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DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED RELOCATION OF A COAL HANDLING AND PREPARATION PLANT AND TAILINGS STORAGE FACILITY TO PORTIONS 5 AND 10 OF THE FARM VOORSLAG 274 IS, MPUMALANGA PROVINCE

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Submitted to:
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Environment and Tourism, Gert Sibande District
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DISCLAIMER

EXECUTIVE SUMMARY

Introduction and project description

The Applicant, South African Coal Mine Holdings Limited (Pty) Ltd, is making an application for Environmental Authorisation for the relocation of a Coal Handling and Preparation Plant (CHPP) and Tailings Storage Facility (TSF) on the Farm Voorslag 274 IS in terms of the National Environmental Management Act, Act No. 107 of 1998 [as amended] (NEMA). This Application for Environmental Authorisation is being made to the Competent Authority (CA) namely the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), and is required since the proposed development includes activities which are listed in terms of NEMA and the Environmental Impact Assessment (EIA) Regulations, 2010 [as amended] (EIA Regulations). The site where the activity is proposed is located at the existing Umlabu mine, in the Breyten area of Mpumalanga Province.

Environmental Assurance (Pty) Ltd. (ENVASS) was appointed by South African Coal Mine Holdings Limited (Pty) Ltd. (SACMH) to undertake the Scoping and Environmental Impact Assessment process which requires compliance with the EIA Regulations promulgated in terms of NEMA.

The project proposal entails the following**:**

1. The construction of a Coal Handling and Preparation Plant (CHPP). A coal handling and preparation plant is a facility that processes coal by washing it of impurities and preparing it for transportation to the end user or market. Coal processing is a vital part of coal handling and preparation plants as it needs to be stored at different stages of the preparation process and conveyed across the CHPP.

2. The construction of a Tailings Storage Facility (TSF) for refused mining tailings where the waterborne refuse material will be pumped in to allow the sedimentation (meaning separation) of solid particles from the water.

Legislative requirements

National Environmental Management Act, 1998 (Act 108 of 1998) [as amended] (NEMA):

The proposed development requires compliance with the EIA Regulations promulgated in terms of NEMA. The proposed activity requires a Scoping and EIA process as listed activities 11, 13 18, 22 and 28 under Government Notice No R. 544 as well as listed activities 15 and 20 of Government Notice No R. 545 of the EIA Regulations are triggered.

National Water Act, 1998 (Act 36 of 1998) [as amended] (NWA)

The proposed development also requires compliance with the National Water Act, 1998 (Act 36 of 1998) [as amended (NWA). An application for an Integrated Water Use Licence (IWUL) in terms of Section 21 to undertake the following activities will be submitted to the Department of Water and Sanitation:

(a) taking water from a water resource;
(b) storing water;
(c) impeding or diverting the flow of water in a watercourse;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource; and
(i) altering the bed, banks, course or characteristics of a watercourse.

The requirements of the following legislation have also been considered:

- Constitution of South Africa (Act No. 108 of 1996) [as amended];
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [as amended] and associated regulations;
- National Environmental Waste Management Act (Act No. 59 of 2008) [as amended];
- Waste Classification and Management Regulations, 2013 (Government Notice 634 – 635 of 2013);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004) [as amended];
- National Dust Control Regulations, 2013 (Government Notice 827 of 2013);
- Veld and Forest Fire Act, 1998 (Act No. 25 of 1998) [as amended];
- National Environmental Management: Biodiversity Act (Act No.10 of 2004) [as amended] (NEMBA);
- Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014);
- Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended];
- Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995);
- Minerals and Petroleum Resources Development Act (Act No. 28 of 2002) [as amended]; and
- All relevant national, provincial and local guidelines, policies and frameworks and provincial and local legislation.

Need and Desirability

Currently the Coal Handling and Preparation Plant (CHPP) and Tailings Storage Facility (TSF) is located on the Farm Mooifontein 109 IT (refer to the general plan in ***Annexure 1***). Most of the mining activities were undertaken here and currently no opencast table reserves are left on the property. The only reserve left is on Farm Voorslag 274 IS. Therefore, it makes sense to locate the CHPP as near as possible to mining activities to limit the environmental impact associated with coal mining and processing.

If the mining operations move to the Farm Voorslag, the existing CHPP and TSF will be approximately 2 to 3 kilometres away (further to the south). If the CHPP and TSF remain at its current location on the Farm Mooifontein 109 IT, it would entail moving raw coal to the CHPP and TSF using heavy vehicles, over treacherous terrain which may ultimately result in unnecessary spillages and incidents.

To limit the environmental impact of the coal mining and processing it is required to relocate (and possibly upgrade) the existing facility to the Farm Voorslag 274 IS.

The current plant is located in a sensitive catchment where a stream had to be diverted to accommodate the plant. The impact on the water resources will be significantly lower should the plant be moved away and the stream rehabilitated.

Alternatives

Alternatives are defined in the NEMA EIA Regulations (2010) as *"different means of meeting the general purpose and requirements of the activity, which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; (e) the operational aspects of the activity; and (f) the option of not implementing the activity*".

For the purpose of this application, the following Alternatives are investigated:

- Input alternatives for the construction of the CHPP *i.e. building materials obtained from sustainable and legal resources vs. building materials from unsustainable resources and not blending with the surrounding environment;*
- Location alternatives for the CHPP and *TSF i.e. relocating the facility to the Farm Voorslag or leaving the facility at its current location (Farm Mooifontein);*
- Technology alternatives for processing and beneficiation of coal *i.e. alternatives for the dewatering of ultra-fine coal: filter presses vs. older types of filters;*
- Scheduling alternatives *i.e. construction during dry winter months vs. wet summer months;* and
- No-Go / Status Quo alternative.

Public Participation

A Public Participation Process was undertaken in accordance with the NEMA EIA (2010) Regulations and in terms of the DEA's Guideline on Public Participation (October 2012):

The following PPP tasks were conducted to date for the proposed development:

- Identification of key Interested and Affected Parties (I&APs) (affected and adjacent landowners) and other stakeholders (organs of state and other parties or organisations);

- Formal notification of the application to key I&APs and other stakeholders:
  - Publication of a media advertisement in the Highvelder was placed on Friday 25 January 2013. Refer to the PPP Report (Annexure 4) for proof of placement of the newspaper advert.
  - In order to inform surrounding communities and adjacent landowners of the proposed development, four (4) site notices were erected on site and at visible locations close to the site.
  - I&AP's and other key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on the 25th of March 2013.
- Consultation and correspondence with I&APs and stakeholders and the addressing of their comments;
- The Draft Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority on 18 July 2013 as per the requirements of Regulation 56 (4);
- The Final Scoping Report (FSR) and Plan of Study (POS) were released for a period of 21 days from 18 February 2014 to 14 March 2014 for public review and comment; and
- The Draft Environmental Impact Assessment (EIA) Report and Draft Environmental Management Programme (EMP) are hereby released to registered I&APs and stakeholders for review and comment.

The only comment received from an I&AP to date is from a neighbouring farmer who is concerned about the impact of the proposed development on the dam located on his property. A formal response was sent to him and the impact of potential pollution of the dam was assessed and is described in this report. Further comments from the South African Heritage Resources Agency (SAHRA) on the Heritage Impact Assessment (HIA) were also received.

Next steps in the process:

The Final EIA report will be released to registered I&APs and stakeholders for review and comment for a period of 21 calendar days.

Findings of specialists' studies

Based on the specialists' findings and recommendations, it is clear that the development can be approved and implemented, provided that the EMP, containing mitigation measures, be strictly implemented and monitored. It is clear from the findings that the benefits of the proposed activity outweigh the negative impacts on the environment.

Impact statement

(a) The following potential impacts resulting from the proposed development were identified:

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
PREFERRED ALTERNATIVE – CONSTRUCTION PHASE				
GEOLOGICAL AND SOILS		Loss of topsoil and soil erosion through vegetation clearance, wind and storm water.	Negative	Very Low
		Soil compaction by heavy duty vehicles	Negative	Low
		Contamination of soils through: - Indiscriminate disposal of construction waste; and - Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints.	Negative	Low
		Loss of soil resources for agricultural land uses.	Negative	Low
HYDROLOGICAL	SURFACE WATER AND GROUND WATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the construction phase.	Negative	Very Low
		Contamination of stormwater runoff and ground water, caused by: - Spills and leaks of cement; - Sediment release; - Chemical toilets; - Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles; - Other chemicals from construction activities e.g. paints; and - Effluent discharges, due to a lack of stormwater management.	Negative	Very Low
		Altered drainage patterns and stormwater runoff flows.	Negative	Very Low
		Impacts of dewatering on the groundwater aquifer should water be abstracted from ground water during the construction phase.	Negative	Low

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
BIOLOGICAL	FAUNA AND FLORA	Decrease in biodiversity on the study and surrounding area.	Negative	Low
		Wetlands on site and in the surrounding area could be damaged.	Negative	Medium
		Spill-over impacts, which may occur on adjacent ecological systems.	Negative	Medium
		Loss of vegetation on the areas surrounding the plant.	Negative	Medium
		Spreading of alien invasive species	Negative	Low
		Impact on natural migratory routes and faunal dispersal patterns.	Negative	Medium
		Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna.	Negative	Low
EXISTING LAND USE		Possibility of construction activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers.	Negative	Very Low
		Loss of land for other purposes e.g. for livestock or game farming.	Negative	Low
HERITAGE RESOURES		Potential for alteration of archaeological, historical and palaeontological resources, should it be discovered during the construction phase.	Negative	Low
VISUAL		Change of the visual character of the area as a result of the establishment of mining infrastructure (The plant will be situated on the watershed which is also the highest contour on site).	Negative	Medium
		Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	Negative	Medium
		Visibility of solid domestic waste and building rubble.	Negative	Low
		Dust settling on the surrounding area	Negative	Very Low
NOISE, VIBRATION AND LIGHTING		Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of construction vehicles and equipment.	Negative	Very Low
		Disturbance due to vibrations caused by construction vehicles.	Negative	Very Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
	Impact of security lighting on surrounding landowners and animals.	Negative	Very Low
AIR QUALITY	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	Negative	Very Low
	Settling of dust on the surrounding area and pasture for livestock.	Negative	Very Low
	Windborne fugitive dust and vehicle fumes and particulate matter PM10, altering air quality.	Negative	Very Low
WASTE	Generation of additional general waste/ litter / building rubble and hazardous material during the construction phase.	Negative	Low
SERVICES	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional strain on natural resources.	Negative	Low
TRAFFIC	The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	Negative	Low
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars, busses and other heavy vehicles.	Negative	Low
HEALTH AND SAFETY	Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers.	Negative	Very Low
	Increased risk to public health and safety: Dangerous areas and construction activities poses health risks and possible loss of life to construction workers and visitors to the site.	Negative	Very Low
	Security risks: Trespassing of construction workers on adjacent properties and possible crime.	Negative	Very Low
	Spreading of diseases such as diarrhoea, HIV and TB.	Negative	Low
SOCIO-ECONOMIC	Creation of short term employment opportunities for the local communities, during the construction phase.	Positive	Medium (+)
	Sourcing supplies from local residents and businesses.	Positive	Medium (+)

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
PREFERRED ALTERNATIVE - OPERATIONAL PHASE				
GEOLOGICAL AND SOILS		Loss of topsoil, soil erosion and soil compaction by heavy duty vehicles on site.	Negative	Very Low
		Contamination of soils through: - Indiscriminate disposal of waste; and - Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.	Negative	Low
		Soil degradation as a result of beneficiation process and coal handling.	Negative	Low
HYDROLOGICAL	SURFACE WATER AND GROUNDWATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the operational phase.	Negative	Very Low
		Contamination of stormwater runoff and ground water, caused by: - Spills and leaks of cement; - Sediment release; - Chemical toilets; - Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles; - Other chemicals from maintenance activities e.g. paints; and - Effluent discharges, due to a lack of stormwater management.	Negative	Very Low
		Altered drainage patterns and stormwater runoff flows.	Negative	Very Low
		Impacts of dewatering on the groundwater aquifer should water be abstracted from ground water during the operational phase.	Negative	Low
		Seepage from product stockpiles and tailings could cause a contamination plume affecting the underground resources.	Negative	Low
BIOLOGICAL	FAUNA AND FLORA	Destruction and or deterioration of biodiversity on the study and surrounding area.	Negative	Low
		Loss of vegetation type, ecologically important species and species of conservation concern.	Negative	Medium
		Wetlands on site and in the surrounding area could be damaged.	Negative	Medium

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
	Spill-over impacts, which may occur on adjacent ecological systems.	Negative	Medium
	Spreading of alien invasive species.	Negative	Low
	Impact on natural migratory routes and faunal dispersal patterns.	Negative	Medium
	Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna.	Negative	Low
EXISTING LAND USE	Possibility of mining activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers.	Negative	Very Low
HERITAGE RESOURCES	Potential for alteration of archaeological, historical and palaeontological resources, should it be discovered during the construction phase.	Negative	Low
VISUAL	Change of the visual character of the area as a result of the establishment of mining infrastructure (The plant will be situated on the watershed which is also the highest contour on site).	Negative	Medium
	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including stockpiles and waste dumps and activities.	Negative	Medium
	Visibility of solid domestic and operational waste.	Negative	Very Low
NOISE, VIBRATION AND LIGHTING	Nuisance and health risks caused by an increase in the ambient noise level as a result of the new tertiary crusher; however this will be housed within the coal handling and preparation plant.	Negative	Very Low
	An additional dump hopper to be constructed, will generate more noise.	Negative	Very Low
	Impact of security lighting on surrounding landowners and animals.	Negative	Very Low
AIR QUALITY	Increased dust pollution due to stockpiles and vehicles on gravel roads as well as other mining activities.	Negative	Very Low
	Settling of dust including coal dust, on the surrounding area and pasture for livestock.	Negative	Very Low
	Windborne dust (soil and coal fines) and vehicle fumes and particulate matter PM10, altering air quality.	Negative	Very Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
WASTE (INCLUDING HAZARDOUS WASTE)	Generation of additional general waste/ litter / and hazardous material during the operational phase.	Negative	Low
	Generation of operational waste i.e. reject material and hazardous material during the operational phase.	Negative	Low
SERVICES	Need for services i.e. water, electricity and sewerage systems during the operational phase causing additional strain on natural resources.	Negative	Low
TRAFFIC	The change in the traffic patterns as a result of traffic entering and exiting the new mine on the surrounding road infrastructure and existing traffic.	Negative	Low
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars, busses and other heavy vehicles.	Negative	Low
HEALTH AND SAFETY	Possibility of operational activities and workers causing veld fires, which can potentially cause injury and or loss of life to employees and surrounding landowners, visitors and employees.	Negative	Very Low
	Increased risk to public health and safety: Dangerous areas and operational activities poses health risks and possible loss of life to employees and visitors to the site.	Negative	Very Low
	Security risks: Trespassing of employees on adjacent properties and possible crime.	Negative	Very Low
	Spreading of diseases such as diarrhoea, HIV and TB.	Negative	Very Low
SOCIO-ECONOMIC	Job creation in an area where the main source of income is generated through primary activities e.g. farming;	Positive	Medium (+)
	Creation of job opportunities during the operation, maintenance phase, for local communities	Positive	Medium (+)
	The provision of improved infrastructure and social upliftment by creating employment and skills transfer to unskilled and semi-skilled unemployed individuals.	Positive	Medium (+)

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
ECOLOGICAL, HEALTH AND SAFETY AND SOCIO-ECONOMIC INCLUDING LAND USE	**Potential for spontaneous combustion or self-heating of coal stockpiles and coal in rail cars through oxidation, may have the following impacts:** - **Smouldering of coal reducing the quality of the coal;** - **It may emit noxious gases i.e. carbon monoxide and hydrogen and hydrocarbons i.e. propane and methane, other toxic substances, carcinogens and heavy metals;** - **Fires, causing damage to surrounding vegetation, loss of animals, economical loss of agricultural crops, handling problems, a threat to safety and economic loss of coal.** **The likelihood of this impact at transfer locations are however much less than at mines, power stations and collieries due to the shorter storage periods. The likelihood of combustion increases with the length of time coal is stored at any one location.**	**Negative**	**Low**
NO-GO ALTERNATIVE			
SOCIO-ECONOMIC	**No skills development for historically disadvantaged individuals (HDI's) and others from the local communities. Individuals will be more employable after the operational phase, which will benefit themselves, the workforce, the community and the economy.**	**Negative**	**Medium**
	No development and upliftment of the surrounding communities and infrastructure.	**Negative**	**Medium**
	No development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	**Negative**	**Medium**
	No creation of short to long term employment during all the phases of development for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	**Negative**	**Medium**

The impact assessment showed that the potential negative impacts resulting from the construction phase are generally low – medium in significance before mitigation. After mitigation most negative impacts have a very low or low significance and the remaining a medium significance. During the operational phase most negative impacts generally have a medium significance and the remaining a low or high significance. After mitigation most negative impacts will have a very low to low significance and the remainder a medium significance.

Two positive impacts with a medium significance during the construction phase and three during the operational phase have been identified. The significance of the positive impacts are rated as medium and the nature of the impacts are generally socio-economic.

(ii) Comparative Assessment of the activity and identified alternatives

Summary of Alternatives Comparative Assessment

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Proposed activity vs. No-Go Alternative	**Approve proposed activity and implement: Relocate the CHPP and TSF (the facility) from the existing location on the Farm Mooifontein 109 IT to the proposed position on the Farm Voorslag 274 IS.**	**No-Go Alternative: This will entail leaving the facility in its present location on the Farm Mooifontein 109 IT.**
	Conclusion: Due to fewer negative impacts on the environment of this option and positive impacts in terms of rehabilitating the stream, it makes sense to move the facility as close as possible to the adit, to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option.	**Conclusion:** Due to more disadvantages including more negative impacts on the environment associated with this option, it is not the preferred alternative.
Locality Alternatives	**Farm Voorslag 274 IS: Away from the drainage line of the tributary river to the Torbanite dam.**	**Farm Mooifontein 109 IT: In direct line of a tributary river flowing into the Torbanite dam.**
	Conclusion: The investigation concluded that the subject location (on the Farm Voorslag 274 IS) is the most suitable due to its ideal location in terms of the requirements for location of a CHPP and TSF and less environmental impacts.	**Conclusion:** Due to the current location of the facility being further away from the coal reserves currently mined on the Farm Voorslag 274 IS and other disadvantages as described in the detailed comparative analysis in Section 9.2 of this report, this option is not deemed to be the best alternative to the proposed activity location.
Input Alternatives Building Materials	**Sustainable Building Materials Obtained from Sustainable and Legal Resources/Origins:**	**Unsustainable Building Materials and Building Materials not blending with the surrounding environment:**
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Technology Alternatives: Dewatering of ultra-fine coal	**Filter Presses:**	**Older types of filters:**
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.
Scheduling Alternatives Construction Period	**Dry Winter Months:**	**Wet Summer Months:**
	Conclusion: This alternative will have a negative effect on air quality i.e. dust pollution and water usage for mitigating the impact. However should recycled water be used for dust suppression, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.	**Conclusion:** This alternative will have a negative effect on soil and rivers through sedimentation. However should an appropriate stormwater management plan be implemented, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.

Reasoned opinion of the Environmental Assessment Practitioner (EAP)

Based on the findings of the specialists' and the result of the EIA, the EAP is of the opinion that the proposed development be approved. The potential negative impacts can be mitigated to acceptable levels and are therefore not a limiting factor in the approval of the environmental authorisation. Due to fewer negative impacts on the environment of the proposed relocation of the CHPP and the TSF, as well as positive impacts in terms of rehabilitating the stream, it makes sense to move the facility as close as possible to the adit, to minimise further environmental impacts on the surrounding environment.

Recommendations

The recommendation of the EAP based on the assessment of the available information, is that the application for the proposed development should be authorised. This authorisation should be in line with sensitive planning, design and good environmental management. If the concept of sustainable development is considered it is proposed that the Coal Handling and Preparation Plant (CHPP) and TSF (Tailings Storage Facility) will have a positive impact on the provision of social and economic criteria. With the recommended guidelines provided by the various specialists' studies; the ecological component can also be brought into balance.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through physical measures, the recommendations from the EIA are included within the Environmental Management Programme (EMP). It is also recommended that the EMP attached as ***Annexure 6*** be approved. The EMP is based on all the information contained in this report as well as all the specialists' reports. It is recommended that the conditions of the Environmental Authorisation include that an independent Environmental Control Officer (ECO) should be appointed by the Applicant to monitor the implementation of the EMP through the site establishment and construction phase, the operational, decommissioning and rehabilitation phases.

Conclusion

A variety of mitigation measures have been identified that will serve to mitigate the scale, intensity, duration and significance of the potential negative impacts and enhance the potential positive impacts identified. These include guidelines to be applied during all phases of the project. The Environmental Management Programme (EMP) contains detailed mitigation measures.

The proposed mitigation measures, if implemented, will reduce the significance of the majority of the identified impacts. The impact assessment showed that the potential negative impacts resulting from the construction phase are generally low – medium in significance before mitigation. After mitigation most negative impacts have a very low or low significance and the remaining a medium significance. During the operational phase most negative impacts generally have a medium significance and the remaining a low or high significance. After mitigation most negative impacts will have a very low to low significance and the remainder a medium significance.

The proposed activities will have some positive impacts as it will allow for employment of individuals during the construction and operational phase in the Breyten area, which is an area where unemployment is rife. Two positive impacts with a medium significance during the construction phase and three during the operational phase have been identified. The significance of the positive impacts are rated as medium and the nature of the impacts are generally socio-economic.

The relocation of the CHPP and the TSF and associated operations can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks will be limited in its extent and most negative impacts can be mitigated to acceptable levels.

LIST OF ABBREVIATIONS

AIA - Archaeological Impact Assessment

ASAPA - Association of South African Professional Archaeologists

BID - Background Information Document

CA - Competent Authority

CSA - Constitution of South Africa (Act No. 108 of 1996) [as amended]

DEA - Department of Environmental Affairs

DEAT - Department of Environmental Affairs and Tourism (currently known as DEA)

DWA - Department of Water Affairs

EA - Environmental Authorisation

EAP - Environmental Assessment Practitioner

ECA - Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989)

EIA - Environmental Impact Assessment

EIR - Environmental Impact Report

EMP - Environmental Management Programme

ENVASS - Environmental Assurance (Pty) Ltd

ENPAT - Environmental Potential Atlas

EP - Equator Principles

EPC – Engineering and Procurement Contract

EPFI - Equator Principles Financial Institutions

ESA - Early Stone Age

GN - Government Notice

FGM - Focus Group Meeting

FSR - Final Scoping Report

GDP - Gross Domestic Product

GGP - Gross Geographic Product

GIS - Geographic Information System

GPS - Global Positioning System

HIA - Heritage Impact Assessment

I&APs - Interested and Affected Parties

IDP - Integrated Development Plan

IEM - Integrated Environmental Management

IHAS - Invertebrate Habitat Assessment System

IHIA - Intermediate Habitat Integrity Assessment

IWULA - Integrated Water Use License Application

IWWMP - Integrated Water and Waste Management Plan

IUCN - International Union for the Conservation of Nature

KSW - Key Stakeholder Workshop

LSA - Late Stone Age

LIA - Late Iron Age

LTI - Latitude Tilt Irradiation

MDEDET - Mpumalanga Department of Economic Development, Environment and Tourism

MSA - Middle Stone Age

MIA - Middle Iron Age

NEMA - National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended]

NEMAQA - National Environmental Management: Air Quality Act (Act No. 39 of 2004) [as amended]

NEMBA - National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended]

NEMWA - National Environmental Management: Waste Act (Act No. 59 of 2008) [as amended]

NHRA - National Heritage Resources Act, 1999 (Act No. 25 of 1999)

NSBA - National Spatial Biodiversity Assessment

NVFFA - National Veld and Forest Fire Act (Act No. 101 of 1998) [as amended]

NWA - National Water Act, 1998 (Act No. 36 of 1998) [as amended]

O&M - Operations and Maintenance

OTS - Old Torbanite Shaft

PES - Present Ecologica Status

PHRA - Provincial Heritage Resources Agency

PIA - Palaeontological Impact Assessment

PM - Public Meeting

PPP - Public Participation Process

PSSA - Palaeontological Society of South Africa

ROM - Run of Mine

SADC - Southern African Development Community

SAHRA - South African Heritage Resources Agency

SALA - Subdivision of Agricultural Land of 1970

SANBI - South African National Biodiversity Institute

SASS5 - South African Scoring System, version 5

SAWS - South African Weather Service

SDF - Spatial Development Framework

TSF - Tailings Storage Facility

VT - Vegetation Type

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Anthropogenic: Change induced by human intervention.

Applicant: Any person who applies for an authorisation to undertake an activity or undertake an Environmental Process in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA) as contemplated in the scheduled activities listed in Government Notice (GN) No R. 543, 544 and 545.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Archaeological resources:

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Cultural significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative impact: In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Ecology: The study of the interrelationships between organisms and their environments.

Environment: All physical, chemical and biological factors and conditions that influence an object.

Environmental impact assessment: In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental impact report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental management programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Hydromorphic / hydric soil: Soil that in its undrained condition is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Macro-geomorphological: Related to / on the scale of geomorphic provinces. A geomorphic province is a spatial entity with common geomorphic attributes.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Red data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping report: An "issues-based" report which forms the first phase of an Environmental Impact Assessment process.

Soil compaction: Soil becoming dense by blows, vehicle passage or other type of loading. Wet soils compact.

1. INTRODUCTION

Environmental Assurance (Pty) Ltd (ENVASS) has been appointed as independent environmental consultants to undertake the Scoping and Environmental Impact Assessment process for the relocation of a Coal Handling and Preparation Plant (CHPP) and Tailings Storage Facility to Portions 5 and 10 of the Farm Voorslag 274 IS, in the Breyten area of Mpumalanga Province. Refer to Figure 1 below.

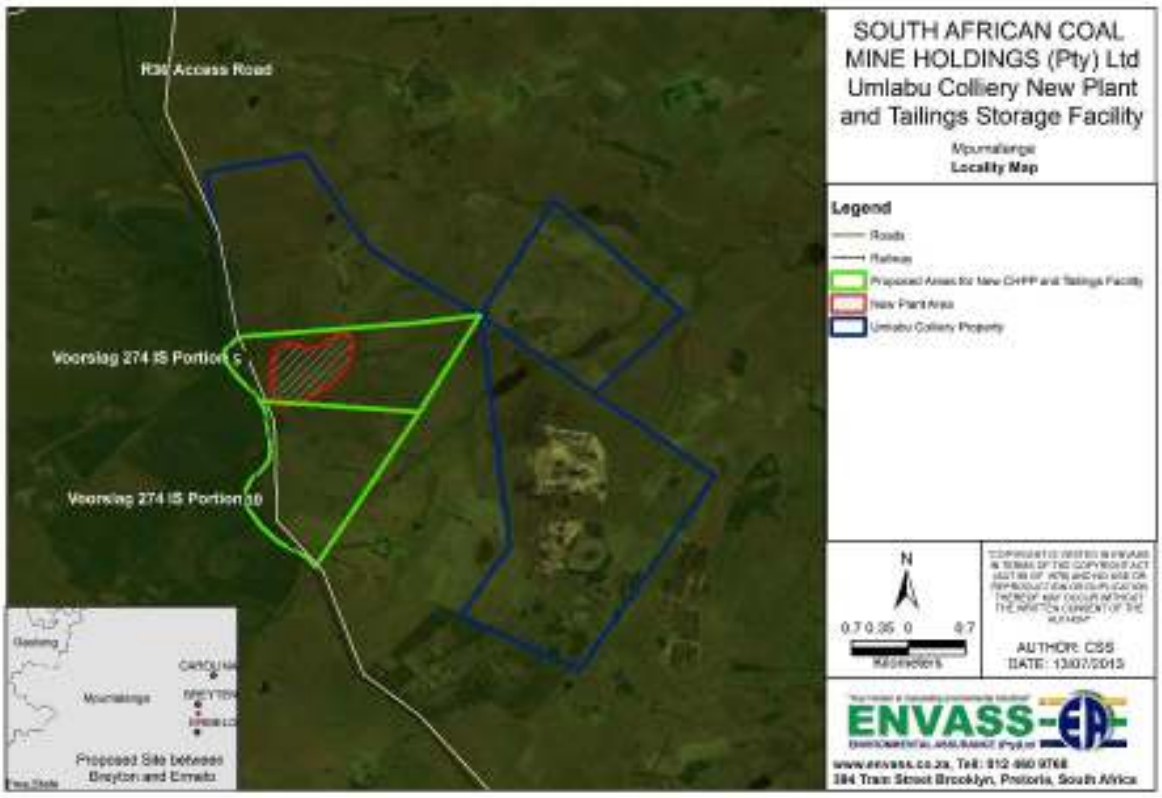

Figure 1: Locality Map

The proposed development requires environmental authorisation from the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), however, the Department of Water and Sanitation (DWS) have also been consulted in this regard. The development will be carried out in accordance with the Environmental Impact Assessment Regulations [as amended] (EIA Regulations), which were promulgated in June 2010 under the National Environmental Management Act (Act 107 of 1998) [as amended] (NEMA). All relevant legislation have been consulted during the EIA process and will be complied with at all times.

The proposed project will entail the construction of a Coal Handling and Preparation Plant (CHPP) and Tailings Storage Facility (TSF) that will be relocated from the Farm Mooifontein 109 IT. A CHPP is a facility that processes coal by washing it of impurities and preparing it for transportation to the end user or market. Coal preparation entails taking of raw coal and producing a saleable product that meets contract specifications by

removing the impurities. Coal preparation, as commonly practiced today, is carried out in water based processes, and makes use of slurry transport principles and procedures.

2. APPLICANT AND ENVIRONMENTAL PRACTITIONER DETAILS (REGULATION 31 (2) (A) (I-II))

Table 1: Applicant details

NAME OF APPLICANT	South African Coal Holdings Limited (Pty) Ltd
NAME OF THE FACILITY	The Umlabu Colliery (Portion 5 and 10 of the Farm Voorslag 274 IS, Breyten, Mpumalanga Province)
CONTACT PERSON	Mr Roelof Hugo
POSTAL ADDRESS	PO Box 55190, Northlands 2116
PHYSICAL ADDRESS	198 Oxford road, Illovo, Johannesburg 2000
TELEPHONE NUMBER	011 025 3103
FAX NUMBER	086 663 3019
CELL PHONE NUMBER	071 875 5398
EMAIL	roelof.hugo@sacmh.co.za
LOCATION OF MINE	The mine is situated on Portion 5 and 10 of the Farm Voorslag 274 IS, Breyten Mpumalanga Province.
MINERAL TYPE	Coal
ESTIMATED LIFE OF MINE	Estimated at approximately 30 years

Details of Environmental Practitioners

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Project team

Emile van Druten:

Emile started Environmental Assurance (Pty) Ltd in 2004 after having spent 12 years as an Environmental manager at various corporate institutions. His career started in the conservation field as an anti-poaching team member at the Kwa-Zulu Natal Parks Board.

He then joined the mining industry where he served companies such as Kudu Granite, Anglo American and BHP (Ingwe mining); his most recent corporate move was to Telkom South Africa where he headed up the Environmental and Health department.

Emile holds a BSc. (Hons) degree from the University of Potchefstroom (University of the North West); he complimented this with an Environmental training diploma from the University of Rhodes and a Masters' Degree in Project Management from the University of Pretoria [Management School].

He is a qualified ISO 14001 auditor having been appointed through a European based certification authority (TGA Germany).

Monica Niehof:

Monica has seven years' experience in the environmental field and 13 years work experience overall in a variety of fields including the tourism industry. She is currently studying towards a BSc. (Hons) degree in Environmental Management.

Her experience in the environmental field include Environmental Impact Assessments (EIAs), Environmental Management Programmes (EMPs), Public Participation Processes (PPPs) and Environmental Control and Monitoring for a variety of development projects including residential, retail, commercial and infrastructure projects.

3. DESCRIPTION OF THE PROPOSED ACTIVITY (REGULATION 31 (2) (B) AND (C) I-II)

Coal preparation is regarded as the processing of raw coal to yield marketable products and waste (refuse) by means that do not destroy the physical and chemical identity of the coal. Coal is a very heterogeneous material made up of different coal types and varying amounts of mineral matter. As mined, it normally contains all the layers of coal and impurities found in the seam, plus portions of the strata above and below the coal seam. The preparation plant sizes, crushes and removes impurities so that the coal may be shipped as a saleable product.

There are four basic types of operations used in the beneficiation of coal. To these may be added a number of auxiliary operations which are not directly involved in the cleaning of coal. The four basic operations are comminution, sizing, concentration and dewatering.

Comminution

Comminution means reduction to a smaller size. Depending on the size involved, the coal is crushed, broken or ground. Breaking is commonly used on the largest sizes, crushing on the mid-range sizes and grinding is used on the very finest sizes. Grinding or pulverizing is normally done just prior to utilisation. There are no hard and fast rules as to what these size ranges are. Adjacent coal preparation facilities may have different size ranges for similar coal.

Sizing

Sizing is the separation of coal into products characterised by difference in size. This can be accomplished by screening or by classifying, the latter being a sizing method dependent upon the relationship existing between the size of coal particles and their settling velocity in a fluid medium, generally water.

Concentration

Concentration is the separation of coal into products characterised by some physical difference such as specific gravity. Concentration is the heart of coal preparation, where the actual cleaning occurs and where the refuse is separated from the coal. It is normally accomplished in jigs and dense medium vessels, on tables in dense medium cyclones, water only cyclones or flotation cells. It can also be accomplished during other unit operations, such as sulphur removal by crushing to liberate the sulphur particles (pyrite) and then screening or classifying to achieve separation (pyrite being normally smaller and heavier than coal).

Dewatering

Dewatering is the removal of surface moisture that clings to the coal surface area. The finer the coal, the greater the surface area and surface moisture will be. Dewatering by mechanical means is generally conducted only to the extent of producing a damp cake. If further dewatering is desired, driers requiring fuel for evaporation of moisture are essential. Thermal dryers also produce a large amount of dust that must be scrubbed from the air and then disposed of. A common by-product of dewatering is the removal of super fine coal which in most coals is high in ash, sulphur and surface moisture; this is referred to as desliming.

Auxiliary operations are by nature quite diverse. They involve storing (in bins, silos or open piles), material transport (by conveyors, feeders, elevators or pumps), sampling, weighing, chemical reagent feeding, fed distribution and such other operations needed to move or control the coal from one cleaning operation to another.

The terms "*preparation*" and "*cleaning*" are used interchangeably in referring to the processing of the raw "run of mine" (ROM) coal. The "feed" to the cleaning plant or equipment is the material received for processing. "Near gravity" material is that material which is within ± 0.10 specific gravity units of a desired specific gravity. For example at 1.6 specific gravity, near gravity would be material that sinks at 1.5 Sp.Gr. and floats at 1.7 Sp.Gr. The products are the concentrate and the tails (a final tailings is called "refuse" if dry and "slurry" if wet and pumpable). If more than two products are made, the other is called "middlings". To process the coal in a piece of equipment, it is necessary to have the coal moving through the machine. The depth of the coal moving is referred to as the thickness of the "bed". In some processes (notably breaking or screening), the process efficiency can be increased by removing the material which is smaller ("minus") than the product size. This is called "scalping", and on larger sizes is done with a large opening screen ("grizzly").The clean product is referred to as "clean coal" or "washed coal", interchangeably. Material going over or out the top of a machine is called the "overflow". Similarly material coming out the bottom of a machine is called "underflow".

Coal process selection:

The selection of the processing flow sheet is probably the single most important step in the plant design process. Design of physical structures, placement of equipment, etc. will stem from the flow sheet and be influenced by the flow selected. The question "What do the client want to achieve?" must continually be asked, and each answer scrutinized to make sure that basic purposes are not being lost in the enthusiasm of the design.

Prior to selecting the flow sheet, the following questions must be asked in determining the basic purpose of the plant:

i) What characteristics of the raw coal make it necessary to install preparation facilities? Why?
ii) What sizes of raw coal must be cleaned?
iii) To what degree must the percentage of ash and sulphur be reduced to ensure a saleable product?
iv) Will further reduction of ash and / or sulphur improve saleability? Utilization?
v) What limit must be placed on preparation cost per clean ton due to reject losses, operations, maintenance and depreciation?

Analysis of the foregoing considerations guides the choice of the best way to clean the specific gravities greater than coal. So the density of a coal particle is a direct measure of its purity; and differences in specific gravity provide the basis for the mechanical separation of coal from non-coal refuse.

Coal preparation processes fall into two general types:

1. Those conducted in water-only medium; and
2. Those conducted in a mixture of water and a high gravity material such as magnetite (dense medium systems).

The general guideline for selecting the applicable process is based on the sink-float data for the coal under question. A dense medium is normally used when the separating gravity is 1.50 or below, or if there is more than 10% near gravity material. Water only processes are normally used when the separating gravity is above 1.60 and there is less than 10% near gravity material.

COARSE COAL

Jigging has been the most widely used means of cleaning coarse coal for more than half a century. The first coal jigs were direct copies of ore jigs, in which a basket loaded with mixed particles was moved up and down in a tank of water. Thus agitated, the particles become re-arranged in layers of increasing density from top to bottom. The same principle is used in modern coal jigs to stratify and separate usable and unusable products. Highly refined versions exist of the Baum type jig, based on an air impulse concept in which the water is cyclically jigged by air pressure from and adjacent sealed chamber. Jigging is more preferably applied to a wide size-range of particles with a top sizes up to 203 mm than to a closely sized fraction.

Dense medium separation provides more accurate separation and higher recovery of saleable coal than jigging. Coal is slurried in a medium with a specific gravity close to that of the desired separation. The lighter coal tends to float and the refuse to sink. The two fractions are then mechanically separated. While other media have been used, most coal cleaned by the dense medium process is separated in suspensions of magnetite in water. The process is versatile, offering easy changes of specific gravity to meet varying market requirements, and the ability to handle fluctuations in feed in terms of both quantity and quality. In practice, feed sizes may range from a bottom size of 6.3 mm to a top size of approximately 150mm or larger.

FINE COAL

Fine coal concentrating processes generally include those processes which clean 9.652 mm top size coal. This is an arbitrary size which seems most consistent with actual practice, although certainly these processes can effectively clean coarser or finer coal.

The feasibility of cleaning fine coal was enhanced with the development in Europe around 1946 of the first efficient centrifugal (cyclone) cleaners. In the United States, the first cyclone installation was made in 1961. Inclusion of cyclones in coal cleaning circuits has grown in numbers as their profitability in applicable situations was proven.

Essentially the same considerations involved in the selection of means for cleaning coarse coal apply in specifying the proper cyclone cleaner for fine coal. Analysis of adequate washability samples, feed tonnages, size analysis and other data should precede the design of all stages of the coal cleaning circuit. Further specific data needed to select the optimum type and size of cyclone for a given installation includes:

- Type of solids in feed;

- Gallons per minute of feed pulp;
- Size of solids in feed;
- Percent of solids by weight in feed pulp;
- Specific gravity of the solids; and
- Classification desired.

In its operation a slurry of coal and medium (magnetite dispersed in water) is admitted at a tangent near the top of the cylindrical section that is affixed to a cone shape lower vessel. The slurry forms a strong vertical flow; and under gravimetric forces the refuse with its higher specific gravity moves along the wall of the cone and is discharged below at the apex. The coal particles of lesser specific gravity move toward the longitudinal axis of the cyclones and finally through the centrally positioned vortex finder and the upper overflow chamber to the discharge outlet as clean coal. The dense medium cyclone functions efficiently regardless of the amount of near gravity material in the feed.

Original research on cyclones led to the development of the water-only, or hydrocyclone, which performs a specific gravity separation employing only water and centrifugal force. Its design features which permits the use of water only is the wide angle, or angles, in its conical bottom. This promotes the formation of a hindered settling bed, as the dense particles move down the side wall under the impetus of gravity. Less dense particles cannot penetrate this heavy bed, and move back into the main hydraulic current to be discharged out the top of the unit through the vortex finder. Applied in easier cleaning situations than dense medium devices, water only cyclones have been used to wash coal. Those water only cyclones washing coal are generally specified because of the presence of pyrite or oxidized coal which has proved difficult to wash by other means.

Another commonly used fine coal cleaning device is the concentration table. Tables have been used for cleaning coal for over 70 years. The most generally accepted explanation of the action of a concentrating table is that, as the material to be treated is fanned out over the table deck by the differential motion and gravitational flow, the particles become stratified in layers behind the riffles. This stratification is followed by the removal of successive layers from the top downward by cross-flowing water as the stratified bed travels toward the outer end of the table. The cross flowing water is made up partly of water introduced with the feed and partly of dressing water fed separately through troughs along the upper side of the table. The progressive removal of material from the top toward the bottom of the bed is the result of the taper off of the table riffles toward their outer end, which allows a successively deeper layer of material to be carried away by the cross flowing water as the outer end of the table is approached. By the time the end of the table is reached, only a thin layer, probably not thicker than one or two particles, remains on the surface of the deck, this layer being finally discharged over the end of the table. The above processes are all based on the different specific gravity of coal and refuse. The last process is based on the surface chemistry of the various constituents in the feed stream. Froth flotation is a chemical process that depends on the selective adhesion to air of some solids and the simultaneous adhesion to water of the solids. A separation of coal from coal waste then occurs as a finely disseminated air bubbles are passed

through a feed coal slurry. Air adhering particles (usually the coal) are separated from non-adhering particles, floated to the surface of the slurry, and then removed as a concentrate. This process involves the use of suitable reagents to establish a hydrophobic or air-adhering surface on the solid's hydrophilic or water loving surface.

Coal preparation circuits:

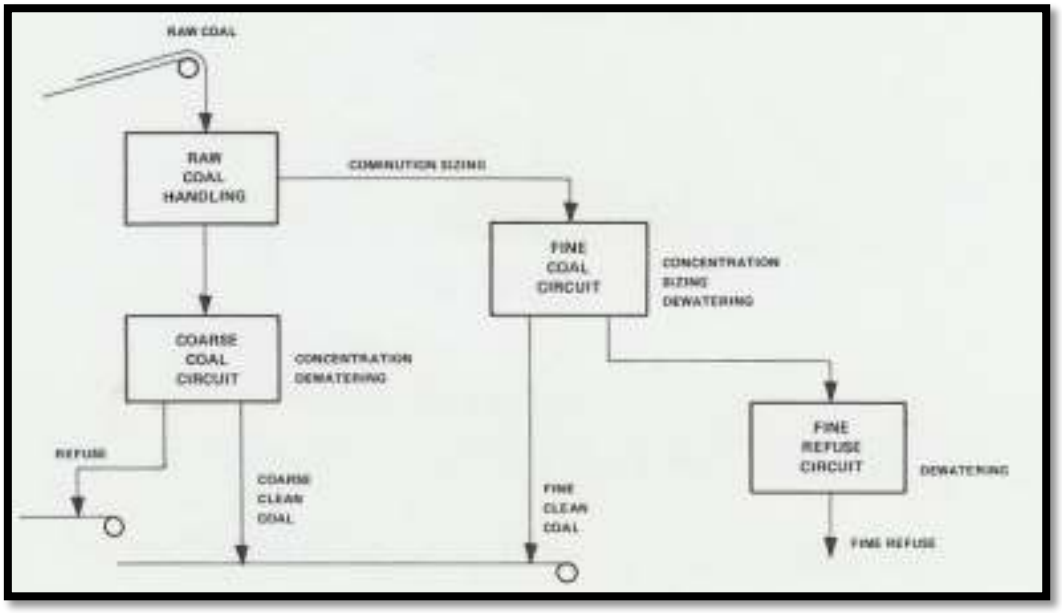


Figure 2: Typical coal preparation plant flow scheme

Each block shown in Figure 2 is composed of several separate pieces of equipment performing the various unit operations required. Often, when coal preparation is discussed, the discussion fixes upon the concentrating equipment, and it is forgotten that none of this equipment can function by itself. This equipment is all interrelated and supported by other equipment.

The raw coal handling is similar to any bulk material process whether it is coal, iron ore, phosphate, wheat, fish etc. There are six basic circuits used in processing coal. They are:

- Jig;
- Dense Medium Vessel;
- Dense Medium Cyclone;
- Water only cyclone;
- Table; and
- Froth flotation.

Jig

The jig circuit is the simplest circuit generally found in a coal preparation plant. Raw coal enters the preparation placed on the plant feed belt conveyor. The raw coal, after discharging from the conveyor, is sluiced into the jig. The jig produces a refuse product, a clean coal product and a middling product. Refuse and middlings are removed from the jig box by means of a bucket elevator, with perforated buckets to allow drainage of the excess water. The middling product is crushed to liberate coal, and is then returned to the jig feed sluice for reprocessing via a sump and pump. The clean coal screen separates the coal from the jig into three size fractions. The top size coal is crushed to size and then placed on the clean coal conveyor. The middle size fraction is dried in a centrifugal dryer and then placed on the clean coal conveyor. The fine coal flows into the sump where it is pumped to further processing as required. Besides the raw coal and electricity for the motors a jig requires a constant makeup water stream and a low pressure air supply to operate. The major portion of the water is added as push water at the head end of the jig, and the rest is added to each cell of the jig. The water is one of the control items in jig operations. Low pressure air from centrifugal blowers is used as the motivating force behind the pulsations in a jig. It is controlled by a series of valves to give a moving pulsation through the jig. The interaction of the raw coal feed and re-circulated middlings, water addition and air pulsations is used to control the jig capacity. Separating Specific Gravity is controlled by floats which open and close the refuse and middlings discharge gates.

Dense Medium Vessel

Dense medium vessels circuits are used for more difficult to clean coals. Raw coal and pre-wet screens will separate at 30mm. The oversize fraction will flow by gravity to the dense medium vessel to be combined with the media, where separation of clean coal and refuse products will take place. The major quantity of media used in the process will be drained by screens for both clean coal and refuse and will return directly to the recirculation medium sump. The remaining media adhering to the coal and refuse products will be rinsed on the rinse section of the screens and will be treated as dilute media. The top deck product from the clean coal drain and rinse screen will be crushed to desired product size. The second deck product will be dewatered in mechanical centrifuges. Refuse material will only be screened and conveyed to a refuse bin.

The dilute media will be treated in double-drum magnetic separators. The magnetic (most commonly used media) concentrate from the separators will be returned to the dense media circuit. The tailings from the magnetic separators will go to the raw coal feed as push water. Magnetic makeup will be fed on demand from the magnetic storage bin directly into the heavy media sumps. Also required is a constant supply of fresh water for sprays and makeup. Control circuitry is driven commonly by pneumatic means from a 100+ PSI instrument air compressor.

Dense Media Cyclone

Dense media cyclone circuits are used where applicable on the next size range below dense media vessels. De-sliming sieve bends and screens will separate at 28 mesh. The oversize fraction will flow by gravity to the dense media cyclone sump to be combined with the media and then pumped to the dense media cyclones, where separation of clean coal and refuse products will take place. The major quantity of media used in the process will be drained by sieve bends and screens for both clean and refuse, and will return directly to the heavy media sump. The remaining media adhering to the coal and refuse products will be rinsed on the rinse section of the screens and will be treated as dilute media. The product from the clean coal drain and rinse screen will be dewatered in mechanical centrifuges. Refuse material will only be screened and conveyed to the refuse bin.

The dilute media will be treated in double-drum magnetic separators. The magnetic concentrate from the separators will be returned to the heavy media circuit. The tailings from the magnetic separators will go to the raw coal distributor. Magnetite makeup will be fed on demand from the magnetite storage bin directly into the heavy media sumps.

Water Only Cyclone

Water only cyclones (other terms being hydrocyclones or concentrating cyclones) are commonly used for easy to separate coals. The coal in slurry form flows into a sump, where it is pumped to primary water only cyclones. The underflow from these cyclones is collected in a sump and pumped to the secondary water-only cyclones. The overflow from these secondary cyclones is recycled to the primary water-only cyclone sumps. The underflow from the secondaries, which is refuse, is dewatered by a screen and then combined with the other refuse material and is collected by conveyor. The screen underflow is piped to the refuse dewatering circuit. The overflow slurry from the primary water-only cyclone contains clean coal as well as un-cleaned fine material.

The two are separated by classifying devices such as VorSivs making the desired size separations. After separation the clean coal is dewatered by centrifugal dryers and then joins the other clean coal on the clean coal conveyor.

Tables

Concentrating table circuits are used for the same application as water only cyclones. The solids wet-screened from the raw coal feed will be slurried and directed to a sump under the raw coal screens. Each pump will pump this slurry to two VorSivs with ¼mm screen openings. A bypass valve will be provided to bypass a part of the VorSiv feed to each table distributor as desired.

The distributors will split the solids into equal streams. Each of these streams will feed a single deck table where the actual separation of clean coal and refuse products will take place.

The undersize slurry from the raw coal VorSivs will flow by gravity into the refuse sump. The clean coal product, from the tables, will gravity flow via pipes and launders into clean coal VorSivs.

Centrifuge effluent, after passing over tell-tale screens and the fine slurry from the clean coal VorSivs will discharge into a fine coal sump for further processing.

Froth Flotation

Fine coal cleaning circuits are becoming increasingly more common as coal product specifications become tighter. One circuit that has been appearing quite frequently is a combination of a single stage water only cyclone and froth flotation. This combination is interactive and requires careful planning as to how they relate to each other.

The de-sliming under-product, consisting of fine overflow of the cyclones will be fed to the rapped sieve bends, which will de-slime the clean coal products. The oversize coal product from the sieve bends will be fed to the vacuum filters. The sieve bend underflow, which will consist of the fine fraction of the coal, will be fed to the froth flotation circuit. Cyclone underflow will flow by gravity to the flotation circuit to recover any misplaced coal, or it can be bypassed to the flotation tailings.

The flotation circuit will process the undersize of the rapped sieve bend, which consists of the fine size fraction and the water-only cyclone underflow. The float product, together with the coarser water-only cyclone product from the sieve bend, will be fed to the vacuum filter. The filtrate will combine with the flotation cell tails and flow to the refuse thickener.

In addition the flotation also requires a reagent system consisting of storage tanks; reagent feed pumps and a reagent material system. Certain flotation also requires, or is enhanced by, addition of low pressure air. Clean coal handling from the flotation system must also consider that the product is aerated and hard to handle.

Refuse Dewatering

Refuse dewatering circuits are used to reclaim water for process use and to dewater the fine refuse prior to disposal. A refuse thickener will be provided to remove most of the fine solids in the process water. Sources of water to the refuse thickener are: tailings from the flotation cells and filtrate from the vacuum filter. Thickener overflow will be pumped back into the plant as raw coal slurry water and spray water. A thickener underflow pump will be provided to pump the slurry to settling ponds or to a vacuum filter or centrifuge for solids dewatering. If the solids are dewatered they are combined with the coarse refuse.

Material handling in a coal preparation plant

Like any process industry, coal preparation is a group of unit operations interconnected by a materials handling system. The materials handling system involves those dry process steps such as the conveyor system and the slurry process steps, which include the pumping system and the launderers. There are also process steps that are neither dry nor slurry; this last area is normally classed with the slurry handling system, as it usually runs to wet rather than to dry.

In a typical coal preparation plant, most material handling streams are slurry flow, except for the initial feed and the last three products (two clean coal and one dry refuse), which are dry flow. Slurry is either piped or flumed and laundered. Even in those areas such as sieve bend discharge, which are commonly chutes, the material is a very thick slurry.

Coal plant operators' problem with material handling systems fall into five basic and interrelated categories: accessibility, maintainability, availability, corrosion and abrasion. The first three categories are related to plant design and the problems can normally be resolve through the use of good engineering practices. The last two categories (corrosion and abrasion) related to the characteristics of the coal and how they affect the plant operation.

While coal is relatively soft as minerals go, it still can give operators problems in their slurry systems. Problems arise from several factors, one being that while coal is soft and tends to break into fresh surfaces instead of becoming rounded.

Because the coal particles break and do not round this means that the final processing steps are as subject to wear or abrasion as the first steps. Actually, they are subject to higher wear, due to the increase in the number of particles handled. An example of this would be that the fine coal discharge chutes need the same amount of wear protection as the fine coal underflow pans at the raw coal screens. The fine coal discharge chute from the basket centrifuge is usually lined with polished stainless steel, because the product is relatively dry, while the raw coal screen underflow pan is lined with cementations liner, because the product is in a true slurry form. Abrasion appears in the preparation plants as equipment, chutes and pipes wear. Depending on flow conditions, some items have been known to wear out in less than 500 hours.

Corrosion in a preparation plant occurs only on the non-wearing surfaces, as the wearing surfaces do not last very long. Historically, the primary source of corrosion has been from the leaching of sulphur to form sulphuric acid, or "coal mine drainage" water – the typical reddish runoff from old coal wash piles. A fairly new corrosion problem has begun to appear in the coal industry, and this is the build-up of ions in the processing water. This build-up has been occurring as more plants are closing their water circuits and only adding sufficient water for makeup product losses.

3.1 DESCRIPTION OF OPERATIONS AND INFRASTRUCTURE

Coal is highly variable with respect to the physical and chemical properties that affect its use. Industries that use coal specify a range of properties that are required for their intended process. Coal suppliers try to find coals that most closely match those requirements. Coal is treated in processes called "beneficiation" to prepare a material that meets the customer's needs and is as homogenous as possible. Samples of coal from both cores and mines are taken to determine the treatment that must be performed. Preparation plants that perform specific beneficiation processes are constructed as near as possible to the location where the coal is mined.

Three kinds of processes may be performed at the plants:

- sizing, controlled by a crushing and screening process,
- increasing heating value, by removing non-combustible ash and rock by gravity separation; and
- removing or controlling undesirable mineral and chemical components (sulphur, sodium, and trace elements) by a combination of gravity separation and blending.

Traditionally, most coal preparation was primarily concerned with sulphur and ash reduction. Today, however, much more sophisticated processes have more narrow and complex physical and chemical requirements for coal stock.

Coal beneficiation is the process of removal of the contaminants and the lower grade coal to achieve a product quality which is suitable to the application of the end user - either as an energy source or as a chemical agent or feedstock. A common term for this process is coal "washing" or "cleaning".

Coal washing operation

The washability characteristics of a coal reserve are provided by obtaining liberation data on the raw coal sample. Liberation refers to the amount of physical breakage required to separate material of different material densities. Low density material is clean coal where high density material is reject (rock). The intermediate density material is called middlings. Liberation data is commonly obtained by float and sink analysis.

Coal processing is a broader term used to describe the complete process of sizing, handling and washing of the run-of-mine coal. While the coal preparation engineer will require a full understanding of all the classification methods and properties of coal, it is mainly the relative density distribution of the mined material and its relationship to ash, volatile matter, moisture content and fixed carbon (collectively known as the proximate analysis) with which he will mostly work. Calorific value and sulphur content are also important parameters which relate to the relative density distribution.

This analytical method is termed "washability analysis" and it describes and quantifies the opportunity to upgrade a particular coal to a desired quality by gravity concentration methods. By study of the washability of the coal the

preparation engineer will decide at what specific gravity to separate the product from the discards to obtain the correct specification for the client.

Crushing and screening

Crushing reduces the overall topsize of the ROM coal so that it can be more easily handled and processed within the coal preparation plant. Crushing requirements are an important part of coal preparation plant design and there are a number of different types. Screens are used to group process particles into ranges by size. These size ranges are also called grades. Dewatering screens are used to remove water from the product. Screens can be static, or mechanically vibrated. Screen decks can be made from different materials such as high tensile steel, stainless steel, or polyethylene.

Closure processes

The closure objective is to ensure that all the significant impacts have been mitigated against. All rehabilitated areas will be left in a stable, self-sustainable state. Proof of this will be submitted at closure.

The closure objectives for the Umlabu Coal Colliery can be summarised as follows:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Ensure impact on any water bodies, water courses and catchment areas have been avoided or minimised;
- Rehabilitate disturbed areas as soon as possible; and
- Minimise the impact on the local community.

With specific reference to the groundwater environment, the following closure objectives should be pursued:

i. Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment); and
ii. Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion).

When and if necessary suitable structures and or systems are to be put, and kept in place to limit contamination of water resources to concentrations in accordance with the Target Water Quality Ranges for human consumption.

The goals upon decommissioning and closing of the CHPP and TSF will include that all significant impacts have been mitigated and that there are no alterations to the environment that are apparent as far as is practically

possible. All land will be rehabilitated to a state that facilitates compliance with current national environmental quality objectives including air quality objectives and water quality guidelines.

Storage of ore

The Run of Mine (ROM) stockpile will store a maximum of 30 000 ton of ore at any one time, at a steady state in the beginning, a stockpile will be built of up to 30 000 tons so as to start up the contractor.

Discard disposal facility

After the ore is extracted, waste rock will be placed on the waste rock dump by means of a conveyor belt. The waste rock dump will be positioned near the plant area.

3.1.1 Roads

No new haul roads will be required for access to the mineral reserves. All current road infrastructure will be utilized.

3.1.2 Loading and hauling

After the mineral resource that has been fragmented through blasting is loaded, using frontend loaders, onto haul trucks and transported to the CHPP. Active haul roads are watered to reduce dust generation during haulage. Alternative means of dust suppression on haul roads are intermittently being investigated and viable solutions will be implemented.

Material from the underground workings will be transported to the surface via conveyor belts. Where these belts reach the surface they may decant some raw product into temporary stockpiles or alternatively it can be directly linked with the CHPP.

3.1.3 Fuel depot

Plant vehicles are re-fuelled on a daily basis at the bunded fuelling depot. There will be fuel tanks within the bunded facilities on site.

3.1.4 Vehicle parking

Quarry Plant vehicles are parked adjacent to the quarry offices when not in use.

3.1.5 Mining administration

Plant administration and training of employees is performed within the administrative offices.

3.1.6 Workshop / wash bay

There is a dedicated workshop for the servicing of all mining and plant vehicles. The workshop also services the drilling equipment, compressors and pumps. Associated with the workshop is a lubricant store, a store for tyres and store for lead alkaline batteries.

3.1.7 Pollution Control impoundments

During the process of mining and cleaning of coal, waste is created and must be permanently disposed of in an impoundment. Preparation of coal, also called washing, is how non-combustible materials are removed from the mine. As the coal is washed, waste is created and classified as either course refuse or fine refuse. Larger materials such as rocks and pieces of coal are defined as course refuse. Slurry, a combination of silt, dust, water, and bits of coal and clay particles is considered fine refuse, and is the most commonly disposed of material held in an impoundment. Between 20 to 50 percent of the material received at a coal preparation plant may be rejected and housed in impoundments. The coarse refuse is used to construct the impoundment dam, which then holds the fine refuse or slurry, along with any chemicals used to wash and treat the coal at the coal preparation plant.

Whenever possible, impoundments are constructed using naturally occurring basins, but are often built up on an embankment at the mouth of a watershed. They are reinforced with course refuse and are characteristic of a typical dam. After the waste is spilled into the basin, the coal particles are allowed to settle, leaving the leftover water on top. This water is often recycled and used once again by the preparation plant. Settling ponds are constructed nearby to catch the runoff of excess water through a pumping system, and excess water from these ponds is discharged into a local waterway. Before being discharged, the water will be subject to water testing to determine whether the water quality is complying with DWA standards.

An impoundment is a system of multiple parts, and thus any weakness in one of these parts affects the others. Therefore, an impoundment can fail in many ways. Embankment failure and dam construction are two major concerns. During the past decade, malfunctions of this nature have fuelled better engineering and design of impoundments, but those built before then are more at risk for failure. Seepage, weakness in the walls, and undermining (in which an impoundment has been built a few meters above a mine, weakening the ground beneath it and causing it to fall through) are also major risks for failure. Breakthroughs into underground mine workings have been the cause of more recent catastrophic failures.

3.1.7.1 Site selection review criteria

An ad hoc site selection has been undertaken to give an idea on what to consider prior to the construction of the Tailing Storage Facility (TSF). Site specific information, as described below, is vital for the TSF site selection process. In order to ensure that this information is available at the time, the final decision needs to be made.

Included below is a list of typical factors that need to be taken into account to qualitatively or semi qualitatively identify suitable areas for tailing disposal.

3.1.7.2 TSF Volumetric capacity and footprint

Based on typical design criteria for a TSF site (As per Table 2 below) the TSF must be designed as to accept the given tonnes of tailings, at the given rates of rise, in a safe and environmentally acceptable manner.

Table 2: Typical TSF Design parameters

DESIGN PARAMETERS	DESIGN VALUE
Placed density	m3
Deposition rate	tpm
Life of mine	years
Total tailings over life of mine	t
Total storage capacity required	m3
Footprint plan area (excl. infrastructure within starter wall)	m2
Total affected area	m2
Final height	m
Total volume	m3
Total capacity	m3
Life of facility	years
Side slope angle	H
Side slope area	m2

3.1.7.3 Topography and drainage

The TSF needs to be located in suitable topography that can accommodate the storage requirements without excessive earthworks and onerous engineering design. A suitable location for the TSF would need to be moved away from the area where the underground mine is situated. A pre-requisite for the design of the TSF is to undertake a Geotechnical Assessment of the site and to ensure the stability of the underlying geology on which the TSF is to be constructed.

Other important reports and documents to consider include:

- Hydrogeology reports, maps and documents;
- Borehole positions and maps;
- Details of groundwater abstraction;
- Conceptual groundwater model;
- Recharge estimation;
- Blast risk assessment information and magnetometry; and

- Groundwater quality information.

3.1.7.4 Government legislation

According to Government Regulation GN R704 of the National Water Act (Act 36 of 1998) [as amended] (NWA); no mine residue dam and reservoir may be located within a 1:100 year flood-line or within a horizontal distance of 100m from a watercourse, estuary or well.

There are two non-perennial rivers that are considered during the EIA phase of the project. Although these rivers do not cross the portions to be affected by the proposed construction of the TSF, they are located in close proximity to the mine. Refer to

Figure 5. The existence in close proximity of the proposed development was identified as environmental aspects on which the proposed development may impact on, and it is assessed in this EIR. Mitigation measures for potential impacts are also recommended.

3.1.7.5 Distance from blasting area and plant

Generally a TSF should not be located within 500m of a blasting area. DMR approval is required for a TSF located within 500m of a blasting area.

A TSF should ideally be located as close as possible to the plant while at the same time should not have the plant within its zone of influence (failure zone) as describe in the SANS 10286 (code of practice for Mine Residue Deposits). Ideally a TSF should be located within a radius of 5km from the plant but this is not a restriction.

3.1.7.6 Geology and Hydrogeology

At this stage it is assumed that the TSF will be a lined TSF i.e. a facility that utilises a geo-membrane to form a barrier between tailings slurry (mine residue) and the natural hydro-geological environment. The primary objective of the liner is to prevent contamination of soil and ground and surface water as well as loss of water to the permeable foundation. Water contamination and loss must be minimised given the scarcity of water in South Africa.

3.1.7.7 Infrastructure and settlements

As far as possible the TSF should be sited away from high density settlements, commercial areas and regional services (e.g. provincial roads, main power lines, railway lines etc). More particularly as in the case with the plant, the siting of the TSF should be such that infrastructure and settlements are outside its zone of influence. Also proximity to settlements will cause communities discomfort from a dust pollution perspective.

3.1.7.8 Environmental issues

Specialists' studies were conducted and the findings and recommendations are summarised in Section 9.2 of this report.

The primary design objectives outlined should address the following aspects:

- the safe and stable containment of tailings;
- the management of decant and rainfall runoff;
- the minimisation or control of seepage;
- a cost effective storage system; and
- a planned system for effective closure.

The design should be adequate for the proposed use, meet contemporary standards and have identified and addressed all the likely risks associated with the site, the nature of the containment materials, the nature, quantity and treatment of the tailings, construction process and closure.

Good water management is critical to the safety of the TSF and the quality of the final outcome. The design of a TSF should display a quantitative water and salt balance of all gains and losses and satisfy the 'worst case' combination of risk factors (e.g. full TSF, wave action, design storm, breakdown of decant process). Water design requirements for TSFs including freeboard and emergency spillways are specified, these are adapted from criteria outlined by legislation and guidelines for dam design.

TSFs must be designed to ensure that the beneficial uses of groundwater and surface water are protected and to prevent other undesirable impacts such as waterlogging and land salinisation.

Although the permeability of deposited tailings sediment is often low and they may have the capacity to quickly attenuate contaminants, some seepage from TSFs, both during the deposition phase and after decommissioning, is inevitable. Where seepage may contain contaminates it must be minimised to levels that will not cause groundwater or surface water pollution.

Seepage may be controlled by the installation of a liner and/or adequate under drains. Proposed under drainage systems should be subject to appropriate Risk Assessment. In some cases, an external seepage collection system may be required.

Should a liner be required for the TSF, the Risk Assessment process should be used to specify an appropriate design permeability and liner thickness. The Risk Assessment should include consideration of the:

- Potential rate of seepage under and through the embankment and the base of the TSF;
- Predicted chemical composition of seepage;

- Predicted physical and chemical properties of the tailings;
- Characteristics of the underlying substrate; and
- Potential impacts on the beneficial uses of groundwater and surface water systems.

TSF design proposals incorporating a clay liner should specify a minimum thickness for the liner, taking the following factors into account:

- The thickness required to ensure construction is practicable given the need to compact in layers and minimise the development of preferential pathways;
- The applicability of assumptions about the degree of compaction to be achieved and the extent of homogeneity in the liner material;
- The permeability of the underlying substrate;
- The expected permeability of the emplaced tailings; and
- The risk of the liner integrity being compromised by cracking or mechanical damage while tailings are being deposited or prior to commencement of deposition.

3.1.7.9 Design closure and the TSF

Most TSFs require large quantities of cover material for closure. Accordingly, the Environmental Management Programme (EMP) should describe how the TSF is to be closed and the source of the cover material. A preliminary assessment of the geochemistry of the tailings, to identify any constituents with the potential to have an environmental impact, is fundamental to assessing requirements for closure.

The type and depth of cover are also influenced by the desired re-vegetation outcomes and future activities permitted on the closed TSF. These matters are discussed later in this document.

It is essential that construction of a TSF accords with the approved design and is carried out to a high standard of workmanship. Adequate supervision of the works is essential to ensure relevant factors are addressed.

A suitably qualified and experienced civil engineer should undertake supervision of the construction of the TSFs and those where contaminated tailings are to be stored.

'As Constructed' Reports detailing the construction of each lift should be prepared and retained to assist determination of the overall stability and the future life of the TSF.

The reports should include survey drawings of:

- The original ground surface contours inside and outside the TSF;
- The locations of test boreholes and pits (and details about their backfilling);
- The locations of the drainage system;

- The locations and profiles of any borrow pits inside the facility;
- Embankment profiles; and
- Confirmation that the lining has been constructed to the required specifications.

The retention of Construction Records is essential for the effective monitoring of long term performance. Ground conditions should be properly monitored and appropriate remedial works undertaken where zones of higher permeability or lower structural strength are encountered in the substrate. This information should be included in the 'As Constructed' Report.

The embankment walls should be correctly keyed in. The materials used should be appropriate and compatible with the rest of the design, emplaced to the correct compaction levels and gradient and produce an erosion resistant outer wall. Where it is necessary to vary the design during construction of the TSF, the operator should verify that the changes do not compromise the design objectives. The changes should be reviewed and endorsed by a suitably qualified and experienced person (such as the original designer).

Where a significant change to the design of the TSF is necessary a revised design, prepared and certified by suitably qualified and experienced person, must be submitted to the Department of Water and Environmental Affairs as well as the Department of Mineral Resources for approval.

A significant change in the design is one that would affect the Risk Assessment of the TSF.

3.1.7.10 Pipelines

The TSF will involve pumping and conveying of tailings and decant water by pipeline, discharge spigotting processes. All of these activities introduce a risk of accidental discharge as a result of failure of mechanical systems - such as broken pipelines or faulty control devices - or materials. Appropriate maintenance and replacement schedules for mechanical equipment are necessary for safe operation.

Tailings pipelines may be required to have control systems designed to shut the supply pump down if a no-flow condition is detected at the discharge end. This ensures that the tailings supply is stopped if a catastrophic failure occurs in the pipeline. These systems do not, however, eliminate the risk of a discharge event where a pipeline develops a serious leak but does not fail completely.

Most existing pipelines are constructed in trenches or between parallel bunds so that spillage is directed to dedicated catch dams. Escapes may still occur where liquid under pressure escapes as a jet at an elevated trajectory. Mechanisms to minimise the chance of such events include completely encasing the pipeline in a secondary sleeve or constructing covers over pipe joints.

Although the Department of Water Affairs does not specify particular measures for increased safety for tailings pipelines and other equipment, the proponent and operator should be able to demonstrate that the measures proposed and implemented reduce the risks to an acceptable level.

Procedures for pipeline inspections should form part of the Audit protocol and Environmental Management Programme.

3.1.7.11 Monitoring and auditing

A site specific monitoring program should be developed for the TSF based on the key risks identified in the Risk Assessment process and on other currently known issues.

The monitoring program should ensure early detection of any unexpected impacts. It should also enable validation of the assumptions made in the Risk Assessment and indicate aspects of the operation where further risk analysis is warranted.

A program to monitor the TSF should:

- Identify the scope of the program;
- Define the objectives of the program;
- Determine the indicators to be measured;
- Select sample collection sites (for example, for surface and groundwater);
- Determine the monitoring frequency (daily, weekly, monthly, etc);
- Where necessary, establish a site based laboratory and/or select an appropriate testing laboratory; and
- Report results, particularly any which exceed specified limits.

Routine monitoring of the TSF is aimed at avoiding failure by giving early warning of any symptom of trouble so that timely maintenance can be carried out.

Further, the TSF is designed for particular tailings characteristics. Deviations from these particular characteristics (such as grading, density or chemical constituents) could influence the operating procedures and the performance of the facility.

Depending on the facility, features to be included in a safety monitoring program for the TSF may include:

- seepage or leakage through the embankment;
- cracking, slips, movement or deformation of the embankment;
- erosion of the embankment;
- pond level;

- pond location (location of the pond against the embankment may pose particular problems);
- piezometric levels in embankments (to this end, knowing the location of the phreatic surface would assist);
- structural defects or obstruction in infrastructure (outlet pipes, spillway, decant system);
- borehole groundwater elevations;
- under-drain flow rates;
- obstruction or erosion of diversion drains; and
- characteristics and consolidation behaviour of the tailings (enabling prediction of final settlement and refinement of design to suit the predicted conditions).

In preparing a safety monitoring program, South African Coal Holdings Limited (Pty) Ltd should also consider the provisions of various guidelines on dam safety management.

Environmental aspects that may require monitoring include:

- impacts on surface water;
- impacts on groundwater quality;
- impacts on groundwater level;
- impacts on vegetation;
- impacts on fauna (birds in particular are susceptible to poisoning by drinking tailings supernatant water);
- impacts on aquatic ecosystems;
- generation of dust, noise or odour, and
- spray drift and its effects on the vigour of adjacent vegetation, where aerial sprays are used to enhance evaporation or to reduce dust.

Remedial action should be implemented if conditions are found to be outside the design or predicted parameters. Groundwater is one of the most commonly monitored environmental aspects. A number of boreholes are usually installed at selected locations around a TSF to enable monitoring of both the level and quality of groundwater. A good understanding of the local groundwater environment and chemistry is necessary to ensure that boreholes are located in appropriate places and drilled to the correct depth. In some cases, multiple boreholes are required to intercept different aquifers.

It is also common to install shallow boreholes near dam walls to permit detection of any seepage that might occur. Where a TSF is constructed near surface watercourses it is also good practice to monitor upstream and downstream from the facility. Although, in most cases, no discharge is permitted, monitoring allows the operator to verify compliance and ensure that no contamination has occurred by any pathway associated with the TSF. Samples will need to be collected before, during and after the life of the operation.

Additional parameters to be monitored and the nature and detail of the monitoring would depend on the site-by-site Risk Assessment that would identify the critical hazards.

3.1.7.12 Decommissioning

Tailings material must be securely stored for an indefinite period and present no hazard to public health and safety or the environment. Therefore the closure of a TSF and rehabilitation works must be as inherently stable, as resistant to degradation and as consistent with the surrounding landscape as possible. The design should also seek to minimise maintenance or upkeep.

The nature of the tailings, the process by which they were deposited and the design for water recovery can significantly influence the costs and risks associated with closure of a TSF.

The diversity in materials and objectives makes it impractical to prescribe designs for TSF covers. Operators are encouraged to undertake research into cover designs and to justify the type proposed based on a case by case analysis of the objectives and risks. Proposed designs will be assessed on their merits.

Closure strategy

Early planning for closure of the TSF can reduce risks for both the community and operator and minimise costs at the end of the project's life. Most TSFs require large quantities of cover material for closure. Accordingly, South African Coal Holdings Limited (Pty) Ltd must demonstrate in the initial Environmental Management Programme how the TSF is to be closed and the source of cover material. At the end of the project aspects of the initial Rehabilitation Plan might no longer be appropriate. In this situation a revised closure proposal, submitted as an Environmental Management Programme Variation may be required.

Closing the TSF can involve a number of processes. In many cases stored tailings must be dried over a long period to enable the passage of earthmoving equipment. In some, significant engineering works may be required, such as the construction of a spillway and alteration of surface drainage, the provision of a layered dry cover or controls to establish a permanent water cover.

The potential environmental impacts of decommissioned TSFs include groundwater contamination, acid drainage and erosion of material by water and wind. While the threat of catastrophic failure is usually reduced due to the de-watered nature of the deposit, under certain circumstances it remains an important consideration.

The final landform design must be compatible with the form of containment or encapsulation of the tailings, the nature of the embankment materials, the needs of the community and the landowner, any legal requirements, climate, local topography and the level of management available after reclamation.

Cover design

The characteristics of the particular tailings and the topographic, hydrogeological, geotechnical and climatic characteristics of the disposal site usually determine the appropriate cover design. Covers range from complex multi-layers of earth and rock to those where only a relatively thin growing medium is required on the surface.

Where the tailings are less reactive, impermeable layers may not be required but it may be necessary to install a layer of broken rock to stop capillary rise or to use a large volume of material in order to provide a sufficient depth of soil for root establishment.

Re-vegetation

The type and depth of cover used in rehabilitation of the TSF are also influenced by the desired re-vegetation outcomes and future activities permitted on the closed facility.

In some cases large depths of soil and rock may be required to ensure adequate resources for tree growth while, where the area is expected to return to pasture, less cover would be required. Caution should be exercised in re-vegetating with trees, however, as the cover or lining may be compromised by roots or when trees fall or are removed.

The potential for erosion of enclosures is also of concern, and the risk increases considerably where the area is used for intensive agriculture (cultivation) and with the steepness of the embankment. Even with less intensive agriculture, such as grazing, potential for erosion exists along frequently used stock routes and during drought.

3.1.8 Solid waste disposal

Waste is generated from the start to the decommissioning of a project. It is proposed that the waste that would be generated on site would be managed by reducing, reusing and recycling as far as possible. The Gert Sibande District Municipality would not be responsible for the solid waste disposal.

The overall aim of the project is to keep the carbon footprint of the entire project as small as possible. This will include the use of “green” products as far as possible as well as the reclamation of all building rubble during the construction phase.

Several waste streams are likely to originate from the activities associated with day to day activities in the workplace. Some of these waste streams may not be hazardous, but the majority may contain a component(s) that may need special treatment. The nature of these waste streams may also vary due to composition and physical form. In order to make informed decisions on determining the appropriate waste management options to handle, treat and dispose of waste, the different waste streams must be identified in terms of hazardous and

non-hazardous wastes. Waste streams can be categorised into 6 (six) different streams, based on similar health and environmental concerns namely:

- **Inorganic wastes** – acids, alkalis, cyanide wastes, heavy metal sludges and solutions, asbestos wastes and other solid residues.
- **Oily wastes** – primarily from the processing, storage and use of mineral oils.
- **Organic wastes** – halogenated solvents residues, non-halogenated solvent residues, polycarbon based (PCB) wastes, paint and resin wastes.
- **Putrescible Organic Waste** – wastes from production of edible oils, slaughter houses, tanneries and other animal based products.
- **High Volume/Low Hazard Wastes** – waste based on their intrinsic properties present relatively low hazards but may pose problems due to high volumes such as fly ash from power plants.
- **Miscellaneous Wastes** – infectious waste from diseased human/animal tissue, redundant chemicals, laboratory wastes and explosive wastes from manufacturing operations or redundant munitions.

The following shall apply to the temporary storage of waste at source:

- The employer shall provide adequate and appropriate containers for the temporary storage of waste at source;
- Adequate containers must be available to store different types of waste separately to allow for recycling and disposal according to the IWM Plan;
- Dedicated storage areas for various types of waste must be allocated and clearly marked;
- Waste collected at source shall be collected on a daily basis;
- Waste must be stored in such a manner that it can be safely accessed and loaded;
- Should waste be stored in containers, drums or skips care must be taken that:
    - Waste types (special vs. controlled vs. general waste) are not mixed.
    - Waste is not kept in a corroded or worn container.
    - The container is secure so as to prevent accidental spillage or leakage.
    - All waste skips and containers are labelled with their contents.
    - Skips or containers do not overflow.
    - Skips for special waste is always covered.
    - Skips for controlled waste is covered skips wherever possible.
- Waste must be kept in such a way as to prevent it falling while in storage or while it is being transported;
- Waste must be protected from scavenging by people and animals;
- Do not dispose of (burn, bury or treat) waste on site;

- Collection of waste must be scheduled and the site/location manager must be notified beforehand of collection times and type of waste to be collected; and
- Implement dust suppression measures, such as wetting of access routes and accumulated controller waste.

Refer to the EMP attached as ***Annexure 6*** for detailed mitigation measures.

3.1.9 Water supply

Mining and coal beneficiation activities in close proximity to a water resource may undoubtedly contribute towards environmental resource degradation. However, if appropriate water resource management principles, strategies and measures are in place, the impact on the resource could potentially be controlled to ensure project sustainability and long-term resource protection. This can be achieved through the issuance of an Integrated Water Use Licence for all water uses linked to the mining activities to be executed by the applicant.

South African Coal Mining Limited (Pty) Ltd will apply for an Integrated Water Use Licence Application (IWULA) for the water use related to its mining and coal beneficiation operations. The IWULA process includes the collation of all the necessary information required by the Department of Water Affairs for the identified Section 21 water uses and motivation for exemption from certain requirements of Government Notice 704 (GN R 704), Gazette 20118, 4 June 1999)).

The water uses for which South African Coal Mining Limited (Pty) Ltd will submit a Water Use Licence Application includes:

Section 21:

(a) Taking water from a water resource;
(b) Storing water;
(c) Impeding or diverting the flow of water in a watercourse;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource; and
(i) Altering the bed, banks, course or characteristics of a watercourse.

This Integrated Water and Waste Management Plan (IWWMP) is compiled in order to promote the environmentally sustainable and equitable use of water in relation to the existing mining operations at the South African Coal Mining Limited (Pty) Ltd operations. The IWWMP is intended to be a simple, feasible, implementable plan for the CHPP and TSF, is based upon site specific programmes also taking into account the National Water Resource Strategy (NWRS), relevant Catchment Management Strategy (CS), Resource Quality Objectives (RQO) and the sensitivity of the receiving water resources and down-stream water users in the vicinity of the mine.

4. LEGISLATIVE FRAMEWORK (REGULATION 28 (2) (F))

4.1 NATIONAL LEGISLATIVE FRAMEWORK

This section includes a list of Acts and legislative requirements applicable to this project. The aim of this component of the report is to provide a brief overview of the pertinent policies as well as legal and administrative requirements applicable to the proposed activities on Portions 5 and 10 of the Farm Voorslag 274 IS, Mpumalanga Province.

The legislative motivation for this project is underpinned by the Constitution of South Africa (Act No. 108 of 1996) [as amended], which states that:

The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa. Section 24 of the Constitution:

24. Environment

-Everyone has the right-

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and use of natural resources while promoting a justifiable economic and social development.

Section 24 of the Constitution of South Africa (Act No. 108 of 1996) [as amended] requires that all activities that may significantly affect the environment and require authorisation by law must be assessed prior to approval. In addition, it provides for the Minister of Environmental Affairs or the relevant provincial Ministers to identify:

- new activities that require approval;
- areas within which activities require approval; and
- existing activities that should be assessed and reported on.

Section 28(1) of the Constitution of South Africa (Act No. 108 of 1996) [as amended] states that: *"every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring".* If such

pollution or degradation cannot be prevented then appropriate measures must be taken to minimise or rectify such pollution or degradation. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution or degradation; and
- Remedying the effects of the pollution or degradation.

National Environmental Management Act, 1998 (Act 107 of 1998) [as amended] (NEMA) and Environmental Impact Assessment Regulations (2010)

South African Coal Mine Holdings Limited (Pty) Ltd is applying for environmental authorisation (EA) in terms of NEMA and the EIA Regulations (Government Notice No's R 543, 544 and 545 in Government Gazette No. 33306 of 18 June 2010) for the relocation of the CHPP and TSF.

NEMA strives to regulate national environmental management policy and is focussed primarily on co-operative governance, public participation and sustainable development. NEMA makes provisions for co-operative environmental governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by Organs of State and to provide for matters connected therewith.

The proposed activities falls within the ambit of the scheduled activities listed in Government Notice (GN) No. 544 and 545. A full Scoping and EIA process must be undertaken in terms of the requirements stipulated in GN. No. 543. The content of an Environmental Impact Assessment Report must include:

31. (2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation 35, and must include-

(a) details of-

(i) the EAP who compiled the report; and

(ii) the expertise of the EAP to carry out an environmental impact assessment;

(b) a detailed description of the proposed activity;

(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is-

(i) a linear activity, a description of the route of the activity; or

(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;

(d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;

(e) details of the public participation process conducted in terms of sub-regulation (1), including –

(i) steps undertaken in accordance with the plan of study;

(ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;

(iii) a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and

(iv) copies of any representations and comments received from registered interested and affected parties;

(f) a description of the need and desirability of the proposed activity;

(g) a description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;

(h) an indication of the methodology used in determining the significance of potential environmental impacts;

(i) a description and comparative assessment of all alternatives identified during the environmental impact assessment process;

(j) a summary of the findings and recommendation of any specialist report or report on a specialised process;

(k) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;

(l) an assessment of each identified potentially significant impact, including-

(i) cumulative impacts;

(ii) the nature of the impact;

(iii) the extent and duration of the impact;

(iv) the probability of the impact occurring;

(v) The degree to which the impact can be reversed;

(vi) the degree to which the impact may cause irreplaceable loss of resources; and

(vii) the degree to which the impact can be mitigated;

(m) a description of any assumptions, uncertainties and gaps in knowledge;

(n) a reasoned opinion as to whether the activity should or should not be authorised, and if the opinion is that is should be authorised, any conditions that should be made in respect of that authorisation;

(o) an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment; and

(ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;

(p) a draft environmental management programme containing the aspects contemplated in regulation 33;

(q) copies of any specialist reports and reports on specialised processes complying with regulation 32;

(r) any other matters required in terms of sections 24(4) (b) (i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 31 (2) (g), exist.

NEMA was first enacted in November 1998 and several amendments were promulgated after. NEMA strives to legislate National Environmental Management Policy and has repealed a number of the provisions of the Environment Conservation Act, 1989 (Act 73 of 1989) [ECA]. NEMA is focussed primarily on co-operative governance, public participation and sustainable development.

NEMA makes provisions for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by Organs of the State and to provide for matters connected therewith. Section 2 of the Act establishes a set of principles, which apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised and positive enhanced; and

- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its entire life cycle.

These principles are taken into consideration when a Government department exercises its powers, for example, during the granting of permits and the enforcement of existing legislation or conditions of approval.

The authorities may direct an industry to rectify or remedy a potential or actual pollution or degradation problem. If such a directive is not complied with, the authorities may undertake the work and recover the costs from the responsible industry.

The Environmental Impact Assessment (EIA) process followed is in compliance with NEMA and the EIA Regulations. The proposed development involves 'listed activities', as defined by the NEMA. Listed activities are activities, which may have potentially detrimental impacts on the environment and therefore require environmental authorisation from the relevant authorising body. The proposed development occurs in the Mpumalanga Province and the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) is the responsible regulatory authority.

The proposed development includes the relocation of the CHPP and the TSF, which triggers listed activities, as stipulated in the EIA Regulations, and as such is required to undergo a Scoping/EIA exercise in support of the application for environmental authorisation from MDEDET (Government Notice No. 544 and 545 of April 2010).

The proposed development includes the following listed activity as stipulated in the EIA Regulations of 2010:

NEMA (Act 107 of 1998) GNR 544 of 2010:

Item 11: The construction of:

i) canals;
ii) channels;
iii) bridges;
iv) dams;
v) weirs;
vi) bulk stormwater outlet structures;
vii) marinas;
viii) jetties exceeding 50 square metres in size;
ix) slipways exceeding 50 square metres in size;
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.

Item 13: Storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres;

Item 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;
ii) the sea;
iii) the seashore;
iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater-

but excluding where such infilling, depositing, dredging, excavation, removal or moving

a) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or
b) occurs behind the development setback line.

Item 22: The construction of a road outside urban areas –

i) With a road reserve wider than 13,5 meters; or
ii) Where no reserve exists where the road is wider than 8 meters; or
iii) For which an environmental authorization was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.

Item 28: The expansion of existing facilities for any process or activity where such expansion will result in the need for a new, or amendment to, an existing permit or license in terms of national or provincial legislation governing the release of emissions or pollution, excluding where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act (Act 59 of 2008) in which case that Act will apply.

NEMA (Act 107 of 1998) GNR 545 of 2010:

Item 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;

Item 20: Any activity which requires a mining right or renewal thereof as contemplated in section 22 and 24 respectively of the Mining and Petroleum Resources Development Act, 2002 (Act 28 of 2002).

National Water Act, 1998 (Act No.36 of 1998) [as amended] (NWA)

The NWA aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level.

The purpose of the NWA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways, which take into account:

- *Meeting the basic human needs of present and future generations;*
- *Promoting equitable access to water;*
- *Redressing the results of past racial discrimination;*
- *Promoting the efficient, sustainable and beneficial use of water in the public interest;*
- *Facilitating social and economic development;*
- *Providing for growing demand for water use;*
- *Protecting aquatic and associated ecosystems and their biological diversity;*
- *Reducing and preventing pollution and degradation of water resources;*
- *Meeting international obligations and*
- *Managing floods and droughts.*

The construction and operational activities associated with the proposed activity requires compliance with the requirements of the NWA as listed under GN No. 19182. An application for an Integrated Water Use License (IWULA) was lodged to the Department of Water and Sanitation (DWS) in terms of Section 21 of the NWA to undertake the following activities:

Section 21:

(a) Taking water from a water resource;

(b) Storing water;

(c) Impeding or diverting the flow of water in a watercourse;

(g) Disposing of waste in a manner which may detrimentally impact on a water resource; and

(i) Altering the bed, banks, course or characteristics of a watercourse.

The WULA will be undertaken as a separate process and does not fall within the scope of this environmental authorisation process. The public participation process did however make provision for both processes.

Mine Health and Safety Act (Act No. 29 of 1996) [as amended] and associated regulations

The following is an extract from the Act:

"….Objectives of Act:

1. The objectives of this Act are:
   i) To protect the health and safety of persons at mines;
   ii) To require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines;
   iii) To give effect to the public international law obligations of the Republic that concern health and safety at mines;
   iv) To provide for employee participation in matters of health and safety through health and safety representatives and the health and safety committees at mines;
   v) To provide for effective monitoring of health and safety conditions at mines;
   vi) To provide for enforcement of health and safety measures at mines;
   vii) To provide for investigations and inquiries to improve health and safety at mines; and
   viii) To promote –
      (i) a culture of health and safety in the mining industry;
      (ii) training in health and safety in the mining industry; and
      (iii) co-operation and consultation on health and safety between the State, employers, employees and their representatives…."

The construction and operational activities associated with the proposed relocation of the CHPP and TSF shall be in accordance with the requirements of the Act.

National Environmental Management: Waste Act (Act 59 of 2008) [as amended] and the Waste Classification and Management Regulations, 2003 (GNR: 634 – 635):

The objectives of NEMWA and the Waste Classification and Management Regulations, 2003 (GNR: 634 – 635) are:

- To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
- To provide for institutional arrangements and planning matters;
- To provide for national norms and standards for regulating the management of waste by all spheres of government;
- To provide for specific waste management activities

- To provide for the remediation of contaminated land;
- To provide for the national waste information system;
- To provide for compliance and enforcement; and
- To provide for matters connected therewith.

The implementation of the proposed activities shall be in accordance with the requirements of NEMWA and the Waste Classification and Management Regulations, 2003 (GNR: 634 – 635).

National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The proposed activity must comply with the requirements stipulated in the National Heritage Resources Act, 1999 (Act 25 of 1998) (NHRA). The NHRA legislates the necessity for Heritage Impact Assessment (HIA) in areas earmarked for development, which exceed 0.5 ha or linear development exceeding 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's / palaeontologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Section 38(1) of NHRA, subject to the provisions of subsections (7), (8) and (9), requires that any person who intends to undertake a development categorised as:

(a) The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) The construction of a bridge or similar structure exceeding 50m in length;
(c) Any development or other activity which will change the character of a site-
  (i) Exceeding 5 000 m^2 in extent; or
  (ii) Involving three or more existing erven or subdivisions thereof; or
  (iii) Involving three or more erven or divisions thereof which have been consolidated within the past five years; or
  (iv) The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) The re-zoning of a site exceeding 10 000 m^2 in extent; or
(e) Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Archaeological Impact Assessments (AIAs) and Palaeontological Impact Assessments (PIAs) are often commissioned as part of the heritage component of an EIA and are required under Section 38(1) of the NHRA of 1999, Section 38(8) of the NEMA.

The process of archaeological and palaeontological assessment usually takes the form of:

- A scoping or initial pre-assessment phase where the archaeologist / palaeontologist and developer's representative establish the scope of the project and terms of reference for the project;
- A Phase 1 AIA / PIA or desktop study;
- A Phase 2 archaeological or palaeontological mitigation proposal; and
- A Phase 3 heritage site management plan.

AIA

Phase 1: Archaeological Impact Assessment

A Phase 1 AIA generally involves the identification and assessment of sites during a field survey of a portion of land that is going to be affected by a potentially destructive or landscape altering activity. The locations of the sites are recorded and the sites are described and characterised. The archaeologist assesses the significance of the sites and the potential impact of the development on the sites and makes recommendations. It is essential that the report supply the heritage authority with sufficient information about the sites to assess, with confidence, whether or not it has any objection to a development, indicate the conditions upon which such development might proceed and assess which sites require permits for destruction, which sites require mitigation and what measures should be put in place to protect sites that should be conserved.

Minimum standards for reports, site documentation and descriptions are clearly set out by the SAHRA and supported by the Association of Southern African Professional Archaeologists (ASAPA). The sustainable conservation of archaeological material (*in situ*) is always the best option for any sites that are deemed to be of importance. The report needs to indicate which sites these are, explain why they are significant and recommend management measures. In certain kinds of developments which involve massive intervention (mining, dam construction, etc.), it is not possible to reach a conservation solution other than to develop a programme of mitigation which is likely to involve the total or partial "rescue" of archaeological material and its indefinite storage in a place of safety.

Phase 2: Archaeological Mitigation Proposal

If the Phase 1 report finds that certain archaeological sites in a development area are of low significance, it is possible to seek permission from the heritage authority for their destruction. The final decision is then taken by the heritage resources authority, which should give a permit or a formal letter of permission, or in the case of an EIA issue a comment allowing destruction.

Phase 2 archaeological projects are primarily based on salvage or mitigation excavations preceding development that will destroy or impact on a site. This may involve collecting of artefacts from the surface,

excavation of representative samples of the artefact material to allow characterisation of the site and the collection of suitable materials for dating the sites. The purpose is to obtain a general idea of the age, significance and meaning of the site that is to be lost and to store a sample that can be consulted at a later date for research purposes. Phase 2 excavations should be done under a permit issued by SAHRA, or other appropriate heritage agency, to the appointed archaeologist. Permit conditions are prescribed by SAHRA, or other appropriate heritage agencies. Conditions may include as minimum requirements reporting back strategies to SAHRA, or other appropriate heritage agencies and/or deposition of excavated material at an accredited repository.

Should further material be discovered during the course of development, this must be reported to the archaeologist or to the heritage resources authority and it may be necessary to give the archaeologist time to rescue and document the findings. In situations where the area is considered archaeologically sensitive the developer will be asked to have an archaeologist monitor earth-moving activities.

Phase 3: Management plan for conservation and planning, site museums and displays

On occasion Phase 2 may require a Phase 3 program involving one of the following:

- The modification of the site;
- The incorporation of the site into the development itself as a site museum;
- A special conservation area; or
- A display.

Alternatively, it is often possible to re-locate or plan the development in such a way as to conserve the archaeological site or any other special heritage significance the area may have. For example in a wilderness or open space areas where such sites are of public interest, the development of interpretative material is recommended since it adds value to the development. Permission for the development to proceed can be given only once the heritage resources authority is satisfied that measures are in place to ensure that the archaeological sites will not be damaged by the impact of the development or that they have been adequately recorded and sampled. Careful planning can minimise the impact of archaeological surveys on development projects by selecting options that cause the least amount of inconvenience and delay. The process as explained above allows the rescue and preservation of information relating to our past heritage for future generations. It balances the requirements of developers and the conservation and protection of our cultural heritage as required of SAHRA and the provincial heritage resources authorities.

PIA

The Republic of South Africa (RSA) has a remarkably rich fossil record that stretches back in time for some 3.5 billion years and must be protected for its scientific value. Fossil heritage of national and international significance is found within all provinces of South Africa. South Africa's unique and non-renewable

palaeontological heritage is protected in terms of the National Heritage Resources Act. According to this act, palaeontological resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

Desktop Study

Phase 1

The main aim of the Palaeontological Impact Assessment (PIA) process is to document resources in the area earmarked for development and identify both the negative and positive impacts that the development may have on the receiving environment. The PIA therefore identifies palaeontological resources in the area to be developed and makes recommendations for protection or mitigation of these resources.

The PIA report needs to comply with the Heritage Impact Assessment requirements of Section 38 of the Act.

A PIA is generally warranted where rock units of LOW to VERY HIGH palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed area is unknown. The specialist will inform whether further monitoring and mitigation are necessary.

Types and ranges of heritage resources as outlined in Section 3 of the Act:

(i) (i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens.

Section 38, 1(b) requires the details of the construction of a bridge or similar structure exceeding 50m in length.

The PIA needs to comment and recommend on the impact of the development on fossil heritage, and if mitigation or conservation is necessary.

The South African Heritage Resources Agency (SAHRA) requested that a Phase 1 Palaeontological Impact Assessment be conducted and submitted. The PIA was conducted by Dr. Heidi Fourie and submitted to SAHRA. Dr. Fourie recommended a Phase 2 mitigation be carried out prior to development. The specialist recommended that comments from SAHRA should be awaited to confirm whether Phase 2 mitigation is required.

National Environmental Management: Air Quality Act (Act No 39 of 2004) [as amended] (NEMAQA)

Section 28 (1) of NEMA places a general duty of care on any person who causes pollution to take reasonable measures to prevent such pollution from occurring. The objective of NEMAQA is to regulate air quality in order to protect, restore and enhance the quality of air in the Republic, taking into account the need for sustainable development. Furthermore, the provision of national norms and standards regulating air quality monitoring,

management and the control by all spheres of government determine that specific air quality measures should be adhered to. Dust created during the phases of the proposed activities could influence air quality and thus make this legislation relevant to this development. Air quality monitoring during the operational phase of the mine will be considered to be a measure to exercise this duty of care, since it will establish the types and volumes of dust emissions and other pollutants emanating from the operational activities.

National Dust Control Regulations, 2013 (Government Notice 827 of 2013)

The Dust Control Regulations provides in its Section 6 measures for dust control. Dust created by the proposed activities during all phases of the development, which may affect employees and surrounding landowners may need to be controlled according to the regulations. The applicant will comply with these regulations and the measures are included in the EMP attached in ***Annexure 6*** of this report.

National Veld and Forest Fire Act (Act No. 101 of 1998) [as amended] (NVFFA)

The purpose of the act is to prevent and combat veld, forest and mountain fires throughout the Republic. The act provides for a variety of institutions, methods and practices for achieving this purpose. There is a risk of veld fires during the construction and operational phases of the proposed activity. The applicant and all contractors and employees have roles and responsibilities in terms of this act that have to be implemented.

National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) [as amended] (NEMBA)

The overarching aim of NEMBA, within the framework of NEMA, is to provide for:

- *The management and conservation of biological diversity within South Africa as well as for the components of such biological diversity;*
- *The use of indigenous biological resources in a sustainable manner; and*
- *The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.*

As part of its implementation strategy of NEMBA, the National Spatial Biodiversity Assessment was developed. This assessment classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels. The approach used for biodiversity planning is systematic and entails the following three key principles:

- *The need to conserve a representative sample of biodiversity pattern, such as species and habitats (the principle of representation);*
- *The need to conserve the ecological and evolutionary processes that allow biodiversity to persist over time (the principle of persistence); and*

- *The need to set quantitative biodiversity targets that quantifies the degree of conservation required for each biodiversity feature in order to maintain functioning landscapes and seascapes.*

Furthermore, the South African National Biodiversity Institute (SANBI) was established by NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems. NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 8 of the Act. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake an Ecological (Fauna and Flora) Impact Assessment for developments in an area that is considered ecologically sensitive and which requires environmental authorisation in terms of NEMA, with such assessment taking place during the Scoping or EIA phase. The Applicant is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity and to obtain permits if required.

NEMBA is relevant to the proposed project as construction and operational activities may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide comments on any documentation resulting from the proposed development.

Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014)

The notices provides lists of alien and invasive species that the applicant is exempted from obtaining a permit for, a national list of invasive species and a list of prohibited species. It is the responsibility of the Applicant to ensure that all prohibited plant and animal species are eradicated as far as possible.

- *Notice 2 - Exempted Alien Species in terms of Section 66 (1) of NEMBA;*
- *Notice 3 - National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-9 & 11 of NEMBA; and*
- *Notice 4 - Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-7, 9-10 & 12.*

Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended]

The following sections of the act is relevant to the application:

- *Section 2 - Declaration of grouped hazardous substances;*
- *Section 4 - Licensing;*
- *Section 16 - Liability of employer or principle; and*
- *Section 9 (1) - Storage and handling of hazardous chemical substances; and*

- *Section 18 - Offences.*

The Applicant must ensure the safety of people working with hazardous chemicals (specifically fuels), as well as safe storage, use and disposal of containers during the on-site operational phase together with the associated liability should non-compliance be at the order of the day.

Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995);

The following sections of the act is relevant to the application:

Section 4 - Duties of persons who may be exposed to hazardous chemical substances; and
Section 9A (1) - Penalties.

Hazardous substances will be stored and utilised on the site and non-compliance to management measures will result in prosecution of the Applicant in terms of his liabilities to the socio-economic environment. The applicant will comply with the regulations.

4.2 PROVINCIAL LEGISLATIVE FRAMEWORK

Table 3: Provincial and local legislation and other policies, strategies and guidelines considered

TITLE OF LEGISLATION, POLICY OR GUIDELINE	APPLICABILITY TO THIS PROJECT	ADMINISTERING AUTHORITY	DATE
Msukaligwa Local Municipality Integrated Development Plan 2014-2015	This plan was consulted to inform the Need and Desirability of the proposed development as the Socio-Economic characteristics of the area. In addition, this plan was consulted to inform whether the proposed development is aligned with the objectives and strategies of the municipalities' planning objectives.	Msukaligwa Local Municipality	2014-2015
Msukaligwa Local Municipality Spatial Development Framework	This framework was consulted to inform whether the proposed development is aligned with the objectives and strategies of the Msukaligwa Local Municipality's Policies and Spatial Planning. The SDF accordingly recognises and is aligned with the applicable statutes, policies, protocols and agreements that regulate land-use at all levels throughout the biosphere, including: Relevant international agreements, protocols and conventions. National and provincial legislation and policy. Regional and local SDFs, structure plans and other policy.	Msukaligwa Local Municipality	March 2010
DEA&DP and DEA Guidelines on Public Participation	Used as a guide to inform of the public participation process.	Department of Environmental Affairs and Development Planning	2012

TITLE OF LEGISLATION, POLICY OR GUIDELINE	APPLICABILITY TO THIS PROJECT	ADMINISTERING AUTHORITY	DATE
		Department of Environmental Affairs	
DEA&DP and DEA Guidelines on Alternatives	Used as a guide to inform on the use and presentation of alternatives in the EIA process.	Department of Environmental Affairs and Development Planning Department of Environmental Affairs	2012
DEA&DP and DEA Guidelines on Need and Desirability	Used as a guide to inform on the need and desirability of the proposed development in conjunction with the above mentioned SDF's and IDP's.	Department of Environmental Affairs and Development Planning Department of Environmental Affairs	
The Vegetation of South Africa, Lesotho and Swaziland. Mucina & Rutherford (2006). SANBI, Pretoria	Utilised as a reference guide for the identification specific environmental information	Cape Nature	2006

5. PROJECT MOTIVATION: NEED AND DESIRABILITY (REGULATION 31 (2) (F))

According to the Western Cape Department of Environmental Affairs and Development Planning's (WC DEADP) Guideline on Need and Desirability: EIA Guideline and Information Document Series (2011), to describe the need for a development, it must be determined whether it is the right time for locating the type of land use and/or activity being proposed. To describe the desirability for a development, it must be determined, whether it is the right place for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of wise use of land which can be determined through the question of what is the most sustainable use of land. In light of the above, the need and desirability of an application must be addressed separately and in detail.

Currently the Coal Handling and Preparation Plant (CHPP) and Tailings Storage Facility (TSF) are located on the Farm Mooifontein 109 IT (refer to the general plan in ***Annexure 1***). Most of the mining activities were undertaken here and currently no opencast table reserves are left on the property. The only reserve left is on the Farm Voorslag 274 IS. Therefore, it makes sense to locate the CHPP and TSF as near as possible to mining activities to limit the environmental impact associated with coal mining and processing.

If the mining operations move to the Farm Voorslag, the existing facility will be approximately 2 to 3 kilometres away (further to the south). If the CHPP and TSF remain at its current location on the Farm Mooifontein 109 IT, it

would entail moving raw coal to the CHPP and TSF using heavy vehicles, over treacherous terrain which may ultimately result in unnecessary spillages and incidents.

To limit the environmental impact of the coal mining and processing it is required to relocate and possibly upgrade the existing facility to the Farm Voorslag 274 IS.

The current facility is located in a sensitive catchment where a stream had to be diverted to accommodate the facility. The impact on the water resources will be significantly lower should the facility be moved away and the stream rehabilitated. Refer to Figure 3 below.

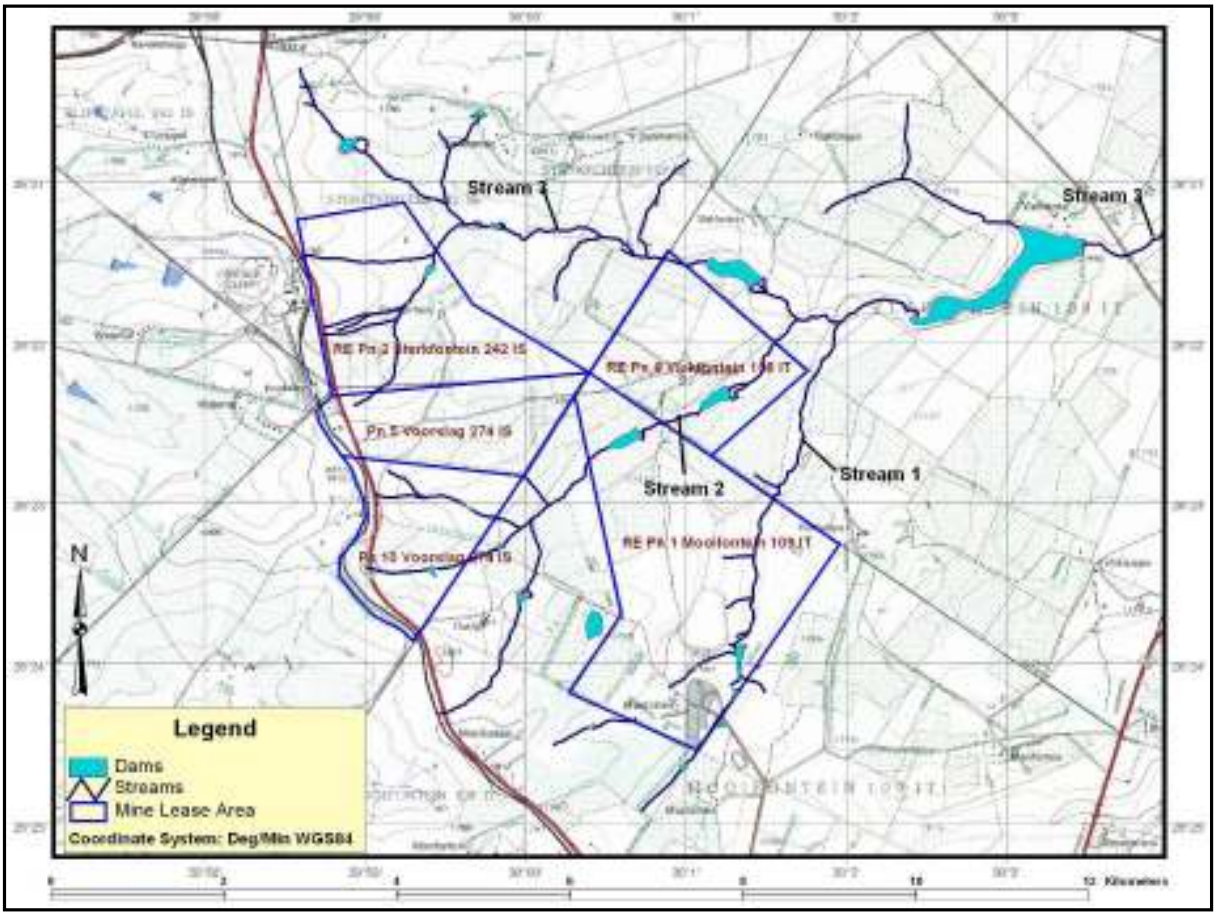


Figure 3: The mining boundaries of the Umlabu Colliery, showing the surface streams and dams

6. DESCRIPTION OF THE BASELINE ENVIRONMENT (REGULATION 31 (2) (D))

DESCRIPTION OF THE BIO-PHYSICAL ENVIRONMENT

The bio-physical environment includes the following aspects:

- Climate;
- Topography and elevation;
- Geology and soils;

- Hydrology including surface water and groundwater features; and
- Biodiversity including the fauna and flora of the study area.

The above aspects of the study area will be described below.

6.1 CLIMATE

Climate can influence the potential for environmental impacts and related mine design. Specific issues are listed below:

- Rainfall could influence erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression, and surface water management planning;
- Temperature could influence air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which could influence rehabilitation planning; and
- Wind could influence erosion, the dispersion of potential atmospheric pollutants, and rehabilitation planning.

The site is located in the Mpumalanga Province and falls within the summer rainfall region of South Africa. The climate is temperate with characteristically warm summers and cold winters. Frost occurs during the winter months peaking with an average occurrence of nine days in July. Summer precipitation occurs in the form of mist, drizzle, hail and more frequent thunder showers and lightning storms.

The mean annual rainfall is 748mm, 83% of which occur during the months of October to March. The mean rainfall is given in Table 4.

Table 4: Mean rainfall measured over 54 year period at Ermelo weather station

MONTH	MEAN RAINFALL (mm)
January	126
February	94
March	83
April	35
May	19
June	8
July	9
August	11
September	28
October	87
November	131
December	124
MEAN ANNUAL	748

The highest recorded rainfall for periods of between 30 minutes and 24 hours are depicted in Table 5 below together with the 1:50 and 1:100 year computed rainfall events for a period of 24 hours.

Table 5: Maximum precipitation

24 hr max recorded	24 hr 50 year recurrence	24 hr 100 year recurrence	24 hr RMF recurrence
79mm	98.8mm	108.1mm	118.1mm

The mean daily maximum temperature exceeds 23˚C between October and March, the hottest months. The daily maximum temperatures in the winter months (May to August) vary between 16˚C and 19˚C. The daily minimum temperatures during the winter months vary between -11.1˚C and 4˚C. Refer to Table 6 below.

Table 6: The mean maximum and minimum temperatures

MONTH	MEAN	DAILY MAX	DAILY MIN	EXTREME MAX	EXTREME MIN
January	18.7	25.4	12.1	34.4	3.3
February	18.3	24.9	11.7	35.0	4.4
March	17.2	23.7	10.7	32.8	0.0
April	14.8	22.2	7.4	30.0	-3.3
May	11.8	19.8	3.8	28.3	-6.8
June	8.6	16.4	0.8	25.0	-8.9
July	8.4	16.5	0.4	25.1	-11.1
August	11.2	19.6	2.8	29.4	-11.1
September	14.3	22.4	6.1	33.3	-6.8
October	17.0	24.7	9.4	34.4	-2.2
November	17.5	24.6	10.4	35.6	0.0
December	18.4	25.2	11.7	34.2	3.3
AVERAGE	14.7	22.1	7.3	30.5	-3.2

Owing to the location of the site, the gentle undulating topography and the non-existing mountain ranges and ridges, no localised wind system will be generated. The wind patterns at the mine will conform to the regional wind patterns. The predominant wind direction is north north-easterly and during the months of May to December, strong west to north-westerly winds also develop.

Thunderstorms occur frequently in summer and are usually accompanied by lightning, heavy rain, strong winds and occasional hail. An average of 3.8 hail incidents per annum can be expected at any particular site. Frost occurs in the winter months, peaking with an average occurrence of nine days in July.

6.2 TOPOGRAPHY AND ELEVATION

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

- Flow of surface and groundwater;
- Depth of soils and the potential for soil erosion, dependent on the slope of the study area;
- Type of land use;
- Aesthetic appearance of the area; and
- Climatic factors such as wind speeds and direction (which might be influenced by the topography of an area).

Changes in the topography caused by the mining activities could therefore alter all of the above-mentioned aspects of the environment. Project-related activities have the potential to alter the topography of the site through the establishment of both temporary and permanent infrastructure.

The topography of the area is characterised by gentle undulating hills. No mountain ranges or ridges occur in the area. The area is well vegetated with grasses, small shrubs and trees. There is evidence of previous mining activity in the immediate area as well as on neighbouring properties.

The area elevation varies between 1805 masl and 1763 masl. The area where it is proposed to place the facility is near the entrance from the R36 at elevation 1800 masl. Plains generally characterise this region with low and moderate relief but also significant areas of lowlands with low and high relief, open hills with low relief and closed hills with moderate relief.

6.3 GEOLOGY AND SOILS

The information below was obtained from the geohydrological investigation by Rison Groundwater Consulting CC, 2008 and the Phase 1 Palaeontological Impact Assessment by Dr. Heidi Fourie attached in Annexure 3.

6.3.1 Geology

The geology of the area is dominated by near horizontally bedded and wavy successions of sandstone, mudstone, siltstone and coal layers of the Natal Middle Ecca Stage coal province of the Vryheid Formation. The lower Vryheid Formation is described as upward coarsening shale and sandstone cycles which represent prograding deltaic environments. This in turn is overlain by upward fining sandstone and shale cycles, which are of a fluvial origin. The coal beds, which were deposited in the back swamps of meandering river systems, cap the Lower Vryheid lithologies. The depositional environment is believed to be a dendritic channel system that resulted in the deposition of more arenaceous material in the active channels and mud and coal deposited on their floodplains. Channel closure led to the filling of channels by mud, the establishment of swamps and the deposition of coal beds within them. Similar deltaic and fluvial processes characterise the sediments overlying

the coal seams, consisting mainly of alternating sequences of shale and sandstone. The more competent sandstone formations can result in localised hilly terrains. The coal layers form part of the Karoo Sequence of which the Middle Ecca Group contains the coal measures, which are of economic value. The succession of sedimentary rocks generally overlies the well consolidated conglomerates and diamictites and tilite of the Dwyka Formation. The coal seams for the Ermelo sector of the Natal Middle Ecca Stage coal province are alphabetically ordered from E seam at the base through to A seam at the top. In the area under investigation the A seam has been weathered and or eroded away.

The regional geology consists of various groups within the Karoo Supergroup as well as numerous dolerite intrusions, occurring as both dykes and sills. The most relevant Karoo Supergroup unit to this study area is the Permian aged Ecca Group. Although the Ecca Group is defined by 16 formations, only one dominates the immediate study area, namely the Vryheid Formation. Dolerite dykes are therefore present in the area. The dykes serve as a groundwater divide. The strata, including the coal seams, generally dip towards the west, displaying a weak undulating attitude. This probably reflects the palaeo-topography of the Karoo sediments. Dolerite sill intrusions are found to the west of Umlabu Colliery. The geological map (2630 Mbabane and 2628 East Rand) depicted in Figure 4, indicates a definite presence of geological lineaments that are oriented predominantly in a northeast-southwest direction.

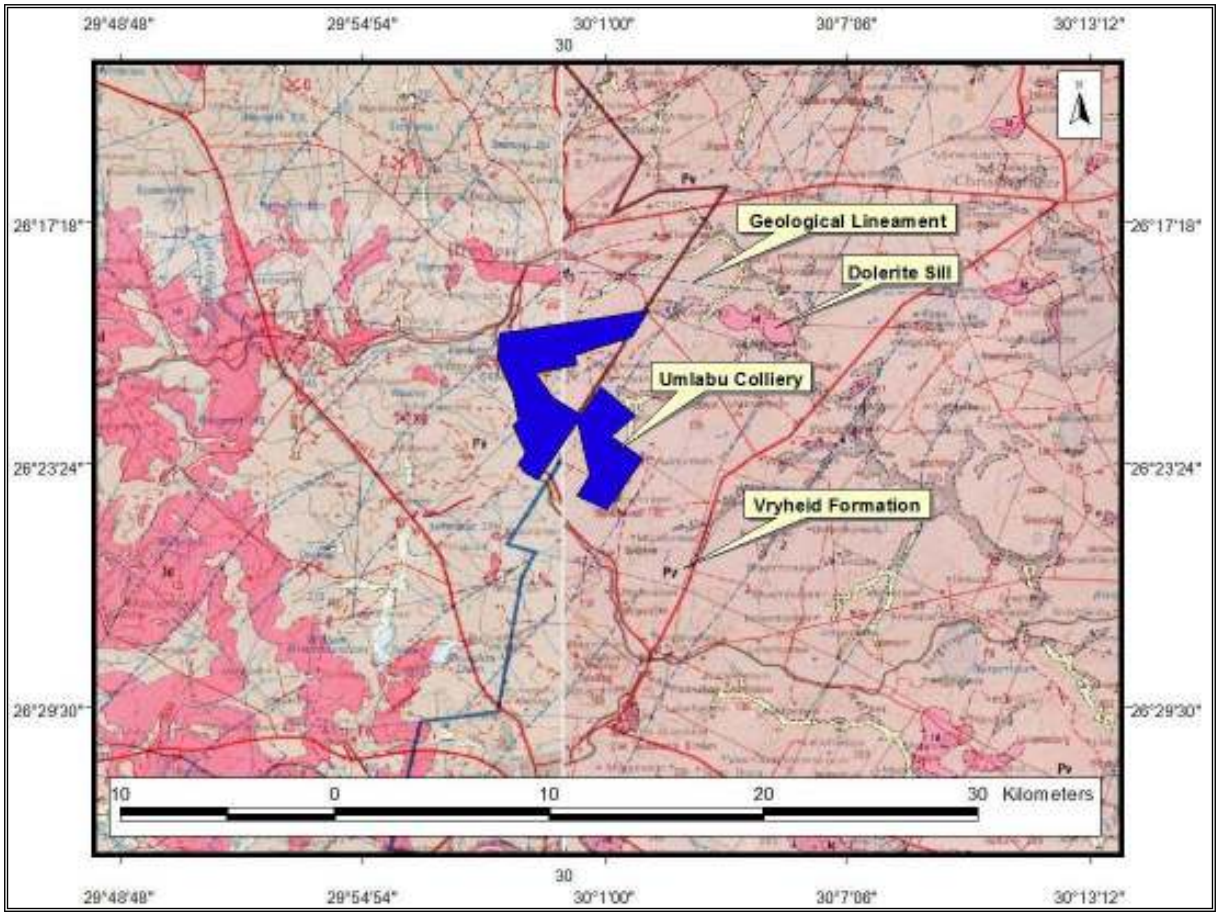


Figure 4: Local and Regional Geology

6.3.2 Soils and Agricultural Potential

The soil potential of the different soil forms within the study area is presented in Table 7 below.

Table 7: Soil potential of the soil forms occurring on the study area

SOIL FORM	SOIL POTENTIAL		
	Dryland	**Irrigation**	**Grazing**
Katspruit	None	None	Medium
Dresden	None	None	Medium
Longlands	Low	None	Medium
Hutton	High	High	High
Avalon	High	None to very low	High
Pinedene	Low	None	Medium
Witbank	None	None	Low to Medium

Of all the soil forms that occur on the study area only the Hutton and Avalon soil Forms are suitable for dryland crop production. The Pinedene soil form although having a low dryland soil potential is disqualified due to water logging during the wet season (summer months).

The Katspruit soil form is disregarded as a potential dry land soil due to its shallow soil depth and position in the valley bottom, terrain unit 5, a sensitive unit.

Dryland potential to support specific crops

Table 8 below, indicates cash crops that can be cultivated in the Ermelo area.

Table 8: Potential crops together with potential crop yields for the different soil forms

	Maize Ton/ha	**Grain / Sorgum Ton/ha**	**Beans Ton/ha**	**Wheat Ton/ha**	**Sunflower Ton/ha**	**Peanuts Ton/ha**
Katspruit	2,34	2,47	1,04	1,31	1,24	0
Dresden	0	0	0	0	0	0
Longlands	0	0	0	0	0	0
Hutton	4,22	6,24	2,2	2,34	2,49	2,23
Avalon	3,28	4,74	1,82	1,64	2,17	1,63
Pinedene	3,28	4,32	1,82	1,4	2,17	1,63
Witbank	0	0	0	0	0	0

Table 8 indicates that of the seven soil types identified in the study area only three soil forms should be utilised for crop production viz.: Hutton, Avalon and Pinedene.

The chemical properties of the different soil forms and the different horizons are presented in Table 9.

Table 9: Chemical properties of the different soil forms on the study area

SOIL FORM	HORIZON	pH	EC	P	K	Ca	Mg	Na
		KCl	mS/m	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Katspruit	Orthic A	3.8	63.7	11	69	122	45	6
	G Horizon	4.1	37.0	7	44	186	163	6
Dresden	Orthic A	4.3	20.4	6	131	251	120	5
Hutton	Orthic A	4.2	16.67	5	158	368	133	23
	Red Apedal B	4.3	10.88	1	89	478	173	18
Avalon	Orthic A	4.2	14.59	11	144	354	64	5
	Yellow Brown Apedal B	3.9	46.3	6	122	171	31	5
Pinedene	Orthic A	4.1	99.3	3	96	208	123	51
	Yellow Brown Apedal B	4.2	46.6	1	82	50	38	18

The erodibility of the soils occurring in the study area is presented in Table 10 below.

Table 10: Derived erodibility of the soils occurring in the study area

SOIL FORM	EROSION SUSCEPTIBILITY INDEX	
	WATER EROSION	WIND EROSION
Katspruit	Moderate	Low
Dresden	Moderate	High
Longlands	Moderate	High
Hutton	Very Low	Moderate to High
Avalon	Moderate	High
Pinedene	Moderate	High
Witbank	Moderate to High	Moderate to High

The land capability classification is done in accordance with the Chamber of Mines Rehabilitation Guidelines.

Table **11** indicates the land capability of the different soil forms in the study area.

Table 11: The land capability of the different soil forms

SOIL FORM	LAND CAPABILITY CLASS	SOIL DEPTH (cm)	TOPSOIL DEPTH (cm)
Katspruit	Wetland / Grazing	75	35
Dresden	Grazing land	22	22
Longlands	Wetland / Grazing	75	40
Hutton	Cultivated Land	120	30
Avalon	Cultivated Land	85	30
Pinedene	Pastures and Grazing	120	35
Witbank	Grazing	120	10

Seven different soil forms were identified across the study area. Soils identified during the survey can be classified as Orthic soils. The crop production potential of soils is generally low except for the Hutton and Avalon soil forms. Grazing potential for the area is high to moderate on all soil types identified. The susceptibility of the soils to wind erosion is high and to water erosion moderate. The pre-mining land use of the study area was identified as dry land crop production and grazing. Several streams and associated riparian wetlands occur on the study area.

6.4 HYDROLOGY

The Mine lease area falls within the Msukaligwa (MP302) local municipal area. The site is located in the quaternary catchment, C11A (Upper Vaal River catchment). Actually, the mine lease area starts right on the watershed between quaternary catchments C11A and C11F, but is located entirely within C11A to the east of the watershed between the two catchments. Quaternary catchment C11A has a mean annual rainfall of 742.71 mm and a mean annual run-off into surface streams of 75.7 mm. (Midgley *et. al*. 1994).

6.4.1 Surface Water

The information below was obtained from the surface water assessment by African Environmental Development, 2008 attached in Annexure 3.

Several unnamed streams flows across the site towards the Torbanite dam. Three sub-catchments occur within the mining area namely, Upper Torbanite dam, Western and Southern catchments. Refer to

Figure 5 below.

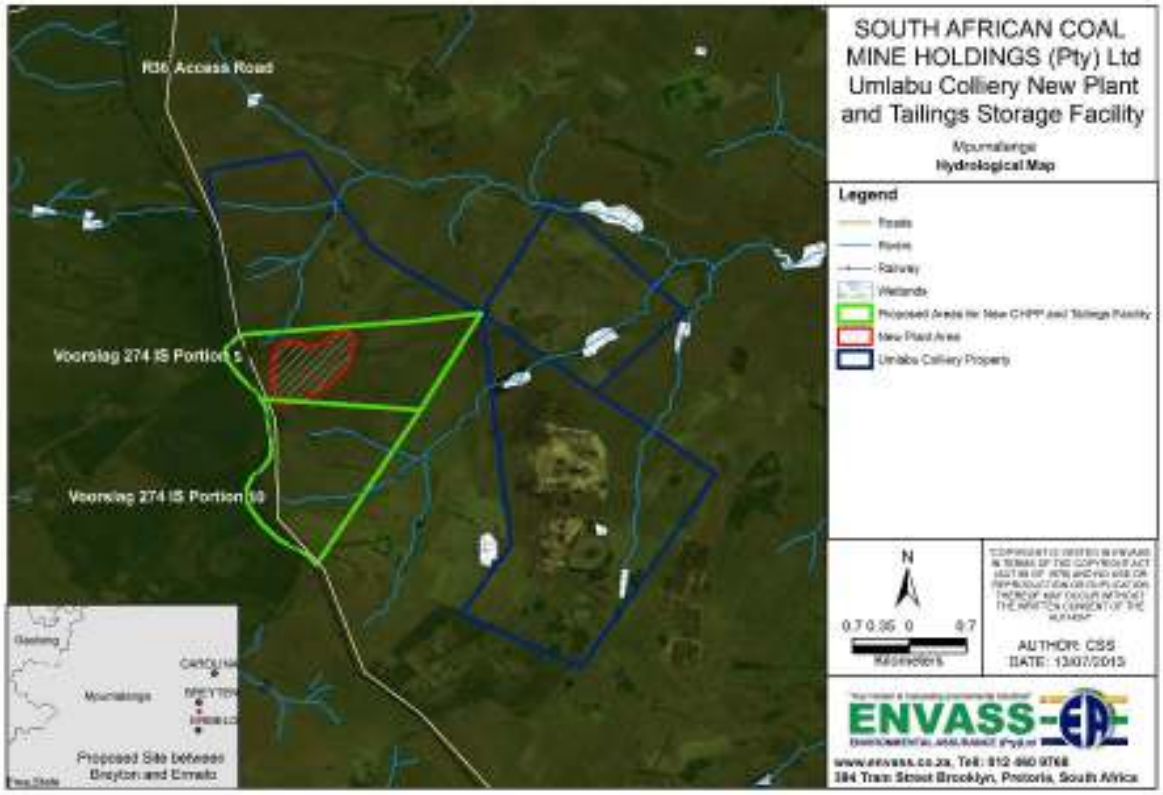


Figure 5: The surface hydrology of the Umlabu mine

Mean annual runoff, as well as flood peak volumes and discharges of the respective catchments are indicated in Table 12 below.

Table 12: Catchments within Umlabu Colliery

	Size	MAR	Peak Volume (V)			Peak Volume (Q)		
Catchment	**Ha**	**(106m3)**	**V50**	**V100**	**VRMF**	**Q50**	**Q100**	**QRMF**
Upper Torbanite Dam catchment	5 116,0	12,0	1,8	2,4	6,5	185,3	227,5	436,5
Western tributary catchment	1 345,2	4,1	0,5	0,9	1,9	47,1	57,6	102,9
Northern tributary catchment	1 155,4	3,7	0,4	0,8	1,6	40,2	49,1	86,1

Note that no mining will occur within 100m of a stream, which is further from the channel than the 1:100 year flood lines, thus no river diversion will occur.

The entire Eastern Highveld is characterised by seep zones, springs and wetlands as well as seasonal pans.

Shallow groundwater usually daylights where sandstone or ferricrete outcrops force the groundwater to the surface, forming springs and seep zones. For this reason there are mostly two distinct aquifers in these parts of the land, a shallow weathered aquifer above the sandstone/mudstone/shale layer and a deeper fractured aquifer underlying this layer, usually among or underneath the coal seams, where these occur.

Surface water users in the vicinity of Umlabu Colliery are quite varied. The immediate neighbouring properties are utilized for agricultural purposes mostly. Some farmers, farm commercially while other farm on basic subsidence scale. There are also quite a number of smallholdings. Some members of the Ermelo fishing community enjoy fishing in the first dam downstream from the mine on Mr. Naude's farm. Except for fishing at this dam, there's no other recreational activities practised in close vicinity to the mine utilizing surface water. There has been observation of a house built right next to the water's edge a few kilometres downstream from the mine with a small motorized float. It can be safely assumed that this surface water area serves a recreational purpose to the owner of the land.

6.4.2 Wetlands

The information below was obtained from the High Level Wetland Assessment by Strategic Environmental Focus (SEF) attached in Annexure 3.

With South Africa being a contracting party to the Ramsar Convention on Wetlands, the South African government has taken a keen interest in the conservation, sustainable utilisation and rehabilitation of wetland in in South Africa. This aspect is also reflected in various pieces of legislation controlling development in and around wetlands, of which the most prominent are the National Water Act, 1998 (Act No. 36 of 1998) [as amended] [NWA]. As South Africa is an arid country, with a mean annual rainfall of only 450mm in relation to the world average of 860mm (DWAF, 2003), water resources and the protection thereof is critical to ensure their sustainable utilisation. Wetlands perform various important functions related to water quality, flood attenuation, stream flow augmentation, erosion control, biodiversity, harvesting of natural resources, and others, highlighting their importance as an irreplaceable habitat type. Determining the location and extent of existing wetlands, as well as evaluating the full scope of their ecosystem services, form an essential part in striving towards sustainable development and protection of water resources. Due to the nature of the present study, no wetland functional assessments were conducted.

Wetland Soils

For an area to be considered a wetland, redoximorphic features must be present within the upper 500mm of the soil profile (Collins, 2005). Redoximorphic features are the result of the reduction, translocation and oxidation (precipitation) of iron and manganese oxides that occur when soils are saturated for sufficiently long periods of time to become anaerobic. Only when soils within 500mm of the surface display these redoximorphic features, can the soils be considered to be wetland soils. According to DWS (2005), identification of redoximorphic

features are the most important indicator of wetland occurrence due to the fact that they remain in wetland soils, even if the wetlands are degraded or desiccated.

Redoximorphic features were identifiable within all sampled delineated wetland areas.

Wetland Vegetation

According to DWS (2005), vegetation is regarded as a key component in the delineation of wetlands. However, using vegetation alone as an indicator requires undisturbed conditions and several species common in wetlands also occur extensively outside of wetlands.

It is important to identify the vegetative indicators which determine the three wetness zones (temporary, seasonal and permanent) characterising wetlands. Each zone is characterised by different plant species which are uniquely suited to the soil wetness within that zone.

Areas with permanent zonation and associated high water tables contained hydrophilic plants such as *Typha capensis, Persicaria lapathifolia, Phragmites australis,* and grasses such as *Leersia hexandra, Hemarthria altissima* and *Agrostis lachnanta*. *Typha capensis*, *Persicaria lapathifolia* and *Phragmites australis* were able to grow in water up to 500mm deep while areas with standing water of up to 200mm were dominated by graminoids such as *Leersia hexandra*, *Pycreus macranthus* and *Paspalum* sp., *Miscathus junceus, Agrostis lachnanta*, and obligatory wetland species, was present in all three wetland zones, but were more abundant in the seasonal zones. The temporary and seasonal wetlands zones were dominated by grass species such as *Andropogeon eucomus, Sporobolus pyramidalis, Arundinella nepalensis, Imperata cilindirica* and *Paspalum urvillei* as well as Cyperaceae such as *Pycereus polystachyos, Cyperus articulates* and *C. fastigiatus*.

Several temporary seepages were identified within the study area and would therefore be classified as moist grassland. Moist grassland contains globally significant biodiversity, supplies essential ecosystem services, supports crop and livestock agriculture, yet is poorly conserved. Moist grasslands also provide habitat to a large number of threatened plant species. Provincially protected plants such as the grass orchids and *Brunsvigia radulosa* are likely to occur within some of the moist grasslands of the study area.

Functionality of Wetlands

Wetlands within the study area serve to improve habitat within and downstream of the study area through the provision of various ecosystem services. The following potential wetland services and functions may occur within the study area:

- Water balance: streamflow regulation, flood attenuation and groundwater recharge;
- Water purification: Nitrogen removal, Phosphate removal, toxicant removal and water quality;
- Sediment trapping: Particle assimilation;

- Harvesting of natural resources: Reeds, Hunting, etc.;
- Livestock usage: Water for livestock; and
- Crop farming: Irrigation.

Hydro-geomorphic units are inherently associated with hydrological characteristics related to their form, structure and particularly because of their position in the landscape. This, together with the biotic and abiotic character (or biophysical environment) of wetlands in the study area, means that these wetlands are able to contribute better to some ecosystem services than others (Kotze et al. 2005) Each wetland's ability to contribute to ecosystem services within the study area is further dependant on the particular wetlands' Present Ecological Status (PES) in relation to a benchmark of reference condition. Many of the isolated seepages are likely to be categorised in the lower classes of PES as a result of historic impacts such as cultivation, whereas the valley-bottom wetlands as well as depression wetlands are likely to fall into higher category PES scores.

National Freshwater Ecosystem Priority Areas (NFEPA)

The National Freshwater Ecosystem Priority Areas (NFEPA) project is currently underway, and represents a multi-partner project between the CSIR, South South African National Biodiversity Institute (SANBI), Water Research commission (WRC), Department of Water Affairs (DWA), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANP). The NFEPA's objectives include:

- Identify Freshwater Ecosystem Priority Areas (FEPA) to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

Some of the wetlands within and surrounding the study area are classified as FEPAs. Refer to Figure 6 below.

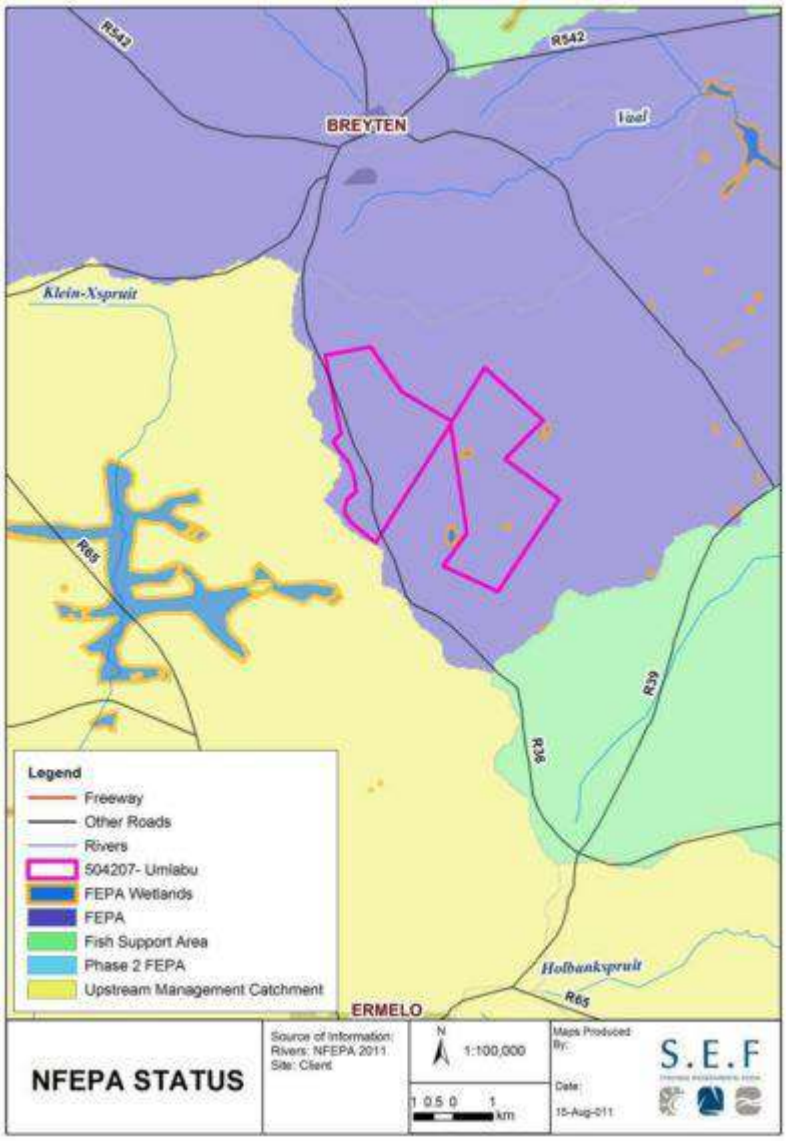


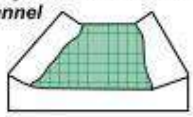
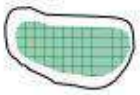
Figure 6: NFEPA status of wetlands and catchments within and surrounding the study area

The study area is located within an FEPA. The wetlands surrounding the study area are classified as FEPA wetlands. The area to the southeast of the study area is classified as a Fish Support area and the area further southeast, south, southwest and northwest of the study area classified as an Upstream Management Catchment.

Delineated Wetland Areas

Five different types of wetland areas were classified within the study area and were categorised into hydro-geomorphic (HGM) units. These include valley bottom wetlands without a channel, valley bottom wetlands with a channel, hillslope seepage wetlands feeding a watercourse (including valleyhead seepages), hillslope seepage wetlands not feeding a watercourse and a depression wetland. A total of 37 HGM units were delineated and classified surrounding the study area. Due to the high level nature of the wetland study, the boundary of several wetland sections could still potentially change as a result of ground-truthing processes. Refer to Table 13 for the wetland hydro-geomorphic types and to Figure 7 for the wetland delineation of the study area.

Table 13: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa (adapted from Kotze *et. al*, 2005)

Hydro-geomorphic types	Description	Source of water maintaining the wetland[1]	
		Surface	Sub-surface
Valley bottom with a channel 	Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage feeding a watercourse 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a watercourse.	*	***
Hillslope seepage not feeding a watercourse 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a watercourse.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent.	*/ ***	*/ ***

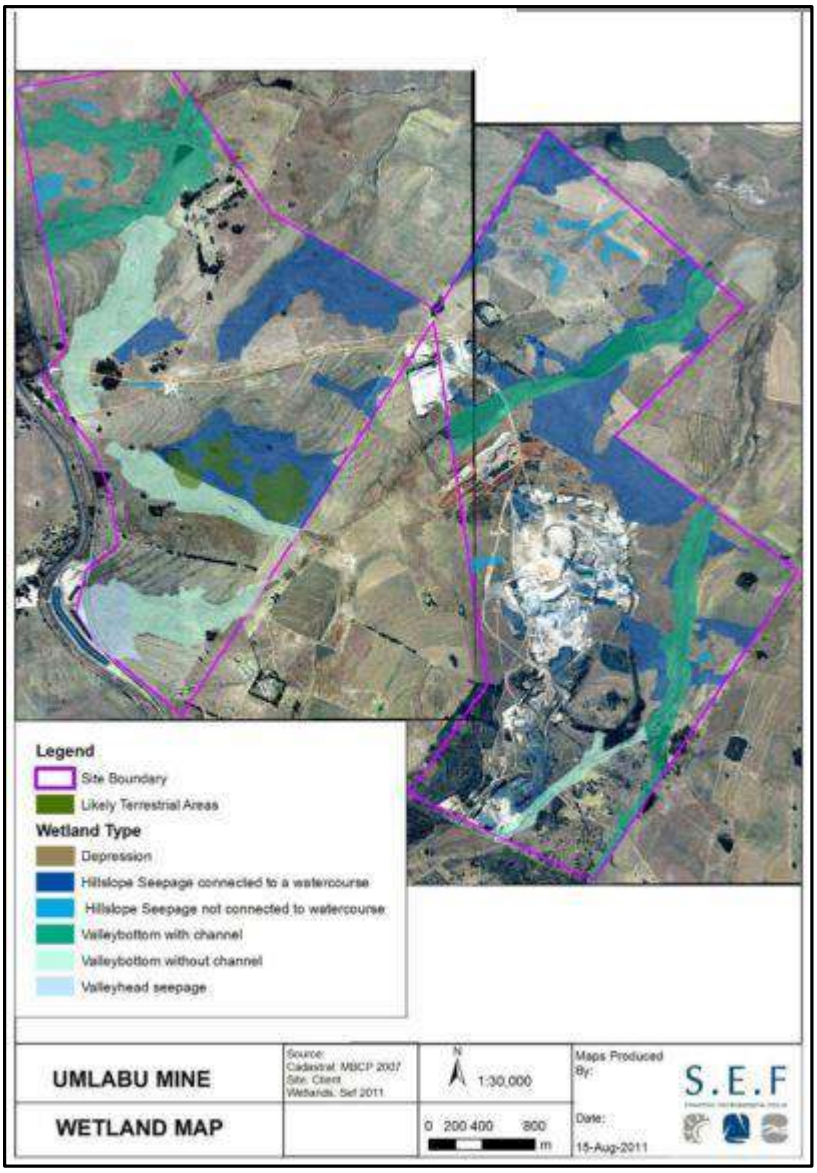


Figure 7: Wetland delineation for the study area

6.4.3 Groundwater

The information below was obtained from the geohydrological investigation by Rison Groundwater Consulting CC, 2008 attached in Annexure 3.

Since mining activities can potentially impact on the groundwater, a description of the current groundwater conditions is required. The purpose of this section is, therefore to describe the current prevailing groundwater conditions. This will serve as a reference baseline for quantifying potential mining impacts on the existing groundwater regime.

From historical available data it is evident that the groundwater depth varies across the site, mainly due to the topography and heterogeneity of the secondary structures in the bedrock. The heterogeneity of the fractured rock aquifer on such a small scale can be ascribed to the presence of structures such as dykes, fractures, fissures,

joints and faults creating secondary pathways for flow. Groundwater levels varying between 2m and 30m below ground level have been determined. There is a poor correlation between static water level and topography. (Refer to Figure 8 below). This can be ascribed to current mining activities in the area. Boreholes located on or close to the old Satmar underground mine workings to the south of the site showed deeper water levels to other boreholes in the area.

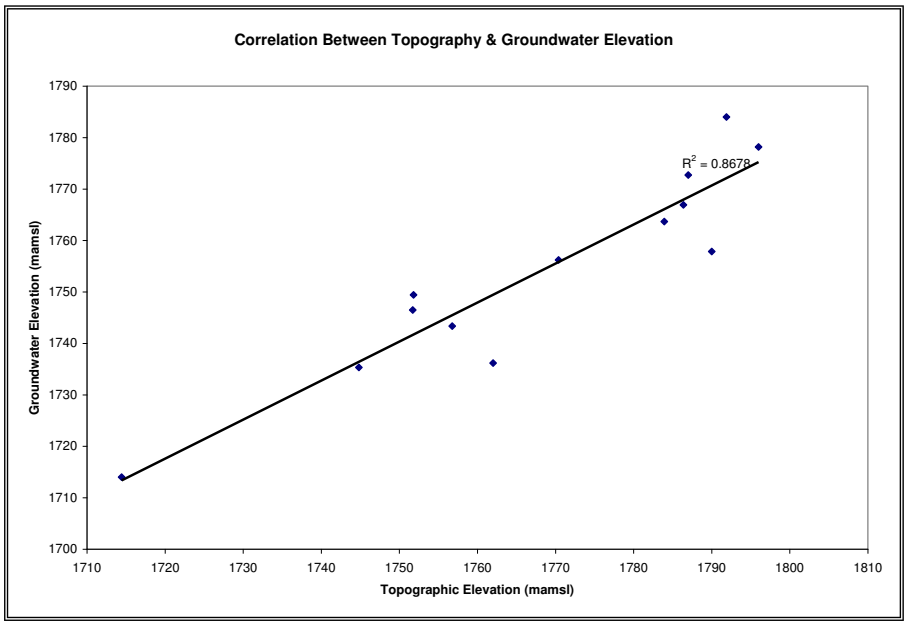


Figure 8: Groundwater levels versus topography (after Rison, August 2008)

The borehole abstraction rates on many of the identified boreholes are unknown as they are largely used for private purposes, consisting largely of domestic usage as can be seen in Table 14 below.

Table 14: Borehole abstraction rates in the Umlabu coal Colliery surrounds

BH	Easting	Northing	Depth	SWL	Use	Owner	Comment
UM4	101205	-2917922	57.72	20.24	Windmill	Umlabu	Planned office use
US3	100879	-2917946	36.28	2.39	None	Leon Naude	Open borehole
US4	101197	-2918505	55.00	13.42	Farm use	Leon Naude	Electric pump
US6	100094	-2921173	100	32.14	Domestic	Johan Swanepoel	Submersible pump
US7	98396	-2919724	100	7.89	Live stock		Wind pump
US8	99415	-2920762	100	19.45	Domestic & live stock		Submersible pump
US9	99099	-2920880	100	17.83	Domestic & live stock		Submersible pump
US10	99285	-2920796	100	14.29	Domestic & live stock		Submersible pump
US11	99370	-2921393	0	0	Bottled water		Natural spring
US13	99588	-2920812	100	25.81	Domestic		Submersible pump

Umlabu Colliery currently abstracts groundwater from the Old Torbanite Shaft (OTS) to supply the plant. The exact volumes abstracted are not currently known although a flow meter was installed subsequent to recommendations. The current abstraction estimate is in the region of 35 ℓ/s on a permanent basis.

The Department of Water and Sanitation (DWS) classifies the underlying aquifer as type d2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is intergranular and fractured.

Further to the east of the mine, the aquifer is classified as type b2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is fractured.

Pump tests were undertaken on four boreholes, namely US3, US13, UM5 and UM6. Tests on US3, US13 and UM6 consisted of a constant rate test (max. 3 hours) followed by a recovery test (max 3 hour or until 90% was achieved). A pump test of 6 hour duration was undertaken on borehole UM5.

Constant rate as well as recovery data were analysed using the FC program which was designed at the Institute for Groundwater Studies at the University of the Free State. A summary of the pump tests is given in Table 15. Estimated aquifer parameters are summarised in Table 16.

Table 15: Aquifer test summary

	US3	US13	UM5	UM6
Constant Rate (L/s)	0.80	0.83	0.14	0.48
Constant Rate Duration (min)	12.00	60.00	360.00	180.00
Drawdown (m)	20.09	0.51	27.58	0.95
Recovery Duration (min)	60.00	25.00	360.00	180.00
Recovery Achieved (%)	31.00	99.00	84.00	96.00

Table 16: Estimated aquifer parameters

	Unit	US3	US13	UM5
Transmissivity (Cooper Jacob method)	m^2/day	0.40	44.6	1.5
Transmissivity (Recovery)	m^2/day	1.30	40.6	1.6
Average Transmissivity	m^2/day	0.85	42.6	1.55
Borehole Depth	m	50.00	100	55
Static Water Level (SWL)	mbgl	2.45	25.81	2.88
Saturated Zone	m	47.55	74.19	52.12
Hydraulic Conductivity (k)	m/day	0.02	0.57	0.028

- The plant uses 600 litres of water for every Ton ROM (run-of-mine) processed;
- Process water is pumped from an old flooded shaft;
- The plant currently processes 120 T/hour, (24/7) with 40 hours down time per month, i.e. it currently processes 81 600 T/month (i.e. 48 960 Kℓ/month @ 600 ℓ/T).

An additional investigative measure undertaken with regard to the above issue was to sample groundwater from the surrounding plots and the Old Torbonite Shaft (OTS) and to compare the hydrochemical signature by means of a Schoeller plot Refer to Figure 9: Schoeller Diagram for Umlabu coal Colliery below.

The Schoeller plot shows that the groundwater sampled at the OTS has a very similar hydrochemical signature to that of the surrounding boreholes, thus strongly suggesting that the groundwater has a similar provenance.

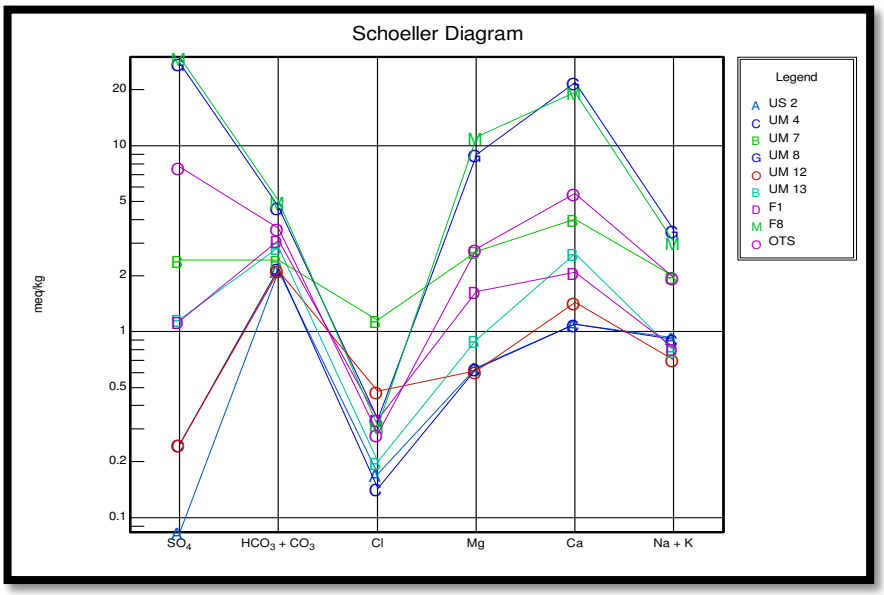


Figure 9: Schoeller Diagram for Umlabu coal Colliery

A static groundwater map of the area was constructed through the utilization of the Bayes interpolation method whereby the topography is used as an intelligent parameter to estimate groundwater levels in areas where data is scarce. Before undertaking a Bayesian interpolation, a correlation between topographic elevation and static water level needed to be determined. Groundwater levels as well as natural spring elevations were used in the correlation. The relationship between these two variables suggests an 87% correlation, meaning that groundwater elevation strongly mimics topographical elevation. Refer to Figure 10: Groundwater flow for the Umlabu coal Colliery below.

Using average aquifer parameters, gradient of 3% and a porosity of 5%, a flow velocity of 0.126 m per day is estimated.

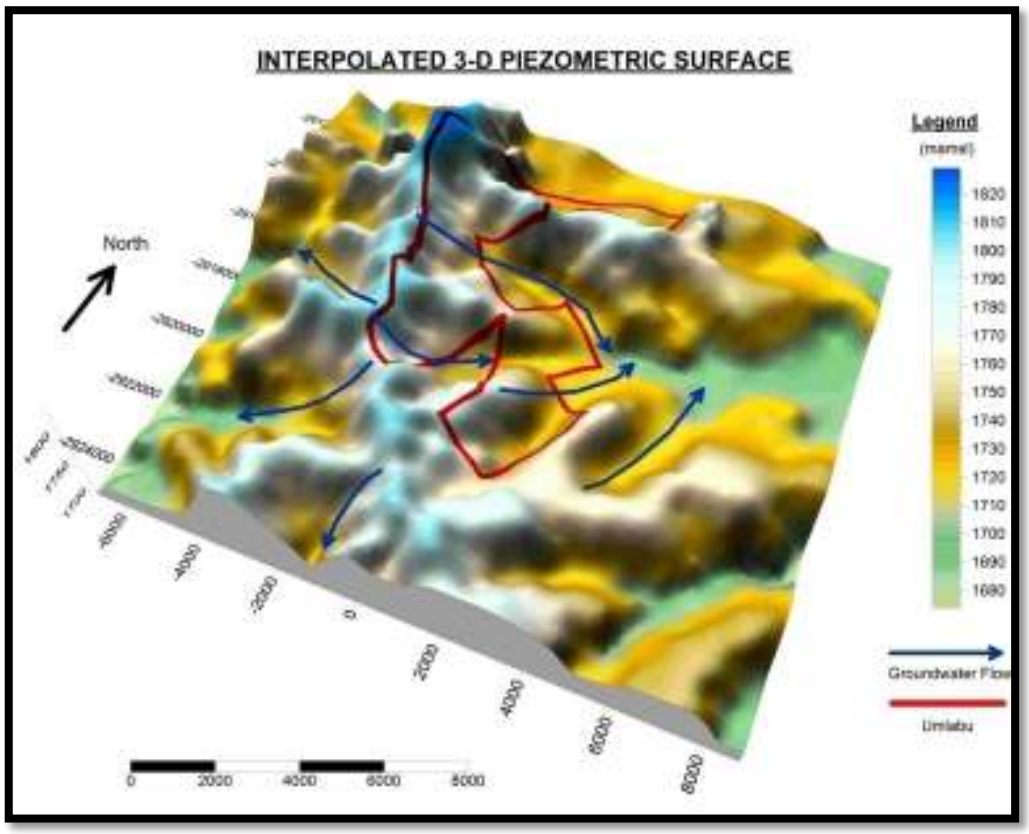


Figure 10: Groundwater flow for the Umlabu coal Colliery

A total of 16 groundwater samples were taken from around the project area and submitted to DD Science which is a SANAS accredited laboratory. Results are presented in Table 17.

Table 17: Groundwater quality of samples collected during the hydrocensus

PARAMETER	Unit	SABS Guideline			US 2	US 3	US 4	UM 2	UM 4	UM 7	UM 8	UM 9	UM 10	UM 11	UM 12	UM 13	F1	F4	F8	OTS
		Class 0	Class 1	Class 2																
pH	pH units	6 - 9	5 - 9.5	4 - 10	7.60	7.50	7.10	6.30	7.20	5.90	6.10	6.40	6.90	7.60	7.00	7.00	7.30	7.80	7.00	7.00
EC in mS/m	mS/m	<70	70 - 150	150-370	23.00	7.40	14.00	4.40	26.00	77.00	249.00	45.30	40.00	55.00	27.00	39.00	40.80	38.40	241.00	99.50
TDS	mg/L	<450	>450	NS	175.00	67.00	112.00	35.20	175.00	639.00	2330.00	354.00	258.00	498.00	173.00	313.00	276.00	242.00	2320.00	696.00
Alkalinity as CaCO3	mg/L	NS	NS	NS	107.00	21.00	10.00	16.00	110.00	122.00	235.00	40.00	125.00	290.00	107.00	143.00	156.00	200.00	252.00	180.00
Nitrate as N	mg/l N	<6	6 - 10	10 - 20	0.20	0.40	5.80	0.30	1.30	29.00	0.40	-	0.40	0.10	0.20	0.10	-	-	-	-
Chloride as Cl	mg/L	<100	100-200	200-600	6.10	7.80	14.00	<5.0	5.10	41.00	12.00	37.00	49.00	9.20	17.00	7.10	12.00	8.00	11.00	10.00
Sulphate as SO4	mg/L	<200	200-400	400-600	4.00	3.00	3.00	3.00	12.00	117.00	1340.00	29.00	16.00	10.00	12.00	56.00	55.00	9.00	1445.00	371.00
Fluoride as F	mg/L	<0.7	0.7-1	1-1.5	0.40	<0.1	0.10	0.10	0.20	0.20	0.90	<0.2	0.50	2.00	0.10	0.10	<0.2	1.10	0.30	0.30
Sodium as Na	mg/L	<100	100-200	200-400	17.00	12.00	12.00	6.00	18.00	40.00	76.00	24.00	50.00	126.00	15.00	15.00	16.00	74.00	66.00	42.00
Potassium as K	mg/L	<25	25-50	50-100	7.40	3.00	3.70	1.30	5.20	9.90	8.30	6.30	5.30	2.20	2.30	5.50	5.00	1.50	6.10	4.90
Calcium as Ca	mg/L	<80	80-150	150-300	22.00	4.00	7.70	2.40	22.00	81.00	441.00	27.00	27.00	9.70	29.00	53.00	42.00	5.00	388.00	111.00
Magnesium as Mg	mg/L	<30	30-70	70-100	7.80	0.50	3.10	0.40	7.70	33.00	109.00	13.00	9.10	1.20	7.50	11.00	20.00	14.00	136.00	34.00
Iron as Fe	mg/L	<0.01	0.01-0.2	0.2-2	<0.1	0.10	<0.1	<0.1	<0.1	<0.1	0.10	-	0.20	<0.1	0.10	<0.1	-	-	-	-
Manganese as Mn	mg/L	<0.05	0.05-0.1	0.1-1	<0.1	0.90	<0.1	<0.1	3.90	<0.1	1.80	-	0.50	<0.1	<0.1	<0.1	-	-	-	-

6.5 BIODIVERSITY

The information below was obtained from the Ecological Impact Assessment by Environmental Assurance (Pty) Ltd attached in Annexure 3.

Biodiversity forms one of the most crucial environmental considerations of a development and it is used to formulate decisions pertaining to activities with significant environmental impacts. The inclusion of biodiversity in decision making has been aimed to bridge a gap between economic development and land destruction, thus

mitigating the environmental effects these developments may pose while still maintaining a functioning biodiversity. Therefore, as part of the EIA guidelines it is important to assess the potential impact of these proposed activities as they can impact directly or indirectly on the receiving environment. In general, biodiversity represents the variety of species within a specified ecosystem and can thus be used to assess the ecosystem health.

The study area falls within the Grassland biome, a critically endangered and vulnerable eco-zone. The grassland biome offers essential ecosystem services and is being used by number of plants and animals as a habitat. The grassland biome holds water as groundwater or in wetlands and releases it slowly throughout the year. Furthermore, the biome is known for its ability to reduce runoff and prevents erosion due to its dense coverage which protects the soil. However, the Grassland biome is considered the most threatened and endangered ecosystem due to extensive mining and agricultural practices (NSBA, 2004).

Wetlands

The ecology of the study area show a diverse and important ecosystem functioning. Firstly, there are National Freshwater Ecological Priority Areas (NFEPA) (refer to Figure 11) recognised wetlands and rivers randomly distributed through the sites within and across the mining boundaries. The occurrence of these ecosystems within the proposed mining sites automatically highlights the sensitivity of the area. A diverse array of biodiversity such as plants and fauna depend and interact within these ecosystems.

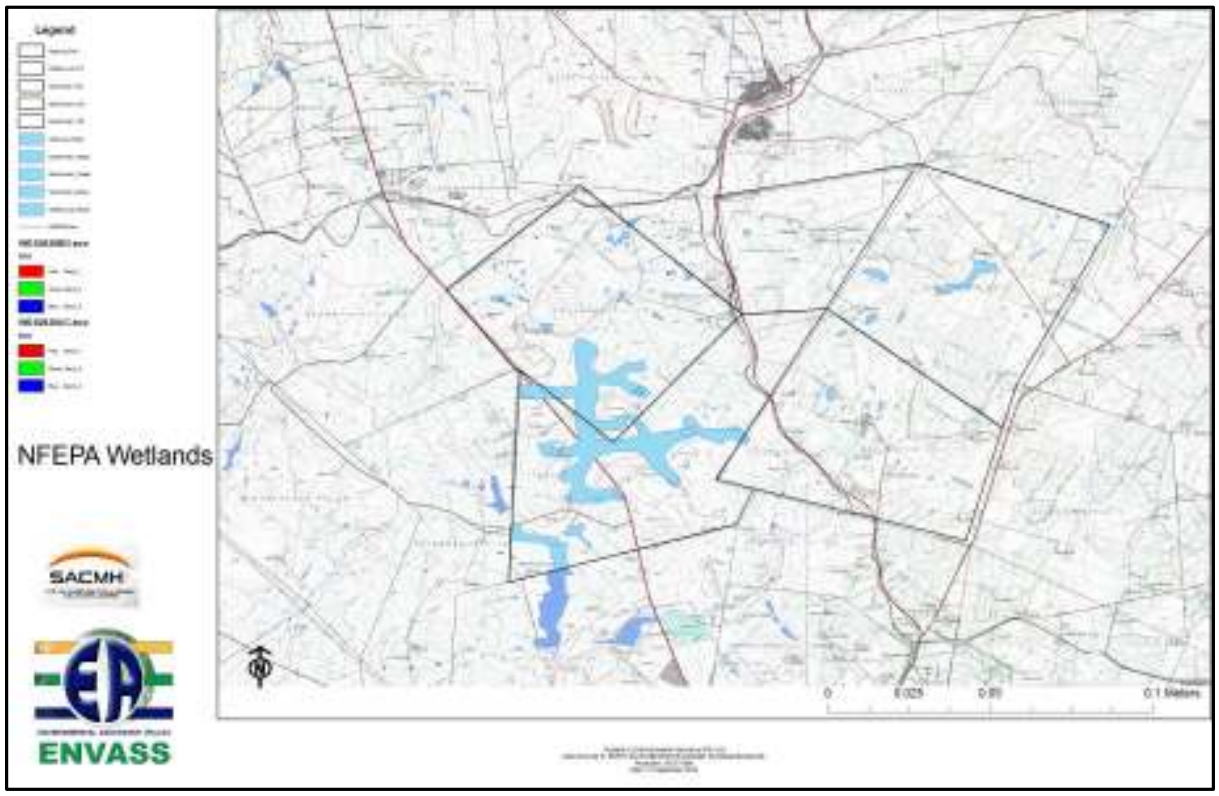


Figure 11: NFEPA Wetlands in the area

For a more detailed description of wetlands found on and surrounding the study area refer to Section 6.4.2 of this report.

Terrestrial Ecosystem status

The land use practices of the Mpumalanga Province had inflicted an enormous change in the terrestrial ecosystem. Current regional, provincial and national environmental conservation agency such as NSBA and MPBCP has considered the area very important and of biodiversity significance thus requiring protection (Driver et al, 2004; Ferrar & Lötter, 2006). The portion of remaining natural habitat in the province requires maintenance and an optimum management plan to avoid further loss. The terrestrial ecosystem where UMLABU Colliery is situated is affected by land-use activities that make the area prone to habitat loss. Refer to Figure 12 below.

Figure 12: Terrestrial Ecosystem status of the study site

6.5.1 Flora

The study site is situated on various farms in the Ermelo area, which lies within the summer rainfall area. Bredenkamp and van Rooyen (1995) classified the study site within the Moist Sandy Highveld Grassland biome (refer to Biome Map in Annexure 1, and indicated that it should be dominated by *Erogistis sp.* and *Themeda triandra*. Dicotyledonous forbs although well represented within the biome, should not be abundant. The biome into which Accocks (1988) classified the area is the North eastern sandy Highveld, specifically the Near Bankenveld veldt type occurring in the western side of the Drakensburg. According to Acocks (1988) the area should most likely be dominated by *Graminoid* species, such as *Tristachya leucothrix, T. triandra* and *E.*

racemosa. This biome according to Accocks, is dominated by sourveld species, and while not be considered suitable for grazing as typically utilised for agricultural purposes.

Floral communities presented within the study site were differentiated into 3 groups of the above mentioned floral types, namely:

- Flora species of special conservation concern;
- Pioneer plants species; and
- Invasive and noxious plant species

The flora species of special conservation concern (SCC) were identified as plant species that play an optimum role in the ecosystem functionality. These plants were found to occur around the wetland areas within the study sites. They were necessary for the continuous functionality of the wetland and such plants were represented by flowering plants and grasses observed in the study area.

Pioneer plant species observed in the area were represented by *Verbana bonariensis* and *Hyparrhenia hirta* which are plants that uses any opportunity to invade a disturbed or transformed area for such a short period of time.

The invasive and noxious weeds observed in the area were *Datura stramonium, Acacia mearnsii and Red Eucalyptus sp.* stand. These plants are often used as indicators of disturbed areas. They use such opportunity to invade, infest and encroach in the area gradually displacing endemic species. They become problematic to the invaded or introduced area because they outcompete and displace indigenous plant species, and they use large amount of ground- and surface water drying the rivers, dams or any water source close to their range.

6.5.2 Fauna

The disturbance of the site due to agricultural and mining activities has resulted in many animal species moving out of the area to less disturbed locations. Thus, species that are known to occur within the greater area may not occur on the survey area. Hence, community structure and ecosystem functioning will already have been altered, particularly as a result of noise generation, cultivation and habitation.

The study area and the surroundings have numerous wetlands that are known to be crucial to animals that use Moist grassland areas as habitat, breeding and as a migratory dens. Due to the extensive mining and agricultural land use happening in the area, some of the wetlands have been affected and tampered with to a point of dis-functionality or being unable to maintain any ecosystem functionality.

The fauna species in particular the avifauna were mostly observed utilizing the wetland area and their presence on the sites is mainly associated with the wetlands. These wetlands and plants are used for breeding and nesting

habitats. Furthermore, wetlands plants are also used as food source and as shelters, thus the areas which are still intact and functioning should be maintained and managed to avoid further habitat loss or disturbance.

Wetlands ecosystems provide flood protection and control erosion; they purify our water supply, and are a major source of recreation and aesthetic appreciation. It is important that wetlands are protected to ensure the survival of plants species, and natural communities in these ecosystems.

The avifauna observed in the study area was grouped into two categories:

- Birds of special conservation status
- Common birds

Common birds observed were made up of birds that were observed during site visits and sampling together with the birds that are used as indicators of disturbance. The birds observed during the study were, *Streptolia semitorquata*, *Vidua macroura, Bubulcus ibis, Apus caffer, Cisticola juncidis, Corvus albus, Myrmecocichla formicivora, Plegadis falcinellus, Fulica cristata, Anas undulate, Pternistis wainsonii, Amaurornis flavirostris, Acrocephalus beaticatus, Phalacrocrax lucidus, Charadrius tricollaris,Riparia paludicola, Bostrychia hagedash, Ploceus velatus, Euplectes orix, Hirundo rustica, Passer domesticus, Motacilla capensis and Vanellus coronatus.*

The site carrying capacity for wild game was observed to be low due to the fact that the study area is significantly modified by human intervention. Therefore, it is certain that the game unlike avian fauna would either move away from the area of disturbance or decline to the point of non-existence in the area.

The insects observed on the site included the *Lepidopterans* and the *Coleopterans*. The *Lepidopterans* were the dominating group among these insects with *Danus Chrysippus* sp*. orientis* being the most common butterfly seen fluttering around the area. It was followed by *Belenois aurota, Danaus chrysippus, Eurema brigitta* and *Chilandes trochylus* also observed at the site.

6.5.3 Biomonitoring and River Health

The information below was obtained from the Biomonitoring Survey by African Environmental Development (AED), 2011 attached in Annexure 3.

In-stream bioassessment surveys, commonly referred to as aquatic biomonitoring, are used to assess the health of water resources. The in-stream indicators monitored during a biomonitoring survey act as signals of deteriorating conditions or "*red flags*"; thereby indicating a problem, but without providing any definite causal links. For this reason AED has included a chemical water quality assessment as an integral part of the Aquatic Biomonitoring survey. Combining the two types of surveys, causes for deteriorating conditions in rivers/streams can usually be both identified and quantified.

The existing Umlabu Colliery, located in the headwaters of the Vaal River, is characterised by *inter alia*:

- Various springs and seeps that feed the streams associated with the colliery;
- A railway siding where coal is stored and loaded upstream from the actual mining impact areas;
- A mining pit that has been developed in the centre of a seasonal stream;
- Several pollution waste streams that erode from un-rehabilitated areas directly into a perennial stream; and
- An old redundant shaft (adit) where decant water is flowing directly into a perennial stream.

The aforementioned activities are cumulatively, in varying degrees, impacting directly and/or indirectly on surface water quality of the streams associated with Umlabu Colliery. Other contributing factors to ecological deterioration of the catchment relate, *inter alia*, to several roads that cut across wetlands; inadequate culvert systems to allow for base flow; erosion and channel formations; alien invader plant species within the stream and on the riparian zone; etc.

Conclusion and Recommendations

The study is the first of its kind in these particular stream segments under summer conditions and the assessment of the Present Ecological Status (PES) by means of various aquatic biomonitoring indices (i.e. South African Scoring System, version 5 (SASS5); Invertebrate Habitat Assessment System (IHAS); Intermediate Habitat Integrity Assessment (IHIA).

Given the significant role the habitat conditions (and number of biotopes that could be sampled) in the assessment of macro-invertebrate communities, the findings should be used as baseline data for future references, in order to confirm if the particular river segments have improved or deteriorated.

Quaternary catchment C11A, at the headwaters of the Vaal River, is characterised by huge lotic wetlands, most of which are intact and provides various ecosystem services (e.g. flood attenuation; biodiversity; water purification; etc.). These wetlands are hugely impacted by various point and non-point sources of pollution (including evidence of uncontrolled sediment runoff from mining contaminated areas) that are contributing in various degrees towards ecological deterioration of the catchment and impairment of water quality and/or habitat. Other contributing factors to ecological deterioration of the catchment were found to be related to several roads that cut across wetlands; inadequate culvert systems to allow for base flow; erosion and channel formations; alien invader plant species within the stream and on the riparian zone; etc. In this regard it should be noted that both the Stream 1 and 2 upstream biomonitoring sites (refer to Figure 13) are located relatively close to the quaternary watershed. The presence of various wetland systems between the upstream survey sites and that of the Combined (Down) site exist, which explains why there is a general improvement in aquatic macro-invertebrate habitat quality and water quality. These wetland systems are cumulatively filtering out pollutants from higher up in the catchment.

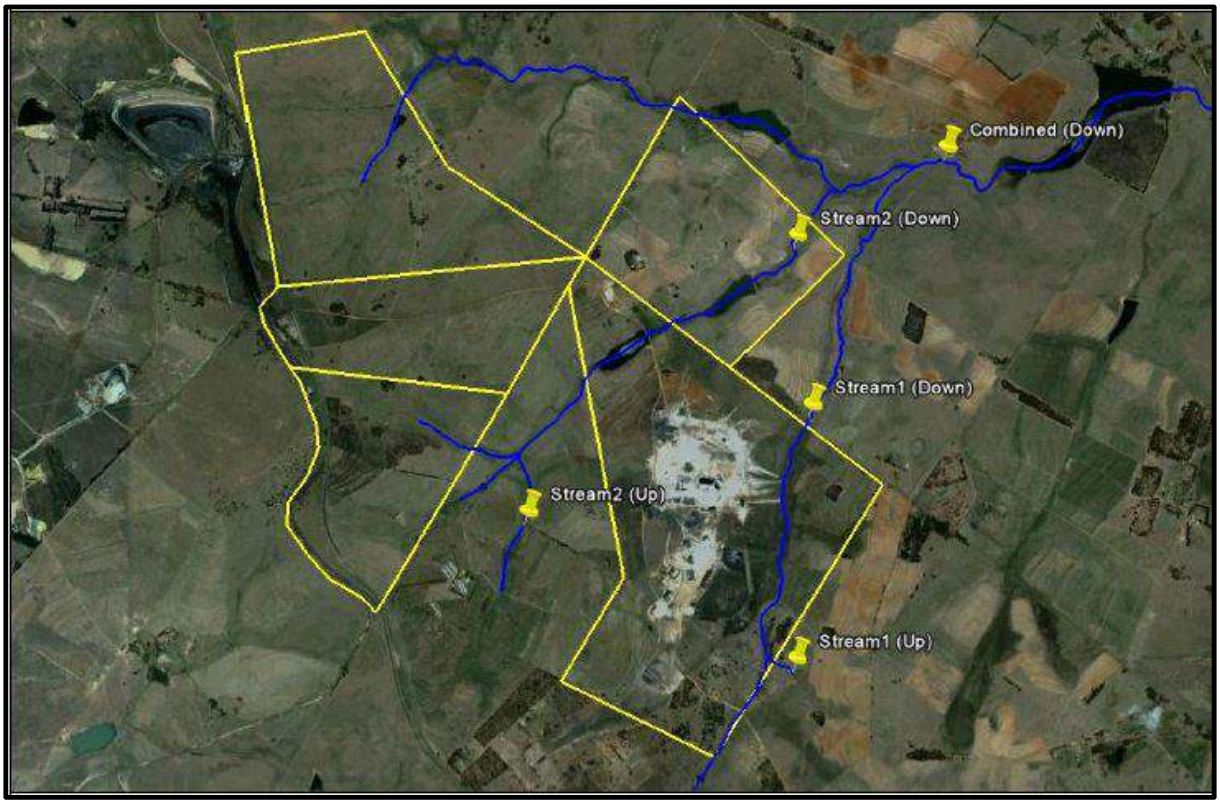


Figure 13: Mine lease area of Umlabu Colliery, including Portion 5 and 10 of the Farm Voorslag in relation to the biomonitoring sites

Given the role of wetlands to recharge the localised ground water aquifers, the likelihood of pollution trapped in the wetland to migrate to perched water tables should be assessed. Similarly, the likelihood of relatively high pollution emanating from discard dumps and other mining areas that have not been rehabilitated during rain storms to *Stream 1* – and eventually into the Vlakfontein Dam, which is the main source of potable water for Breyten – should also be investigated.

Relating to macro-invertebrate populations, the proportion air breathers will rise under conditions of reduced availability of dissolved oxygen, such as experienced when there are high loads of readily decomposable organic matter in streams or when oxidation of high ammonia concentrations takes place. This phenomenon was witnessed during the survey.

In addition to the above, the fact that all the monitoring sites in this particular area flow very slowly, due to the relative gentle slope in the study area, could also be a significant cause of the low oxygen level in this stream segments. It requires a lot of turbulence and waterfalls to re-aerate oxygen-deficient water flowing in the streams. It is suggested that all these sites are oxygen-deficient, hence the higher than usual proportion of air breathers in these segments of the streams.

In view of the issues raised in this report, it was recommended to Umlabu Management to do the following as a matter of urgency:

- To use these status quo assessment results for the Summer Cycle with the view of improving water and habitat qualities, in order to improve the various river segments‟ Present Ecological State Class (PES) (i.e. calculated collectively by the IHAS, IHIA, SASS5 scores, and ASPT). Aquatic biomonitoring should therefore be conducted, where stream flow conditions permit, bi-annually (in Winter and Summer);
- To initiate an immediate rehabilitation and storm water management programme at all localities where contaminated seepage during storm water runoff reports to surface streams. This includes the rehabilitation of all erosion channels, and exposed mining waste surfaces (e.g. waste rock/coal dumps);
- To amend the surface water monitoring programme to include assessing surface water quality associated with Umlabu Colliery during and after rainfall events;
- To initiate a programme to assess ground water quality upstream and downstream from Umlabu Colliery (if it is not already existing);
- To protect and enhance all wetland functions on the mine lease area at all costs. The following recommendations must be considered to minimise or avoid impacts on the wetland zone:
    - Dumping, infilling and excavation for construction purposes: All activities must be outside the 1:100 year flood line and/or the riparian zone – including all culverts. [Such activities usually result in significant impacts on a wetland's hydrology, hydraulics and biota, thereby threatening biodiversity and the goods and services wetlands provide. Thus, such activities are not considered to be generally sustainable practices.];
    - Creation of new hardened surfaces (including building and tarred): All activities must be located outside the 1:100 year flood line and/or the riparian zone. [The seasonal and permanent zones associated with streams and wetlands in general have surface water for extended periods. In the case of the seasonal zone, it may be wet for most of the wet season, while in the case of the permanent zone, it may be wet throughout the year. A buffer is required between areas potentially generating non-point source pollution and such areas where surface water is present.]
    - Stormwater management requirements: Stormwater outflows should not enter directly into the stream, embankments and/or the riparian zone with effective stormwater energy breakers that would reduce the speed of water to levels that would not cause erosion. It is recommended – if practicably possible - that a predominantly vegetated buffer area at 35 m wide be included between the storm water outflow and the outer boundary of the stream, with mechanisms for dissipating water energy and spreading and slowing water flow and preventing erosion. This buffer is particularly important when the catchment feeding the stormwater drain comprises predominantly hardened surfaces. [Extensive hardened surfaces in the catchment and the delivery of runoff by stormwater drains significantly increase the intensity of stormwater runoff, which increases the risk of erosion in a stream/wetland. Furthermore, mining-related stormwater

runoff is often polluted. Energy dissipating structures are required to reduce the energy and erosive power of the stormwater, while a buffer should assist in ameliorating pollution by decreasing the level of pollutants in the runoff before it enters the wetland. A buffer may also contribute to energy reduction of stormwater runoff.]

- Road construction: If no viable alternative route exists then it should be ensured that the road has minimal impacts on the flow of water through the stream (e.g. by using box culverts rather than pipes). No excavation of the wetland or any stream passing through the wetland (i.e. lowering of the base level) is permitted. Ensure an adequate buffer is present to deal with run-off from the road. During construction, minimise disturbance of the wetland at, and adjacent to, the road crossing site. Rehabilitation of damages during construction must be implemented immediately upon completion of construction. [Road, railway and pipelines crossings may potentially greatly modify local water flow patterns in a wetland. In addition to having a damming or draining effect on the flow upstream of the road, roads which do not allow for the adequate passage of water may concentrate (channel) flow downstream, increasing the erosion hazard and drying out this portion of the wetland. A lowering of the base level (ground level) increases the gradient in the wetland, thereby increasing the speed at which water will flow, increasing its erosive potential and the extent to which it contributes to lowering the water table.

The hydrochemistry study distinguishes the samples into two distinct groups, a) relatively uncontaminated upstream from the mining activities, and b) contaminated, i.e. downstream from the colliery. The sample of the combined flow, i.e. the sample in Stream 3 upstream from the Vlakfontein Dam does show a relatively uncontaminated character. The specialist is of the opinion that this improvement is rather attributable to the dilution by the larger Stream 3, than to biological actions occurring in the streams. When these samples are compared with their uncontaminated upstream counterparts, the character of the downstream samples, particularly Stream 1 and to a lesser extent, Stream 2, show a definitive negative impact by the colliery.

During the site visits conducted by the specialist several point sources of contamination into Stream 1 were identified. A particular concern relative to the water quality in Stream 1 is the uncontrolled decant observed during the specialists' site visits on 07 and 13 March 2011 being released from the storage dam used for the washing of the coal. The specialist recommended that this practice be discontinued.

Although the upstream sample of Stream 1 was collected from an old adit from which mine water is decanting, this water was of a surprisingly good quality. The water decanting from this adit complies with Class I of the SANS 241:2006 Standard in all respects. The specialist did not have any additional information relating to the adit or to the mine with which it connects, but this water was certainly not representative of typical water decanting from the underground mine workings of a colliery.

In general it seems as if the reduction in the water quality in Stream 1 is related to the mining activities at Umlabu Colliery, while the same at Stream 2 is related to the activities at the Voorslag Railway Siding. Although the colliery shows a definite negative impact on the water quality in the streams upstream from the mine, the specialist is of the opinion that this deterioration in the water quality is not the only role player responsible for the relatively poor PES Classes of the downstream samples. The specialist is of the opinion that the limited availability of habitat and other factors may play a more important role than the water quality *per se*.

DESCRIPTION OF THE SOCIO-ECONOMIC ENVIRONMENT

6.6 BASELINE AND DEMOGRAPHICS

The site falls within the municipal boundaries (601 566 ha) of the Msukaligwa Local Municipality. According to the Msukaligwa Local Municipality latest Integrated Development Plan (IDP 2007-2012), the local population of the area have the following approximate demographical characteristics:

- A total permanent resident population of 124 319 individuals; with 76 654 elderly individuals (> 65 years) and 48 158 individuals younger than 18 years;
- Approximately 51.8% of the total population comprises of females and 48.2% males;
- The majority ethnic population group comprises of black individuals at 89,2% of the total population, with whites consisting of 9,8%; and
- In terms of the economically active population, 28 038 individuals are employed, 17 361 are unemployed and approximately 31 209 individuals not economically active.

6.7 HERITAGE RESOURCES

Archaeological Resources

The information below was obtained from the Phase 1 Archaeological Impact Assessment by ENVASS attached in Annexure 3.

Cultural resources are all non-physical and physical man-made features as well as natural features associated with human activity. These include all sites, structures and artefacts of importance; whether individually or in a group, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this.

The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential.

The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects.

No artefacts or features of archaeology importance were identified on the study area. However the greater landscape holds a rich archaeological history ranging from stonewalled settlements on a hilltop to various rock art sites, as well as colonial wagon roads. These sites are located a considerable distance from the study area. Because no cultural remains were identified on or immediately adjacent to the study area, it is highly unlikely that it will be affected. This does not guarantee that no culturally significant material occurs on the study area. The site should therefore be monitored on a continuous basis during the construction phase in case any significant material is unearthed.

Palaeontological Resources

The information below was obtained from the Phase 1 Palaeontological Impact Assessment by Dr. Heidi Fourie attached in Annexure 3.

As requested by the South African Heritage Resources Agency (SAHRA), a Palaeontological Impact Assessment (PIA) was conducted by a qualified specialist (Dr. Heidi Fourie), in August 2014.

Formations present are part of the Karoo Supergroup. The Karoo Supergroup is renowned for its fossil wealth. The Vryheid Formation (Pe,Pv), Ecca Group is rich in plant fossils such as the *Glossopteris* flora represented by stumps, leaves, pollen and fructifications. This formation is early to mid-Permian in age and consists of sandstone, shaly sandstone, grit, conglomerate, coal and shale. Coal seams are present in the Vryheid Formation within the sandstone and shale layers. Fossils are mainly present in the grey shale which is interlayered between the coal seams.

The two portions of the Farm Voorslag 274 IS were visited and there are no visible rocky outcrops of the Vryheid Formation on the surface as the overburden is substantial and most of the land is covered in grassland. The topsoil layer is approximately 0.6m thick. The strata, including the coal seams, generally dip towards the west, displaying a weak undulating altitude. The coal seams for the Ermelo sector of the Natal Middle Ecca Stage coal province are alphabetically ordered from E seam at the base through to A seam at the top. The A seam is absent in the study area due to erosion.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH, and here locally VERY HIGH for the Vryheid Formation.

During the study, the overburden and inter-burden was closely inspected for fossiliferous outcrops. Rocky outcrops are absent, but a bulldozed section on Portion 5 shows the typical Vryheid Formation rocks. The overburden is thick in places and care should be taken if foundations for buildings and associated structures are

dug. Both portions will be affected by the CHPP and TSF, pollution control dam, roads, buildings, waste rock dump, coal stockyard. Such structures will need several trenches, foundations and footings to be dug which may enter the more solid Vryheid Formation.

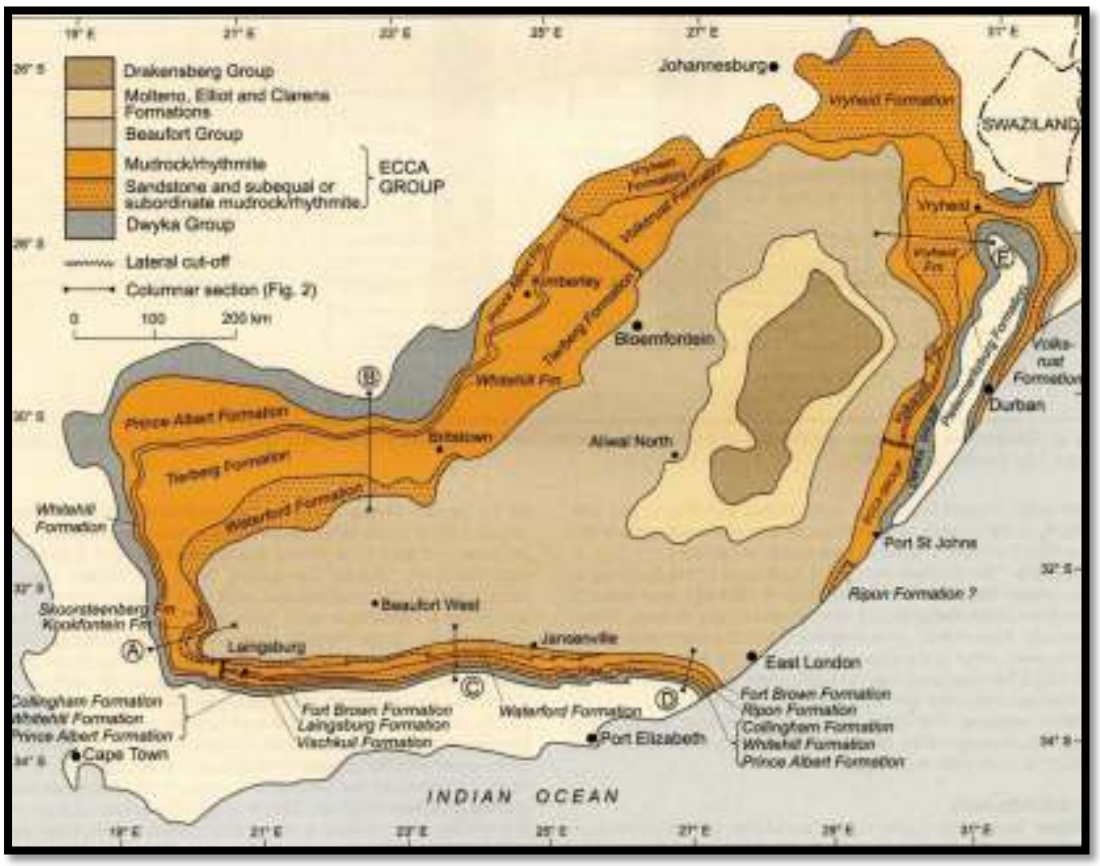


Figure 14: Map showing the extent of the Ecca Group, more specifically the Vryheid Formation *(Source: Johnson (2009) as cited by Fourie (2014)*

The Ecca Group may contain fossils of diverse non-marine trace, *Glossopteris* flora, mesosaurid reptiles, palaeoniscid fish, marine invertebrates, insects, and crustaceans (Johnson 2009). *Glossopteris* trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal. It is only in the northern part of the Karoo Basin that the glossopterids and cordaitales, ferns, clubmosses and horsetails thrived (McCarthy and Rubidge 2005).

The Glossopteris flora is thought to have been the major contributor to the coal beds of the Ecca. These are found in Karoo-age rocks across Africa, South America, Antarctica, Australia and India. This was one of the early clues to the theory of a former unified Gondwana landmass (Norman and Whitfield 2006).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH, but here locally VERY HIGH for the Vryheid Formation.

Criteria used (Fossil Heritage Layer Browser/SAHRA):

Rock Unit	Significance/vulnerability	Recommended Action
Vryheid Formation (Pv) (Pe)	VERY HIGH	Field assessment and protocol for finds is required
Karoo Dolerite Suite (do/Jd)	Insignificant or Zero	No action required

Databases and collections: Ditsong: National Museum of Natural History. Evolutionary Studies Institute, University of the Witwatersrand (ESI).

Impact: VERY HIGH. There are significant fossil resources that may be impacted by the development.

All Karoo Supergroup geological formations are ranked as LOW to VERY HIGH, and here the impact is potentially VERY HIGH for the Vryheid Formation, Ecca Group. Rocks of Permian age in South Africa are particularly rich in fossil plants (Rayner and Coventry 1985). The fossils are present in the grey shale interlayered with the coal seams. The fossils are not very rare and also occur in other parts of the Karoo stratigraphy. The pollen of the Greenside Colliery also on the Vryheid formation was the focus of a Ph.D study. It is often difficult to spot the greyish fossils as they are the same colour as the grey shale in which they are present as these coalified compressions have been weathered to leave surface replicas on the enclosing shale matrix. A locality close to Ermelo, also Vryheid Formation, has yielded *Scutum, Glossopteris* leaves, *Neoggerathiopsis* leaves, the lycopod *Cyclodendron leslii,* and various seeds and scale leaves (Prevec 2011).

Fossils likely to be found are mostly plants such as '*Glossopteris* flora' of the Vryheid Formation. The aquatic reptile *Mesosaurus* and fossil fish may also occur with marine invertebrates, arthropods and insects. Trace fossils can also be present (Johnson 2009).

During storms a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these areas and wherever they are found, they constitute most valuable palaeobotanical records (Plumstead 1963) and can be used in palaeoenvironmental reconstructions.

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units could not be determined due to the thick overburden and alluvium. Depth of the overburden may vary a lot. The vast coal mining industry provides palaeontologists with fantastic access to coal-associated plant fossils, while simultaneously resulting in the destruction of important National palaeontological heritage.

6.8 VISUAL

It is important to bear in mind that determining a visual resource in absolute terms is not achievable. Evaluating a landscapes' visual quality is both complex and problematic, as many quality standards apply and it is largely subjective, with individuals basing evaluations on experiences, their social level and their cultural background. Furthermore, natural features are inherently variable. Climate, season, atmospheric conditions, region and sub-region all affect the attributes that comprise the landscape.

The study area is relatively flat with gentle undulating hills. Therefore the proposed development will be visible from various viewsheds surrounding the study area. The study area is already disturbed with opencast coal mining and other mining infrastructure. Due to the nature of the activity being a relocation of a plant the added visual impact is not likely to be significant. The proposed development should however be aesthetically pleasing, to adjacent landowners and should blend in with the adjacent developments. Various types of material can be used for construction purposes on the proposed plant to make the plant more aesthetically pleasing. These include different brick types (face brick, cement brick etc.) roof types (pitched or flat), finishes (paint colour, external lighting and landscape features etc.), which can be chosen to blend with the natural surroundings.

6.9 NOISE AND VIBRATION

Existing noise sources on site and the immediate surrounds include:

- Agricultural activities on surrounding land;
- CHPP: Transportation of raw materials to site, product from the site and transport of staff to and from site;
- Mining and mineral processing activities at the mining areas; and
- Vehicles serving the existing mine and farming communities.

In terms of Regulation 66 of the Mineral and Petroleum Resources Act (Act 28 of 2002) Regulations GN R527, a holder of a permit or right in terms of the Act must comply with the provisions of the Mine Health and Safety Act (Act 29 of 1996); as well as other applicable law regarding noise management and control.

Many aspects of mining and coal processing operations lead to an increase in noise levels over the ambient environmental levels. This can be temporarily enhanced or the regional impact increased in any direction under the influence of specific climatic factors such as wind direction, cloud cover and temperature inversion layers.

The impacts of noise levels can be both physical and physiological at the high end of the spectrum but more commonly impact on communication or create psychological effects at the lower level of the spectrum.

The repetitive operation of machinery also creates a range of noise levels. Although of low intensity these have an impact due to long periods of operation at the crushing plant and mills. The Mineral and Petroleum Resources Development Act (Act 28 of 2002) requires these areas to be effectively screened to reduce or deflect noise and stipulates that cladding on structures be adequately fastened and separated with soft spacers and washers. Vehicle engines or loading noise and even reverse warning alarms on trucks and loaders can impact on communities near and around the mine. Machinery such as compressors, generators, metal workshops tools such as angle grinders, pneumatic drills and jackhammers create high noise levels that are difficult to screen.

6.10 AIR QUALITY

Dust originating from disturbed areas and CHPP and TSF operations as well as vehicle emissions may contribute to poor air quality.

Air quality monitoring and modelling should for future activities concentrate on dust fallout and ambient PM_{10}. Dust fallout monitoring will be undertaken to assess compliancy with dust fallout limits and will be reviewed annually.

Monitoring will also be undertaken during the mining phase to assess sulphur dioxide compliancy with the ambient air quality guidelines and standards. The monitoring is conducted according to the main impact zone of the mine operations.

Current sources of pollution (predominantly in the form of dust) in the vicinity of the site include the following:

- Dust from mining;
- The handling of ore,
- Ore processing operations;
- Stockpiled materials;
- Disturbed land or land denuded of any vegetation;
- Vehicle movements on un-surfaced roads; and
- Disposal facilities.

Mining activities in the general region as well as burning of wood and coal by the residents of many of the local communities (due to there being no formal electricity infrastructure), are primary contributors to the air pollution experienced in the region.

Dust suppression

Dust suppression must be undertaken in conjunction with a dust monitoring programme that places dust deposition gauges or receiving buckets, directional dust collection receptacles, high volume active air samplers or continuous particle monitors or even personal exposure samplers around the proposed CHPP and TSF area as

well as adjacent areas.

A Dust Control Management Programme will be implemented to ensure compliance with the National Environmental Management Air Quality Act (Act 39 of 2004) and National Dust Control Regulations, 2013 (Government Notice 827 of 2013), Section 6. These should be monitored regularly to ascertain the dust load and emission rates as well as particle size and distribution. Mine Health and Safety requirements for the use of dust masks should be followed and compliance audited regularly.

7. ALTERNATIVES (REGULATION 31 (2) (G))

The IEM procedure stipulates that the environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. The various alternatives are assessed in terms of both environmental acceptability as well as economic feasibility. The preferred option is to be highlighted and presented to the authorities.

Alternatives are defined in the NEMA EIA Regulations (2010) as *"different means of meeting the general purpose and requirements of the activity, which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; and (e) the operational aspects of the activity and (f) the option of not implementing the activity*".

According to the Western Cape Department of Environmental Affairs & Development Planning (WC DEADP) Guideline on alternatives: EIA Guideline and Information Document Series (2011) feasible and reasonable alternatives have to be identified for a development as required by the NEMA EIA Regulations and applicable to EIA. Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose on the environment and socio-economy. Alternatives forms a vital part of the initial assessment process through the consideration of modifications in order to prevent and/or mitigate environmental impacts associated with a particular development. Alternatives are to be amended when the development's scope of work is amended. It is vital that original as well as amended alternative identification, investigation and assessment together with the generation and consideration of modifications and changes to the development and activities are documented.

The EIA Regulations (2010) defines alternatives as the different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

a) The property on which or location where it is proposed to undertake the activity;
b) The type of activity to be undertaken;
c) The design or layout of the activity;

d) The technology to be used in the activity;
e) The operational aspects of the activity; and
f) The option of not implementing the activity.

Although an array of alternatives could be investigated for each project, such alternatives will not necessarily be applicable to each project and/or project phase. However, there must always be strived to seek alternatives that maximises efficient and sustainable resource utilisation and minimise waste production.

Feasible alternatives

Please note that the impacts of each alterative were assessed in detail in Section 11.2 of this report.

For the purpose of this application, the following feasible alternatives are investigated:

- Input alternatives for the construction of the CHPP;
- Location alternatives for the CHPP and TSF;
- Technology alternatives for processing and beneficiation of coal;
- Scheduling alternatives; and
- No-Go / Status Quo alternative.

7.1. INPUT ALTERNATIVES

Various types of material can be used for construction purposes on the proposed plant. These include different brick types (face brick, cement brick etc.) roof types (pitched or flat), finishes (paint colour, external lighting, landscape features etc.), road surfacing (asphalt, brick paving) and underground tank types. The proposed development should however be aesthetically pleasing, to adjacent landowners and should blend in with the adjacent developments.

Energy effective building construction and orientation have not been considered to date. However, the following recommendations regarding structural designs are recommended by the environmental consultant:

- Use of building material that requires excessive amounts of energy to manufacture should be minimised;
- Use of building material originating from sensitive or scarce environmental resources should be minimised. E.g. no tropical hardwood may be used;
- Building material should be legally obtained by the supplier, e.g. wood must have been legally harvested, and sand should be obtained only from legal borrow pits and from commercial sources;
- Building material that can be recycled / reused should be used rather than building material that cannot; and

- Use highly durable building material for parts of the building that is unlikely to be changed during the life of the building (unlikely to change due to e.g. renovation, fashion, changes in family life cycle) is highly recommended.

7.2 LOCATION ALTERNATIVES

The alternative location that was considered by the proponent would move the existing facility to an alternative location away from the drainage line of the tributary river to the Torbanite dam. The investigation concluded that the subject location (on the Farm Voorslag 274 IS) is the most suitable due to its ideal location in terms of the requirements for location of a CHPP.

The geotechnical assessment as well as prospecting boreholes indicated that the quality of the coal in the area where the proponent proposes to mine coal underground via an adit; is of the best quality and therefore no alternative site was investigated. The CHPP would be ideally located in terms of the adit to the underground workings.

Therefore this alternative would see the existing CHPP moving from the Farm Mooifontein 109 IT to the better location Farm Voorslag 274 IS.

7.3 TECHNOLOGY ALTERNATIVES

Generally coal companies use solid preparation plant waste to build an embankment in a hollow. Then this void is filled with the wet preparation plant waste, or slurry – a mix of coal dust, water and preparation plant chemicals. In the past ultra-fine coal (nominally minus 100 micron) was only beneficiated in the former Natal Province and in the Waterberg coalfield. The coking coals from these areas were amenable to flotation (froth flotation was usually employed on the total minus 0,5mm size fraction). In the Witbank area, the ultra-fine coal was not beneficiated and was disposed of by pumping the coal to slurry ponds or into old underground workings.

In recent studies in the USA (2001) it was found that coal waste: "*disintegrates rapidly, is highly soluble sulphates which reduce bonding strength, are non-cohesive and does not compact uniformly. A safe and economic dam could not be constructed from such material alone.*"

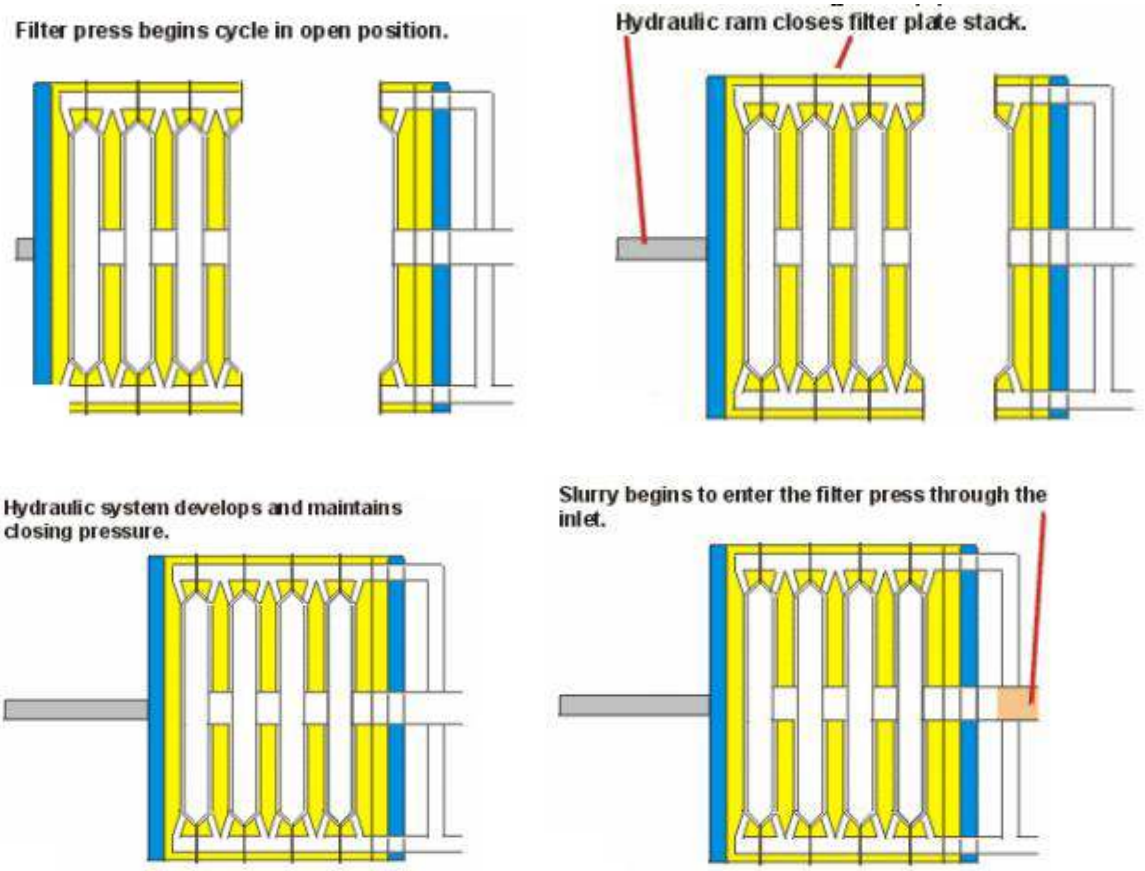
Slurry volumes can be reduced by improving fine coal recovery, minimizing the mass of solids for disposal and dewatering the coal waste using various tools including a filter press. Acceptable alternatives are highly dependent upon regional and site specific conditions.

Froth flotation is still the only beneficiation process for ultra-fine coal and in recent years a number of flotation plants were built in the Witbank area. The main problem with beneficiating the ultra-fine coal is not so much the actual processing of the coal – flotation works well enough despite the fact that it is a very expensive process –

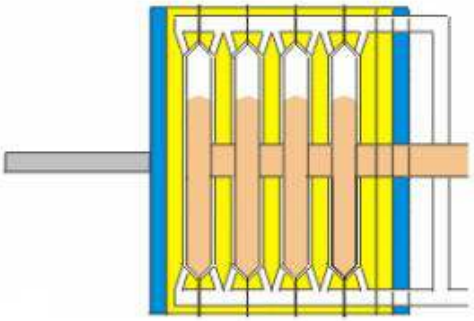
but the dewatering of the product obtained. The ultra-fine flotation product has high moisture content, even after dewatering, and this increases the moisture content of the product coal railed from the mine – for a mine producing thermal coal this can make it very difficult to meet quality specifications and to economically justify the installation of a froth flotation plant. For this reason, it is important to improve the dewatering of ultra-fine coal and to find better methods to employ for this purpose. One should also keep in mind that, even when a plant has a flotation circuit, there is still the need to dispose of flotation tailings.

In recent years a number of filter presses were installed in South Africa and these units proved to be the most effective method currently available to dewater ultra-fine coal. Filter presses have the greatest capacity for solid capture and can be used to close a plant's water circuit. The fact that the filtration pressure and the filtration times can be adjusted allows these units to produce relatively lower product moisture content than the other types of filters available in the past. Filter presses are however, more expensive in terms of capital and operating expenditure than the older filter types.

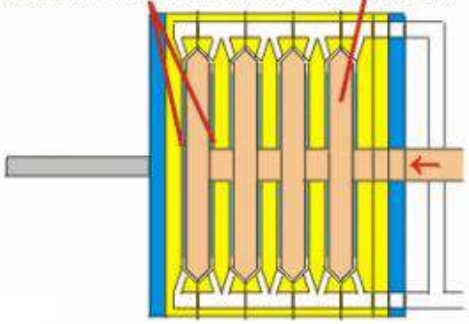
Filter presses operate on a semi batch basis and the filtration cycle consists of a number of steps.



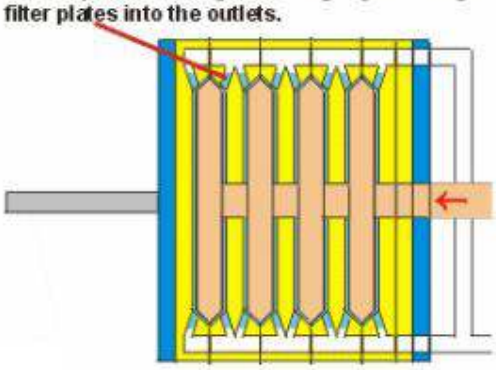
Filter press fills with slurry.



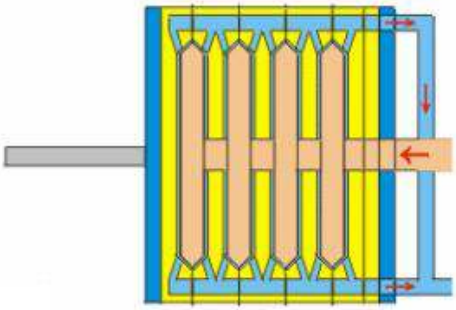
Filtration takes place as filtrate passes through the filter cloth and cake builds in the chambers.



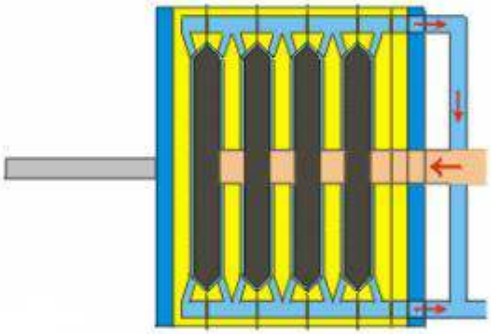
Filtrate passes through discharge eyes at edge of filter plates into the outlets.



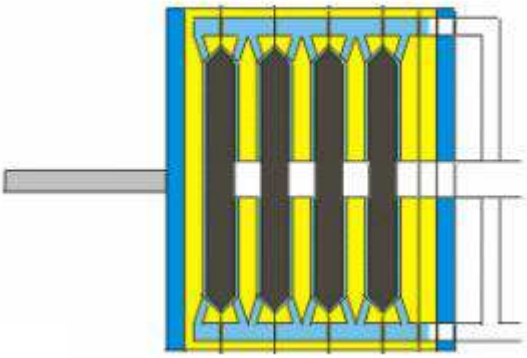
Filtrate exits the filter press through the outlets.



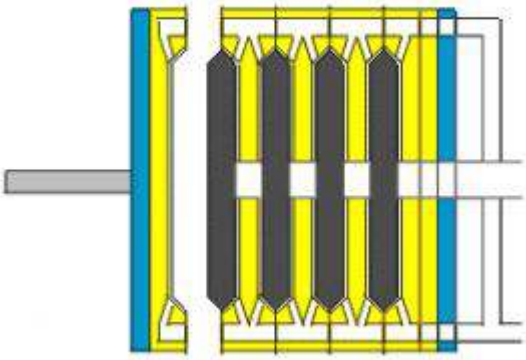
Filter cake builds as slurry continues to dewater.



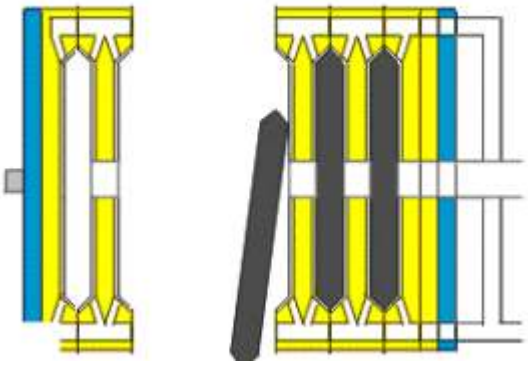
Forward flow is stopped.

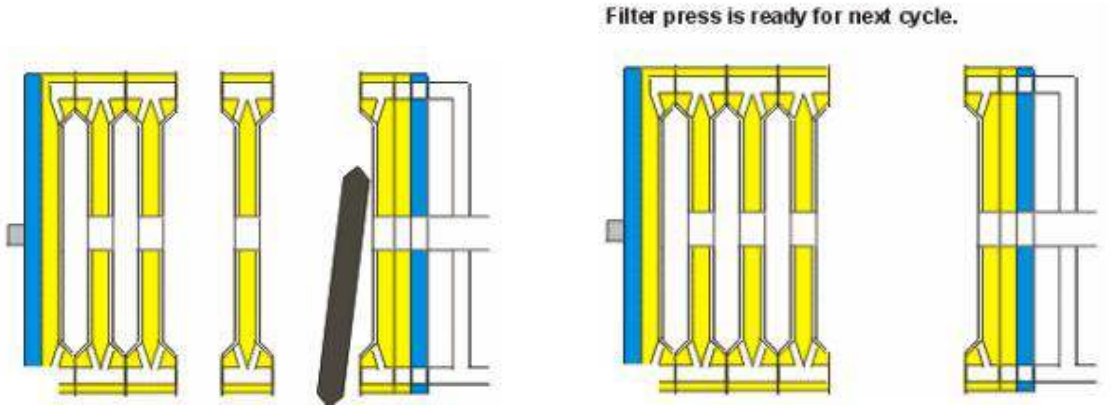


Filter press is opened and plates are shifted one at a time.



Filter cakes drop as each plate is moved.





Filter presses have been proven to be effective in filtering ultra-fine coal to a moisture content which is low enough to render the filter cake transportable on conveyor belts. The filters can recover virtually all the solids in the feed which make it especially suited to closing water circuits in plants.

7.4 SCHEDULING ALTERNATIVES

It is recommended that construction takes place during the drier winter months to avoid any complications in the wet weather. No detailed information regarding the proposed time frame for the project is yet available. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained.

7.5 STATUS QUO / NO-GO ALTERNATIVE

One of the options to be considered for this report is one of no development at all. This will entail leaving the CHPP and TSF in its present location. This would result in the facility remaining on the Farm Mooifontein 109 IT, in the direct line of a tributary of the Torbanite Dam. This situation will result in the possible contamination of the sensitive Upper Vaal River region through activities associated with the CHPP. Should the plant be relocated, this area can be rehabilitated.

Another consideration is that should the adit be moved to mine good quality coal on the Farm Voorslag 274 IS, it would require the movement of the mined coal to the existing CHPP and TSF on the Farm Mooifontein 109 IT. The movement of mined coal via heavy vehicles can possibly result in the contamination of the sensitive environment en route to the CHPP.

It makes sense to move the CHPP as close as possible to the adit to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option and with the necessary specialists' studies, it will be proven as an option which should not be further investigated.

8. PUBLIC PARTICIPATION PROCESS (REGULATION 31 (2) (E) (I-IV) AND REGULATION 54-57))

8.1 INTRODUCTION

Guideline 7 on "Public Participation in the Environmental Impact Assessment Process"**,** published by Department of Environmental Affairs (DEA) in October 2012, states that public participation is one of the most important aspects of the environmental authorisation process. This stems from the requirement that people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also facilitates informed decision-making by the Competent Authority and may result in better decisions as the views of all parties are considered.

The benefits of public participation include the following:

- Provides an opportunity for I&APs, EAPs and the competent authority (CA) to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
- Provides I&APs with an opportunity to voice their support, concerns and questions regarding the project, application or decision;
- Provides I&APs with the opportunity of suggesting ways of reducing or mitigating negative impacts of an activity and for enhancing positive impacts;
- Enables the applicant to incorporate the needs, preferences and values of affected parties into the application;
- Provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;
- It is an important aspect of securing transparency and accountability in decision-making; and
- Contributes toward maintaining a healthy, vibrant democracy.

All PPP undertaken is in accordance with the requirements of the EIA Regulations (2010) *[Refer to the Public Participation Report as per Annexure 4].*

8.2 PUBLIC PARTICIPATION ACTIVITIES TAKEN TO DATE (REGULATION 31 (2) (E)(I)

The following PPP tasks were conducted to date for the proposed development:

- Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);
- Formal notification of the application to key I&APs (all adjacent landowners) and other stakeholders;
- Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments;

- Release of the Draft Scoping Report and the Final Scoping Report to I&APs and stakeholders for review and comment;
- Release of the Draft EIA Report to I&APs and stakeholders for review and comment.

8.3 IDENTIFICATION OF KEY INTERESTED AND AFFECTED PARTIES AND STAKEHOLDERS

Public Participation is the involvement of all parties who are either potentially I&AP by the proposed development. The principle objective of public participation is to inform and enrich decision-making. This is also its key role in this Environmental Impact Assessment (EIA) process.

Interested and Affected parties (I&APs) representing the following sectors of society has been identified:

- National, provincial and local government;
- Agriculture, including local landowners;
- Community Based Organisations;
- Non-Governmental Organisations;
- Water bodies;
- Tourism;
- Industry and mining;
- Commerce; and
- Other stakeholders.

Refer to the PPP Report (Annexure 4) for I&AP and stakeholder database.

8.4 FORMAL NOTIFICATION OF THE APPLICATION (REGULATION 31 (2) (E) (I)

The project was announced as follows:

Newspaper advertisement

Publication of a media advertisement in the Highvelder was placed on Friday 25 January 2013. **Refer to the PPP Report (Annexure 4) for proof of placement of the newspaper advert.**

Site notice placement

In order to inform surrounding communities and adjacent landowners of the proposed development, four (4) site notices were erected on site and at visible locations close to the site. **Refer to the PPP Report (Annexure 4) for proof of site notice placement.**

Written notification

I&AP's and other key stakeholders, who included the abovementioned sectors, were directly informed of the proposed development by e-mail. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on the 25th of March 2013. **Refer to the PPP Report (Annexure 4) for a copy of the BID and proof of email notification.**

8.5 RELEASE OF THE DRAFT SCOPING REPORT

The Draft Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority on 18 July 2013 as per the requirements of Regulation 56 (4). The DSR and supporting documentation were subsequently released for a period of 40 days from 18 July 2013 to 30 August 2013 for public review and comment. All stakeholders and I&AP's was notified of the DSR availability for comment. Hardcopies of the DSR was submitted to all organs of state and relevant authorities. The Draft Scoping Report and supporting documentation was made available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za.

8.6 RELEASE OF THE FINAL SCOPING REPORT

The Final Scoping Report (FSR) and Plan of Study (POS) were released for a period of 21 days from 18 February 2014 to 14 March 2014 for public review and comment. Hard copies of the FSR have been submitted to all organs of state and relevant authorities. The FSR supporting documentation is available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za.

8.7 RELEASE OF THE DRAFT EIA REPORT

The Draft EIA Report are hereby released for a period of 40 days from 14 November to 15 January 2015 for public review and comment. Hard copies of the Draft EIA Report were submitted to all organs of state and relevant authorities that commented on the FSR. The Draft EIA and supporting documentation is available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za. Username: envass Password: 077umlabu#.

8.8 CONSULTATION AND CORRESPONDENCE WITH INTERESTED AND AFFECTED PARTIES (REGULATION 31 (2) (E) III)

Two public interested and affected parties registered for the project. State departments and other organisations were identified and the state departments were automatically registered as interested and affected parties. [Refer to Annexure 4 for a comprehensive register of all registered interested and affected parties]

Interested and Affected Parties had the opportunity to raise issues either in writing, by telephone, fax and/or email. *[Refer to the Public Participation Report as per Annexure 4]*

8.9 SUMMARY OF COMMENTS AND RESPONSES AND LIST OF ISSUES RAISED

Two parties requested to be registered as interested and affected parties.

Table 18 below contains a list of the issues raised by interested and affected parties and a summary of the comments and responses.

Table 18: List of issues raised and summary of comments and responses

Issue raised	Response
Mr. Rautenbach is concerned about the impact of pollution emanating from the mining activities on the dams on his property including the Torbanite Dam.	The proposed development will provide the opportunity to rehabilitate the current location of the plant, which is located in the direct line of a tributary of the Torbanite Dam. Therefore the impact of the proposed activity will be positive on the dam as the plant will no longer be located in the direct line of the tributary of the Torbanite Dam.
SAHRA commented on the Heritage Impact Assessment (HIA) Report requesting the following changes: - The HIA does not contain any track paths as is required in terms of the SAHRA Minimum Standards; - The HIA does not clearly describe the scope of the proposed work; - No assessment of impacts to palaeontology or cultural landscape are provided and only one image of the development area was included in the report; - Therefore SAHRA requires that a Palaeontological study must be undertaken to assess whether or not the development	- The EAP requested a palaeolontological study from the specialist, which is included in Annexure 3 attached to this report; and - The Heritage Impact Assessment Report was amended and is also included in Annexure 3 attached to this report.

will impact upon significant Palaeontological resources. Alternatively a letter of exemption from a Palaeontologist is required to indicate that this is unnecessary.	

Copies of all correspondence between the Environmental Assessment Practitioner (EAP) and interested and affected parties and stakeholders and the comments and responses report recording comments and responses in detail are included in Annexure 4 (REGULATION 31 (2) (e) iv).

8.10 NEXT PHASES OF THE PUBLIC PARTICIPATION PROCESS

All stakeholders and registered I&APs will have the opportunity to review and comment on all the documents released in the Final EIA phase. The Final EIA Report will be released for 21 calendar days for review and comment. During all the PPP phases, hardcopies and CDs of all reports and supporting documents will be submitted to the organs of state and relevant authorities. The report will also be available for review at the Gerald Sekoto Community Library (Wanderers Avenue, Middelburg. Tel: 013 249 7314); Ermelo Public Library (017 801 3621); and on Environmental Assurance's website: www.envass.co.za.

9. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES (REGULATION 31 (2) (H, K-L))

9.1 IMPACT ASSESSMENT METHODOLOGY (REGULATION 31 (2) (H))

A ***"significant impact"*** is defined as it is defined in the EIA Regulations (2010): *"an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect of one or more aspects of the environment".* The objective of this EIA methodology is to serve as framework for accurately evaluating impacts associated with current or proposed activities in the biophysical, social and socio-economical spheres. It aims to ensure that all legal requirements and environmental considerations are met in order to have a complete and integrated environmental framework for impact evaluations.

The process of determining impacts to be assessed is one of the most important parts of the environmental impact assessment process. It is of such high importance because the environmental impacts identified can and are often linked to the same impact stream. In this method all impacts on the biophysical environment are assessed in terms of the overall integrity of ecosystems, habitats, populations and individuals affected. For example the removal of groundcover for the sloping or scraping of an embankment, can lead to higher amounts of water runoff which increases the rate of erosion. Further down in the river the amount of sediment increases because of the increased erosion. A number of fish species cannot endure the high amount of sediment and moves off. The habitat is thus changed or in the process of changing. Thus one needs to understand that the root of the problem (removal of groundcover) is assessed in terms of the degree of change in the health of the

environment and/or components in relation to their conservation value. Thus if the impact of removal of groundcover of a definable system is high and the conservation value is also high then the impact of removal of groundcover is highly significant.

9.1.1 Environmental Impact Assessment (EIA) 2010 requirements

The Environmental Impact Assessment (EIA) 2010 Regulations promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act (NEMA) (Act 107 of 1998) requires that all identified potential impacts associated with the proposed project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2010) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

ENVASS has developed an impact assessment methodology (as defined in Section 9.1.2 below) whereby the ***Significance*** of a potential impact is determined through the assessment of the relevant temporal and spatial scales determined of the ***Extent, Magnitude*** and ***Duration*** criteria associated with a particular impact. This method does not explicitly define each of the criteria but rather combines them and results in an indication of the overall significance.

9.1.2 ENVASS Impact Assessment Methodology

(a) Nature of the impact

The NATURE of an impact can be defined as: "a *brief description of the impact being assessed, in terms of the proposed activity or project, including the socio-economic or environmental aspect affected by this impact*".

(b) Extent of the impact

The EXTENT of an impact can be defined as: "*a brief description of the spatial influence of the impact or the area that will be affected by the impact*".

EXTENT Extent or spatial influence of impact	**Footprint**	Only as far as the activity, such as footprint occurring within the total site area
	Site	Only the site and/or 500m radius from the site will be affected
	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
	Region	Entire region / province is affected
	National	Country is affected

(c) Magnitude of the impact

The MAGNITUDE of an impact can be defined as: "*a brief description of the intensity or amplitude of the impact on socio-economic or environmental aspects".*

MAGNITUDE Magnitude / intensity of impact (at the specified scale)	**Zero**	Natural and/or social functions and/or processes remain *unaltered*
	Very low	Natural and/or social functions and/or processes are *negligibly* altered
	Low	Natural and/or social functions and/or processes are *slightly* altered
	Medium	Natural and/or social functions and/or processes are *notably* altered
	High	Natural and/or social functions and/or processes *severely* altered

(d) Duration of the impact

The DURATION of an impact can be defined as: "*a short description of the period of time the impact will have an effect on aspects*".

DURATION Duration of the impact	**Short term**	Construction phase up to 3 years after construction
	Medium term	Up to 6 years after construction
	Long term	More than 6 years after construction

(e) Probability of the impact occurring

The PROBABILITY of an impact can be defined as: "the *estimated chance of the impact happening*".

PROBABILITY	**Unlikely**	*Unlikely* to occur (0 – 25% probability of occurring)
	Possible	*May* occur (26 – 50% chance of occurring)
	Probable	*Likely* to occur (51 – 75% chance of occurring)
	Definite	Will *certainly* occur (76-100% chance of occurring)

(f) Degree to which impact can be reversed

The REVERSABILITY of an impact can be defined as: *"the ability of an impact to be changed from a state of affecting aspects to a state of not affecting aspects*".

REVERSABILITY	**Reversible**	Impacts can be reversed through the implementation of mitigation measures
	Irreversible	Impacts are permanent and can't be reversed by the implementation of mitigation measures

(g) Degree to which impact may cause irreplaceable loss of resources

The IRREPLACEABILITY of an impact can be defined as:" the amount of resources that can-(not) be replaced".

IRREPLACEABILITY Irreplaceable loss of resources	**No loss**	*No* loss of any resources
	Low	*Marginal* loss of resources
	Medium	*Significant* loss of resources
	High	*Complete* loss of resources

(h) Degree to which the impact can be mitigated

The degree to which an impact can be MITIGATED can be defined as: "the effect of mitigation measures on the impact and its degree of effectiveness".

MITIGATION RATING	**MITIGATED** Degree impact can be mitigated	**High**	*Impact 100% mitigated*
		Medium	*Impact >50% mitigated*
		Low	*Impact <50% mitigated*

(i) Confidence rating

CONFIDENCE in the assessment of an impact can be defined as the:" *level of certainty of the impact occurring*".

CONFIDENCE RATING	**CONFIDENCE**	**Unsure**	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *limited*.
		Sure	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *reasonable and relatively sound.*
		Certain	Amount of information on and/or understanding of the environmental factors the potentially influence the impact is *unlimited and sound*.

(j) Cumulative impacts

The effect of CUMULATIVE impacts can be described as:" the effect the combination of past, present and "reasonably foreseeable" future actions have on aspects".

CUMULATIVE RATING	**CUMULATIVE EFFECTS**	**Low**	*Minor* cumulative effects
		Medium	*Moderate* cumulative effects
		High	*Significant* cumulative effects

9.1.3 Significance of Impacts

The SIGNIFICANCE can be defined as:" *the combination of the duration and importance of the impact, in terms of physical and socio-economic extent, resulting in an indicative level of mitigation required*".

Table 19: Significance of Impacts

SIGNIFICANCE RATING	**SIGNIFICANCE**	**Neutral**	• Zero magnitude with any combination of extent and duration.
		Very low	• Very low magnitude with any combination of extent and duration except regional and long term. • Low magnitude with a site specific extent and short term duration.
		Low	• Very low magnitude with a site specific extent and long term duration. • Low magnitude with any combination of extent and duration except site specific and short, regional or long term duration. • Medium magnitude with a site specific extent and short term duration. • High magnitude with a site specific extent and short term duration.

		Medium	• Low magnitude with a regional extent and long term duration. • Medium magnitude with any combination of extent and duration except site specific and short, regional or long term duration. • High magnitude with either a local extent and short term duration or a site specific extent and medium term duration. • High magnitude with a regional extent and short term duration or a site specific extent and long term duration. • High magnitude with a local extent and medium term duration.
		High	• Medium magnitude with a regional extent and long term duration. • High magnitude with either a regional extent and medium term duration or a local extent and long term duration.
		Very high	• High magnitude with either a regional extent and long term duration or a national extent and long term duration.

9.2 COMPARATIVE ASSESSMENT OF ALTERNATIVES (REGULATION 31 (2) (l))

Table 20: Alternatives Analysis

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Proposed activity vs. No-Go Alternative	**Approve proposed activity and implement:** Relocate the CHPP and TSF (the facility) from the existing location on the Farm Mooifontein 109 IT to the proposed position on the Farm Voorslag 274 IS.	**No-Go Alternative:** This will entail leaving the facility in its present location on the Farm Mooifontein 109 IT.
	Advantages: • It makes sense to move the coal handling and preparation plant as close as possible to the adit to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option; and • This option will provide the opportunity to rehabilitate the current location of the plant, which is located in the direct line of a tributary of the Torbanite Dam.	**Advantages:** • No additional cost in relocating the plant, however this may be potentially be reversed by the cost of transporting the coal to the existing facility.
	Disadvantages: • Potential impacts on natural and socio-economic features of the study area and surrounding land uses.	**Disadvantages:** • This would further result in the coal handling and preparation plant remaining on the Farm Mooifontein 109 IT, in the direct line of a tributary of the Torbanite Dam. This situation will result in the possible contamination of the sensitive Upper Vaal River region through activities associated with the coal handling and preparation plant. • Another consideration is that should the adit be moved to mine good quality coal on the Farm Voorslag 274 IS, it would require the movement of the mined coal to the existing coal handling and preparation plant on the Farm Mooifontein 109 IT. The movement of mined coal via heavy vehicles can possibly result in the contamination of the sensitive environment en route to the coal handling and preparation plant.

Alternative Type	Alternative 1 (Preferred)	Alternative 2
	Conclusion: Due to fewer negative impacts on the environment of this option and positive impacts in terms of rehabilitating the stream, it makes sense to move the facility as close as possible to the adit, to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option.	**Conclusion:** Due to more disadvantages including more negative impacts on the environment associated with this option, it is not the preferred alternative.
Locality Alternatives	**Farm Voorslag 274 IS:** Away from the drainage line of the tributary river to the Torbanite dam.	**Farm Mooifontein 109 IT:** In direct line of a tributary river flowing into the Torbanite dam.
	Advantages: • The geotechnical assessment as well as prospecting boreholes indicated that the quality of the coal in the area where the proponent proposes to mine coal underground via an adit; is of the best quality; and • The coal handling and preparation plant would be ideally located in terms of the adit to the underground workings.	**Advantages:** • See above.
	Disadvantages: • See above	**Disadvantages:** • See above
	Conclusion: The investigation concluded that the subject location (on the Farm Voorslag 274 IS) is the most suitable due to its ideal location in terms of the requirements for location of a CHPP and TSF and less environmental impacts.	**Conclusion:** Due to the current location of the facility being further away from the coal reserves currently mined on the Farm Voorslag 274 IS and other disadvantages as described in the detailed comparative analysis in ***Section 9.2*** of this report, this option is not deemed to be the best alternative to the proposed activity location.
Input Alternatives: Building Materials	**Sustainable Building Materials Obtained from Sustainable and Legal Resources/Origins:**	**Unsustainable Building Materials and Building Materials not blending with the surrounding environment:**
	Advantages: • Use of building material that does not require excessive amounts of energy to manufacture will reduce energy consumption and associated impacts; • Building material from abundant sources and legal will reduce the impact on scarce resources; • Building material that can be recycled will reduce the impact on resources; and • Highly durable material for parts of the building unlikely to be modified during its lifetime will also reduce the impact on resources.	**Advantages:** • No advantages were identified.

Alternative Type	Alternative 1 (Preferred)	Alternative 2
	Disadvantages: No disadvantages were identified.	**Disadvantages:** This option will increase the impact on already scarce resources including sand and other building materials not abundant as well as coal for energy.
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.
Technology Alternatives: Dewatering of ultra-fine coal	**Filter Presses:**	**Older types of filters**
	Advantages: • Filter presses have the greatest capacity for solid capture; • The fact that the filtration pressure and the filtration times can be adjusted allows these units to produce relatively lower product moisture content than the other types of filters available in the past; • Filter presses have been proven to be effective in filtering ultra-fine coal to a moisture content which is low enough to render the filter cake transportable on conveyor belts. The filters can recover virtually all the solids in the feed which make it especially suited to closing water circuits in plants; • Slurry volumes can be reduced or eliminated by improving fine coal recovery, minimizing the mass of solids for disposal and dewatering the coal waste using various tools.	**Advantages:** • Less expensive in capital and operating costs.
	Disadvantages: • Filter presses are more expensive in terms of capital and operating expenditure than the older filter types;	**Disadvantages:** • The ultra-fine flotation product has high moisture content, even after dewatering by the older filter types, and this increases the moisture content of the product coal railed from the mine – for a mine producing thermal coal this can make it very difficult to meet quality specifications.
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Scheduling Alternatives Construction Period	**Dry Winter Months:**	**Wet Summer Months:**
	Advantages: • Minimal stormwater causing erosion;	**Advantages:** • Less dust pollution; • Improved air quality; • Less usage of water for dust suppression.
	Disadvantages: • More dust pollution; • Decreased air quality; and • More water needed for dust suppression.	**Disadvantages:** • Frequency of storms create more erosion through stormwater impacts;
	Conclusion: This alternative will have a negative effect on air quality i.e. dust pollution and water usage for mitigating the impact. However should recycled water be used for dust suppression, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.	**Conclusion:** This alternative will have a negative effect on soil and rivers through sedimentation. However should an appropriate stormwater management plan be implemented, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.

9.3 SUMMARY OF FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS (REGULATION 31 (2) (J)

The following specialist studies have been undertaken in accordance with the Plan of Study:

- Geo-hydrological Assessment;
- Land Capability Assessment;
- Wetland Surface Water Assessment;
- Ecological Assessment;
- Biomonitoring and River Health Assessment;
- Archaeological Impact Assessment; and
- Palaeontological Impact Assessment.

9.3.1 Summary of Findings and Recommendations of the Geo-hydrological Assessment

Findings

- The regional geology consists of various groups within the Karoo Supergroup as well as numerous dolerite intrusions, occurring as both dykes and sills. The most relevant Karoo Supergroup to this study area is the Permian and aged Ecca group. Although the Ecca group is defined by sixteen formations, only one dominates the immediate study area, namely the Vryheid Formation;
- The geological map (2630 Mbabane and 2628 East Rand) indicates a definite presence of geological lineaments that are orientated predominantly in a northeast-southwest direction. These lineaments could either be fault zones or dolerite dykes of Karoo age;
- Karoo rocks are not known for economic aquifers but occasional high-yielding boreholes may occur. Generally these rock types can be divided into two distinct aquifers, namely a shallow weathered aquifer and a deeper fractured aquifer;
- The Department of Water and Sanitation (DWS) classify the underlying aquifer as type d2, meaning the groundwater yield are generally between 0.1 – 0.5 L/s and the aquifer is intergranular and fractured;
- The groundwater depth varies across the site. Groundwater levels varying between 2m and 30m below ground level have been determined. There is a poor correlation between static water level and topography. This can be ascribed to current mining activities in the area;
- The borehole abstraction rates on many of the identified boreholes are unknown as they are largely used for private purposes, consisting largely of domestic usage;
- Umlabu Colliery currently abstracts groundwater from the old torbanite shaft (OTS) to supply the plant. The exact volumes abstracted are not currently known although a flow meter was installed subsequent to recommendations. The current abstraction estimate is in the region of 35 ℓ/s on a permanent basis;
- The Department of Water Affairs an Forestry (DWAF) classify the underlying aquifer as type d2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is intergranular and fractured;
- Further to the east of the mine, the aquifer is classified as type b2, meaning that groundwater yields are generally between 0.1 – 0.5 ℓ/s and the aquifer is fractured;
- The plant uses 600 litres of water for every Ton ROM (run-of-mine) processed;
- Process water is pumped from an old flooded shaft;
- The plant currently processes 120 T/hour, (24/7) with 40 hours down time per month, i.e. it currently processes 81 600 T/month (i.e. 48 960 Kℓ/month @ 600 ℓ/T).

Recommendations

- The quarterly monitoring programme, monitoring water quality and levels as well as flow volumes of the springs, should continue to be implemented.

9.3.2 Summary of findings and recommendations of the Land Capability Assessment

Findings

Seven different soil forms were identified across the study area. Soils identified during the survey can be classified as Orthic soils. The crop production potential of soils is generally low except for the Hutton and Avalon soil forms. Grazing potential for the area is high to moderate on all soil types identified. The susceptibility of the soils to wind erosion is high and to water erosion moderate. The pre-mining land use of the study area was identified as dry land crop production and grazing. Several streams and associated riparian wetlands occur on the study area.

Recommendations

The agricultural crop production potential for the area is medium to low. In terms of land capability, in the long term this area will best be utilised as grazing.

9.3.3 Summary of findings and recommendations of the Wetland and Surface Water Assessment

Findings

- Five different types of wetland areas were classified within and surrounding the study area;
- From a functional perspective, wetlands within the study area serve to improve habitat within and downstream of the study area through the provision of various ecosystem services such as streamflow regulation, flood attenuation, groundwater recharge, nitrogen removal, phosphate removal, toxicant removal, particle assimilation and provision of natural resources.

Recommendations

- It was recommended by the specialist that further wetland studies be conducted as several of the wetlands within and surrounding the study area are classified as Freshwater Ecosystem Priority Areas which represent strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources;
- On-site and off-site mitigation measures must be implemented;
- Wetland rehabilitation and management should continue, as well as the avoidance of wetland habitat through appropriate construction and operational environmental management; and
- Wetland monitoring must continue to ensure that all construction, operational and rehabilitation measures are successful.

9.3.4 Summary of findings and recommendations of the Ecological Impact Assessment

Findings

The ecosystems such as wetlands observed within the study sites are extensively used as habitats. Such habitats are important to species as areas of establishment and persistence.

Plants and grasses observed during the study plays a major role as they offer soil coverage (i.e. ground cover) thus prevent erosion. Plants are the most conspicuous component of wetland ecosystems and play a pivotal role; they function as one of the primary producers by bringing energy to the system. They provide oxygen, critical habitat for fauna and influence water chemistry. Plant roots are used to stabilise the soil and absorb toxic material thus purifying water systems. The occurrence of plants helps reduce the flow of rivers and filters the runoffs therefore minimizing the possibility of sedimentation.

Aliens and invasive plants are opportunistic plants that invade areas that are disturbed, thus competing and replacing endemic plants. They have a potential to degrade the area and make it more susceptible to fire as their fuel content is high and uses more water than the indigenous plant species. Land uses that often disturbed the environment such as mining, agriculture and mismanagement of the environment results in the area being susceptible to alien and invasive plant invasion. In terms for CARA 43 of 1983 alien and invasive plants need to be controlled and prevented (Henderson, 2004).

Recommendations

The proposed project area is already prone to disturbance and invasive and noxious plant establishment and hence rehabilitation measures should be considered as further disturbance would trigger more alien and noxious weed invasion.

9.3.5 Summary of findings and recommendations of the Biomonitoring and River Health Assessment

Findings

Quaternary catchment C11A, at the headwaters of the Vaal River, is characterised by huge lotic wetlands, most of which are intact and provides various ecosystem services (e.g. flood attenuation; biodiversity; water purification; etc.). These wetlands are hugely impacted by various point and non-point sources of pollution that are contributing in various degrees towards ecological deterioration of the catchment and impairment of water quality and/or habitat.

In general it seems as if the reduction in the water quality in Stream 1 is related to the mining activities at Umlabu Colliery, while the same at Stream 2 is related to the activities at the Voorslag Railway Siding. Although the colliery shows a definite negative impact on the water quality in the streams upstream from the mine, the specialist is of the opinion that this deterioration in the water quality is not the only role player responsible for

the relatively poor PES Classes of the downstream samples. The specialist is of the opinion that the limited availability of habitat and other factors may play a more important role than the water quality *per se*.

Recommendations

- To use these status quo assessment results for the Summer Cycle with the view of improving water and habitat qualities, in order to improve the various river segments‟ Present Ecological State Class (PES) (i.e. calculated collectively by the IHAS, IHIA, SASS5 scores, and ASPT). Aquatic biomonitoring should therefore be conducted, where stream flow conditions permit, bi-annually (in Winter and Summer);
- To initiate an immediate rehabilitation and storm water management programme at all localities where contaminated seepage during storm water runoff reports to surface streams. This includes the rehabilitation of all erosion channels, and exposed mining waste surfaces (e.g. waste rock/coal dumps);
- To amend the surface water monitoring programme to include assessing surface water quality associated with Umlabu Colliery during and after rainfall events;
- To initiate a programme to assess ground water quality upstream and downstream from Umlabu Colliery (if it is not already existing);
- To protect and enhance all wetland functions on the mine lease area at all costs. The following recommendations must be considered to minimise or avoid impacts on the wetland zone:
    - Dumping, infilling and excavation for construction purposes: All activities must be outside the 1:100 year flood line and/or the riparian zone – including all culverts. [Such activities usually result in significant impacts on a wetland's hydrology, hydraulics and biota, thereby threatening biodiversity and the goods and services wetlands provide. Thus, such activities are not considered to be generally sustainable practices.];
    - Creation of new hardened surfaces (including building and tarred): All activities must be located outside the 1:100 year flood line and/or the riparian zone. [The seasonal and permanent zones associated with streams and wetlands in general have surface water for extended periods. In the case of the seasonal zone, it may be wet for most of the wet season, while in the case of the permanent zone, it may be wet throughout the year. A buffer is required between areas potentially generating non-point source pollution and such areas where surface water is present.]
    - Storm water management requirements: Storm water outflows should not enter directly into the stream, embankments and/or the riparian zone with effective storm water energy breakers that would reduce the speed of water to levels that would not cause erosion. It is recommended – if practicably possible - that a predominantly vegetated buffer area at 35 m wide be included between the storm water outflow and the outer boundary of the stream, with mechanisms for dissipating water energy and spreading and slowing water flow and preventing erosion. This buffer is particularly important when the catchment feeding the storm water drain comprises predominantly hardened surfaces. [Extensive hardened surfaces in the catchment and the

delivery of runoff by storm water drains significantly increase the intensity of storm water runoff, which increases the risk of erosion in a stream/wetland. Furthermore, mining-related storm water runoff is often polluted. Energy dissipating structures are required to reduce the energy and erosive power of the storm water, while a buffer should assist in ameliorating pollution by decreasing the level of pollutants in the runoff before it enters the wetland. A buffer may also contribute to energy reduction of storm water runoff.]

- Road construction: If no viable alternative route exists then it should be ensured that the road has minimal impacts on the flow of water through the stream (e.g. by using box culverts rather than pipes). No excavation of the wetland or any stream passing through the wetland (i.e. lowering of the base level) is permitted. Ensure an adequate buffer is present to deal with run-off from the road. During construction, minimise disturbance of the wetland at, and adjacent to, the road crossing site. Rehabilitation of damages during construction must be implemented immediately upon completion of construction. [Road, railway and pipelines crossings may potentially greatly modify local water flow patterns in a wetland. In addition to having a damming or draining effect on the flow upstream of the road, roads which do not allow for the adequate passage of water may concentrate (channel) flow downstream, increasing the erosion hazard and drying out this portion of the wetland. A lowering of the base level (ground level) increases the gradient in the wetland, thereby increasing the speed at which water will flow, increasing its erosive potential and the extent to which it contributes to lowering the water table.

9.3.5 Summary of findings and recommendations of the Archaeological Impact Assessment

Findings

The greater landscape holds a rich archaeological history ranging from stonewalled settlements on a hilltop to various rock art sites, as well as colonial wagon roads. These sites, however, are located a considerable distance from the location where the processing plant will be relocated to. Because no cultural remains were observed in the direct vicinity of the area to be impacted, it is highly unlikely that cultural remains will be affected. This does not guarantee an area vacant of culturally significant material; the site should therefore be monitored on a continuous basis during the construction phase should such material be unearthed.

Recommendations

Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material and skeletal remains may be exposed during development, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. It is therefore recommended that the Environmental Control Officer (ECO), who will be responsible for the relocation of the SACMH (Pty) Ltd processing plant, monitor the development, should culturally significant material be observed.

From a heritage point of view the relocation of the processing plant may proceed on the demarcated section on Portions 5 and 10 of the Farm Voorslag 274 IS., subject to the abovementioned conditions and recommendations

9.3.6 Summary of findings and recommendations of the Palaeontological Impact Assessment

Findings

During the study, the overburden and inter-burden was closely inspected for fossiliferous outcrops. Rocky outcrops are absent, but a bulldozed section on Portion 5 shows the typical Vryheid Formation rocks. The overburden is thick in places and care should be taken if foundations for buildings and associated structures are dug. Both portions will be affected by the CHPP and TSF, pollution control dam, roads, buildings, waste rock dump, coal stockyard. Such structures will need several trenches, foundations and footings to be dug which may enter the more solid Vryheid Formation.

The threats are:- earth moving equipment/machinery during sealing-in or destruction of fossils by development, vehicle traffic, and human disturbance.

Recommendations

It is recommended to wait for the response from SAHRA on the Phase 1 study and if mitigation is recommended then the SAHRA protocol must be followed. Alternatives will not be feasible as all proposed development portions and surrounding areas are on the Vryheid Formation.

a. There is no objection (see Recommendation B) to the development of the CHPP and TSF, but it was necessary to request a Phase 1 Palaeontological Impact Assessment to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is VERY HIGH. A Phase 2 Palaeontological Mitigation will be required as the Phase 1 Palaeontological Assessment found traces of fossiliferous outcrops (grey shale).

b. This project may benefit the economy, the growth of the community and social development in general.

c. Preferred choice: Location Alternative one, but the impact on the palaeontological heritage is VERY HIGH for the Vryheid Formation. Care must be taken during the digging of foundations and removing overburden (see Executive Summary).

d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

Sampling and collecting:

Wherefore a permit is needed from the South African Heritage Resources Agency (SAHRA).

a. Objections: Cautious. See heritage value and recommendation.
b. Conditions of development: See Recommendation.
c. Areas that may need a permit: Yes.
d. Permits for mitigation: Needed from SAHRA prior to Mitigation.
    a. All the land involved in the development was assessed and none of the property is unsuitable for development (see Recommendation B).
    b. All information needed for the Phase 1 Palaeontological Impact Assessment and Field scope was provided by the Consultant. All technical information was taken from the Scoping Documents provided by ENVASS.
    c. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed.
    d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. Especially shallow caves.
    e. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment and adjacent areas as well as for safety and security reasons.

9.3.6 Overall Summary

Based on the specialists' findings and recommendations, it is clear that the development can be approved and implemented, provided that the EMP, containing mitigation measures, be strictly implemented and monitored. It is clear from the above that the benefits of the proposed activity outweigh the negative impacts on the environment.

9.4 ENVIRONMENTAL IMPACT ASSESSMENT (REGULATION 31 (2))

Potential impacts resulting from the proposed relocation of the CHPP and TSF were identified using input from the following:

- Views of I&APs;
- Existing information;
- Site visit with the project team; and

- Legislation.

The identified potential negative and positive impacts that may result from the construction, operational and decommissioning phases are depicted in Table 21 below.

Please refer to Section 12 of this report for a summary of the impact assessment and Annexure 5 for the Impact Tables containing full descriptions of each identified impact including the significance assessments and to the EMP (Annexure 6) for mitigation measures.

10. ENVIRONMENTAL IMPACT STATEMENT (REGULATION 31 (2) (O) (I-II)

10.1 ENVIRONMENTAL IMPACT ASSESSMENT SUMMARY

Table 21: Impact Summary

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
PREFERRED ALTERNATIVE – CONSTRUCTION PHASE				
GEOLOGICAL AND SOILS		Loss of topsoil and soil erosion through vegetation clearance, wind and storm water.	Negative	Very Low
		Soil compaction by heavy duty vehicles	Negative	Low
		Contamination of soils through: - Indiscriminate disposal of construction waste; and - Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles and other chemicals from construction activities e.g. paints.	Negative	Low
		Loss of soil resources for agricultural land uses.	Negative	Low
HYDROLOGICAL	SURFACE WATER AND GROUND WATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the construction phase.	Negative	Very Low

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
		Contamination of stormwater runoff and ground water, caused by: - Spills and leaks of cement; - Sediment release; - Chemical toilets; - Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles; - Other chemicals from construction activities e.g. paints; and - Effluent discharges, due to a lack of stormwater management.	Negative	Very Low
		Altered drainage patterns and stormwater runoff flows.	Negative	Very Low
		Impacts of dewatering on the groundwater aquifer should water be abstracted from ground water during the construction phase.	Negative	Low
BIOLOGICAL	FAUNA AND FLORA	Decrease in biodiversity on the study and surrounding area.	Negative	Low
		Wetlands on site and in the surrounding area could be damaged.	Negative	Medium
		Spill-over impacts, which may occur on adjacent ecological systems.	Negative	Medium
		Loss of vegetation on the areas surrounding the plant.	Negative	Medium
		Spreading of alien invasive species	Negative	Low
		Impact on natural migratory routes and faunal dispersal patterns.	Negative	Medium
		Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna.	Negative	Low
EXISTING LAND USE		Possibility of construction activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers.	Negative	Very Low
		Loss of land for other purposes e.g. for livestock or game farming.	Negative	Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
HERITAGE RESOURES	Potential for alteration of archaeological, historical and palaeontological resources, should it be discovered during the construction phase.	Negative	Low
VISUAL	Change of the visual character of the area as a result of the establishment of mining infrastructure (The plant will be situated on the watershed which is also the highest contour on site).	Negative	Medium
	Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	Negative	Medium
	Visibility of solid domestic waste and building rubble.	Negative	Low
	Dust settling on the surrounding area	Negative	Very Low
NOISE, VIBRATION AND LIGHTING	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of construction vehicles and equipment.	Negative	Very Low
	Disturbance due to vibrations caused by construction vehicles.	Negative	Very Low
	Impact of security lighting on surrounding landowners and animals.	Negative	Very Low
AIR QUALITY	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	Negative	Very Low
	Settling of dust on the surrounding area and pasture for livestock.	Negative	Very Low
	Windborne fugitive dust and vehicle fumes and particulate matter PM10, altering air quality.	Negative	Very Low
WASTE	Generation of additional general waste/ litter / building rubble and hazardous material during the construction phase.	Negative	Low
SERVICES	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional strain on natural resources.	Negative	Low

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
TRAFFIC		The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	Negative	Low
		Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars, busses and other heavy vehicles.	Negative	Low
HEALTH AND SAFETY		Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers.	Negative	Very Low
		Increased risk to public health and safety: Dangerous areas and construction activities poses health risks and possible loss of life to construction workers and visitors to the site.	Negative	Very Low
		Security risks: Trespassing of construction workers on adjacent properties and possible crime.	Negative	Very Low
		Spreading of diseases such as diarrhoea, HIV and TB.	Negative	Low
SOCIO-ECONOMIC		Creation of short term employment opportunities for the local communities, during the construction phase.	Positive	Medium (+)
		Sourcing supplies from local residents and businesses.	Positive	Medium (+)
PREFERRED ALTERNATIVE - OPERATIONAL PHASE				
GEOLOGICAL AND SOILS		Loss of topsoil, soil erosion and soil compaction by heavy duty vehicles on site.	Negative	Very Low
		Contamination of soils through: - Indiscriminate disposal of waste; and - Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.	Negative	Low
		Soil degradation as a result of beneficiation process and coal handling.	Negative	Low
HYDROLOGICAL	SURFACE WATER AND GROUNDWATER	Stormwater, erosion and siltation impacts due to a lack of implementing temporary measures to manage stormwater run-off quantity and quality during the operational phase.	Negative	Very Low
		Contamination of stormwater runoff and ground water, caused by:	Negative	Very Low

NATURE OF IMPACT		DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
		- Spills and leaks of cement; - Sediment release; - Chemical toilets; - Chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from construction vehicles; - Other chemicals from maintenance activities e.g. paints; and - Effluent discharges, due to a lack of stormwater management.		
		Altered drainage patterns and stormwater runoff flows.	Negative	Very Low
		Impacts of dewatering on the groundwater aquifer should water be abstracted from ground water during the operational phase.	Negative	Low
		Seepage from product stockpiles and tailings could cause a contamination plume affecting the underground resources.	Negative	Low
BIOLOGICAL	FAUNA AND FLORA	Destruction and or deterioration of biodiversity on the study and surrounding area.	Negative	Low
		Loss of vegetation type, ecologically important species and species of conservation concern.	Negative	Medium
		Wetlands on site and in the surrounding area could be damaged.	Negative	Medium
		Spill-over impacts, which may occur on adjacent ecological systems.	Negative	Medium
		Spreading of alien invasive species.	Negative	Low
		Impact on natural migratory routes and faunal dispersal patterns.	Negative	Medium
		Disturbance of fauna through noise, light and dust pollution and hunting, trapping and killing of fauna.	Negative	Low
EXISTING LAND USE		Possibility of mining activities and workers causing veld fires destroying veld and animals on the study area and on adjacent farms, impacting on the livelihood of farmers.	Negative	Very Low
HERITAGE RESOURCES		Potential for alteration of archaeological, historical and palaeontological resources, should it be discovered during the construction phase.	Negative	Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
VISUAL	Change of the visual character of the area as a result of the establishment of mining infrastructure (The plant will be situated on the watershed which is also the highest contour on site).	Negative	Medium
	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including stockpiles and waste dumps and activities.	Negative	Medium
	Visibility of solid domestic and operational waste.	Negative	Very Low
NOISE, VIBRATION AND LIGHTING	Nuisance and health risks caused by an increase in the ambient noise level as a result of the new tertiary crusher; however this will be housed within the coal handling and preparation plant.	Negative	Very Low
	An additional dump hopper to be constructed, will generate more noise.	Negative	Very Low
	Impact of security lighting on surrounding landowners and animals.	Negative	Very Low
AIR QUALITY	Increased dust pollution due to stockpiles and vehicles on gravel roads as well as other mining activities.	Negative	Very Low
	Settling of dust including coal dust, on the surrounding area and pasture for livestock.	Negative	Very Low
	Windborne dust (soil and coal fines) and vehicle fumes and particulate matter PM10, altering air quality.	Negative	Very Low
WASTE (INCLUDING HAZARDOUS WASTE)	Generation of additional general waste/ litter / and hazardous material during the operational phase.	Negative	Low
	Generation of operational waste i.e. reject material and hazardous material during the operational phase.	Negative	Low
SERVICES	Need for services i.e. water, electricity and sewerage systems during the operational phase causing additional strain on natural resources.	Negative	Low
TRAFFIC	The change in the traffic patterns as a result of traffic entering and exiting the new mine on the surrounding road infrastructure and existing traffic.	Negative	Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars, busses and other heavy vehicles.	Negative	Low
HEALTH AND SAFETY	Possibility of operational activities and workers causing veld fires, which can potentially cause injury and or loss of life to employees and surrounding landowners, visitors and employees.	Negative	Very Low
	Increased risk to public health and safety: Dangerous areas and operational activities poses health risks and possible loss of life to employees and visitors to the site.	Negative	Very Low
	Security risks: Trespassing of employees on adjacent properties and possible crime.	Negative	Very Low
	Spreading of diseases such as diarrhoea, HIV and TB.	Negative	Very Low
SOCIO-ECONOMIC	Job creation in an area where the main source of income is generated through primary activities e.g. farming;	Positive	Medium (+)
	Creation of job opportunities during the operation, maintenance phase, for local communities	Positive	Medium (+)
	The provision of improved infrastructure and social upliftment by creating employment and skills transfer to unskilled and semi-skilled unemployed individuals.	Positive	Medium (+)
ECOLOGICAL, HEALTH AND SAFETY AND SOCIO-ECONOMIC INCLUDING LAND USE	Potential for spontaneous combustion or self-heating of coal stockpiles and coal in rail cars through oxidation, may have the following impacts: - Smouldering of coal reducing the quality of the coal; - It may emit noxious gases i.e. carbon monoxide and hydrogen and hydrocarbons i.e. propane and methane, other toxic substances, carcinogens and heavy metals; - Fires, causing damage to surrounding vegetation, loss of animals, economical loss of agricultural crops, handling problems, a threat to safety and economic loss of coal. The likelihood of this impact at transfer locations are however much less than at mines, power stations and	Negative	Low

NATURE OF IMPACT	DESCRIPTION OF IMPACT	STATUS	SIGNIFICANCE POST-MITIGATION
	collieries due to the shorter storage periods. The likelihood of combustion increases with the length of time coal is stored at any one location.		
NO-GO ALTERNATIVE			
SOCIO-ECONOMIC	**No skills development for historically disadvantaged individuals (HDI's) and others from the local communities. Individuals will be more employable after the operational phase, which will benefit themselves, the workforce, the community and the economy.**	**Negative**	**Medium**
	No development and upliftment of the surrounding communities and infrastructure.	**Negative**	**Medium**
	No development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	**Negative**	**Medium**
	No creation of short to long term employment during all the phases of development for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	**Negative**	**Medium**

The impact assessment showed that the potential negative impacts resulting from the construction phase are generally low – medium in significance before mitigation. After mitigation most negative impacts have a very low or low significance and the remaining a medium significance. During the operational phase most negative impacts generally have a medium significance and the remaining a low or high significance. After mitigation most negative impacts will have a very low to low significance and the remainder a medium significance.

Two positive impacts with a medium significance during the construction phase and three during the operational phase have been identified. The significance of the positive impacts are rated as medium and the nature of the impacts are generally socio-economic.

10.2 COMPARATIVE ASSESSMENT OF THE ACTIVITY AND IDENTIFIED ALTERNATIVES

Please also refer to Section 9.2 of this report for a detailed comparative assessment of alternatives.

Table 22: Conclusions of Alternatives Comparative Assessment

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Proposed activity vs. No-Go Alternative	**Approve proposed activity and implement:** Relocate the plant to the proposed position on the Farm Voorslag 274 IS.	**No-Go Alternative:** This will entail leaving the coal handling and preparation plant in its present location.
	Conclusion: Due to fewer negative impacts on the environment of this option and positive impacts in terms of rehabilitating the stream, it makes sense to move the facility as close as possible to the adit, to minimise further environmental impacts on the surrounding environment. Therefore, the status quo option is not a viable option.	**Conclusion:** Due to more disadvantages including more negative impacts on the environment associated with this option, it is not the preferred alternative.
Locality Alternatives	**Farm Voorslag 274 IS:** Away from the drainage line of the tributary river to the Torbanite dam.	**Farm Mooifontein 109 IT:** In direct line of a tributary river to the Torbanite dam.
	Conclusion: The investigation concluded that the subject location (on the Farm Voorslag 274 IS) is the most suitable due to its ideal location in terms of the requirements for location of a CHPP and TSF and less environmental impacts.	**Conclusion:** Due to the current location of the facility being further away from the coal reserves currently mined on the Farm Voorslag 274 IS and other disadvantages as described in the detailed comparative analysis in ***Section 9.2*** of this report, this option is not deemed to be the best alternative to the proposed activity location.
Input Alternatives: Building Materials	**Sustainable Building Materials Obtained from Sustainable and Legal Resources/Origins:**	**Unsustainable Building Materials and Building Materials not blending with the surrounding environment:**
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.
Technology Alternatives: Dewatering of ultra-fine coal	**Filter Presses:**	**Older types of filters:**
	Conclusion: This option is the best alternative due to less impact on natural resources and aesthetic quality of the area.	**Conclusion:** Although this option is a feasible alternative, it is not recommended due to the cumulative impact on scarce resources and the cumulative visual impact.

Alternative Type	Alternative 1 (Preferred)	Alternative 2
Scheduling Alternatives Construction Period	**Dry Winter Months:**	**Wet Summer Months:**
	Conclusion: This alternative will have a negative effect on air quality i.e. dust pollution and water usage for mitigating the impact. However should recycled water be used for dust suppression, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.	**Conclusion:** This alternative will have a negative effect on soil and rivers through sedimentation. However should an appropriate stormwater management plan be implemented, this option could be mitigated to an acceptable alternative. Site specific conditions i.e. rainfall, water availability and whether it is feasible to recycle water will influence the decision on whether construction should be implemented during this season. However, it is anticipated that construction starts as soon as possible once all the necessary approvals are obtained. Should this be the case the mitigation measures for the season that the construction will start in must be implemented.

11. ASSUMPTIONS AND LIMITATIONS (REGULATION 31 (2) (M))

- All information provided to the environmental team by the applicant and I&APs was correct and valid at the time that it has been provided;
- The investigations undertaken by specialists during the EIA process, indicated that the development site is suitable and technically acceptable;
- It is not always possible to involve all I&APs individually, however every effort has been made to involve as many affected stakeholders as possible;
- The information provided by the applicant and specialists was accurate and unbiased; and
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and decommissioning of the proposed coal handing and procession plant and tailings storage facility.

12. REASONED OPINION OF THE EAP (REGULATION 31 (2) (N))

Based on the findings of the specialists' and the result of the EIA, the EAP is of the opinion that the proposed development be approved. The potential negative impacts can be mitigated to acceptable levels and are therefore not a limiting factor in the approval of the environmental authorisation. Due to fewer negative impacts on the environment of the proposed relocation of the CHPP and the TSF, as well as positive impacts in terms of

rehabilitating the stream, it makes sense to move the facility as close as possible to the adit, to minimise further environmental impacts on the surrounding environment.

13. RECOMMENDATIONS (REGULATION 31 (2))

The recommendation of the EAP based on the assessment of the available information, is that the application for the proposed development should be authorised. This authorisation should be in line with sensitive planning, design and good environmental management. If the concept of sustainable development is considered it is proposed that the Coal Handling and Preparation Plant (CHPP) and TSF (Tailings Storage Facility) will have a positive impact on the provision of social and economic criteria. With the recommended guidelines provided by the various specialists' studies; the ecological component can also be brought into balance.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through physical measures, the recommendations from the EIA are included within the Environmental Management Programme (EMP). It is also recommended that the EMP attached as Annexure 6 be approved. The EMP is based on all the information contained in this report as well as all the specialists' reports. It is recommended that the conditions of the Environmental Authorisation include that an independent Environmental Control Officer (ECO) should be appointed by the Applicant to monitor the implementation of the EMP through the site establishment and construction phase, the operational, decommissioning and rehabilitation phases.

14. CONCLUSION

A variety of mitigation measures have been identified that will serve to mitigate the scale, intensity, duration and significance of the potential negative impacts and enhance the potential positive impacts identified. These include guidelines to be applied during all phases of the project. The Environmental Management Programme (EMP) contains detailed mitigation measures.

The proposed mitigation measures, if implemented, will reduce the significance of the majority of the identified impacts. The impact assessment showed that the potential negative impacts resulting from the construction phase are generally low – medium in significance before mitigation. After mitigation most negative impacts have a very low or low significance and the remaining a medium significance. During the operational phase most negative impacts generally have a medium significance and the remaining a low or high significance. After mitigation most negative impacts will have a very low to low significance and the remainder a medium significance.

The proposed activities will have some positive impacts as it will allow for employment of individuals during the construction and operational phase in the Breyten area, which is an area where unemployment is rife. Two positive impacts with a medium significance during the construction phase and three during the operational

phase have been identified. The significance of the positive impacts are rated as medium and the nature of the impacts are generally socio-economic.

The relocation of the CHPP and the TSF and associated operations can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks will be limited in its extent and most negative impacts can be mitigated to acceptable levels.

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16. ANNEXURES (REGULATION 31 (2))

Annexure 1: Maps and GIS

Annexure 2: Authority Correspondence

Annexure 3: Specialists Reports

Annexure 4: Public Participation

Annexure 5: Impact Assessment Tables

Annexure 6: Environmental Management Programme