUDING CULTURAL AND PALAEONTOLOGICAL) RESOURCES

Information based on the heritage (Pistorius 2015) (Appendix K) and the palaeontological (Bamford 2015) (Appendix L) specialist studies.

Introduction

There is a number of activities/infrastructure in all phases that have the potential to damage heritage resources and result in the loss of the resource for future generations (see table below for further detail). Heritage resources include sites of archaeological, cultural or historical importance. The more significant of these are expected to occur during the construction and operational phases when most of the project infrastructure will be established on site. No impacts are expected to occur after closure.

<u>Link to mine phases and activities/infrastructure</u>

Construction	Operational	Decommissioning	Closure
			Not applicable
Exploration Site preparation Earthworks Road building and upgrading Site/contract management	Exploration Underground mining Transport systems Site/contract management Demolition* Rehabilitation	Transport systems Site/contract management Demolition Rehabilitation	-

** For maintenance*

Rating of impact

<u>Severity / nature</u>

Heritage resources that will be impacted on by the positioning of project-related infrastructure include three graveyards and a single grave. These sites are considered to have a high significance and therefore destruction of these sites without proper mitigation has a high severity. Although there is potential for palaeontological resources to be present, this can only be determined once excavations are started. If any heritage resources such as unmarked graves/graveyards or fossils are uncovered during the construction, operation and decommissioning of the site, the loss of these resources has a high severity in the unmitigated scenario. Mitigation measures could reduce the severity of impacts on these graveyards and graves to low by relocating graves through a formalised process and obtaining the required permits. Similarly if any other heritage or paleontological resources are found, mitigation will involve further investigation to determine the significance and obtainment of relevant authorisations to remove these and preserve these if deemed necessary.

<u>Duration</u>

In the unmitigated scenario, the loss of heritage resources will be long term and will continue after the life of the project. This could be reduced to less than the life of the project with effective mitigation.

Spatial scale / extent

Although the actual loss of the resource will be within the site boundary, the impact could extend beyond the site boundary in both the unmitigated and mitigated scenarios.

Consequence

The consequence of this potential impact is high in the unmitigated scenario and moderate in the mitigated scenario because severity and duration is reduced.

Probability

The probability of impact occurrence is high in the unmitigated scenario, but this can be reduced to low with mitigation.

Significance

The significance of this potential impact is high in the unmitigated scenario and low in the mitigated scenario. No residual impacts are expected after closure.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	L	L	M	M	L	L
Closure – not applicable						

Cumulative impacts

No cumulative impacts identified.

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 20, Table 47).

Objective

To prevent the loss of heritage (including cultural and paleontological) resources.

Mitigation measures

The following management and mitigation measures will be implemented during all phases (excluding closure):

- Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police.

- The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.
- Any access roads will be a minimum of 20m from heritage sites.
- All workers (temporary and permanent) will be educated about the tell-tale signs of heritage and paleontological resources that may be encountered and about the need to conserve these.
- Should any fossils be uncovered during the development of the site, a palaeontologist or palaeoanthropologist will be consulted to identify the possibility for research.

Emergency situations

In the event that additional sites are identified during construction works, the mine will implement its chance find procedure (see Section 21). The key components of which are to ensure that the site remains undisturbed until a specialist has assessed the site, assessed the potential damage, advised on the necessary management steps and advised on the requirements for stakeholder consultation and permitting.

8.2.15 ISSUE: DISTURBANCE (INDIRECT) OF HERITAGE RESOURCES

Information based on heritage specialist study (Pistorius 2015) (Appendix K).

Introduction

Activities at the mine site have the potential to indirectly damage heritage resources and result in the loss of the resource for future generations (see table below for further detail). Heritage resources include sites of archaeological, cultural or historical importance. The potential exists for these impacts to occur in the construction, operation and decommissioning phases.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
			Not applicable
Exploration Site preparation Earthworks Road building and upgrading Transport systems Site/contract management	Exploration Road building and upgrading* Transport systems Site/contract management Demolition* Rehabilitation	Road building and upgrading* Transport systems Site/contract management Demolition Rehabilitation	-

** For maintenance*

Rating of impact

Severity / nature

A few graveyards and a stone walled cattle enclosure are located in close proximity to the proposed access road. These resources could be unintentionally damaged or destroyed during the construction, operation or decommissioning activities. These sites are considered to have a high significance and therefore damage to or destruction of these sites without proper mitigation has a high severity. This can be reduced to low with mitigation.

<u>Duration</u>

In the unmitigated scenario, the loss of heritage resources will be long term and will continue after the life of the project. This could be reduced to the life of the project with effective mitigation.

<u>Spatial scale / extent</u>

Although the actual loss of the resource will be within the site boundary, the impact could extend beyond the site boundary in both the unmitigated and mitigated scenarios.

<u>Consequence</u>

The consequence of this potential impact is high and can be mitigated to moderate.

<u>Probability</u>

The loss of heritage resources is possible but this can be reduced to low with effective mitigation.

<u>Significance</u>

The significance of this potential impact is moderate in the unmitigated scenario and low in the mitigated scenario.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning.						
Unmitigated	H	H	M	H	M	M
Mitigated	L	L	M	M	L	L
Closure – not applicable						

Cumulative impacts

No cumulative impacts identified.

Conceptual description of mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 20, Table 47).

<u>Objective</u>

To prevent the loss of heritage (including cultural and paleontological) resource.

<u>Mitigation measures</u>

The following management and mitigation measures will be implemented during all phases (excluding closure):

- The area of disturbance will be limited to that described in this report.
- Any access roads will be a minimum of 20m from heritage sites.
- All heritage sites not impacted by the initial development of the project infrastructure will be marked on the site layout plan.
- All workers (temporary and permanent) will be educated about the tell-tale signs of heritage and paleontological resources that may be encountered and about the need to conserve these.
- Heritage sites located in close proximity to exploration or surface activities will be inspected regularly for encroachment and/or damage in line with monitoring programme.
- Should any fossils be uncovered during the development of the site, a palaeontologist or palaeoanthropologist will be consulted to identify the possibility for research.
- Access will be allowed for family members to visit the graves within the mining right area.

Emergency situations

In the event that additional sites are identified during construction works, the mine will implement its chance find procedure (see Section 21). The key components of which are to ensure that the site remains undisturbed until a specialist has assessed the site, assessed the potential damage, advised on the necessary management steps and advised on the requirements for stakeholder consultation and permitting.

SOCIO-ECONOMIC

8.2.16 ISSUE: INWARD MIGRATION AND ASSOCIATED SOCIAL AND HEALTH ISSUES

Introduction

Projects of this nature tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can directly lead to the negative influx of job seekers to an area which in turn indirectly increases pressure on existing communities and traditional lifestyles, housing, basic service delivery and raises concerns around safety, community health and security. Potential impacts associated with inward migration can be ongoing or recurring particularly in the unmitigated scenario. This section focuses on the potential for inward migration and related social and health issues. Positive social impacts are assessed separately.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
			Not applicable
Site establishment Recruitment of contractors Housing (if required)	Recruitment for the operational phase Mine operation	Recruitment for decommissioning (if required)	-

Rating of impact

Severity / nature

The project will attract employment and procurement opportunity seekers. During the construction phase, it is expected that 16% of these opportunities will be for unskilled labour and 84% will be for semi-skilled and skilled labour. During the operation phase, it is expected that 22% will be unskilled and 78% will be semi-skilled and skilled labour. The effects of inward migration on landowners, rural communities and their social structures can be significant. The socially marginalised community members including households headed by women, children and the elderly and persons with disabilities may experience impacts more. In the unmitigated scenario, these effects could include, but not be limited to:

- potential establishment of informal settlements
- increased pressure on shared community resources (water, energy, building materials) and services (sanitation, waste management, infrastructure)
- increased pressure on health care capacities which are already limited
- increase in social ills (including crime, poaching and prostitution)
- disruption of existing social structures or change in social cohesion
- introduction and/or spread of disease, most notably HIV/Aids and tuberculosis but also including communicable diseases, non-communicable and other sexually transmitted infections
- general threat to the safety and security of an area
- increased trespassing on private farm land due to poor control of employees and contractors can lead to.

In the unmitigated scenario, given the remoteness of the area from built up towns, the severity is rated as moderate. It would be possible to mitigate this impact to low by managing expectations with regard to employment, by limiting inward migration through collaboration with traditional and local authorities and ensuring the implemnation of community social and health investment programmes.

Duration

In the normal course, social impacts would occur for the life of the project, however negative social issues associated with inward migration can continue beyond the life of the project, particularly in the unmitigated scenario. In the mitigated scenario, the duration can be limited to the life of the mine.

Spatial scale

In the unmitigated scenario, the impacts of inward migration will be felt mainly on the land and in the communities surrounding the site in the unmitigated and mitigated scenarios.

Consequence

In the unmitigated scenario the consequence associated with inward migration is high. With mitigation, the consequence can be reduced to somewhere between medium and low.

Probability

In the unmitigated scenario the probability of this impact occurring is considered to be high. With mitigation, impacts associated with inward migration are considered to be less likely.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation this may be reduced to medium.

Tabulated summary of the assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases except closure						
Unmitigated	**M**	**H**	**M**	**H**	**H**	**H**
Mitigated	**L**	**M**	**M**	**L**	**L**	**L**

Cumulative impacts

No cumulative impacts expected.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 48)

Objectives

To minimise inward migration and related secondary social, safety and health issues

Mitigation measures

Develop and implement a stakeholder communication and engagement strategy. The function of the communication structure will be to keep stakeholders up to date on progress and developments at the mine related to environmental, social and economic issues and respond to stakeholder complaints.

Develop and implement a community awareness programme that focuses on educating the public on risks associated with mining.

Compile and implement recruitment, training and housing policies and procedures that meet industry standards.

Develop and implement an influx management plan that allows for collaboration with traditional and government authorities and landowners to minimise the development of temporary settlements and illegal land use activities.

During all phases including pre-construction:

- enforce a labour recruitment plan that is linked to the authorities in the surrounding communities

- ensure no recruitment takes place at the gate
- control access to the construction and operation site
- give preference to non-skilled workers from local communities and provide mechanisms for training and upskilling.

Use a local labour office during the recruitment of non-skilled and unskilled labour. The labour office functions would include arbitration over incidents such as employer-employee disputes, education of potential workers about the recruitment process, providing assistance with the organization of the necessary documentation, keeping an up to date database of unemployed people who are looking for work and facilitation of information flow between contractors, the mine and job seekers regarding employment opportunities.

Collaborate with local police enforcement to minimise crime and related issues.

During construction, if required, provide a housing camp in a controlled manner that minimises disruption to local community structures and provides the necessary resources and services for the camp dwellers. If feasible from a safety perspective, develop the camp within the footprint of the operational infrastructure.

Develop and implement a social investment programme that takes into account the needs of the community and environment.

Specific measures to prevent or manage the spread of HIV/AIDS include:

- develop an effective HIV/AIDS policy in conjunction with the local authorities
- provide sex education and awareness programmes for workers
- support initiatives to minimise the spread of HIV/AIDS and related illnesses
- make condoms available at the mine
- invest in capacity building with key stakeholders such as health and social welfare.

Develop and implement a health management plan for employees in consultation with the district health authorities that incorporates screening, care and treatment programmes, control programmes and education campaigns where applicable.

Support community-based outreach programmes in partnership with district and local municipalities authorities, where practical.

<u>Emergency situations</u>

The establishment of informal settlements in the area is considered an emergency situation. The emergency response procedure outlined in Section 21 will be followed.

8.2.17 ISSUE: RESETTLEMENT OF HOUSEHOLDS

Introduction

The development of the mine, if approved, will result in the resettlement of households located within the surface infrastructure area. This is unavoidable due to the project footprint and for safety purposes. At this stage in project planning there is planning to relocate households within 500m of the project footprint to mitigate environmental impacts on the nearest households to the surface infrastructure area. It is assumed that the private land on which the mine wants to establish will either be bought by the mine or leased by the mine for a period of time (minimum of 20 years). In this regard, it is expected that the private landowners will receive fair compensation for the loss of their property. Should they decide to sell to the mine, then they would be expected to cover their own relocation and moving costs as is the case with the commercial selling of any property. This section therefore focuses on the potential relocation of homesteads.

Link to mine phase and activities/infrastructure

Construction	Operational	Decommissioning	Closure
		Not applicable	Not applicable
Site establishment	Mine operation	-	-

Rating of impact

Severity / nature

The development of the mine will displace seven households located within the project footprint and 500m buffer. In the unmitigated scenario the relocation of these households will result in the permanent loss of immovable assets such as building structures and agricultural fields. In addition to the loss of assets, access to community facilities such as water points, wood collection areas and schools will be compromised. In the unmitigated scenario, the severity will be high. In the mitigated scenario, households will be relocated in line with industry best practise and in consultation with the relevant owner. The related mitigated severity is low.

Duration

In the unmitigated scenario, the loss of physical assets and subsistence livelihoods would extend beyond the life of the project. With the implementation of mitigation measures, the loss of physical assets can be avoided. This translates to low duration.

Spatial scale

In both the unmitigated and mitigated scenario, potential impacts will be felt on a household and community level, beyond the site boundary but localised.

Consequence

In the unmitigated scenario, the consequence is high. With mitigation, the consequence for loss of physical assets is low.

Probability

The loss of physical assets and subsistence livelihoods is definite in the unmitigated scenario. With mitigation, the loss of physical assets is unlikely (low).

Significance

In the unmitigated scenario the significance is high. With the implementation of mitigation measures the significance reduces to low.

Tabulated summary of assessed impact

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction and operation						
Unmitigated	H	H	M	H	H	H
Unmitigated	L	L	M	L	L	L
Decommissioning and Closure – not applicable						

Cumulative impacts

None identified.

Conceptual description of mitigation measures

Discussion of the management measures is provided below and in the EMP (Section 20, Table 49).

Objective

To minimise the loss of socio-economic conditions due to relocation

Mitigation measures

Clearly communicate resettlement requirements to avoid any misunderstandings and possible expectations from unaffected households.

Develop and implement a detailed resettlement action plan (RAP) in line with industry best practise:

- Ensure accurate capturing of asset inventories of the affected persons
- Ensure transparency with each project affected person on the valuation of assets and the compensation framework
- Ensure that host areas can promote the establishment of livelihoods
- Where host areas are inadequate to support livelihood restoration, other income generation avenues are to be investigated
- An appropriate livelihood restoration plan is to be developed prior to relocation of persons

- Affected households are to be compensated fully for their loss this includes relocation assistance to host areas
- The mine is to avoid cash compensations where possible and rather promote like-for-like compensations – this is especially applicable for the immovable structures such as buildings and agricultural fields
- Access to community infrastructure such as schools, water, healthcare facilities should be included
- No persons are to be resettled without signing relocation agreement and before the host site is ready for occupation
- Resettlement activities are to be monitored during resettlement and after resettlement.

Emergency situations

None identified.

8.2.18 ISSUE: ECONOMIC IMPACTS (POSITIVE AND NEGATIVE)

Information in this section is based on the economic specialist study.

Introduction

The development of the mine as a whole has the potential to impact on the economy both positively through potential growth in the mining sector and negatively through the potential loss of existing economic activities.

Link to mine phases and activities/infrastructure

Construction	Operational	Decommissioning	Closure
Exploration Site preparation Earthworks Civil works Construction of all surface infrastructure Rehabilitation	Exploration Underground mining Crushing, screening, product handling Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Rehabilitation	Decommissioning surface infrastructure Power supply and use Water supply and use Stormwater management Process water management Transport systems Non-mineralised waste management Site support services Storage and maintenance services/ facilities Site/contract management Demolition Rehabilitation	Maintenance and after care

Rating of impact

Severity / nature

There is predicted to be a direct positive economic impact on the local, regional and national economies in both the construction and operational phases. Approximately 160 temporary and 200 permanent jobs will be created in the construction and operational phases respectively. Direct benefits will be derived from wages, taxes and profits. Indirect benefits will be derived through the procurement of goods and services, and the increased spending power of employees. Positive economic impacts could include (Mercury, 2015):

- revenue generation of approximately R2 809 million over the life of mine in present terms
- an estimated amount of R685.5 million in present value will be spent on employment over the life of the mine
- budgeted capital expenditure of R 428 million which will have a direct effect on the local and regional economy
- increase in economic activities in mining, manufacturing, transportation, and trade sectors supported by the demand of the mine for construction materials, equipment, goods and services required for the ongoing mine operations.

In addition to the direct and indirect economic impacts discussed above, the mine will through its corporate social investments and social and labour plan, contribute towards the local economic development in the area. The operation of the mine is anticipated to have the following positive socio-economic benefits to its employees and surrounding communities:

- Development of skills through its skills development plan
- Learnership programmes to provide learners with an occupational qualification
- Investment in infrastructure development through local economic development and integrated development programmes.

In the absence of purchasing or leasing the land needed for the project, the landowner could experience a negative economic loss. However this is not expected, even in the unmitigated scenario.

When considering alternative feasible land uses for the application area such as agriculture, forestry or conservation, the economic study has calculated that the economic benefits of the mine (over a 20 year period) are predicted to significantly outweigh the potential loss in value of alternative land uses.

Given the discussion above the cumulative (considering positive and negative impacts) economic impact is therefore rated a medium positive severity in the unmitigated scenario for all project phases. This positive impact may be enhanced with the implementation of management and mitigation measures. After closure, the positive economic impact from mining will cease but with rehabilitation, the respective pre-mining activities can resume in appropriate areas.

Duration

The positive economic impacts described above will be limited to the life of project. This applies to both the unmitigated and mitigated scenarios. Post closure, the positive impacts will be reduced. There may still be some positive impacts through maintenance and aftercare activities and because it is predicted that the mine would have contributed to a greater economic critical mass, skills, and wealth that can be used in other economic opportunities.

Spatial scale / extent

The positive economic impacts will be regional in both the unmitigated and mitigated scenarios for all project phases.

Consequence

The consequence has been rated as low in unmitigated scenario and moderate in the mitigated scenarios for all project phases until closure.

Probability

The probability is considered to be possible in the unmitigated and can increase to high in the mitigated scenarios.

Significance

The significance has been rated as positive moderate in both the unmitigated and mitigated scenarios for all project phases.

Tabulated summary of assessed impact

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	M+	M	M	M+	M	M+
Mitigated	H+	M	M	M+	H	M+
Closure						
Unmitigated	L+	M	M	M+	M	M+
Mitigated	L+	M	M	M+	M	M+

Conceptual description of proposed mitigation measures

Conceptual mitigation measures are provided below and tabulated in the EMP (Section 20).

Objective

To enhance positive and minimise negative economic impacts.

Actions

The following management and mitigation measures will be implemented during all phases of the project:

- Empower/train, support and use local people for employment and local business for procurement as far as possible
- Develop specific socio-economic mitigation measures and corporate social investment strategies in consultation with the relevant authorities to ensure progress towards achieving the national, provincial and local government priorities
- Offer employment opportunities to and procure local goods and services from the closest communities / service providers where possible
- Start closure planning as soon as practically possible and incorporate economic considerations into mine closure planning from the outset
- Ensure that closure planning considerations address the re-skilling of employees for the downscaling, early closure and long-term closure scenarios
- At closure, the affected area will be rehabilitated and all surface infrastructure will be removed in order to be suitable for end land uses. In this respect the mine will ensure that adequate financial resources are made available to fully rehabilitate the mine area as outlined in EIA and EMP.
- Recruit local people where possible in an open and transparent manner such as through a local labour office.

Emergency situations

None identified.

8.3 DEFINITION OF CRITERIA USED

Both the criteria used to assess the impacts and the method of determining the significance of the impacts is outlined in Table 31. This method complies with the method provided in the EIA guideline document. Part A provides the approach for determining impact consequence (combining severity / nature, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D. Unmitigated scenario is considered for each impact.

8.4 PHASES AND TIMEFRAMES OF POTENTIAL IMPACTS

An indication of the phases in which impacts could occur is included in Section 7.2. This section also provides an indication of the duration of potential impacts. Potential impacts associated with the project have the potential to occur in almost all project phases and on a continuous basis if unmitigated. With the implementation of the mitigation as presented in Section 19 and Appendix A, the monitoring programmes as presented in Section 21 and the emergency response procedures as presented in Section 20 the timeframe of potential impacts will be reduced significantly.

TABLE 31: CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity / nature, spatial extent and duration**
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action. Irreplaceable loss of resources.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints. Noticeable loss of resources.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints. Limited loss of resources.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE/ EXTENT of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

			SEVERITY / NATURE = L		
DURATION	Long term	**H**	Medium	Medium	Medium
	Medium term	**M**	**Low**	**Low**	Medium
	Short term	**L**	**Low**	**Low**	Medium
			SEVERITY / NATURE = M		
DURATION	Long term	**H**	Medium	High	High
	Medium term	**M**	Medium	Medium	High
	Short term	**L**	**Low**	Medium	Medium
			SEVERITY / NATURE = H		
DURATION	Long term	**H**	High	High	High
	Medium term	**M**	Medium	Medium	High
	Short term	**L**	Medium	Medium	High
			L	**M**	**H**
			SPATIAL SCALE / EXTENT		

PART C: DETERMINING SIGNIFICANCE

PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	Medium	Medium	High
	Possible/ frequent	**M**	Medium	Medium	High
	Unlikely/ seldom	**L**	**Low**	**Low**	Medium
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

***H = high, M= medium and L= low and + denotes a positive impact.**

9 COMPARATIVE ASSESSMENT OF IDENTIFIED LAND AND DEVELOPMENT ALTERNATIVES

9.1.1 ALTERNATIVE LAND USES WHICH COULD BE IMPACTED ON

The site is currently used for agriculture, primarily small-scale livestock farming and subsistence cropping, and residential use, however part of the Commissiekraal farm is used for commercial cattle and historically for crop farming (Lens family property). There is evidence of remnant forestry within the centre of the mining right application area. Immediately surrounding land uses include commercial cattle and crop farming (maize and soy beans), conservation including protected areas as well as community land uses.

As an alternative to the development of the mine, these land uses could continue or be developed on site. No other land uses are considered feasible at this stage.

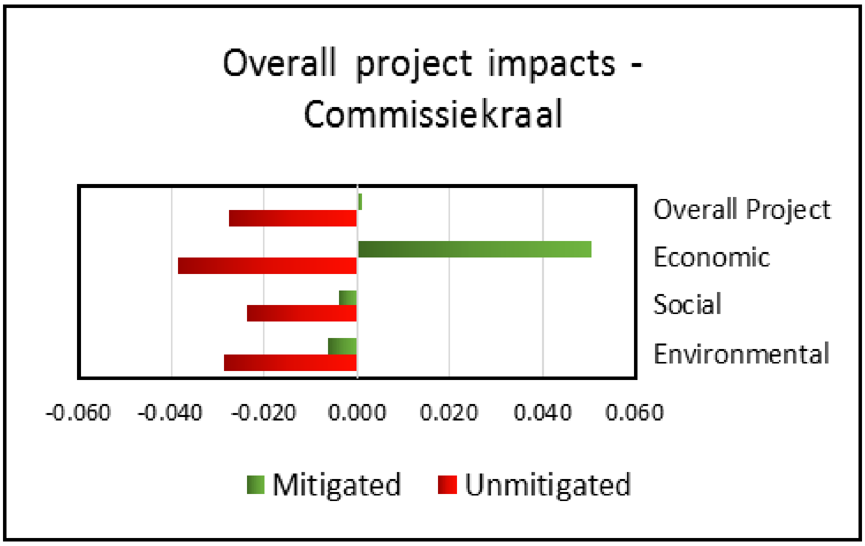
The proposed mining development will temporarily prevent current land uses within the surface infrastructure footprint from continuing, for the life of the mine. However all surface infrastructure will be removed upon closure, and the land rehabilitated to be suitable for the proposed end land uses. These end land uses could comprise agriculture, residential use, tourism or conservancies.

9.1.2 RESULTS OF SPECIALIST COMPARATIVE LAND USE ASSESSMENT

A comparative land use assessment was undertaken by an economic specialist in order to meet the requirements of Regulation 50 of the MPRDA (Act no. 28 of 2002) (Appendix M). Regulation 50 has two distinct components, the first being a straight analysis of the economic value of land between a mining project and the alternative land-use, and the second being an opinion on the sustainable development quality of the project relative to the alternative land-use. The latter requires the integration of all the social, environmental and economic impacts on a cost-benefit basis.

The results of the economic analysis of current agriculture versus the proposed mining activities is provided in Section 8.2.18 and shows that mining outweighs the current land use activities from an economic perspective.

The sustainability analysis was based on the impact ratings of all potential impacts identified and assessed for both the unmitigated and mitigated scenarios. These impact ratings were determined by the SLR Environmental Assessment Practitioner with input from the relevant specialist studies. The outcome of the sustainability analysis concluded an overall unmitigated rating of a negative medium to low and a mitigated rating of positive low, almost neutral (Graph 1). Positive economic impacts in the mitigated scenario by far outweighed the mitigated negative social and environmental impacts. It can be argued that the project will be positive from a sustainability perspective, but only marginally due to the positive economic impact.



GRAPH 1: SUMMARY OF SUSTAINABILITY ANALYSIS

10 LIST OF SIGNIFICANT IMPACTS

A list of significant impacts, when considered **without mitigation**, as identified in the assessment conducted in Section 8 is provided below.

- Hazardous structures / excavations (high)
- Physical destruction and general disturbance of biodiversity (high)
- Loss of water supply to third parties (high)
- Contamination of water (high)
- Increase in air pollution (high)
- Increase in disturbing noise levels (high)
- Negative landscape and visual impacts (high)
- Loss of land uses (high)
- Blasting hazards (high)
- Project-related road use and traffic (high)
- Destruction of heritage resources (medium-high)
- Disturbance (indirect) of heritage resources (high)
- Economic impacts (positive and negative) (high)
- Inward migration and related social ills (high)
- Relocation (high)

11 STAKEHOLDER ENGAGEMENT PROCESS

This section provides a description of the engagement process with interested and affected persons (IAPs) followed during the course of the environmental assessment process. It outlines how IAPs were identified, confirms the details of the engagement process (with supporting documentation included as appendices), and how issues raised have been addressed.

11.1 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The stakeholder engagement process commenced with a stakeholder analysis that was aimed at identifying parties to be involved during the environmental assessment process and associated communication structures. This was done through a deeds search of the relevant properties within the project site and immediately adjacent portions of land; social scans (conducted by SLR in 2013 and March 2015) including site visits in the surrounding areas; the SLP specialist's research; focussed stakeholder meetings; and networking and direct discussions with IAPs.

Key stakeholders identified for the project include:

- **IAPs**
  - landowners and tenant/farm workers on and surrounding the project area
  - non-government organisations and associations including water user associations and farmer and agricultural unions
  - parastatals (Eskom and Mondi)
- **Regulatory authorities:**
  - Department of Mineral Resources (DMR)
  - Department of Economic Development, Tourism and Environmental Affairs (DEDTEA)
  - Department of Water and Sanitation (DWS)
  - Amafa / Heritage KwaZulu Natal
  - Department of Rural Development and Land Reform (DRDLR)
  - Regional Land Claims Commission: KwaZulu - Natal
  - Department of Fisheries and Forestry (DAFF)
  - Ezemvelo KZN Wildlife
  - Mpumalanga Parks Board
  - Department of Transport
- Local authorities:
  - Amajuba District Municipality
  - eMadlangeni Local Municipality (Utrecht)
  - Ward councillor

A full list of landowner names, local communities, other IAPs and non-government organisations consulted is provided in the project's stakeholder database included in Appendix B. The database is updated on an ongoing basis throughout the environmental process.

11.2 DETAILS OF ENGAGEMENT PROCESS

Stakeholder engagement is an integral component of any development process. The goal of stakeholder engagement is to facilitate and improve communication between stakeholders (including the applicant) in the interest of facilitating better decision-making and more sustainable development (DEAT, 2002). In accordance with the requirement of Chapter 6 of the EIA Regulations, 2010, a stakeholder engagement programme has been developed to set out a coordinated process through which IAPs are informed of the proposed development and environmental assessment process and provided with an opportunity to provide input into the project plan and proposed mitigation measures. By consulting with authorities and IAPs, the range of environmental issues to be considered in the EIA has been given specific context and focus. Included below is an outline of the process followed, and the people engaged. Refer to Section 11.3 for a list of issues that were identified during the engagement process.

11.2.1 STEPS IN THE PUBLIC PARTICIPATION PROCESS

Prior to the commencement of the EIA process informal consultation with IAP groups took place. As part of the EIA process, the public consultation process to date has included both direct and indirect consultation methods. Further detail is provided in Table 32 below. Supporting records of the consultation process are provided in Appendix A (regulatory authorities) and Appendix C (IAPs).

IAPs will have the opportunity to provide further input at the planned EIA feedback meetings and through the review of the EIA and EMP report and/or summary.

TABLE 32: PARTICIPATION PROCESS WITH IAPS AND AUTHORITIES

Task	Description	Date
Pre-application		
Social scan	Prior to the commencement of the environmental assessment process, informal consultation took place in the form of a social scan (conducted by SLR) to identify stakeholder groups in the project area and inform a stakeholder engagement strategy. The purpose of the social scan was: • to identify relevant municipal ward councillors, landowners, land occupiers, and other interested and affected parties • to obtain contact details for IAPs • to identify appropriate communication structures.	March 2013 and November 2014

Task	Description	Date
Biodiversity focussed workshop	A biodiversity workshop was facilitated by SLR. SLR acknowledges that biodiversity in the project area is of importance to a number of stakeholders and therefore a pro-active approach was taken to engage with people who have intimate knowledge on biodiversity relevant to the project site and region. The aim of the workshop was to introduce the Commissiekraal project, provide key stakeholders an opportunity to share their plans/knowledge/information on the area that would be used to inform the project plan and any application processes, ensure that the key biodiversity-related issues and risks associated with the project are clearly understood by SLR and the applicant and agree on any information sharing / consultation requirements going forward.	12 August 2014
Landowner notification meetings/ correspondence	The relevant landowners were informed of the project via email, hand delivered letters and/or scheduled meetings.	November 2014
Notification - regulatory authorities and IAPs		
Application to DMR and DEDTEA	Formal applications submitted to the relevant departments	November 2014
Consultation with land claims commissioner	The land claims commissioner was consulted in order to verify if any land claims had been lodged on any of the proposed farms.	May 2013
	The land claims commissioner was consulted to verify the status of the existing land claim and it was confirmed that the land claim had been withdrawn.	March 2015
Social scan	As part of the scoping phase a social scan of the project site was conducted by SLR. The purpose of the social scan was: • to verify relevant municipal ward councillors, landowners, land occupiers, and other interested and affected parties • to obtain additional contact details for IAPs where relevant • to confirm appropriate communication structures • inform IAPs of the project, upcoming public process and associated scoping and EIA and EMP processes. As part of the social scan, notification and information-sharing took place through informal discussions, focussed meetings and/or telephonic discussions. One output of the social scan is an IAP database.	March 2015
Distribution of background information document (BID)	A BID was compiled and distributed by post, e-mail and/or hand delivered during the social scan to IAPs and authorities on the project's public involvement database. The purpose of the BID was to inform IAPs and authorities about the project, the environmental assessment process, possible environmental impacts, and means of providing input into the environmental assessment process. Attached to the BID was a registration and response form, which provided IAPs with an opportunity to submit their names, contact details and comments on the project.	5 to 9 March 2015

Task	Description	Date
Site notices	Laminated A2 site notices in English, Afrikaans and Zulu were placed at key conspicuous positions in and around the project site. This included Luthilunye Combined School, Commissiekraal farm entrance on D699, at various locations on the farm Commissiekraal 90HT and at the Kemplust community entrance.	5 to 9 March 2015
Newspaper advertisements	Block newspaper advertisements were placed in English in the Vryheid Herald and The Recorder newspapers.	5 / 6 March 2015
SMS	A short message system (SMS) was used to notify IAPs on the project's public involvement database of the project and public scoping meetings.	9 March 2015
Scoping stage meetings		
Public scoping meetings	Two public scoping meetings were held. All IAPs were invited to both meetings. The first meeting was held in Zulu and English at the Luthilunye Combined School, The second meeting was held in English and Afrikaans at the Kemplust community hall. The same information was presented at both meetings. At these meetings a presentation was given providing information on the applicant's intention to develop the project and current high level planning. These meetings therefore focussed on: • informing IAPs about the project • providing a description of the key project elements • informing IAPs about the stakeholder engagement process and how IAPs can have input into the process • providing information about the baseline environment and obtaining IAP input • providing information about the potential impacts of the project and obtaining IAP input • providing an opportunity for IAPs to raise issues and concerns – these issues and concerns were used to inform the Plan of Study for the EIA phase.	26 March 2015
Regulatory authority scoping meeting and site visit	A regulatory authorities scoping meeting, including site visit, was held. The purpose of this meeting was to provide an overview of the project, obtain input on the existing status of the environment and on potential impacts, raise and record environmental issues, identify possible specialist investigations and to agree on the process being followed and the way forward.	17 June 2015
Review of scoping report		
DMR review of the scoping report	Nine copies of the scoping report were submitted to the DMR in line with the department's mining right acceptance letter. At the same time, the report was uploaded electronically into the DMR electronic filing system.	11 March 2015
	Following the public review period a copy of the scoping report including comments received were submitted to the DMR for review.	18 June 2015

Task	Description	Date
Public review of the scoping report	The scoping report was made available for public review for a 40 day period. The report was made available at the following venues, as agreed to at the public scoping meetings: • Luthilunye Public School • Kemps Lust • Utrecht Public Library • Tholie Logistics' offices, Cape Town • SLR's Library in Fourways, Johannesburg. As agreed to during the public scoping meetings, full reports were made available in English. Summaries of the report were provided in English, Afrikaans and Zulu and were sent by post, e-mail and/or via the school or Kemps Lust to IAPs and authorities on the project's public involvement database. SMS was also used to notify IAPs of the availability of the report for public review.	10 April 2015
	Following the public review period, IAPs were notified via newsletter sent by post, e-mail, via the school and/or via Kemps Lust of changes made to the scoping report and the availability of the final scoping report including IAP comments for review. Copies of the report were made available on request.	17 / 18 June 2015
Other regulatory authority review of the scoping report	The report was distributed to the following regulatory authorities for a 40-day review period at the same time as it was made available for public review: DWS, Amafa/Heritage, DRDLR, DAFF, Ezemvelo KZN Wildlife, MPU Parks Board, DoT, Amajuba district municipality, eMadlangeni local municipality.	10 April 2015
DEDTEA review of the scoping report	At the same time as the scoping report was made available for public review, a copy of the scoping report was submitted to the DEDTEA for their records in line with the requirements of R543 of NEMA.	10 April 2015
	Following the public review period the final scoping report including comments received were submitted to the DEDTEA for review.	18 June 2015
Written comments	Written comments were received by SLR during the scoping review process	March to July 2015

11.2.2 SPECIALIST TEAM

Upon input from IAPs on the potential impacts that may arise as a result of the proposed development, several specialists (see Table 3 for a complete list of all appointed specialist, their roles and responsibilities) were appointed to assess the potential impact of the proposed development. Where required, specialists consulted with stakeholders directly during their specialist studies. Details are provided in the specialist reports included as appendices.

11.2.3 REVIEW OF THE EIA AND EMP REPORT

DMR review of the EIA and EMP report

Nine copies of the EIA and EMP report were submitted to the DMR on 16 October 2015 in line with the department's mining right acceptance letter.

Public and other regulatory authority review of the EIA and EMP report

The EIA and EMP report has been made available for public review for a 40 day period commencing on 27 October 2015. The report has been made available at the following venues, as agreed to at the public scoping meetings:

- Luthilunye Public School
- Kemps Lust
- Utrecht Public Library
- Tholie Logistics' offices, Cape Town
- SLR's Library in Fourways, Johannesburg.

As with the scoping phase, full reports have been made available in English. Summaries of the report have been provided in English, Afrikaans and Zulu and have been sent by post, e-mail and/or via the school or Kemps Lust to IAPs and authorities on the project's public involvement database. SMS has also been used to notify IAPs of the availability of the report for public review.

Electronic copies of the report will be made available to IAPs on request (electronically on CD).

In addition, the report has been distributed to the following regulatory authorities for a 40-day review period at the same time as it was made available for public review:

- Department of Water and Sanitation
- Amafa / Heritage KwaZulu Natal
- Department of Rural Development and Land Reform
- Department of Fisheries and Forestry
- Ezemvelo KZN Wildlife
- Mpumalanga Parks Board
- Department of Transport
- Amajuba District Municipality
- eMadlangeni Municipality (Utrecht).

All comments received from IAPs during the review period will be included with the final report that is submitted to the DMR and the DEDTEA.

DEDTEA review of the EIA and EMP report

At the same time as the EIA and EMP report is made available for public review, a copy of the report has been submitted to the DEDTEA for their records in line with the requirements of R543 of NEMA.

Following the public review period, the final scoping report including comments received will be submitted to the DEDTEA for review.

11.2.4 FEEDBACK OPEN DAYS

During the review period, two public feedback meetings have been arranged as requested, using the same venues used for the public scoping meetings. The purpose of this meeting will be:

- to provide IAPs with an opportunity to discuss the outcomes of the EIA and EMP report
- to provide IAPs with a chance to submit comments on the EIA and EMP report.

The details of the feedback meetings have been distributed to IAPs together with a summary of the EIA and EMP report.

11.2.5 NOTIFICATION OF DECISIONS

Once the DMR and DEDTEA have issued their respective records of decisions, IAPs will be notified by post, e-mail, sms and/or via the school or Kemps Lust in accordance with the instructions from the relevant department.

11.3 MANNER IN WHICH ISSUES RAISED WERE ADDRESSED

Stakeholder meetings and public review of the scoping report provided IAPs an opportunity to comment on the baseline environment and potential impacts of the project (including social and cultural impacts). All views, issues and concerns raised have been captured into the comments and response report (Appendix D). The comments and response report provides responses to issues raised and identifies where the issues have been addressed in the EIA and EMP report.

12 ADEQUACY OF PREDICTIVE METHODS AND ASSUMPTIONS, AND UNCERTAINTIES

This section identifies knowledge gaps and reports on the adequacy of predictive methods, underlying assumptions and uncertainties encountered in the compilation of specialist reports and this EIA and EMP report. Information is based on the specialist reports and findings of the SLR EIA team.

Technical project information

The EIA is being completed prior to the completion of the feasibility study. The level of detail for the technical information was therefore limited. The information as presented in this EIA and EMP report was assumed accurate for the stage of project planning.

It should be noted that further exploration work may change the geometric layout of the underground mine. Should this change be significant, specialist work and/or the assessment made in this EIA and EMP report may require revision.

The life of mine caters for a 20 year period. Of this, the first 10 years are based on an indicated reserve. The second 10 years are based on inferred reserves and will need to be verified through further exploration work.

It is assumed that a separate EIA will be completed for power supply to the mine should Eskom be chosen as the final power supply option.

Assessment

The assessment as provided in this report caters for the project plan and site layout as presented in Section 3. Any deviations from this project plan or site layout or additional developments not covered in this report will need to be subject to an EIA process.

Two homesteads located within the surface infrastructure footprint will be relocated prior to construction.

Geology

While several structures have been identified during the exploration phase, their potential influence on groundwater flow as a potential preferential flow path or flow barrier is not known. These structures may present a risk of higher inflows during the mine development but the structures are highly heterogenic and it is difficult to determine the related hydrogeological significance at this stage. The aquifer drilling completed during the groundwater study targeted some structures in the vicinity of the Pandana and therefore provides an initial indication on these structures.

Soils and land capability study

Soil profiles were observed using a 1.5 m hand-held soil auger or open profiles where it was possible in erosion gullies. A description of the soil characteristics deeper than 1.5 m cannot be given.

The study did not include a land contamination assessment to determine pre-mining contamination.

Biodiversity

Standard methods for assessment were used for flora and all faunal groups. These are believed by the specialist to be adequate for a sample of the biodiversity present.

The field surveys aimed at coinciding with the flowering times of most plants expected to occur on site and the peak periods of fauna activity.

There is always some measure of uncertainty in a sample, particularly with regards to how representative that sample is of the whole. The main uncertainties in this study were the possibility of species being overlooked in such a large study area and the lack of data for certain invertebrate groups.

Hydrology

Assumptions relevant to the hydrology study are outlined below.

- Hydrological calculations were based on available climatic data
- Standard methods for the calculation of flood peaks for specific return periods were used based on inputs using as much site specific information as possible. The calculation of flood peaks remains an estimation with uncertainties increasing with higher return periods.
- Assumptions are based on inputs into flood hydrology modelling being as representative as possible. Where uncertainties are prevalent, a degree of conservatism was used.
- No abstractions from the river section or discharges into the river section were taken into account during the floodline modelling.

Water balance

The water balance assumes the following:

- Rainfall related inflows and evaporation related losses for the wet and dry season scenarios were estimated based on: i) average values during the three driest months of the year; and ii) average values during the three wettest months of the year
- Runoff and evaporation coefficients for each surface were fixed and not influenced by antecedent climatic conditions, likewise all catchment areas are constant
- Evaporation from the PCD will only occur if there was water in the dam
- The service water tanks are sealed, and not subject to rainfall or evaporation

- This water balance model is run for only steady state average wet season and average dry season conditions and no consideration is given to storage of water at any aspect of the infrastructure modelled i.e. flow in = flow out.

Groundwater

Assumptions relevant to the ground study are outlined below.

- According to best practice the hydrocensus covered different percentages of the area of interest, starting from 80 to 100 % coverage in the immediate vicinity of the proposed development to 20 % coverage in the wider area of interest (up to 11 km radius).
- Specific sampling sites included the Kemplust and Makatees Kop historical mines (area). However, during the survey the mines were essentially dry and the samples were taken from downstream streams, springs or borehole.
- Dirty water containment facilities will be lined and include leakage detection and were therefore not considered a significant groundwater pollution source.
- It is important to note that a numerical groundwater model is a representation of the real system. It is therefore at most an approximation, and the level of accuracy depends on the quality of the data that are available. In addition, the model assumes that the fracture network is connected enough to be simulated as a porous media at the regional scale. As a result to develop a model of an aquifer system, certain assumptions have to be made and are necessary to allow numerical stability and robustness of the model. More specific assumptions relating to the groundwater model are outlined in the specialist report (Appendix H).
- Numerical groundwater models are the best tool available to quantify groundwater and mass balances, which can be used to make decisions. Improvements to the model predictions can be realized through appropriate hydrogeological analysis and data collection to fulfil critical information gaps.

Air

Assumptions and limitations related to the air quality impact assessment are listed below:

- The study only considered atmospheric emissions and impacts associated with project.
- No site specific particle size fraction, moisture or silt content data were available for various sources and use was made of US EPA default values and values from similar operations in South Africa.
- Only routine emissions for the proposed operations were simulated. All other operations were assumed to be continuous.
- Dispersion models do not contain all the features of a real environmental system but contain the feature of interest for the management issue or scientific problem to be solved; Gaussian plume models are generally regarded to have an uncertainty range between - 50% to 200%. It has generally been found that the accuracy of off-the-shelf dispersion models improve with increased averaging periods. The accurate prediction of instantaneous peaks are the most difficult and are normally performed with more complicated dispersion models specifically fine-tuned and validated for the

location. The duration of these short-term, peak concentrations are often only for a few minutes and on-site meteorological data are then essential.

- AERMOD cannot compute real time processes; average process throughputs were therefore used, even though the nature of operations may change over the life of operations.
- Gaseous emissions would result from vehicles, and underground blasting. Emission rates for combustion sources are dependent on the amount of fuel used and for the vehicle emissions the type and size of vehicles used. Only the total fuel use was available and thus only vehicle exhaust emissions were estimated and modelled. It was assumed that 80% of the fuel will be used for underground operations and 20% for the surface operations. Gaseous emissions from blasting are expected to be have less of an impact than the vehicle exhaust due to the infrequency of blasting operations.
- Gaseous emissions from construction, decommissioning, closure and post-closure are expected to be minimal compared to particulate emissions from operations associated with these phases.
- Nitrogen monoxide (NO) is rapidly converted in the atmosphere into the much more toxic nitrogen dioxide (NO_2). The rate of this conversion process is determined by the rate of the physical processes of dispersion and mixing of the plume and the chemical reaction rates as well as the local atmospheric ozone concentration.
- The estimation of greenhouse gases did not form part of the scope of this study.
- It was assumed that all processing operations will have ceased by the closure phase. The potential for impacts during this phase will depend on the extent of rehabilitation efforts during closure and on features which will remain. Information regarding the extent of rehabilitation procedures were limited and therefore not included in the emissions inventory or the dispersion modelling.

Noise

The baseline ambient noise levels were measured and estimated based on a physical and aural inspection, aided by sampling and probing measurements. It should be cautioned that ambient noise in itself is not absolutely constant, the level averaged over daytime, night-time or a 24 hour period is subject to a degree of daily fluctuation and seasonal variance. The results of the survey are based on samples that were taken at single points over a certain period of time. As in any noise monitoring survey, the results are valid for the meteorological and other conditions which prevailed during the time of the investigation.

Assumptions relevant to the noise study include:

- It is assumed that the regional siding will be at Paulpietersburg.
- As any noise emissions from the proposed development would be limited to surface operations only, the noise assessment did not consider underground operations.
- Although baseline sampling was done in June 2013, due to the remoteness and limited activities in the area, these baseline results are still deemed relevant to the study.

- It is considered that the weekend and weekday noise levels would not differ significantly due to the remoteness of the project site therefore baseline monitoring was undertaken on a normal weekday only.
- Weather conditions during the survey periods undertaken near to the proposed development area were not ideal for noise monitoring, although it was warm, sunny and dry, wind speeds were above $5.0ms^{-1}$ at times. This was however not considered to materially affect the noise measurements in any way.
- Predictions are based on 100% soft ground between the sources and the nearby receptors and under weather conditions considered favourable for noise propagation leading to a conservative result.
- Noise predictions have been undertaken for a worst-case scenario in terms of plant location and operational periods, where the mobile plant is operating at the closest approach to the nearby noise-sensitive receptor locations and/or at elevations where noise reduction due to barriers would be at a minimum, and when the plant is operating for 100% of the time.
- Predicted noise levels were adjusted as follows in line with South African guideline documents:
  - project noise sources may have some impulsive content, particularly bucket bangs, which could be heard at the nearest receptors therefore a 5dB penalty was added
  - an additional 10dB penalty was applied to night-time operations
  - due to the separation distances between the noise sources and the receptor locations, it is unlikely that any tonal content of the sound source would be audible therefore no correction was made for tonality.
- It is assumed that the two households located within the footprint of surface infrastructure will be relocated prior to construction.

Visual

The qualitative visual impact assessment was conducted by SLR, with the use of a geographical information system (GIS). The viewshed tool used takes into account atmospheric refraction and curvature of the earth. As factors like vegetation or canopy cover and atmospheric conditions (fog etc) are not included in the model, the result represents the visibility analyses of the bare earth. Therefore the viewshed analysis at best is accompanied by the on the ground observations.

Land uses

All the impacts listed and discussed in the specialist report were derived from the specialist studies and reports conducted by the relevant specialist areas, where necessary interpretation of the impacts on land use were made, however the impacts considered are largely those provided by the individual specialists.

The land use specialist assumed that each specialist gave a correct representation of the potential impacts that will result from the proposed projects. Should these impacts not be correct, it will influence the conclusions of the report.

The scope of the study was neither a land valuation process nor an extensive land use survey. The focus of this report was to identify the current land use in the area and to determine how the proposed project will impact on farm units at varying distances from the proposed mining operation.

Blasting

The qualitative blasting impact assessment was conducted by SLR, in the absence of any specialist input. For the purposes of this report, this was deemed acceptable due to the relatively low risk and easily implementable mitigation measures.

Traffic

Assumptions relevant to the traffic study include:

- For the purposes of the study it was assumed that the regional railway siding will be located in Paulpietersburg based on information available at this stage in project planning and provided by the applicant. The proposed coal haulage route was therefore assumed to include the gravel D699 east and then south east to the P40, the P40 surfaced road east to the R33 south west of Paulpietersburg, the R33 regional road north east to the P221 immediately south of Paulpietersburg and the P221 surface road south to a railway siding.
- Supplies and employees will mainly come from towns such as Paulpietersburg, Piet Retief and Utrecht and would follow the same route as coal haulage. Limited traffic is expected to come from the west of the site.
- The traffic counts were undertaken in 2013 and are still considered relevant. The rural and remote area surrounding the application site is not expected to see any significant increases in the baseline traffic flows and so the traffic data is still deemed applicable. For assessment purposes the data has been growthed to account for a limited level of background growth.
- Due to the very low observed traffic flows on the D699, traffic counts were not conducted for the D699/P40 intersection and a quantitative capacity assessment would not accurately demonstrate the impact of the development as the existing flows are negligible.
- The impact assessment focussed on the most critical time period (i.e. a weekday between 14:00-15:00) when baseline traffic flows and the proposed development trip generation will be its greatest at 40 movements (two-way movements of 18 HGVs, 21 car movements and one bus). This period also coincides with the end of the school day thereby addressing vulnerable road users. This helps ensure that a robust assessment of the impact of the site is achieved.

Heritage and cultural aspects (including palaeontological)

It is possible that the study may have missed heritage resources in the project area as heritage sites may occur in thick clumps of vegetation while others may lie below the surface of the earth and may only be exposed once development commences. If any heritage resources of significance are exposed during the project the South African Heritage Resources Authority (SAHRA) will be notified immediately, all construction activities will be stopped and an archaeologist accredited with the Association for Southern

African Professional Archaeologist (ASAPA) will be notified in order to determine appropriate mitigation measures for the discovered finds.

The methods used and underlying assumptions are based on human effort (search and observe, outcomes of earlier/previous surveys in wider area) and as such is subject to human error.

Socio-economic

Social

Assumptions relevant to the study are outlined below.

- No census was undertaken at a site specific scale. The baseline information is primarily based on 2011 census data. It is assumed that this information is still relevant as the district and local municipality have reported very little population growth from 2001 to 2011.
- Information on the households surrounding the proposed mine is based on work done by Mphahlele Wessels and Associates in 2013 and the site visit undertaken by SLR Social team.
- A detailed survey of affected households within the proposed project footprint was not undertaken. As part of resettlement planning, a census of affected people and a detailed resettlement study will be undertaken. Therefore this study does not provide detailed impacts on the households that will need to be relocated as part of the development.
- For the purpose of this assessment, baseline data is mostly given for the area where mining will be undertaken as this area is likely to experience most social impacts. For the coal transportation route, only land use data is presented as it is believed that the main social impact will be on land use.

The detailed relocation action plan has not been developed as yet. It is expected that this will be done as part of the detailed design stage of the mine.

Economic

The following assumptions and limitations apply to the economic impact assessment:

- the information supplied in relation to employment opportunities, income generation, life of mine, etc. by the client is an accurate reflection of the activities during construction, operational and closure phases of the proposed project
- with regards to agricultural calculation, it should be noted that the best potential crop yield was assumed
- a discount factor of 10% as advised by the client was used to calculate the net present value calculations
- information which were used in some of the agricultural calculations were sourced from third parties. Errors with this information could possible effect the results of the calculations and therefore the assessment
- it was assumed that 70% of capital investment will be spent nationally and 30% will be spent locally and regionally

- 100% of the employment value was assign to local and regional
- land values are based on average land values in the region, however the true value of the land is determined by a range of factors and will therefore most likely be higher or lower than the value used in this report.

Geochemistry

Given that the primary focus for coal units available from the 2014 drilling programme was for resource characterisation test work, including total sulphur determination, limited coal samples were available for geochemical testing. Due to the limited mass of Gus Seam coal material the laboratory analysis for the three coal samples was limited to acid base accounting. It is planned by the applicant to undertake additional leachate tests during the bankable feasibility study.

Leach test results are not an indicator of drainage quality as the conditions of the test, especially the liquid-to-solid ratio, do not represent actual field conditions. Therefore, leachate concentrations are not representative of seepage or run-off that could emanate from site. However, the results may indicate chemicals of concern in mine drainage.

Closure cost calculations

The closure cost calculations are based on the technical information and site layout as provided by the technical project team, and are assumed accurate at the time of compiling this report.

Cumulative impacts

The baseline conditions as presented in the EIA and EMP report are presented taking into account existing activities that may influence the environment.

13 ARRANGEMENTS FOR MONITORING AND MANAGEMENT OF IMPACTS

This section describes the arrangements for monitoring and management of environmental impacts. It identifies the impacts that require monitoring programmes and outlines the functional requirements, roles and responsibilities and timeframes for the monitoring programmes. Further detail on each monitoring programme is included in Section 22.

13.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Impacts that require monitoring include:

- Hazardous excavations and structures (failure of water dams)
- Physical destruction and general disturbance of biodiversity
- Dewatering impacts on third party users
- Contamination of groundwater
- Increase in air pollution
- Increase in disturbing noise levels
- Blasting hazards
- Project-related road use and traffic

In addition to the above, the commitments as included in the EMP report will require monitoring to a) ensure that they are being implemented and b) that they are effective in mitigating potential impacts on the environment, socio-economic conditions of third parties and heritage/cultural aspects. This will be done through regular internal auditing by mine personnel.

13.2 FUNCTIONAL REQUIREMENTS OF MONITORING PROGRAMMES

The purpose of the monitoring programmes is to review the mine's impact on various aspects of the environment and to report on changes needed to the management programme as proposed in this report.

As a general approach, the mine will ensure that the monitoring programmes comprise the following:

- a formal procedure
- appropriately calibrated equipment
- where samples require analysis they will be preserved according to laboratory specifications
- an accredited, independent, commercial laboratory will undertake sample analyses
- parameters to be monitored will be identified in consultation with a specialist in the field and/or the relevant authority
- if necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority
- monitoring data will be stored in a structured database

- data will be interpreted and reports on trends in the data will be compiled by an appropriately qualified person on a quarterly basis
- both the data and the reports will be kept on record for the life of mine.

13.3 ROLES AND RESPONSIBILITIES

The roles and responsibilities for the execution of the monitoring programmes are defined below.

- Environmental manager:
  - ensure that the monitoring programmes are scoped and included in the annual mine budget
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards

13.4 TIMEFRAMES FOR MONITORING AND REPORTING

The timeframes for monitoring and reporting thereof are detailed in the monitoring programme (see Section 22).

14 TECHNICAL SUPPORTING INFORMATION

Technical and supporting information included as appendices to this report are listed below.

- information-sharing with regulatory authorities (Appendix A)
- stakeholder database (Appendix B)
- information-sharing with IAPs (Appendix C)
- comments and response report (Appendix D)
- soil, land capability and land use specialist report (Appendix E)
- biodiversity specialist report (Appendix F)
- hydrological specialist report (Appendix G)
- geo-hydrological specialist report (Appendix H)
- air quality specialist report (Appendix I)
- noise specialist report (Appendix J)
- heritage specialist report (Appendix K)
- palaeontological specialist report (Appendix L)
- social and economic specialist report (Appendix M)
- traffic specialist report (Appendix N)
- geochemistry study (Appendix O)
- water balance specialist report (Appendix Q)

SECTION 2 – ENVIRONMENTAL MANAGEMENT PROGRAMME

15 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR CLOSURE

15.1 ENVIRONMENTAL ASPECTS THAT DESCRIBE THE PRE-MINING ENVIRONMENT

Environmental aspects that describe the pre-mining environment as informed by the baseline description (Section 2) are listed below. This list serves to guide the setting of environmental objectives for mine closure.

- Gently sloping topography
- Soils that support arable land capability, low intensity grazing and natural veld potential
- Moderate to high biodiversity identified on site
- Perennial and ephemeral drainage patterns
- Good water quality of potable standard
- Quiet rural environment
- Open natural grassland environment supporting agricultural uses

15.2 MEASURES REQUIRED FOR CONTAINMENT OR REMEDIATION

Measures required to contain or remedy any causes of pollution or degradation or migration of pollutants, both for closure of the mine and post-closure are listed below.

- Implement a waste management procedure for general and hazardous waste on site throughout the project life
- Ensure immediate clean-up of any spills as per the emergency response procedures
- Establish and maintain dirty stormwater control measures in line with regulatory requirements, until such time as potentially polluting areas are rehabilitated
- Contain pollutants at source by storing and handling potentially polluting substances on impermeable substrates, within bunded areas and with the capacity to contain spills
- Undertake additional geochemical analyses to inform the barrier requirements for the coal related stockpiles
- In the event that excess water needs to be discharged, depending on the quality, treat the water to agreed standards prior to discharge
- Rehabilitate the site in line with a detailed closure plan to be developed at least five years prior to decommissioning

Further detail on the proposed action plans and mitigation measures is included in Sections 20 and 8.

16 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR MANAGEMENT OF IDENTIFIED ENVIRONMENTAL IMPACTS

The environmental objectives and specific goals for the management of identified environmental impacts are detailed in this section.

16.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Impacts that require monitoring include:

- Hazardous excavations and structures (failure of water dams)
- Physical destruction and general disturbance of biodiversity
- Loss of water supply on third party users
- Contamination of water
- Increase in air pollution
- Increase in disturbing noise levels
- Blasting hazards
- Project-related road use and traffic
- Heritage aspects

16.2 SOURCE ACTIVITIES

The source activities of potential impacts which require management are detailed in Section 3.3 and listed below.

- Exploration
- Earthworks
- Road building and upgrading
- Dewatering
- Water supply and use
- Stormwater management
- Transport systems
- Housing (construction only)
- Site/contract management
- Demolition
- Maintenance and aftercare
- Site preparation
- Civil works
- Underground mining
- Crushing, screening and product handling
- Power supply and use
- Process water management
- Non-mineralised waste management
- Site support services
- Storage and maintenance services/ facilities
- Rehabilitation

16.3 MANAGEMENT ACTIVITIES

Management activities which will be conducted to control the project actions, activities or processes which have the potential to pollute or result in environmental degradation are detailed in Sections 8 and 19.

16.4 ROLES AND RESPONSIBILITIES

Prior to the start of the project, the mine will establish a management team for the mine. The key personnel in terms of this EIA and EMP report will be a Safety, Health, Environment (SHE) Manager and Human Resources Manager. As a minimum, these roles as they relate to the implementation of monitoring programmes and management activities will include:

- SHE manager:
  - ensure that the monitoring programmes and audits are scoped and included in the annual mine budget
  - identify and appoint appropriately qualified specialists/engineers to undertake the programmes
  - appoint specialists in a timeously manner to ensure work can be carried out to acceptable standards
- Human Resources manager:
  - manage labour-related aspects for the mine
  - liaise with the relevant structures in terms of the commitments in the SLP
  - ensure that commitments in the SLP are developed and implemented in a timeously fashion
  - establish and maintain good working relations with surrounding communities and landowners

17 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR SOCIO-ECONOMIC CONDITIONS

17.1 ASPECTS OF THE SOCIO-ECONOMIC CONDITIONS

The socio-economic conditions in the vicinity of the mine are described in Section 2.3.5.

17.2 OBJECTIVES AND GOALS

Specific environmental objectives and goals to control, remedy or stop potential impacts emanating from the mine which may impact on communities and IAPs identified in the social and labour plan are described below. The information is presented in tabular format (Table 33).

TABLE 33: ENVIRONMENTAL OBJECTIVES AND GOALS – SOCIO-ECONOMIC CONDITIONS

Aspect	Environmental objective	Goals
Land uses	To prevent unacceptable impacts on surrounding land uses and their economic activity	To co-exist with existing land uses To negatively impact existing land uses as little as possible
Blasting	To minimise the potential for third party damage and/or loss	To protect third party property from mine-related activities, where possible Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome
Traffic	To reduce the potential for mine-related safety and vehicle related impacts on road users	To ensure the mine's use of public roads is done in a responsible manner
Socio-economic	To enhance the positive economic impacts and limit the negative economic impacts To minimise inward migration and related secondary social, safety and health issues	To work together with existing structures and organisations To establish and maintain a good working relationship with surrounding communities and land owners

18 ENVIRONMENTAL OBJECTIVES AND SPECIFIC GOALS FOR HISTORICAL AND CULTURAL ASPECTS

Environmental objectives and goals in respect of historical and cultural aspects are listed in the table below (Table 34).

TABLE 34: ENVIRONMENTAL OBJECTIVES AND GOALS – HISTORICAL AND CULTURAL ASPECTS

Aspect	Environmental objective	Goals
Heritage and cultural	To prevent unacceptable loss of heritage resources and related information	To protect heritage resources where possible If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements
Palaeontological resources	To minimise loss of fossil resources and related information	To protect palaeontological resources where possible through mitigation If disturbance is unavoidable, then provide opportunity for research

19 APPROPRIATE TECHNICAL AND MANAGEMENT OPTIONS

19.1 PROJECT ACTIONS, ACTIVITIES AND PROCESSES

All activities associated with the project have the potential to cause pollution or environmental degradation. These are described in Section 2 of this EIA and EMP report.

19.2 TECHNICAL AND MANAGEMENT OPTIONS

Appropriate technical and management options chosen to modify, remedy, control or stop any action, activity or process associated with the project which will cause significant impacts on the environment, socio-economic conditions and historical and cultural aspects are described in detail in Sections 8 and 20. In addition to these, the mine will implement an environmental management system to assist in the implementing and monitoring of commitments included in this EIA and EMP report.

20 ACTION PLANS TO ACHIEVE OBJECTIVES AND GOALS

Action plans to achieve the objectives and goals set out in Section 16 (bio-physical environment), Section 17 (socio-economic conditions) and Section 18 (historical and cultural) above, are listed in tabular format together with timeframes for each action. The action plans include the timeframes and frequency for implementing the mitigation measures as well identifies the responsible party.

TABLE 35: ACTION PLAN – HAZARDOUS STRUCTURES

Objective of mitigation measures:	To prevent physical harm to third parties and animals from potentially hazardous excavations					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Establish security control measures. • Undertake regular patrols of mine perimeter. • Educate and train workers • Educate third parties on potential dangers • Design and construct the boxcut, stockpiles and dam for stability and safety • In case of injury or death due to hazardous excavations, follow emergency response procedure in Section 21.	At start On-going At start and on-going On-going As required As required	Once off Daily Regularly Quarterly As required As required	Site Manager Security Manager SHE Manager SHE Manager SHE Manager SHE Manager
Operation	H	L	• Maintain security control measures • Undertake regular patrols of mine perimeter • Operate the boxcut, stockpiles and dam for stability and safety • Educate and train workers • Educate third parties on potential dangers • Monitor in line with monitoring programme • In case of injury or death due to hazardous excavations, follow emergency response procedure in Section 21.	On-going On-going On-going On-going On-going As per plan As required	As required Daily Constant Regularly Quarterly As per plan As required	SHE Manager Security Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Decommission	H	L	• Rehabilitate the site in line with recommended rehabilitation plan • Educate and train workers • Educate third parties on potential dangers • Monitor in line with monitoring programme • In case of injury or death due to hazardous excavations, follow emergency response procedure in Section 21.	On-going On-going On-going As per plan As required	As required Regularly Quarterly As per plan As required	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Closure	H	L	• Repair and maintain security measures at dams (where applicable)	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 36: ACTION PLAN – LOSS OF SOIL RESOURCES

Objectives of mitigation measures:	To strip and effectively store all soil resources that would otherwise be lost damaged or sterilised so that rehabilitation of the site for optimal post mine land use can occur. To prevent soil contamination. To minimise soil erosion from the area of disturbance.					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	M-L	• Limit the project footprint to that identified in this EIA and EMP report.	On-going	On-going	SHE Manager
Operation	H	M-L	• Strip, store maintain soils in line with the soil management plan (this includes measures for erosion control) • Prevent dirty water runoff and spillages from entering the environment • Implement and maintain a waste management plan • Where practical, rehabilitate in line with rehabilitation plan as soon as possible. • Handle major spillage incidents in accordance with emergency response procedure.	As required On-going On-going Where possible As required	As required As required On-going As required As required	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Decommissioning	H	M-L	• Limit the project footprint to that identified in this EIA and EMP report. • Replace soils in line with soil management plan. • Prevent dirty water runoff and spillages from entering the environment until such time as infrastructure is removed. • Rehabilitate disturbed areas in line with recommended rehabilitation plan. • Handle major spillage incidents in accordance with emergency response procedure	On-going As required On-going Where possible As required	On-going As required As required As required As required	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Closure	H	M-L	• Repair erosion gullies and maintain erosion control facilities	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 37: ACTION PLAN – TERRESTRIAL BIODIVERSITY

Objective of mitigation measures:	To prevent unacceptable disturbance of biodiversity and related ecosystem functionality To prevent the unacceptable loss of aquatic ecosystems and related functionality					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	M	• Limit the project footprint and activities	On-going	On-going	SHE Manager
Operation	H	M	• Areas of disturbance will be clearly demarcated and movement by mine personnel and activities outside of the demarcated boundaries will be strictly prohibited	Pre-construction and on-going	Once off and on-going	SHE Manager
			• Activities within 100 m of watercourses will be limited as far as practically possible	On-going	On-going	SHE Manager
			• Implement plant and animal species of conservation importance rescue and relocation programme, with the relevant permits	Pre-construction	Once off	SHE Manager
			• Biomass from the clearing of the site will be used to create compost for the rehabilitation of disturbed areas	On-going	As required	SHE Manager
			• Stream crossings will be constructed in such a manner that these do not impede the flow of water	As required	As required	SHE Manager
			• An alien/invasive/weed management programme will be implemented throughout the mine right application area	On-going	On-going	SHE Manager
			• Fires will be strictly prohibited	On-going	On-going	SHE Manager
			• Train workers (permanent and temporary) on the value of biodiversity and the need to conserve species and ecosystems.	On-going	On-going	SHE Manager
			• Vegetation harvesting will be strictly prohibited unless for medicinal purposes and agreed to by the environmental officer	On-going	On-going	SHE Manager
			• Faunal hunting, poaching, snaring or capturing will be strictly prohibited	On-going	On-going	SHE Manager
			• Monitor the overall mining right application area for illegal harvesting and evidence of poaching	On-going	On-going	SHE Manager
			• The use of light will be kept to a minimum, and where it is required, yellow lighting will be used where possible	On-going	On-going	SHE Manager
			• Strict speed control measures will be implemented on access roads and vehicles will be restricted to travel on designated roads. A record of road kills and injuries will be kept	On-going	On-going	SHE Manager
			• Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels	On-going	On-going	SHE Manager
			• All permanent water impoundments will be fenced off	On-going	On-going	SHE Manager
			• Dust control measures will be implemented	On-going	On-going	SHE Manager
			• Surface and groundwater management measures will be implemented	On-going	On-going	SHE Manager
			• Soil pollution and erosion will be prevented and managed	On-going	On-going	SHE Manager
			• Blasting hazards will be managed	On-going	On-going	SHE Manager
			• Areas no longer being used for mining activities will be rehabilitated	As required	As required	SHE Manager
			• A nursery will be established where indigenous and endemic plants species will be propagated	On-going	On-going	SHE Manager
			• Rehabilitation trials will be conducted throughout the life of mine	On-going	On-going	SHE Manager
			• The nursery and rehabilitation plan will be continuously updated in accordance with the trial results to ensure that optimal rehabilitation methods are employed	On-going	On-going	SHE Manager
			• Rehabilitation measures must be continued for at least five years after closure	On-going	On-going	SHE Manager
			• Implement the biomonitoring programme outlined in Section 22.	On-going	On-going	SHE Manager

Objective of mitigation measures:	To prevent unacceptable disturbance of biodiversity and related ecosystem functionality To prevent the unacceptable loss of aquatic ecosystems and related functionality					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Decommission	H	M		As required	As required	SHE Manager
Closure	H	L	• Monitor rehabilitation at least five years after closure.	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 38: ACTION PLAN – AQUATIC BIODIVERSITY

Objective of mitigation measures:	To prevent the unacceptable loss of biodiversity and related functionality through physical loss from project-related activities					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Conduct desktop Reserve determination	Pre-construction	Once off	SHE Manager
Operation	H	M	• Conduct toxicity tests on geochemical samples	Pre-construction	Once off	SHE Manager
Decommission	H	M	• Limit the project footprint and activities to that identified in this EIA and EMP report.	On-going	On-going	SHE Manager
			• Areas of disturbance will be clearly demarcated and movement by mine personnel and activities outside of the demarcated boundaries will be strictly prohibited	Pre-construction and on-going	Once off and on-going	SHE Manager
			• Activities within 100 m of watercourses will be limited as far as practically possible	On-going	On-going	SHE Manager
			• Stream crossings will be constructed in such a manner that these do not impede the flow of water	Construction	Once off	SHE Manager
			• An alien/invasive/weed management programme will be implemented throughout the mine right application area	On-going	As required	SHE Manager
			• Fires will be strictly prohibited	As required	As required	SHE Manager
			• Train workers (permanent and temporary) on the value of biodiversity and the need to conserve species and ecosystems.	On-going	On-going	SHE Manager
			• Vegetation harvesting will be strictly prohibited unless for medicinal purposes and agreed to by the environmental officer	On-going	On-going	SHE Manager
			• Faunal hunting, poaching, snaring or capturing will be strictly prohibited	On-going	On-going	SHE Manager
			• Surface and groundwater management measures will be implemented	On-going	On-going	SHE Manager
			• Soil pollution and erosion will be prevented and managed	On-going	On-going	SHE Manager
			• Implement the biomonitoring programme outlined in Section 22.	As per plan	As per plan	SHE Manager
Closure	H	M	• Monitor rehabilitation at least five years after closure.	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 39: ACTION PLAN – LOSS OF WATER SUPPLY TO THIRD PARTIES

Objective of mitigation measures:	To prevent the loss of groundwater to third party users in the project area						
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**			
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	-	-	-	-	-	-
Operation	H	L	• Verify all users in potentially affected zone	Pre-construction	Once off	SHE Manager
Decommission	H	L	• Minimise the designated dirty areas	On-going	On-going	SHE Manager
			• Design and construct river crossings in a manner which will not impede the flow of water	Construction	Once off	SHE Manager
			• Update and optimise the site wide water balance regularly in order to minimise the discharge of excess water	On-going	On-going	SHE Manager
			• Operate in line with water use license (dewatering, treatment and discharge).	On-going	On-going	SHE Manager
			• Implement the monitoring programme outlined in Section 22	On-going	On-going	SHE Manager
			• If boreholes CK BH4 and 5 are used for water supply, limit pumping rates to 8 hours per day to ensure no significant drawdown occurs and that groundwater levels can recover to pre-abstraction levels	As required	As required	SHE Manager
			• Develop and maintain a dynamic water balance using suitable measurement points and devices for expected flow rates, focussing especially on groundwater inflows into the underground mine workings.	On-going	Quarterly	SHE Manager
			• The potential intersection of water bearing fractures by underground mining should be investigated. Associated risks and potential impacts of such intersections should be minimised by using suitable techniques such as pre-grouting	As required	As required	SHE Manager
			• Set up and maintain a transient groundwater flow model showing changes in water levels as a result of its operations using water level data sourced from its monitoring programme. If the model predictions change to those assessed and discussed in this report, additional mitigation measures will be implemented in consultation the authorities and an appropriately qualified specialist.	Pre-construction and on-going	On-going	SHE Manager
			• If mine-related loss in water supply occurs within the cone of depression, an alternative source of water supply should be provided for identified users.	As required	As required	SHE Manager
			• If flow monitoring and updated modelling predicts a significant decrease in water flow in the Pandana River as a result of dewatering activities, investigate and implement measures to minimise and/or mitigate for this loss.	As required	As required	SHE Manager
Closure	-	-	-	-	-	-

Note: Refer to Section 3 for project activities per phase

TABLE 40: ACTION PLAN – WATER CONTAMINATION

Objective of mitigation measures:	To prevent unacceptable water pollution related impacts					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Pre-construction			• Conduct kinetic testing on representative coal samples and design stockpiles in line with regulatory requirements and including measures for containing spillages, seepage and/or dirty water runoff.	Pre-construction	Once off	SHE Manager
Construction Operation Decommission	M M M	L L L	• Limit the project footprint to that described in the EMP • Prevent pollution through construction, operation and maintenance of infrastructure and facilities as per design process • Vehicles and equipment will be serviced regularly to limit potential for leaks. All vehicles and equipment servicing and maintenance activities will take place in workshops and washbays with impermeable floors, dirty water collection facilities and oil traps • All potentially polluting storage and handling facilities will be operated with containment facilities • The mine will implement good "house-keeping practices" which will include a non-mineralised waste management procedure as outlined in Section 3. • Prevent pollution through education and training of workers (permanent and temporary) • Spillages will be cleaned up and disposed of in accordance with set procedures and immediately when they are detected r • Clean and dirty water systems will be designed and operated in accordance with Regulation 704 • Construct and maintain dirty water dams with appropriate lining and leakage detection and to comply with Regulation 704 • Set up and undertake groundwater monitoring in line with recommended programme (Section 22). • The predicted rate of mine flooding and quality of decant shall be re-evaluated once more site-specific groundwater monitoring and geochemical data become available • Should mine related activities be proven to compromise the quality of third party water supplies, an alternative source of water supply of at least equivalent quality and quantity shall be provided for affected users • Rehabilitate and hydraulically seal the mine boxcut upon decommissioning • In the event of any significant pollution incident follow the emergency response procedure (see Section 21).	On-going Design and on-going On-going On-going On-going On-going On-going On-going Construction and on-going On-going On-going As required Decommissioning As required	On-going Once off and on-going On-going On-going On-going On-going Once off On-going Once-off and on-going On-going On-going As required Once-off As required	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Closure	H	M	• Undertake groundwater monitoring in line with recommended programme (Section 22). • Implement aftercare and maintenance programme • Should surface and groundwater monitoring show that there is a significant decrease in water quality downstream of the mine and resulting from the mining activities (poor quality seepage and decant from the mine void), the water level in the mine void shall be managed below critical levels to prevent further seepage into the weathered aquifer	To be agreed with regulatory authorities To be agreed with regulatory authorities As required	Quarterly As required As required	SHE Manager SHE Manager SHE Manager

Objective of mitigation measures:	To prevent unacceptable water pollution related impacts					
Phase of operation	Sig		Technical and management options *(Refer to Chapter 8 for further detail on mitigation measures)*	Action plan		
	UM	M		Timeframe	Frequency	Responsible parties
			utilising suitable engineering designs • Implement a pump and treat system (if required) with appropriate authorisations.	Until the decant and seepage from the mine void is of acceptable quality	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 41: ACTION PLAN – AIR POLLUTION

Objective of mitigation measures:	To prevent unacceptable air quality related pollution impacts.					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Locate dust generating sources as close as possible to each other and centroid of activities around the boxcut.	On-going	On-going	SHE Manager
Operation	H	M to L	• Keep unpaved roads to a minimum	Pre-construction	On-going	SHE Manager
Decommission	H	L	• Keep disturbed areas to a minimum and keep areas moist through regular water spraying	On-going	On-going	SHE Manager
			• Develop and maintain an air quality management plan in consultation with an appropriately qualified specialist to achieve set control efficiencies	Pre-construction	On-going	SHE Manager
			• Investigate alternative measures that reduce demand on water but maintain control efficiencies	As required	As required	SHE Manager
			• Limit vehicle speeds	On-going	On-going	SHE Manager
			• Coal trucks will be covered to prevent unnecessary generation of coal dust during transport	Operational	On-going	SHE Manager
			• Undertake monitoring in line with recommended programme.	As per plan	As per plan	SHE Manager
			• If monitoring data confirms that either the emissions or the ambient concentrations exceed the relevant standards then the mine will, in consultation with the relevant authorities, take steps to further reduce the emissions or ambient concentrations where possible. This may include relocation of receptors.	As required	As required	SHE Manager
Closure	H	L	• Monitor and maintain vegetation cover on f rehabilitated areas	5 years	On-going	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 42: ACTION PLAN – DISTURBING NOISE

Objective of mitigation measures:	To limit excessive noise pollution from project activities and facilities					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	M-L	• Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan (Section 8.2.17).	Prior to construction	Once off	SHE Manager
Operation	H	M-L	• Restrict construction activities to daytime hours.	Construction	On-going	SHE Manager
Decommissioning	H	M-L	• Ensure that all equipment and vehicles are kept in proper working order, and exhausts and silencers of diesel operated equipment are functioning correctly. An equipment and vehicle maintenance programme will be developed and implemented. Records will be kept for auditing purposes.	On-going	On-going	On-going
			• Ensure that the site access road and all internal service roads are kept clean and maintained in good state of repair to avoid unnecessary rattles, bangs and 'body-slap' on mine vehicles.	On-going	On-going	SHE Manager
			• Noise reducing measures such as minimising drop heights when loading or unloading, no unnecessary engine revving, etc. will be investigated and implemented.	On-going	On-going	SHE Manager
			• Equipment used intermittently will be shut down between operational periods.	As required	As required	SHE Manager
			• Pumps, compressors and generators will be fitted with acoustic enclosures if required.	As required	As required	SHE Manager
			• Soils stripped in the construction phase and overburden from the development of the boxcut will be stockpiled, as far as possible, in such a manner as to act as a noise screen between noise generating equipment and sensitive receptor sites (and in line with the soil management plan).	Construction	Once off	SHE Manager
			• Acoustic screening of noise generating components of the operations will be investigated and implemented by the mine where feasible.	As required	As required	SHE Manager
			• Potential receptors will be informed of the mine's construction blasting programme.	On-going	On-going	SHE Manager
			• Transport of coal will be limited to daylight hours only.	On-going	On-going	SHE Manager
			• Where possible and where occupational safety requirements allow, use alternative reverse alarms with a wide-band type alarm rather than conventional beeping type reverse alarms on trucks and earth-moving vehicles.	As required	As required	SHE Manager
			• Good site practice measures should also be employed which could also provide some mitigation against potential noise impacts. These measures could include, but are not limited to the following: Educate and train workers on the noise impacts of their actions and ways in which to minimize noise generation.	On-going	On-going	SHE Manager
			• Noise monitoring as detailed in Section 22 will be undertaken to verify the outcomes of the noise modelling and provide input into additional management measures, if required.	As required	As required	SHE Manager
			• All registered complaints will be documented, investigated in a timeously manner and efforts made to address the area of concern where possible.	As required	As required	SHE Manager
Closure	Not applicable					

Note: Refer to Section 3 for project activities per phase

TABLE 43: ACTION PLAN – LANDSCAPE AND VISUAL

Objective of mitigation measures:	To limit excessive visual impacts					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	M	• Limit the clearing of vegetation	On-going	On-going	SHE Manager
Operation	H	M	• Limit the emission of visual air emission plumes (dust emissions) • Use visual screens between the mine site and sensitive viewers • Limit use of lighting to what is absolutely necessary from a safety perspective • Use colours that reflect natural colours of the surrounding landscape where possible • Undertake rehabilitation of disturbed areas.	As required On-going As required As required On-going	As required On-going As required As required On-going	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Decommission	H	M	• Undertake rehabilitation of disturbed areas • Implement a rehabilitation and closure plan	On-going On-going	On-going On-going	SHE Manager SHE Manager
Closure	H	L	• Monitor and maintain vegetation cover.	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 44: ACTION PLAN – LAND USES

Objective of mitigation measures:	To limit loss of land uses					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction Operation Decommission	H H H	M-L M-L M-L	• Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan • Effective implementation of all mitigation measures as outlined in this EMP report to reduce its overall impact on the environment and surrounding land-uses.	Pre-construction On-going	Once off On-going	SHE Manager SHE Manager
Closure	H	M-L	• Monitor and maintain rehabilitated areas	5 years	As required	SHE Manager

Note: Refer to Section 3 for project activities per phase

TABLE 45: ACTION PLAN – BLASTING RELATED DAMAGE

Objective of mitigation measures:	To prevent blast related damage to third parties and infrastructure					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Prior to construction, homesteads situated within 500m of the boxcut will be relocated in line with a resettlement plan (Section 8.2.17).	Pre-construction	Timeously	SHE Manager
Operation	H	L	For surface and near surface blasts:			
			• Develop a blast design	On-going	As required	SHE Manager
			• Plan blast times	On-going	As required	SHE Manager
			• Apply threshold criteria	On-going	Each blast	SHE Manager
			• Mark, drill-off in the field and audit (once charging commences) the final approved blast design	On-going	Each blast	SHE Manager
			• Keep detailed blast records	On-going	Each blast	SHE Manager
			• If fumes occur after a blast then keep the immediate vicinity of the blast area clear until these have dissipated	As required	As required	SHE Manager
			• Notify closest receptors and schools of blast schedule.	On-going	As required	SHE Manager
			• Evacuate anyone located within the 500m of the blast zone	On-going	Each blast	SHE Manager
			• Conduct monitoring in line with monitoring programme	As per plan	As per plan	SHE Manager
			• If monitoring indicates unacceptable impacts investigate and implement additional mitigation measures.	As required	As required	SHE Manager
			• Repair any damage to third party property caused by the mine's blasting activities.	As required	As required	SHE Manager
			• Comply with relevant explosives legislation			
			• Document, investigate all registered complaints and address the area of concern where possible.	On-going As required	On-going As required	SHE Manager SHE Manager
			• If a person or animal is injured by fly rock this must be handled in accordance with the mine's emergency response procedure.	Emergency	Emergency	SHE Manager
Decommissioning	Not applicable					
Closure	Not applicable					

Note: Refer to Section 3 for project activities per phase

TABLE 46: ACTION PLAN – TRAFFIC

Objective of mitigation measures:	To reduce the potential for mine-related safety and vehicle related impacts on road users.					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Complete detailed design drawings and submit to various authorities for approval purposes	Design	Once off	SHE Manager
Operation	H	M/L	• Investigate establishing an alternative access point onto the D699. Should this be feasible, this alternative access will be established and used instead of using the existing farm access point.	Pre-construction	Once off	SHE Manager
Decommission	H	L	• Establish permanent mine access road on the farm Commissiekraal as per project plan	At construction	Once off	SHE Manager
			• Address any road improvements along D699 road and at the D699/P40 intersection in conjunction with the relevant Roads Department	At construction	Once off	SHE Manager
			• Initiate discussions with road authority to set up a maintenance plan. Ensure plan includes initial investigations on quality and lifespan of roads trucks will travel.	Pre-construction	Once-off	SHE Manager
			• Provide traffic and information signs and lighting where relevant in consultation with the Roads Department	On-going	On-going	SHE Manager
			• Co-ordinate transport of any abnormal heavy loads with the relevant roads department.	As required	As required	SHE Manager
			• Transport of any hazardous substances will comply with Hazchem requirements.	As required	As required	SHE Manager
			• Maintain all equipment in proper working order	On-going	On-going	SHE Manager
			• Investigate a school bus service for relevant schools in the vicinity of the D699 and P40	At construction	Once off	SHE Manager
			• Train employees and create employee and contractor awareness	On-going	Regularly	SHE Manager
			• Undertake community awareness programme	On-going	Regularly	SHE Manager
			• Monitor and evaluate use of relevant road intersections and road sections (see Section 22).	All phases	Annually	SHE Manager
			• Handle any road accident involving or caused by project related traffic in accordance with the emergency response procedure (see Section 21).	As required	As required	SHE Manager
Closure	-	-	-	-	-	-

Note: Refer to Section 3 for project activities per phase

TABLE 47: ACTION PLAN – HERITAGE (AND CULTURAL)

Objective of mitigation measures:	To limit the loss of heritage resources					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Limit project footprint to that identified in EIA and EMP report.	Pre-construction	Timeously	SHE Manager
Operation	H	L	• Any access roads will be a minimum of 20m from heritage sites	Ongoing	As required	SHE Manager
Decommissioning	M	L	• Obtain permission for the exhumation and relocation of graves from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.	Pre-construction	As required	SHE Manager
			• All heritage sites not impacted on by the initial development of the site will be marked on the site layout plan.			
			• Inspect sites located in close proximity to exploration or surface activities for encroachment and/or damage in line with monitoring programme	All phases	On-going	SHE Manager
			• Educate all workers (temporary and permanent) about the heritage sites and tell-tale signs of heritage and paleontological resources that may be encountered.	As per plan	As per plan	SHE Manager
			• Access will be allowed for family members to visit the graves within the mining right area.	All phases	On-going	SHE Manager
			• Personnel discovering any fossils, graves or potential heritage sites must inform the Environment department immediately.	All phases	On-going	SHE Manager
			• Should any fossils be uncovered during the development of the site, a palaeontologist or palaeoanthropologist will be consulted to identify the possibility for research.	As required	As required	SHE Manager
			• Any chance finds of heritage sites will follow its emergency procedure detailed in Section 21.	As required	As required	SHE Manager
				As required	As required	SHE Manager
Closure	-	-	-	-	-	-

Note: Refer to Section 3 for project activities per phase

TABLE 48: ACTION PLAN – INWARD MIGRATION AND ASSOCIATED SOCIAL AND HEALTH ISSUES

Objective of mitigation measures:	To minimise inward migration and related secondary social, safety and health issues					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Develop and implement a stakeholder communication and engagement strategy	At start and on-going	Once off	SHE Manager
			• Develop and implement a community awareness programme	At start and on-going	Once off	SHE Manager
			• Compile and implement recruitment, training and housing policies and procedures	At start	Once off	SHE Manager
Operation	H	L	• Develop and implement an influx management plan that allows for collaboration with traditional and government authorities and landowners	At start	Once off	SHE Manager
Decommission	H	L				
Closure	H	L	• Enforce a labour recruitment plan	At start and on-going	Once off	SHE Manager
			• Ensure no recruitment takes place at the gate	On-going	As required	Site Manager
			• Control access to the construction and operation site	On-going	Daily	Security Manager
			• Give preference to non-skilled workers from local communities	At start	As required	Site Manager
			• Use a local labour office during the recruitment of non-skilled and unskilled labour	At start	As required	SHE Manager
			• Collaborate with local police enforcement to minimise crime and related issues.	On-going	As required	Security Manager
			• During construction, if required, provide a housing camp	At start	Once off	SHE Manager
			• Develop and implement a social investment programme	At start	Once off	SHE Manager
			• Develop an effective HIV/AIDS policy in conjunction with the local authorities	At start	Once off	SHE Manager
			• Provide sex education and awareness programmes for workers	On going	As required	SHE Manager
			• Support initiatives to minimise the spread of HIV/AIDS and related illnesses	On going	As required	SHE Manager
			• Make condoms available at the mine	On going	Regularly	SHE Manager
			• Invest in capacity building with key stakeholders such as health and social welfare.	On going	Regularly	SHE Manager
			• Develop and implement a health management plan for employees	At start and on going	Regularly	SHE Manager SHE Manager
			• Support community-based outreach programmes	On going	Regularly	SHE Manager

TABLE 49: ACTION PLAN – RESETTLEMENT OF HOUSEHOLDS

Objective of mitigation measures:	To minimise the loss of socio-economic conditions due to relocation					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H	L	• Clearly communicate resettlement requirements • Develop and implement a detailed resettlement action plan (RAP) • Ensure accurate capturing of asset inventories of the affected persons • Ensure transparency with each project affected person • Ensure that host areas can promote the establishment of livelihoods • Where host areas are inadequate to support livelihood restoration, other income generation avenues are to be investigated • An appropriate livelihood restoration plan is to be developed • Affected households are to be compensated fully • The mine is to avoid cash compensations where possible • Access to community infrastructure such as schools, water, healthcare facilities should be included • No persons are to be resettled without signing relocation agreement and before the host site is ready for occupation • Resettlement activities are to be monitored during resettlement and after resettlement.	At start At start At start On going At start and on-going As per plan At start At start At start and on going On-going At start At start and on going	Once off Once off Once off Regularly As per plan As per plan Once off Once off As per plan Regularly As per plan Regularly	SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager SHE Manager
Operation	H	L				
Decommission	H	L				
Closure	H	L				

TABLE 50: ACTION PLAN – ECONOMIC (POSITIVE AND NEGATIVE)

Objective of mitigation measures:	To enhance positive and minimise negative economic impacts					
Phase of operation	**Sig**		**Technical and management options** *(Refer to Chapter 8 for further detail on mitigation measures)*	**Action plan**		
	UM	**M**		**Timeframe**	**Frequency**	**Responsible parties**
Construction	H+	H+	• Start closure planning as soon as practically possible and incorporate economic considerations into closure planning. Ensure that closure planning considerations address the re-skilling of employees for the downscaling, early closure and long-term closure scenarios • Develop specific socio-economic mitigation measures and corporate social investment strategies in consultation with the relevant authorities to ensure progress towards achieving the national, provincial and local government priorities • Offer employment opportunities to and procure local goods and services from local people from the closest communities where possible • At closure, the affected area will be properly rehabilitated and all surface infrastructure will be removed in order to be suitable for end land uses. In this respect the mine will ensure that adequate financial resources are made available to fully rehabilitate the mine area as outlined in EIA and EMP.	At least 5 years prior to decommissioning On-going On-going Decommissioning	On-going On-going On-going As required	SHE Manager and HR Manager SHE Manager and HR Manager HR and procurement Managers SHE Manager and Mine Manager
Operation	H+	h+				
Decommission	H+	h+				
Closure	M+	h+	• Monitor site in line with closure objectives and goals	6 years	On-going	SHE Manager

21 PROCEDURES FOR ENVIRONMENTAL EMERGENCIES AND REMEDIATION

21.1 ONGOING MONITORING AND MANAGEMENT MEASURES

The on-going monitoring as described in Section 22 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

21.2 PROCEDURES IN CASE OF ENVIRONMENTAL EMERGENCIES

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in the table below (Table 51).

21.2.1 GENERAL EMERGENCY PROCEDURE

The general procedure that should be followed in the event of all emergency situations is as follows.

- Applicable operational managers must be notified of an incident upon discovery
- Area to be cordoned off to prevent unauthorised access and tampering of evidence
- If dams, stormwater diversions, etc. are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Plant Manager on shift must be notified
- Take photographs and samples as necessary to assist in investigation
- Report the incident to the responsible person of the Safety, Health, Environment and Quality (Environment) department (or equivalent)
- The Environment department must comply with Section 30 of the National Environmental Management Act (107 of 1998) such that:
  - The Environment department must immediately notify the Director-General (DEA, DWS, DMR, Inspectorate of Mines, as appropriate), the South African Police Services and relevant fire prevention service, the provincial head of DEDTEA or municipality, the head of the regional DWS office and any persons whose health may be affected of;
    - The nature of the incident
    - Any risks posed to public health, safety and property
    - The toxicity of the substances or by-products released by the incident
    - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
  - The Environment department must as soon as is practical after the incident:
    - Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons

  - Undertake clean up procedures
  - Remedy the effects of the incident
  - Assess the immediate and long term effects of the incident (environment and public health)
- Within 14 days the Environment department must report to the Director-General (DEA, DWS, DMR, as appropriate), the provincial head of DEDTEA and the local municipality such information as is available to enable an initial evaluation of the incident, including:
  - The nature of the incident
  - The substances involved and an estimation of the quantity released
  - The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects)
  - Initial measures taken to minimise the impacts
  - Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure
  - Measures taken to avoid a recurrence of the incident.

21.2.2 IDENTIFICATION OF EMERGENCY SITUATIONS

The site wide emergency situations that have been identified together with specific emergency response procedures are outlined in Table 51.

21.3 TECHNICAL, MANAGEMENT AND FINANCIAL OPTIONS

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a mine of this scale and nature.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and mitigation measures as included in this EIA and EMP report.
- On an annual basis, the mine will undertake a risk assessment as part of its auditing procedures to identify and check potential risks associated with its operations. The findings of the risk assessment will be reported to mine management to be actioned.
- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations.
- Where required, the mine will seek input from appropriately qualified people.

TABLE 51: EMERGENCY RESPONSE PROCEDURES

Item	Emergency Situation	Response in addition to general procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that material will contaminate the land (leading to a loss of resource), surface water and/or groundwater, the mine will: • Notify residents/users downstream of the pollution incident. • Identify and provide alternative resources should contamination impact adversely on the existing environment. • Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. refuelling tanker) and the infrastructure 'made safe'. • Contain the spill (e.g. construct temporary earth bund around source such as road tanker). • Pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal. • Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	Discharge of dirty water to the environment	Apply the principals listed for Item 1 above. To stop spillage from the dirty water system the mine will: • Redirect excess water to other dirty water facilities where possible; • Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system; and • Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. • Apply for emergency discharge as a last resort.
3	Pollution of surface water	Personnel discovering the incident must inform the Environment department of the location and contaminant source. Apply the principals listed for Item 1 above. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. Contamination entering the surface water drainage system should be redirected into the dirty water system. The Environment department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.
4	Groundwater contamination	Use the monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). Investigate the source of contamination and implement control/mitigation measures.
5	Burst water pipes (loss of resource and erosion)	Shut off the water flowing through the damaged area and repair the damage. Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.
6	Flooding from failure of surface water control infrastructure	Evacuate the area downstream of the failure. Using the emergency response team, rescue/recover and medically treat any injured personnel and/or animal (where applicable). Temporarily reinstate/repair stormwater diversions during the storm event (e.g. emergency supply of sandbags).

Item	Emergency Situation	Response in addition to general procedures
		Close the roads affected by localised flooding or where a stormwater surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals. Ensure medical assistance is available to recovered individual (where applicable).
8	Veld fire	Evacuate mine employees from areas at risk. Notify downwind residents and industries of the danger. Assist those in imminent danger/less able individuals to evacuate until danger has passed. Provide emergency fire fighting assistance with available trained mine personnel and equipment.
9	Falling into hazardous excavations	Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). In the event of a human, the injured party should be recovered by trained professionals such as the mine emergency response team. A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital. In the event of an animal, the animal should be recovered by the mine emergency response team and reported to the local authority/relevant stakeholder for further action.
10	Collapse of underground mine (if unplanned)	Sound the alarm to evacuate all employees from the mining void. Determine location of collapse and number of unaccounted for personnel (i.e. those still trapped underground). Assess risk of further collapse (based on reason for initial collapse). Stabilise mine void in area of collapse and attempt rescue of trapped personnel with emergency response team. Ensure medical personnel are mobilised to accept casualties. Investigate extent of surface subsidence in consultation with relevant authorities and/or specialist and determine remedial measures (if required).
11	Road traffic accidents (on site)	The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. Access to the area should be restricted and access roads cleared for the emergency response team. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). Casualties will be moved to safety by trained professionals and provided with medical assistance. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected.
12	Development of informal settlements	The mine will inform the local authorities (local municipality, traditional authority, and police) that people are illegally occupying the land.
13	Injury from fly rock	The person discovering the incident will contact the mine emergency response team to recover the injured party and provide medical assistance.

Item	Emergency Situation	Response in addition to general procedures
		Whilst awaiting arrival of the emergency response team, first aid should be administered to the injured party by a qualified first aider if it is safe to do so.
14	Uncovering of graves and sites	Personnel discovering the grave or site must inform the Environment department immediately. Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.
15	Uncovering of fossils	Personnel discovering the fossil or potential site must inform the Environment department immediately. Should any fossils be uncovered during the development of the site, a palaeontologist or palaeoanthropologist will be consulted to identify the possibility for research.

22 PLANNED MONITORING AND EMP PERFORMANCE ASSESSMENT

22.1 PLANNED MONITORING OF ENVIRONMENTAL ASPECTS

Environmental aspects requiring monitoring include: water resources (see Table 52 and Table 53); air (see Table 54 and Table 55); noise (see Table 56); biodiversity (see Table 57); blasting (see Table 58); heritage (see Table 60); water dam and unplanned surface subsidence above workings (see Table 61), traffic (see Table 59). See Figure 31 for monitoring points.

FIGURE 31: PROPOSED MONITORING NETWORK

TABLE 52: MONITORING PLAN - WATER

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Pre-construction to establish a baseline record. All subsequent phases, including post-closure for a period to be agreed upon with the regulatory authorities.	Surface water pollution	See Table 53- initial analysis to include full list. Once trends are established this list will be revised to monitor parameters of concern on a monthly basis and other parameters less frequently	Receiving watercourse (Figure 31)	Comply with relevant water quality limits as well as upstream and downstream in-stream quality objectives set by the Department of Water and Sanitation.	Grab sampling Continuous volume monitor for effluent discharge	SHE Manager	Monthly or when water is present after rainfall events	Internal and external reports	Compare against baseline groundwater quality and WUL limits	Implement additional measures in consultation with authorities and surface water specialist
	Groundwater pollution		Boreholes and springs as shown in Figure 31 – can be amended with input from specialist	Maintain baseline groundwater quality; however if pollution does migrate off site corrective action must be taken.	Grab sampling after borehole purging Grab sampling from springs	SHE Manager	Quarterly	Internal and external reports	Compare against baseline groundwater quality and WUL limits	Implement additional measures in consultation with authorities and groundwater specialist
Pre-mining to establish a baseline record. During and post-mining for a period to be agreed	Surface water flow	Flow volumes	Receiving watercourse - upstream and downstream of mining activities (See Figure 31)	<15% reduction in flow volume from baseline	Manual or fixed flow point	SHE Manager	Monthly	Internal and external reports	Compare against baseline water levels	If significant reduction recorded, implement corrective measures

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
upon with the regulatory authorities	Dewatering	Water level	Boreholes as shown in Figure 31	Maintain flow at springs	Flow measurement	SHE Manager	Monthly	Internal and external reports	Compare against baseline water levels	If third party water supply is proven to be affected by the operation, provide water of the same quality and quantity to the affected party.
Operations	Water supply and quality impacts	Water balance	Measure water volumes and quality at key points in the mine's internal water circuit	Maintain and update a dynamic water balance in order to minimise water usage and maximise reuse of water while minimising the volume of water to be discharged to the receiving environment.	Continuous volume monitoring at key points in mine water circuit and monthly grab samples at these key points. Should include all water abstraction, discharges into water holding facilities and discharge into receiving environment	Environmental Manager	Continuous flow monitoring Monthly quality sampling (or in accordance with any relevant water licence requirements).	Internal and external reports	Build up a record of volume and quality and compare new data with this information.	Implement additional measures in consultation with authorities and surface water specialist.

TABLE 53: MONITORING PARAMETERS

In field measurements							
pH		Electrical conductivity			Total dissolved solids		
Laboratory analysis							
pH	Arsenic	Cobalt	Chloride	Total dissolved soilds (TDS)	Potassium	Chrome	Aluminium
Electrical conductivity	Ammonium	Phosphate	Fluoride	Zinc	Sodium	Chrome VI	Manganese
Boron	Alkalinity as $CaCO_3$	Copper	Magnesium	Bicarbonate	Calcium	Iron	
Selenium	Sulphate	Mercury	Nitrate	Cadmium	Barium	Lead	

TABLE 54: MONITORING PLAN – AIR QUALITY

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Pre-construction to establish a baseline record. All subsequent phases, including post-closure for a period to be agreed upon with the regulatory authorities.	Dust generation	Dustfall	On-site receptors and at eastern farm boundary (see Figure 31).	Compliance with non-residential limits at source and residential limits at receptors on- and off-site	Visual, photos, dust buckets using American Society of Testing and Materials (ASTM) method	SHE Manager	Continuous with quarterly reporting	Internal and external reports	No visible dust plume in immediate vicinity of sources. Evaluation criteria adopted for this project (Table 55) can be revised with input from air specialist.	Implement additional measures in consultation with authorities and air specialist.
	Generation of fine particulate matter	PM_{10}		Compliance with limits at sensitive on-site receptors and all off-site receptors	PM_{10} sampler					
		$PM_{2.5}$			$PM_{2.5}$ sampler					
	Climate	Meteorological	On-site	Measure rainfall, evaporation, temperature, wind data	Daily records		Continuous with monthly reporting	Internal report and database	Not applicable	Not applicable

TABLE 55: MONITORING PLAN – AIR QUALITY EVALUATION CRITERIA

Pollutant	Averaging period	Limit values		Frequency of exceedance	Compliance date
		Concentration (µg/m³)	Dustfall rate (mg/m₂/day)	Occurrences per year	
$PM_{2.5}$	24 hour	40	-	4	1 January 2016 – 31 December 2029
	24 hour	25	-	4	1 January 2030
	1 year	20	-	Not applicable	1 January 2016 – 31 December 2029
	1 year	15	-	Not applicable	1 January 2030
PM_{10}	24 hour	75	-	4	Immediate
	1 year	40	-	Not applicable	Immediate
Dustfall – residential areas	-	-	D < 600	Two within a year, not sequential months	-
Dustfall – non-residential areas	-	-	600 < D < 1200		-

TABLE 56: MONITORING PLAN - NOISE

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Construction	Increase in ambient noise levels	Day-time A-weighted equivalent continuous noise level L_{Aeq} over a period of one hour day-time	At off-site receptors (see Figure 31) – these points may be reviewed annually based on noise monitoring results	Increase of <5dBA from the measured baseline levels	Day measurements with suitable instruments	SHE Manager and appropriately qualified specialist	Once pre-construction to obtain a baseline for the specific receptor point Every two months	Internal and external reports	Increase of <5dBA from the measured baseline levels	Implement additional measures in consultation with authorities and noise specialist.
Operations		Daytime and night-time A-weighted equivalent continuous noise level L_{Aeq} over a period of one hour day-time and 30min at night at each location			Day and night measurements with suitable instruments		Once when the plant becomes operational Once following implementation of any new mitigation measures Every three months during first year of operation, annually thereafter To investigate a complaint			

TABLE 57: MONITORING PLAN – BIODIVERSITY

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
All phases, including post-closure for a period to be agreed upon with the regulatory authorities.	Physical loss or disturbance of biodiversity	Aquatic ecosystem health	Upstream and downstream of mining activities (See Figure 31)	Maintain baseline conditions.	SASS5 Macro-invertebrate response assessment Fish community index Invertebrate habitat assessment Intermediate habitat integrity assessment Riparian vegetation response assessment index Habitat cover rating for fish Toxicity testing Visual monitoring for moisture stress	SHE Manager	Every 6 months	Internal and external reports	Maintain baseline conditions	Implement additional measures in consultation with authorities and biodiversity specialist.
			Upstream and downstream of water discharge point to be agreed with DWS	Maintain baseline conditions.		SHE Manager	Every 6 months	Internal and external reports	Maintain baseline conditions	

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
		Terrestrial ecosystem health	Permanent monitoring plots to be determined in consultation with floral specialist	Maintain baseline conditions.	Crown and basal cover Species diversity and abundance Recruitment of indigenous species Alien versus indigenous plant ratio Soil erosion levels and efficiency of soil control measures Plant community structure	SHE Manager	Annual	Internal and external reports	Maintain baseline conditions	
			Permanent monitoring plots to be determined in consultation with fauna specialist	Maintain baseline conditions.	Species diversity and abundance Faunal community structure	SHE Manager	Annual	Internal and external reports	Maintain baseline conditions	
			Permanent fixed and random monitoring plots to be determined in consultation with bird specialist	Maintain baseline conditions.	Species diversity and abundance	SHE Manager	Annual	Internal and external reports	Maintain baseline conditions	
			Relocated species	Achieve baseline conditions.	Visual inspection	Specialist	Every 6 months	Internal report	Achieve baseline conditions.	

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
			All rehabilitated areas and rehabilitation trials areas	Rehabilitate to pre-mining conditions as far as practically possible.	Floral monitoring criteria indicated above	Specialist	Trial areas - quarterly Rehabilitated areas - annually and for a period of 10 years post closure	Internal and external reports	Rehabilitate to pre-mining conditions as far as practically possible – achieve a 50% return in pre-mining species post closure	
					Visual inspection	Environmental Manager	Monthly	Internal reports		
		Alien/ invasive plant species/ weeds	All disturbed and rehabilitated areas	Alien/invasive plant species/weeds controlled	Visual inspection	Environmental Manager	Quarterly	Internal and external reports	Alien/invasive plant species/weeds controlled	

TABLE 58: MONITORING PLAN - BLASTING

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Surface and near surface blasting	Blasting related injury to third parties or animals and damage to third party infrastructure	Monitoring stability, safety and prevention of environmental impacts.	Nearest third party receptor to blast site	No mine related damage to third party structures	Seismo-graphs to monitor vibration and airblast. Visual monitoring of fly rock.	SHE Manager	Each surface and near surface blast – can be changed in consultation with a specialist	Internal and external reports	Contain fly rock within 500 m of each blast For ground vibration: Peak particle velocity at the closest well-constructed third party structures is less than 12 mm/s For air blast: < 130 dB at the closest well-constructed third party structures Where structures are located within the 500m blast zone, fire only one hole at a time Where structures are not compliant with basic building practices within 500m of the blast sites, conduct pre-blast and post-blast surveys to determine if any damage occurred due to the blast.	Remediate any damage of third party infrastructure proven to be caused by blasting.

TABLE 59: MONITORING PLAN - TRANSPORT

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Operation	Road condition and Safety of third party road users	Condition of road/ intersection and mine (including contractor) use	At a point along the D699 At D699/P40	No of accidents, capacity of intersection/road from a safety perspective and road condition	Traffic counts, records from police station, audit	Health and Safety Manager and traffic specialist	Annually	Inspection reports and audits	No fatal accidents or <1 accident a month due to mine use of roads Minimal road deterioration	Implement additional measures in consultation with authorities and traffic specialist

TABLE 60: MONITORING PLAN – HERITAGE

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
Construction, operation, decommissioning	Disturbance to heritage	Damage, encroachment	At heritage sites in close proximity to exploration and surface activities	No damage	Visual	SHE Manager	Quarterly or when activities occur close to sites	Internal reports	No damage	Implement any measures recommended

TABLE 61: WATER DAM AND UNPLANNED SURFACE SUBSIDENCE ABOVE WORKINGS

Project phase	Impact	Parameter	Location of monitoring	Key performance indicator	Method of monitoring	Responsible person	Frequency	Reporting mechanism	Thresholds / standards	Recommended action
All phases, including post-closure for a period to be agreed upon with the regulatory authorities.	Safety risk to third parties	Monitoring stability, safety and prevention of environmental impacts.	All water dams and relevant areas above underground workings	No incidents of third party/ animal injury	Stability monitoring to be determined by a qualified person	SHE Manager	Frequency of monitoring and qualification of monitoring personnel to be determined on an infrastructure specific basis	Internal and external reports	No incidents of third party/animal injury	Implement any measures recommended by qualified person.

22.2 AUDITING AND PERFORMANCE ASSESSMENTS

The environmental manager will conduct internal management audits against the commitments in the EMP and project plan in the EIA. During the construction and decommissioning phases, these audits will be conducted every two weeks. In the operational and closure phases, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy of the EIA and EMP report relative to the on-site activities will be assessed in the performance assessment.

22.3 FREQUENCY FOR REPORTING

As a minimum, the following documents will be submitted to the relevant authorities from the start of construction until mine closure:

- EMP performance assessment, submitted every two years to DMR
- updated closure cost estimate, submitted annually to the DMR
- water monitoring reports, submitted annually to DWS – these reports will not only present monitoring data but will also provide interpretations of trends in the data and reporting on compliance with water quality guidelines
- air monitoring reports, submitted annually to the DMR and DEDTEA
- traffic, submitted every two years to relevant roads authorities
- detailed plan for decommissioning/closure, submitted to DMR at least five years prior to decommissioning.

23 FINANCIAL PROVISION

The information in this section was sourced from the closure cost calculation study completed by SLR (Appendix P).

23.1 PLAN SHOWING LOCATION AND AERIAL EXTENT OF PROPOSED OPERATION

A plan showing the location and aerial extent of the proposed operation is provided as Figure 24 (Section 3.4). A plan showing the annual progression of the mining operation relative to the overall plan is included as Figure 22 (Section 3.2.1).

23.2 ANNUAL FORECASTED FINANCIAL PROVISION

The annual forecasted financial provision for the first 10 years of operation together with the progress total in Year 10 is provided in the table below (Table 62). There is no ongoing ramp up of financial closure liability during the life of mine since all above ground disturbance is created during the first year of operation, and these areas remain constant during the life of the project.

TABLE 62: FINANCIAL PROVISION – UP TO YEAR 10

Phase	Year	Financial provision (R, including VAT)
Construction	1 (mid 2017)	R8,415,752
Operation	2	+0
	3	+0
	4	+0
	5	+0
	6	+0
	7	+0
	8	+0
	9	+0
	Progressive total for Year 10 of operation	R8,415,752
Life of mine	20 (mid 2036)	R8,415,752

23.3 CONFIRMATION OF AMOUNT TO BE PROVIDED

The amount of financial provision that will be provided should the right be granted is is R 8,415,752 (including VAT).

23.4 METHOD OF PROVIDING FINANCIAL PROVISION

The financial provision will be provided in the form of a financial guarantee or insurance.

24 ENVIRONMENTAL AWARENESS PLAN

This section includes an environmental awareness plan for the mine. The plan describes how employees will be informed of environmental risks which may result from their work, the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment and the training required for general environmental awareness and the dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of the mine are bound by the content of the EMP and a contractual condition to this effect will be included in all such contracts entered into by the mine. If contractors are used, the responsibility for ensuring compliance with the EMP will remain with the mine.

The purpose of the environmental awareness plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable the mine to achieve the objectives of an environmental policy.

24.1 ENVIRONMENTAL POLICY

The mine will display the environmental policy prominently at the mine entrance and key notice boards. The mine's environmental policy is described below:

- To minimise the impact of its mining operations on the environment wherever possible
- To comply with all applicable environmental legislation and the commitments contained in the mine's Environmental Management Programme (EMP) report
- To ensure that all mine employees, contractors and sub-contractors:
  - Are aware of the impact of their activities on the environment
  - Are informed about the measures required to prevent, mitigate and manage environmental impacts
  - Apply these principles whilst carrying out their work.
- To establish and maintain a good relationship with stakeholders and other interested and affected parties with regard to the mine's activities
- To develop a localised environmental strategy with the local authority and relevant stakeholder groups
- To provide relevant and constructive consultation/public participation on the management of the potential environmental impacts posed by the mine in the future.

24.2 STEPS TO ACHIEVE THE ENVIRONMENTAL POLICY OBJECTIVES

The mine's environmental policy will be realised by setting specific and measurable objectives. It is proposed that new objectives are set throughout the life of mine, but initial objectives are as follows:

- Management of environmental responsibilities:
  - The mine will establish and appoint an Environmental Manager at senior mine management level, who will be provided with the necessary resources to carry out the management of all environmental aspects of the site as a primary function, for example:
    - Compliance with environmental legislation and EMP commitments
    - Implementing and maintaining an environmental management system
    - Developing environmental emergency response procedures and coordinating personnel during incidents
    - Managing routine environmental monitoring and data interpretation
    - Environmental trouble shooting and implementation of remediation strategies
    - Closure planning.
- Communication of environmental issues and information:
  - Meetings, consultations and progress reviews will be carried out, and specifically the mine will:
    - Set the discussion of environmental issues and feedback on environmental projects as an agenda item at all company board meetings
    - Provide progress reports on the achievement of policy objectives and level of compliance with the approved EMP to the Department of Minerals Resources
    - Ensure environmental issues are raised at monthly mine management meetings and relevant meetings at all levels
    - Ensure environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties.
- Environmental awareness training:
  - The mine will provide environmental awareness training to individuals at a level of detail specific to the requirements of their job, but will generally comprise:
    - Basic awareness training for all prior to granting access to site (e.g. short video presentation requiring registration once completed). Employees and contractors who have not attended the training will not be allowed on site.
    - General environmental awareness training will be given to all employees and contractors as part of the Safety, Health and Environment induction programme. All non-mine personnel who will be on site for more than five days must undergo the SHE induction training.
    - Specific environmental awareness training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling, sanitation, etc.).
- Review and update the environmental topics already identified in the EMP which currently includes the following issues:
  - Topography (hazardous excavations and surface subsidence)

   - Soil and land capability management (loss of soil resource)
   - Management of biodiversity
   - Surface water management (alteration of surface drainage and pollution of surface water)
   - Groundwater management (reduction in groundwater levels/availability and groundwater contamination)
   - Management of air quality (dust generation)
   - Noise (specifically management of disturbing noise)
   - Visual aspects (reduction of negative visual impacts)
   - Surrounding land use (traffic management, blast management, land use loss)
   - Heritage resources (management of sites)
   - Socio-economic impacts (management of positive and negative impacts)
- All mine projects will be designed to minimise impact on the environment and to accomplish closure/rehabilitation objectives.
- The mine will maintain records of all environmental training, monitoring, incidents, corrective actions and reports.
- Contractors and employees will be contractually bound to participate in the achievement of environmental policy objectives and compliance with the EMPR.

24.3 TRAINING OBJECTIVES OF THE ENVIRONMENTAL AWARENESS PLAN

The environmental awareness plan ensures that training needs are identified and that appropriate training is provided. The environmental awareness plan should communicate:

- The importance of conformance with the environmental policy, procedures and other requirements of good environmental management
- The significant environmental impacts and risks of individuals' work activities and explain the environmental benefits of improved performance
- Individuals roles and responsibilities in achieving the aims and objectives of the environmental policy
- The potential consequences of not complying with environmental procedures.

24.3.1 GENERAL CONTENTS OF THE ENVIRONMENTAL AWARENESS PLAN

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
   - Short (15min) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts.
   - Individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than 5 days:
   - General understanding of the environmental setting of the mine (e.g. local communities and proximity to natural resources)

  - Understanding the environmental impact of individuals' activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, noise, etc.)
  - Indicate potential site specific environmental aspects and their impacts
  - The mine's environmental management strategy
  - Identifying poor environmental management and stopping work which presents significant risks
  - Reporting incidents
  - Examples of poor environmental management and environmental incidents
  - Procedures for emergency response and cleaning up minor leaks and spills.
- Module 3 – Specific training plan:
  - Environmental setting of the workplace (e.g. proximity of watercourses, vulnerability of groundwater, proximity of local communities, etc.);
  - Specific environmental aspects such as:
    - Spillage of hydrocarbons at workshops
    - Spillage of explosive liquids
    - Poor waste management such as mixing hazardous and general wastes, inappropriate stockpiling and handling of waste
    - Poor housekeeping practices
    - Poor working practices (e.g. not carrying out oil changes in designated bunded areas)
    - Excessive noise generation and unnecessary use of hooters
    - Protection of heritage resources (including palaeontological resources).
  - Impact of environmental aspects, for example:
    - Hydrocarbon contamination resulting in loss of resource (soil, water) to downstream users
    - Groundwater contamination also resulting in loss of resource due to potential adverse aesthetic, taste and health effects
    - Dust impacts on local communities (nuisance and health implications).
  - The mine's duty of care
  - Purpose and function of the mine's environmental management system.

Individuals required to complete Module 3 (Specific training module) will need to complete Modules 1 and 2 first. On completion of the Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training.

The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance).

In addition to the above the mine will:

- Conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals.
- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Manager to ensure relevance.
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

25 TECHNICAL SUPPORTING INFORMATION

Technical and supporting information included as appendices to this report, not already attached in terms of the EIA, are listed below.

- Calculation of financial closure liability report (Appendix P)

26 CAPACITY TO MANAGE AND REHABILITATE THE ENVIRONMENT

The capital cost includes the development of all surface and ground infrastructure. Key infrastructure to be constructed to manage environmental impacts is water management infrastructure in order to manage contamination and flow impacts. The Mine Works Programme provides an operational cost which includes the employment of personnel and the cost of the resources required to implement the management and mitigation measure commitments in the EMP. The closure costing provides for the removal of surface infrastructure and site rehabilitation to be suitable for end land use i.e. limited agricultural and residential use.

27 UNDERTAKING SIGNED BY APPLICANT

COMMITMENT/UNDERTAKING BY APPLICANT

I,...

the undersigned and duly authorised thereto by

....……………………………………

undertake to adhere to the requirements and to the conditions set out in the approved EMP with the exception of the exemption(s) and amendment(s) agreed to be relevant by the Regional Manager: _________________________ (include relevant province).

Signed at: ....………………

On: ....

Signature: …………………...………………

Designation: ……………………...…………….

REGIONAL MANAGER: __KWA-ZULU NATAL_____ REGION

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) this document of ………………………………….………………………… is approved subject to the conditions as set out in the letter of approval.

Signed at: ....………………...

On: ....

Signature: …………………………………..

Designation: …………………………………..

REGIONAL MANAGER: _________________

28 ENVIRONMENTAL IMPACT STATEMENT & CONCLUSION

This document presents the project plan as defined by Tholie Logistics, presents findings of specialist studies, identifies and assesses potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts, and identifies measures together with monitoring programmes to monitor and mitigate potential impacts.

An overall summary of the potential impacts (as per Section 8 of the EIA and EMP report), associated with the chosen alternatives (as per Section 3 of the EIA and EMP report), in the unmitigated and mitigated scenarios for all project phases is included in Table 63 below.

The assessment of the proposed project presents the potential for significant impacts to occur on the bio-physical, cultural and socio-economic environments. In most instances, impacts are easily managed and the post mitigation significance can be reduced to low. This is mainly due to the reduced footprint of surface infrastructure and the decision by the applicant to sell all material mined and to focus on underground coal resources only. Due to the sensitivities of the natural environment and presence of homesteads within the study area, impacts that will require careful monitoring include impacts on biodiversity (terrestrial and more specifically aquatics), water resources, the safety of road users, air quality and noise.

The project is expected to generate significant economic benefits when compared to alternative land uses for the project site. Nearby communities are expected to benefit both directly and indirectly. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the increased spending power of employees.

TABLE 63: TABULATED SUMMARY OF POTENTIAL IMPACTS

Section	Potential impact	Unmitigated	Mitigated
Topography	Hazardous excavations	High	Low
Soils and land capabilities	Loss of soil resources and associated natural land capabilities	Medium	Low
Biodiversity	Physical loss of biodiversity	High	Medium to Low
	General disturbance of biodiversity	High	Medium to Low
	Loss or disturbance of aquatic ecosystems	High	Medium
Water	Loss of water affecting third party users	High	Medium to Low
	Contamination of water	High	Medium to Low
Air quality	Increase in air pollution	High	Medium to Low
Noise	Increase in disturbing noise levels	High	Medium to Low
Visual	Negative landscape and visual impact	High	Medium
Land use	Impact on surrounding land uses	High	Medium to low
	Blasting hazards	High	Low
	Project-related road use and traffic – reduced road conditions	High	Low
	Project-related road use and traffic – safety related	High	Medium

Section	**Potential impact**	**Unmitigated**	**Mitigated**
	aspects		
Heritage (and cultural)	Destruction of heritage resources	High	Low
	Disturbance (indirect) of heritage resources	Medium	Low
Socio-economic impacts	Loss of mineral resources through sterilisation	Negligible	
	Economic impact (positive and negative)	Medium+	Medium+
	Inward migration and social ills	High	Low
	Relocation	High	Low

Given the findings of this study, it is possible for Tholie Logistics to develop the mine with significant positive economic impacts (including secondary positive social impacts) and medium to low impact on the environment on condition that the mine is operated in a responsible manner, recommendations contained in this report are implemented and where monitoring indicates an area of concern (if applicable), corrective actions are implemented without delay.

Alex Pheiffer (PrSciNat)
(Project Manager)

SLR Consulting (Africa) (Pty) Ltd

REFERENCES

Airshed Planning Professionals (Pty) Ltd. October 2015: *Air Quality Specialist Impact Assessment Report for the proposed Commissiekraal Coal Mine.*

Bamford, M. October 2015: *Palaeontological Impact Assessment for the proposed Coal mine on farm Commissiekraal 90HT, in the eMadlangeni Local Municipality and Amajuba District Municipality of the KwaZulu Natal Province, Desktop study*

Delta H Water Systems Modelling. October 2015: *Groundwater Impact Assessment for the Commissiekraal Coal Mine Project.*

Highlands Hydrology. October 2015: *Hydrology Assessment for the proposed Commissiekraal project.*

Mercury. October 2015: Economic Impact Assessment and Sustainable Land Use Assessment for the proposed Commissiekraal Coal Mine

Mphahlele Wessels and Associates (MWA) Socio-Sustainability Advisors. April 2013: *Commissiekraal Coal Project - Lawful Tenants, Interested and Affected Parties Consultation Report*

Pistorius, Julius. October 2015: *A Phase I Heritage Impact Assessment for the proposed Commissiekraal coal mine on the farm Commissiekraal 90HT to the east of Wakkerstroom in the Kwa Zulu Natal Province of South Africa.*

PLANKONSULT Town and Regional Planners. March 2015: Proposed Coal Mine Including Support Services and Associated Infrastructure the Farm Commissiekraal 90ht No 17106, Emadlangeni Municipality Need and Desirability Motivation

Scientific Aquatic Services CC. July 2015: *Floral, Faunal, Wetland and Aquatic Assessment as part of the environmental assessment and authorisation process for the proposed Commissiekraal Colliery, KwaZulu Natal Province, Section B: Floral Assessment*

Scientific Aquatic Services CC. July 2015: *Floral, Faunal, Wetland and Aquatic Assessment as part of the environmental assessment and authorisation process for the proposed Commissiekraal Colliery, KwaZulu Natal Province, Section C: Faunal Assessment*

Scientific Aquatic Services CC. July 2015: *Floral, Faunal, Wetland and Aquatic Assessment as part of the environmental assessment and authorisation process for the proposed Commissiekraal Colliery, KwaZulu Natal Province, Section D: Wetland Assessment*

Scientific Aquatic Services CC. July 2015: *Floral, Faunal, Wetland and Aquatic Assessment as part of the environmental assessment and authorisation process for the proposed Commissiekraal Colliery, KwaZulu Natal Province, Section F: Impact Mitigations*

SLR Consulting (Africa) (Pty) Ltd. October 2015: *Development of the Proposed Commissiekraal Coal Mine KwaZulu-Natal Province, South Africa, Noise Assessment*

SLR Consulting (Africa) (Pty) Ltd. October 2015: *Commissiekraal Project, Traffic Impact Assessment Rev 2.*

SLR Consulting (Africa) (Pty) Ltd. August 2014: *Commissiekraal Coal Prospecting Asset, Kwa-Zulu Natal. Geochemical Assessment, Phase 1: Preliminary Assessment.*

SLR Consulting (Africa) (Pty) Ltd. August 2014: *Commissiekraal Coal Prospecting Asset, Kwa-Zulu Natal. Geochemical Assessment Phase 2: Geochemical Characterisation for Underground Mining*

SLR Consulting (Africa) (Pty) Ltd. October 2015: *Calculation of the Financial Closure Liability Associated with the Proposed Commissiekraal Coal Project*

SLR Consulting (Africa) (Pty) Ltd. October 2015: *Development of the Proposed Commissiekraal Coal Mine, Social Impact Assessment Report*

SLR Consulting (Africa) (Pty) Ltd. October 2015: *Commissiekraal - Site Wide Water Balance for EIA*

TerraAfrica. October 2015: *Soil, Land Use and Land Capability Report for the Proposed Commissiekraal Coal Mine Project*

Tholie Logistics Pty Ltd. November 2014: *Social and Labour Plan: Tholie Logistics (Pty) Ltd Commissiekraal Coal Mine.*

APPENDIX A: INFORMATION-SHARING WITH REGULATORY AUTHORITIES

- Proof of delivery for application to the DEDTEA (December 2014)
- DEDTEA acknowledgement of acceptance of application (December 2014)
- DMR mining right application acceptance letter (January 2015)
- Correspondence received from land claims commission (May 2013 and March 2015)
- Proof of invitation to public scoping meeting and site visit to regulatory authorities (February 2015)
- Proof and acknowledgement of scoping report submission to DMR (March 2015)
- Proof of submission on SAMRAD (March 2015)
- Proof of scoping report distribution to regulatory authorities (April 2015)
- DEDTEA acknowledgement of scoping report (April 2015)
- DAFF acknowledgement of scoping report (April 2015)
- Written comments on the scoping report (April – June 2015)
- Proof of site visit invitation to regulatory authorities (May 2015)
- DMR response to comments received (June 2015)
- Regulatory authority site visit meeting minutes, presentation on the 17 June 2015 and proof of distribution to regulatory authorities (July 2015)
- Proof of final scoping report submission to DMR and DEDTEA (19 June 2015)
- DEDTEA acknowledgement of final scoping report (July 2015)
- DEDTEA acceptance and comments on scoping report (July 2015)
- Proof of DWS site visit invitation (August 2015)
- Updated EIA timing notification to regulatory authorities and IAPs (September 2015)

APPENDIX B: STAKEHOLDER DATABASE

APPENDIX C: INFORMATION-SHARING WITH IAPS

- Proof of invitation to biodiversity workshop (July 2014)
- Biodiversity workshop minutes and attendance register (August 2014)
- Social scan notes and landowner notification meeting minutes (March 2013, November 2014, March 2015)
- English, Afrikaans and Zulu background information document (BID) (March 2015)
- English, Afrikaans and Zulu site notices
- Proof of site notices placements (March 2015)
- Proof of newspaper advert placements (March 2015)
- Proof of invitation to public scoping meetings and distribution of BID (emails, sms, post, radio announcement) (March 2015)
- Public scoping meeting minutes and presentation
    - Luthilunye Combined School (26 March 2015)
    - Kemplust Community Hall (26 March 2015)
- Response form comments received during public scoping meetings (March 2015)
- Request for tourism business database from WWF and Afriforum (May 2015)
- Proof of scoping report and summary distribution to public venues (hand delivered) and summary to IAPs (emails, sms, post) (April 2015)
- Written cmments on scoping report (May 2015)
- Newsletter (English, Afrikaans and Zulu) notifying IAPs of final scoping report and EIA timing update
- Proof of newsletter distribution (hand delivered, email and post) (June 2015)
- EIA update notification (September 2015)

APPENDIX D: COMMENT AND RESPONSE REPORT

APPENDIX E: SOIL, LAND CAPABILITY AND LAND USE STUDY

APPENDIX F: BIODIVERSITY STUDY

APPENDIX G: HYDROLOGICAL STUDY

APPENDIX H: GEOHYDROLOGICAL STUDY

APPENDIX I: AIR QUALITY STUDY

APPENDIX J: NOISE STUDY

APPENDIX K: HERITAGE (INCLUDING CULTURAL ASPECTS) STUDY

APPENDIX L: PALAEONTOLOGICAL STUDY

APPENDIX M: SOCIAL AND ECONOMIC STUDIES

APPENDIX N: TRAFFIC STUDY

APPENDIX O: GEOCHEMISTRY STUDY

APPENDIX P: CLOSURE COST CALCULATION STUDY

APPENDIX Q: CLIMATIC WATER BALANCE

RECORD OF REPORT DISTRIBUTION

Project Number:	710.02038.00001
Title:	Commissiekraal Coal Mine including support services and associated infrastructure
Report Number:	2
Proponent:	Tholie Logistics (Pty) Ltd

Name	Entity	Copy No.	Date issued	Issuer
S Francis	Department of Mineral Resources	1 – 9	October 2015	Alex Pheiffer
N Mabaso	Department of Economic Development, Tourism Environmental Affairs	10	October 2015	
L Sibango	Department of Water and Sanitation	11	October 2015	
J Maivha	Department of Agriculture, Forestry and Fisheries	12	October 2015	
R Ryan	Department of Transport	13	October 2015	
L Boucher	Department of Rural Development and Land Reform	14	October 2015	
D Wieners	Ezemvelo KZN Wildlife	SAHRIS upload	October 2015	
B Pawandiwa	Amafa/ Heritage	15	October 2015	
F Krige	Mpumalanga Tourism and Parks Agency	16	October 2015	
P Baytop	Amajuba District Municipality	17	October 2015	
M Gugu	eMadlangeni Local Municipality	18	October 2015	
Public review	Utrecht Library C/o Sizakele Magubane (Reference librarian)	19	October 2015	
Public review	Luthilunye Combined School (plus 250 Zulu summary documents) C/o Mr T Ndimande (School principal)	20	October 2015	
Public review	Kemplust (plus 100 Afrikaans summary documents) C/o Eugene de Witt (Caretaker)	21	October 2015	
Heye Daun	Tholie Logistics C/o Bright Resources	Electronic	October 2015	
Carol Kenyon	SLR Fourways Library	22	October 2015	