NEMA APPLICATION: FINAL SCOPING REPORT

KEBRAFIELD (PTY) LTD

REPORT

24/02/2014

REF 13 14/AUTH - 016: (FINAL SCOPING REPORT)

2014

ENVIRONMENTAL & PROJECT MANAGEMENT PROFESSIONALS

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Key Project Information	
Project Title:	Kebrafield Roodepoort Colliery
Farm Description:	Roodepoort 151 IS Portion 17
SG Code:	T0IS000000000115100017
Mining Right Reference Number:	MP30/5/1/2/2/479 MR
District Municipality:	Nkangala District
Local Authority:	Steve Tshwete Local Municipality
Nearest Town:	Pullenshope
Site Midpoint Coordinates:	26° 0'25.87"S 29°34'41.21"E

Project applicant:	Kebrafield (Pty) Ltd		
Trading name (if any):	Kebrafield		
Contact person:	Wayne van der Burgh c/o Burgh Group Holdings (Pty) Ltd		
Physical address:	54 Guinea Fowl Str, Silver Lakes, Pretoria		
Postal address:	P.O. Box 71986, Die Wilgers		
Postal code:	0041	**Cell:**	
Telephone:	012 807 0229	**Fax:**	012 807 0339
EAP:	Ilze Ueckermann for Eco Elementum (Pty) Ltd		
Contact person:	Henno Engelbrecht (Project Manager)		
Postal address:	26 Greenwood Crescent, Lynnwood Ridge, Pretoria		
Postal code:	0040	**Cell:**	082 6909 105
Telephone:	012 348 5214	**Fax:**	086 714 5399
E-mail:	henno@ecoelementum.co.za / info@ecoelementum.co.za		
Qualifications & relevant experience	Masters Degree specializing in Environmental Management 10 Years' experience in Environmental Consultancy		
Professional affiliation(s) (if any)	Chartered Environmental Assessment Practitioner South Africa (CEAPSA)		
Landowner:	Joseph Christiaan van Wyk - ID 7604145228088		
Contact person:	Van Wyk Attorneys, 48 Mouton Street, Hendrina, 1095		
Postal address:	PO Box 22, Hendrina		
Postal code:	1095	**Cell:**	
Telephone:	013 293 0505	**Fax:**	013 293 0530

EXECUTIVE SUMMARY

i) Introduction

Eco Elementum (Pty) Ltd has been appointed by Eyethu on behalf of the applicant Kebrafield (Pty) Ltd to undertake the Scoping Environmental Impact Assessment and Water Use Licensing for all the relevant listed activities as discussed further on in this report. The mining right which has been awarded to Kebrafield (Pty) Ltd, MP30/5/1/2/2/479 MR, includes various farms and associated farm portions although for this specific project only the farm Roodepoort 151 IS portion 17 in the vicinity of the town of Pullenshope in Mpumalanga is being applied for. The project falls within the district municipality of the Nkangala District while the local authority is the Steve Tshwete Local Municipality. This report entails an application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, and falls within the jurisdiction of the Department: Economic Development, Environment and Tourism, Mpumalanga Provincial Government.

The proposed project relate to the opencast mining of approximately 800 000tons of high grade coal over a period of approximately three years. When coal seams are near the surface, it may be economical to extract the coal using open cut (also referred to as open cast, open pit, or strip) mining methods. Open cast coal mining recovers a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited. The activity will cover approximately 50 hectares and is situated next to the town of Pullenshope downstream of the Eskom Hendrina Power Station.

The Environmental Impact Assessment (EIA) process followed is in compliance with the National Environmental Management Act, 1998 (Act 107 of 1998), as amended and the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R544, 545 and 546 in Government Gazette No. 33306 of 18 June 2010). The proposed opencast coal mining operations constitutes various listed activities which have been listed within the scheduled activities in Government Notice Regulation No 544, 545 and 546 and therefore require a full Scoping and EIA process to be followed. Prior to such a listed activity being approved, it is required that an environmental process is undertaken and a report is submitted to the relevant environmental authority for consideration.

ii) Legislative Requirements

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

The proposed development requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and EIA process as listed activities 9, 11, 13, 18, and 22 under Government Notice No R. 544 as well as listed activities 10 and 15 of Government Notice No R. 545 and also activity 13 and 14a of Government Notice No R 546 of the EIA 2010 Regulations are triggered.

National Water Act, 1998 (Act 36 of 1998):

The mine envisaged to engage in several water uses that need to be authorised in terms of section 21 of the National Water Act, 1998 (Act 36 of 1998). The water uses that need to be applied for are:

- Section 21 (a) for the taking of water from a resource (for abstraction of potable water from a borehole and use of water from pollution control dam for dust suppression). No surface water abstraction is allowed within the quaternary catchment (under GA) as specified in Table 1.1 within Government Gazette Notice No 26187 during March 2004. The taking of groundwater is regulated in terms of quantity and rate of abstraction by Table 1.2 within the same Gazette Notice mentioned.
- Section 21 (c) and (i) in respect of the altering of water courses by mining infrastructure
- Section 21 (g) for the disposing of mine waste in a manner which may impact on a water resource (for pollution control dams and discard dumps)
- Section 21 (g) for the dirty water containment structures (PCD's)
- Section 21 (j) for removing of water from open pit operations

There are no General Authorisations applicable to this application.

Various legal references have been considered throughout the application while the following list serves as a summary;

- The Constitution of the Republic of South Africa, 1996
- The National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA]
- National Heritage Resource Act, 1999 (Act No. 25 of 1999) [NHRA]
- National Water Act, 1998 (Act No.36 of 1998) [NWA]
- Integrated Environmental Management [IEM] (DEAT Guideline Series)
- National Environmental Air Quality Act (Act No 39 of 2004) [NEMAQA]
- Mineral and Petroleum Resources Development Act (Act 28 of 2002) [MPRDA]
- National Environmental Management: Waste Act (Act 59 of 2008) [NEMWA]
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [MHSA]
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) [NEMBA]
- Conservation of Agricultural Resources Act (Act 43 of 1983) [CARA]
- Occupational Health and Safety Act (Act 85 of 1993)[OSHAct]

iii) Potential Environmental Impacts Identified

Detailed Breakdown of Potential Environmental Impacts	
Ground Water Contamination	• During mining ground water can seep through the high walls and become contaminated in the pit when in contact

	with carbonaceous material • Based on the Acid Base Accounting score for the material that will be mined including the material used for backfill rehabilitation potential water contamination can occur • The drawdown effect can cause water sources in the vicinity of the opencast pit to potentially flow into the pit
Surface Water Contamination	• Open pit mining is associated with surface water contamination due to the leaching of stockpiles - also dependant on the characteristics of the stockpiled material • The quality of the water used for dust suppression has the potential to contaminate surface water sources • The clean and dirty water separation system could potentially contaminate surface water sources • Erosion of denuded soil surfaces could potentially increase the total dissolved solids and cause sedimentation of surface water sources
Geology, soil and land capability	• Opencast mining will impact the geology, soil and land capability and must be addressed during the backfill rollover rehabilitation
Socio-economic issues	• A potential positive impact could occur as the mine will create in excess of direct 100 jobs while many more indirect jobs will be created • The mining of the coal resource will positively impact on the economy of the country
Waste products	• General waste will be generated on site • Small amounts of hydrocarbon waste associated with maintenance activities will be generated on site • No washing of coal will take place on site therefore no negative impact from slurry dams
Flora and faunal displacement	• During opencast mining total displacement of flora and fauna will take place within the footprint of the opencast pit

Impacts on the wetlands and drainage patterns	• Potential impacts could arise due to mining in the vicinity of a wetland and therefore a 100m buffer must be adhered to according to specialist investigations. A WULA will however be applied for to authorise mining within the 500m radius from a wetland up and to the 100m buffer line. • Surface water drainage patterns will be altered according to the storm water management plan to ensure clean and dirty water separation.
Dust and noise impacts	• Mining is associated with dust and noise impacts as a result of blasting, excavation, stockpiling, crushing & screening and general vehicle movement on gravel roads.
Visual impacts	• Opencast mining is associated with potential visual impacts as a result of the stockpiles and waste rock dumps that is higher than the initial topography before mining
Blast & vibration impacts	• Blasting will be required during the opencast mining operation and potential blast and vibration impacts exist
Identified heritage sites	• Various graves have been identified during the initial site visits on the edge of the mining footprint (not within) that might be impacted due to mining activities
Paleontological impacts	• Based on the findings from the Paleontological investigation can we further determine possible impacts

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ABBREVIATIONS

AIA - Archaeological Impact Assessment
ASAPA - Association of South African Professional Archaeologists
BID - Background Information Document
DEA - Department of Environmental Affairs
DEAT - Department of Environmental Affairs and Tourism (currently known as DEA)
DWA - Department of Water Affairs
EIA - Environmental Impact Assessment
EIR - Environmental Impact Report
EMPr - Environmental Management Programme
ENPAT - Environmental Potential Atlas
EP - Equator Principles
EPC – Engineering and Procurement Contract
EPFI - Equator Principles Financial Institutions
ESA - Early Stone Age
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
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)
NEMBA - National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NHRA - National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NSBA - National Spatial Biodiversity Assessment
NWA - National Water Act, 1998 (Act No. 36 of 1998)
O&M - Operations and Maintenance
PHRA - Provincial Heritage Resources Agency
PSSA - Paleontological Society of South Africa
PM - Public Meeting
PPP - Public Participation Process
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
SAWS - South African Weather Service
SDF - Spatial Development Framework
TSF – Tailings Storage Facility
VT - Vegetation Type

GLOSSARY OF TERMS

Air pollution: any change in the composition of the air caused by smoke, soot, dust (including coal), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.

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

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc

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) (NEMA) as contemplated in the scheduled activities listed in Government Notice (GN) No R. 543, 544 and 545.

Archaeological resources:

- 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.

Atmospheric emission or emission: any emission or entrainment process emanating from a point, non-point or mobile source those results in air pollution.

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 (EMPr): The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

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

Hyrdomorphic / 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.

Particulates: comprises a mixture of organic and inorganic substances, ranging in size and shape. These can be divided into coarse and fine particulate matter. The former is called Total Suspended Particulates (TSP), whilst thoracic particles or PM10 (particulate matter with an aerodynamic diameter of less than 10 µm) fall in the finer fraction. PM10 is associated with health impacts for it represents particles of a size that would be deposited in, and damaging to, the lower airways and gas-exchanging portions of the lung. TSP, on the other hand, is usually of interest in terms of dust deposition (nuisance).

Project Manager (PM): Person/organisation appointed by the holder of the environmental authorisation to oversee the work of all consultants, sub-developers, contractors, residents and visitors for the project.

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.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation must aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

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 easier than moist or dry soils.

1. Introduction

Eco Elementum (Pty) Ltd has been appointed by Eyethu on behalf of the applicant Kebrafield (Pty) Ltd to undertake the Scoping Environmental Impact Assessment and Water Use Licensing for all the relevant listed activities as discussed further on in this report. The mining right which has been awarded to Kebrafield (Pty) Ltd, MP30/5/1/2/2/479 MR, includes various farms and associated farm portions although for this specific project only the farm Roodepoort 151 IS portion 17 in the vicinity of the town of Pullenshope in Mpumalanga is being applied for. The project falls within the district municipality of the Nkangala District while the local authority is the Steve Tshwete Local Municipality. This report entails an application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, and falls within the jurisdiction of the Department: Economic Development, Environment and Tourism, Mpumalanga Provincial Government.

The proposed project relate to the opencast mining of approximately 800 000tons of high grade coal over a period of approximately three years. When coal seams are near the surface, it may be economical to extract the coal using open cut (also referred to as open cast, open pit, or strip) mining methods. Open cast coal mining recovers a greater proportion of the coal deposit than underground methods, as more of the coal seams in the strata may be exploited. The activity will cover approximately 50 hectares and is situated next to the town of Pullenshope downstream of the Eskom Hendrina Power Station.

The Environmental Impact Assessment (EIA) process followed is in compliance with the National Environmental Management Act, 1998 (Act 107 of 1998), as amended and the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R544, 545 and 546 in Government Gazette No. 33306 of 18 June 2010). The proposed opencast coal mining operations constitutes various listed activities which have been listed within the scheduled activities in Government Notice Regulation No 544, 545 and 546 and therefore require a full Scoping and EIA process to be followed. Prior to such a listed activity being approved, it is required that an environmental process is undertaken and a report is submitted to the relevant environmental authority for consideration.

A summary of the activities which are being applied for under either Government Regulations No 544, 545 or 546 (Government Gazette No. 33306 of 18 June 2010) with brief descriptions of why it is anticipated that these activities will need to be authorised in terms of the project planning are summarized in the tables below.

Table 1: Description of each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):

Number and Date of relevant Notice	Activity No	Description of listed activities with brief explanations in terms of project planning
National Environmental Management Act, (Act 107 of 1998) GN.R. 544, 18 June 2010	S9	9. Infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water - (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse. *It will be required that water from the opencast mining areas that flow into the pit must be transported to the relevant pollution control facilities, in this case the pollution control dams. Stormwater which has not been contaminated will also need to be diverted away from the opencast mining area.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 544, 18 June 2010	S13	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; *The storage of fuel (especially diesel) for the mining vehicles will be required. Such storage might also be required for the generator required to supply electricity.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 544, 18 June 2010	S11	11. The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water 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. *The construction of canals and bulk stormwater outlet structures will be required to ensure clean and dirty water separation can take place and that stormwater can be diverted away from the opencast mining area. Dams for the control of polluted water will need to be constructed within the mining area for pollution control facilities. The distance from the watercourse will be dependent on the Water Use License Authorisation that is being applied for simultaneously to this NEMA application.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 544, 18 June 2010	S18	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 (i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or occurs behind the development setback line. *The activity will be triggered should the Water Use License Authorisation allow the applicant to conduct mining activities within the watercourse (more specifically wetland) areas as defined by the wetland specialist report.*
National Environmental	S22	22. The construction of a road, outside urban areas,

Management Act, (Act 107 of 1998) GN.R. 544, 18 June 2010		(i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or for which an environmental authorisation 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. *For the purpose of the Kebrafield Roodepoort Colliery the existing gravel road will have to be reconstructed and diverted away from the mining area to ensure a safe flow of traffic can be achieved. Roads will also need to be constructed within the mining area to ensure the mineable resource can be accessed.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 545, 18 June 2010	S10	10. The construction of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following: (i) water catchments, (ii) water treatment works; or (iii) impoundments, excluding treatment works where water is to be treated for drinking purposes. *Water will be required to be transferred between the pollution control facilities for the safe continuation of mining. The most probable of which will be the pollution control dams.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 545, 18 June 2010	S15	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; except where such physical alteration takes place for: (i) linear development activities; or agriculture or afforestation where activity 16 in this Schedule will apply. *The alteration of current agricultural and grazing land is estimated to be more than 20hectares (estimated 60ha) based on the current mine planning and proposed land owner agreement. Mining is a commercial*

		activity and therefore trigger this activity.
National Environmental Management Act, (Act 107 of 1998) GN.R. 546, 18 June 2010	S13	13. The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, *Currently only desktop ecological assessments have been conducted in support of the mining right EIA and therefore this activity is being applied for since the exact coverage of natural vegetation must still be determined by a registered professional natural scientist. The area have however been used for agricultural purposes and have been ploughed and planted to a certain extent while the remainder has been used for grazing purposes. Initial site investigations did indicate various invasive and alien plant species.*
National Environmental Management Act, (Act 107 of 1998) GN.R. 546, 18 June 2010	S14a	14. The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes; the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list; the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010. *For mining purposes more than 5 hectares will need to be cleared, but similar to the above description must the exact coverage of indigenous vegetation still be determined. However, approximately 50% of the proposed mining layout is situated on agricultural fields which are currently being utilized for crop cultivation and not 75% indigenous vegetation.*

The EIA process that is being followed includes the completion of the Scoping Report as well as an Environmental Impact Assessment Report with associated Environmental Management Programme. The Scoping Report identifies and determines the issues or concerns from the relevant authorities as well as interested and/or affected parties, while an Impact Assessment Report is undertaken to determine the likely

consequence of the opencast mining project entitled Kebrafield Roodepoort Colliery on the environment (whether positive or negative).

It is therefore the responsibility of Eco Elementum (Pty) Ltd as independent environmental assessment practitioners to;

- Undertake a comprehensive site evaluation facilitated by a site visit and desk top analysis;
- Advertise, requesting that Interested and Affected Parties (I&AP's) register their concerns;
- Identify and determine the possible I&AP's;
- Undertake the necessary and/or required specialist studies;
- Assess the issues, impacts and alternatives related to this project; and
- Compile a detailed Scoping Report and its submission to the relevant environmental authority.

1.1 Project Details

The proposed Kebrafield Roodepoort Colliery which is an opencast mine is situated on the farm Roodepoort 151 IS Portion 17 which currently belongs to Mr. Joseph Christiaan van Wyk (ID 7604145228088) and he is currently using a section of portion 17 for maize cultivation, and the remainder for grazing purposes.

Table 2: Project applicant details

Project applicant:	Kebrafield (Pty) Ltd		
Trading name (if any):	Kebrafield		
Contact person:	Wayne van der Burgh c/o Burgh Group Holdings (Pty) Ltd		
Physical address:	54 Guinea Fowl Str, Silver Lakes, Pretoria		
Postal address:	P.O. Box 71986, Die Wilgers		
Postal code:	0041	**Cell:**	
Telephone:	012 807 0229	**Fax:**	012 807 0339

Table 3: Details of immediate landowners and their property

Landowner:	Joseph Christiaan van Wyk - ID 7604145228088		
Contact person:	Van Wyk Attorneys, 48 Mouton Street, Hendrina, 1095		
Postal address:	PO Box 22, Hendrina		
Postal code:	1095	**Cell:**	
Telephone:	013 293 0505	**Fax:**	013 293 0530
Farm Name:	Roodepoort 151 IS Portion 17		
SG Code:	T0IS000000000115100017		

Title Deed:	T4074/2001
Extent in ha:	409.3832

Table 4: Details of the Environmental Assessment Practitioner

EAP:	Ilze Ueckermann for Eco Elementum (Pty) Ltd		
Contact person:	Henno Engelbrecht (Project Manager)		
Postal address:	26 Greenwood Crescent, Lynnwood Ridge, Pretoria		
Postal code:	0040	**Cell:**	082 690 9105
Telephone:	012 348 5214	**Fax:**	086 714 5399
E-mail:	henno@ecoelementum.co.za / info@ecoelementum.co.za		
Qualifications & relevant experience	Masters Degree specializing in Environmental Management 10 Years' experience in Environmental Consultancy		
Professional affiliation(s) (if any)	Chartered Environmental Assessment Practitioner South Africa (CEAPSA)		

Table 5: Project Team

Team Member	Qualification	Role
Mr. Henno Engelbrecht	B.Sc Hons Env Mgmt & Anlysis, M.Sc Project Management (final thesis)	Project Manager
Me. Ilze Ueckermann	MA Environmental Management, Registered CEAPSA	Environmental Assessment Practitioner
Mr. Morne Burger	M.Sc Hydrogeology, Pr.Sci.Nat	Geohydrology and Modelling
Dr. Giep du Toit	D.Sc, Pr.Sci.Nat	Geohydrology and Modelling
Mr. Johan Mare	M.Sc, Pr.Sci.Nat	Microbiologist, Surface Water Specialist
Dr. Petro Erasmus	Ph.D	Management Plans
Me. Nicola Gouws	M.Env.Sc	Ecology, Fauna & Flora
Mr. Ferdie Nieman	B.Sc Hons	GIS, Mapping & Field Technician
Mr. Tobias Coetzee	BA Hons	Archaeologist & Heritage Specislist
Me. Leanne George	MA	Archaeologist & Heritage Specialist
Mr. A J Smith	PrEng	Civil Engineering Works, Stormwater Management

		Planning, Dam Designs and Floodlines
Mr. Kas van der Merwe	B.ing (Agriculture)	Land Capability Assessment
Mr. Cobus Havenga	PrEng	Traffic Impact Assessment
Me. Phyllis Kalele	MA	Social Impact Assessment
Mr. Morne Pretorius	B Tech (Nature Conservation) COMCSC, ASANIRE	Blast Risk Assessment
Dr. Barry Millsteed	PhD Geology; Pr.Sci.Nat; MGSSA	Paleontological Impact Assessment

Table 6: Brief commodity overview

Mineral Deposit:	Bituminous coal found in the coal seams of the Witbank Coal Field
Mineable Product:	Coal from a single coal seam horizon will be mined with an estimated thickness of 2.5m – 3.0m at a depth varying from 6.5m to 28m deep.
Reserves:	The estimated mineable in situ resource within the coal seam of the Kebrafield Roodepoort Colliery situated on Portion 17 of the Farm Roodepoort 151IS is 800 000tons of high grade coal.
Mining Method:	Opencast Mining following a roll-over concurrent rehabilitation methodology
Production Rate:	The entire estimated reserve of 800 000tons of high grade coal is proposed to be mined within the three year period at a rate of minimum 50 000tons per month
Planned life of mine:	Three years
Estimated Job Creation:	100 direct employment opportunities

1.2 Legislative Requirements

The following section includes a list of Acts applicable to this project and a brief description of the relevant aspect(s) of the relevant Acts. 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 opencast mining project entitled Kebrafield Roodepoort Colliery. This section also summarises the policy, legal, and administrative framework applicable to the EIA that has been initiated. Further to this does this section also explain the regulatory authorities responsible for decision making related to the proposed project.

1.2.1 The Constitution of the Republic of South Africa, 1996

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

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 1998) 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 and Tourism 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 1998) 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.

Appropriate 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.

1.2.2 The National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA]

An EIA is being undertaken to comply with the requirements of the NEMA. The NEMA EIA Regulations list activities which require environmental assessment and authorisation prior to construction. These activities are known as 'listed activities', and must be authorised by the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET). The EIA was registered with MDEDET in September 2013, reference number 17/2/3N-289.

The National Environmental Management Act, 1998 (Act 107 of 1998)[NEMA] was first enacted in November 1998 and the amended Act came into effect in June 2010. The 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 the National Environmental Management Act, 1998 (Act 107 of 1998) [NEMA], as amended and the Environmental Impact Assessment Regulations of 2010 (Government Notice No's R544, 545 and 546 of 2010). 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 Department of Economic Development, Environment and Tourism (MDEDET) is the responsible regulatory authority.

Listed activities associated with the proposed project on Portion 17 of the Farm Roodepoort 151 IS, as listed in Regulations 544, 545 and 546 of the NEMA are reflected below. A full Scoping and EIA process is required for activities listed in terms of Regulation 545. A single EIA Report and EMP document will be prepared and submitted to both the DMR and MDEDET for authorisation of the proposed project and listed activities.

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

9. Infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water -

(i) with an internal diameter of 0,36 metres or more; or

(ii) with a peak throughput of 120 litres per second or more,

excluding where:

a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or

where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.

It will be required that water from the opencast mining areas that flow into the pit must be transported to the relevant pollution control facilities, in this case the pollution control dams. Stormwater which has not been contaminated will also need to be diverted away from the opencast mining area.

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;

The storage of fuel (especially diesel) for the mining vehicles will be required. Such storage might also be required for the generator required to supply electricity.

11. The construction of:

i. canals;
ii. channels;
iii. bridges;
iv. dams;
v. weirs;
vi. bulk storm water 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.

The construction of canals and bulk stormwater outlet structures will be required to ensure clean and dirty water separation can take place and that stormwater can be diverted away from the opencast mining area. Dams for the control of polluted water will need to be constructed within the mining area for pollution control facilities. The distance from the watercourse will be dependent on the Water Use License Authorisation that is being applied for simultaneously to this NEMA application.

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

The activity will be triggered should the Water Use License Authorisation allow the applicant to conduct mining activities within the watercourse (more specifically wetland) areas as defined by the wetland specialist report.

22. The construction of a road, outside urban areas,

(i) with a reserve wider than 13,5 meters or,

(ii) where no reserve exists where the road is wider than 8 metres, or

for which an environmental authorisation 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.

For the purpose of the Kebrafield Roodepoort Colliery the existing gravel road will have to be reconstructed and diverted away from the mining area to ensure a safe flow of traffic can be achieved. Roads will also need to be constructed within the mining area to ensure the mineable resource can be accessed.

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

10. The construction of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following:

i. water catchments,

ii. water treatment works; or

iii. impoundments,

excluding treatment works where water is to be treated for drinking purposes.

Water will be required to be transferred between the pollution control facilities for the safe continuation of mining. The most probable of which will be the pollution control dams.

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;

except where such physical alteration takes place for:

(i) linear development activities; or

(ii) agriculture or afforestation where activity 16 in this Schedule will apply.

The alteration of current agricultural and grazing land is estimated to be more than 20hectares (estimated 60ha) based on the current mine planning and proposed land owner agreement. Mining is a commercial activity and therefore trigger this activity.

NEMA (Act 107 of 1998) GNR 546 of 2010:

13. The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation,

Currently only desktop ecological assessments have been conducted in support of the mining right EIA and therefore this activity is being applied for since the exact coverage of natural vegetation must still be determined by a registered professional natural scientist. The area have however been used for agricultural purposes and have been ploughed and planted to a certain extent while the remainder has been used for grazing purposes. Initial site investigations did indicate various invasive and alien plant species.

14. The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:

purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes;
the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list;

the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010.

For mining purposes more than 5 hectares will need to be cleared, but similar to the above description must the exact coverage of indigenous vegetation still be determined. However, approximately 50% of the proposed mining layout is situated on agricultural fields which are currently being utilized for crop cultivation and not 75% indigenous vegetation.

1.2.3 National Heritage Resource Act, 1999 (Act No. 25 of 1999) [NHRA]

In terms of the National Heritage Resources Act, 1999 (Act 25 of 1999), a Heritage Impact Assessment will be conducted for the site since the site is greater than 0,5 hectares (ha) in extent, currently estimated to have a footprint of approximately 60ha.

The Act makes provision for the potential destruction to existing sites, pending the archaeologist recommendations through permitting procedures. Permits are administrated by the South African Heritage Resources Agency (SAHRA).

The National Heritage Resources Act legislates the necessity for a cultural and heritage impact assessment in areas earmarked for development that complies with one of the following:

Section 38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized 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) are often commissioned as part of the heritage component of an Environmental Impact Assessment (EIA) and are required under Section 38(1) of the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 38(8) of the National Environmental Management Act (NEMA) and the Mineral and Petroleum Resources Development Act (MPRDA).

The process of archaeological assessment usually takes the form of:

1. A scoping or initial pre-assessment phase where the archaeologist and developer's representative establish the scope of the project and terms of reference for the project;
2. A Phase 1 archaeological impact assessment;
3. A Phase 2 archaeological mitigation; and
4. A Phase 3 heritage site management plan.

Phase 1 archaeological impact assessment

Phase 1 archaeological assessments generally involve 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 South African Heritage Resources Agency (SAHRA) and supported by 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

If a 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 about this is taken by the heritage resources authority, which should give a permit or a formal letter of permission, or in the case of an EIA (in South Africa) 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 artefactual 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, and include as minimum requirements reporting back strategies to SAHRA, or other appropriate heritage agencies, and 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.

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

On occasion, the Phase 2 may require a Phase 3 programme involving the modification of the site or 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 place may have. For example in a wilderness area or open space when sites are of public interest the development of interpretative material is recommended and 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.

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

The National Government is responsible for the equitable allocation and use of the scarce and unevenly distributed water resources of the nation. The aim of water resource management is to ensure the sustainable use of water through the protection of the quality of water resources for the benefit of all water users. There is a need for the integrated management of all aspects of water resources and the delegation of management functions to a regional or catchment level where appropriate, to enable everyone to participate. Provision is made for sharing of certain water resources with other countries.

The preamble to the National Water Act, 1998 (Act No.36 of 1998) can be summarized as follow;

- Recognising that water is a scarce and unevenly distributed national resource which occurs in many different forms which are all part of a unitary, inter-dependent cycle;
- Recognising that while water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources;
- Acknowledging the National Government's overall responsibility for and authority over the nation's water resources and their use, including the equitable allocation of water for beneficial use, the redistribution of water, and international water matters;
- Recognising that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users;
- Recognising that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users; and
- Recognising the need for the integrated management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate.

The National Water Act 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 Act 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 generation;
- 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 mine envisaged to engage in several water uses that need to be authorised in terms of section 21 of the National Water Act, 1998 (Act 36 of 1998). The water uses that need to be applied for are:

- Section 21 (a) for the taking of water from a resource (for abstraction of potable water from a borehole and use of water from pollution control dam for dust suppression). No surface water abstraction is allowed within the quaternary catchment (under GA) as specified in Table 1.1 within Government Gazette Notice No 26187 during March 2004. The taking of groundwater is regulated in terms of quantity and rate of abstraction by Table 1.2 within the same Gazette Notice mentioned.
- Section 21 (c) and (i) in respect of the altering of water courses by mining infrastructure
- Section 21 (g) for the disposing of mine waste in a manner which may impact on a water resource (for pollution control dams and discard dumps)
- Section 21 (g) for the dirty water containment structures (PCD's)
- Section 21 (j) for removing of water from open pit operations

There are no General Authorisations applicable to this application.

The WULA is being undertaken as a separate process and does not fall within the scope of this environmental authorisation process under NEMA although the applications are integrated in terms of addressing the same impacts for the same proposed project.

In an attempt to assist the regulatory authority with the task of reviewing and issuing the Water Use License, the document will:

- Give a brief overview of the proposed activities of the Kebrafield Colliery Project;
- Identify the water uses as defined in Section 21 of the National Water Act, 1998 (Act 36 of 1998) applicable to the project;
- Provide all completed DW forms and legal administrative documents; and
- Provide an overview of the potential impacts on the surface water resources to assist with the decision making process.

1.2.5 Integrated Environmental Management [IEM] (DEAT Guideline Series)

Integrated Environmental Management (IEM) is a philosophy, which prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (Department of Environmental Affairs: DEAT, 1992). The IEM guidelines intend endearing a pro-active approach to sourcing, collating and presenting information at a level that can be interpreted at all levels.

A series of overview information documents on the concepts of, and approaches to, integrated environmental management (IEM) has been used during this EIA. IEM is a key instrument of South Africa's National

Environmental Management Act (NEMA). South Africa's NEMA promotes the integrated environmental management of activities that may have a significant effect (positive and negative) on the environment. IEM provides the overarching framework for the integration of environmental assessment and management principles into environmental decision-making. It includes the use of several environmental assessment and management tools that are appropriate for the various levels of decision-making.

The aim of this document series is to provide general information on techniques, tools and processes for environmental assessment and management. The material in the documents draws upon experience and knowledge from South African practitioners and authorities, and published literature on international best practice.

1.2.6 National Environmental Air Quality Act (Act No 39 of 2004) [NEMAQA]

The National Environmental Management: Air Quality Act, Act No. 39 of 2004 has replaced the older Atmospheric Pollution Prevention Act (APPA), Act 45 of 1965. The Air Quality Act requires a shift from source-based air pollution control to a receiving environment, air quality management approach.

Key features of the new approach to air quality governance include:

- Decentralisation of air quality management responsibilities;
- A requirement that all significant sources be identified, quantified and addressed;
- Setting of ambient air quality targets as goals to achieve emission reductions;
- Recognition of source-based, command-and-control measures (i.e. authorities set source requirements and emission limits requiring adherence by responsible parties), in addition to alternative measures, including market incentives and disincentives, voluntary programmes, and education and awareness;
- Promotion of cost-optimised mitigation and management measures;
- Required air quality management planning by authorities and emission reduction and management planning by sources;
- Access to information and public consultation.

The new approach has significant implications for government, business and civil society.

The National Environmental Management: Air Quality Act 39 of 2004 has shifted the approach of air quality management from source-based control to receptor-based control. The Act made provision for national ambient air quality standards, however it is generally accepted that more stringent standards can be established at the Provincial and Local levels. Emissions are controlled through the listing of activities that are sources of emission and the issuing of emission licences for these listed activities. Atmospheric emission standards have been

established for each of these activities and an atmospheric licence is now required to operate. The issuing of emission licences for Listed Activities will be the responsibility of the Metropolitan and District Municipalities. Municipalities are required to *'designate an air quality officer to be responsible for co-ordinating matters pertaining to air quality management in the Municipality'*. The appointed Air Quality Officer will be responsible for the issuing of atmospheric emission licences or the Air Quality Officer could delegate the responsibility to the Director of community environmental services.

Legislation for Local Government

The Local Government: Municipal Systems Act 32 of 2000, together with the Municipal Structures Act 117 of 1998, establishes local government as an autonomous sphere of government with specific powers and functions as defined by the Constitution. Section 155 of the Constitution provides for the establishment of Category A, B and C municipalities each having different levels of municipal executive and legislative authorities. According to Section 156(1) of the Constitution, a municipality has the executive authority in respect of, and has the right to, administer the local government matters (listed in Part B of Schedule 4 and Part B of Schedule 5) that deal with air pollution.

Ambient Air Quality Guidelines and Standards

Guidelines provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human health and well-being (WHO, 2000). Once the guidelines are adopted as standards, they become legally enforceable. The South African Bureau of Standards (SABS), in collaboration with DEA, established ambient air quality standards for criteria pollutants as which will need to be adhered to during this particular project.

1.2.7 Mineral and Petroleum Resources Development Act (Act 28 of 2002) [MPRDA]

Mining operations require environmental authorisation from the DMR for the mining right application in terms of Section 22 of the MPRDA. The following issues require consideration whilst compiling the Environmental Impact Assessment Report.

- The objectives of the MPRDA include giving effect to Section 24 of the Constitution by ensuring that the Nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development. (Section 2(h) of the MPRDA);
- The principles set out in Section 2 of the National Environmental Management Act, 1998 (Act 107 of 1998)[NEMA] serve as guidelines for the interpretation, administration and implementation of the environmental requirements of the MPRDA. (Section 37(1)(b) of the MPRDA);

- Section 38(1)(a) of the MPRDA requires that effect be given to the general objectives of Integrated Environmental Management laid down in the NEMA. Integrated Environmental Management (IEM) is a philosophy, which prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development process in order to achieve a desirable balance between conservation and development;
- The environmental management programme to be submitted is not limited to but must *inter alia* include the requirements of regulation 51 of the MPRDA. For instance, where regulation 51(a)(ii) refers to measures for the prevention, management and remediation of each environmental impact, these clearly must be understood in the context of the NEMA where the general objectives of the IEM include ensuring that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them. This clearly requires a description of the mining project that lists each activity pertaining to the mining project, in order that each such activity can be assessed.

The MPRDA Amendment Act further states that:

- Environmental reports, as required in terms of Chapter 5 of the NEMA must be submitted to the DMR (Section 18);
- Consultation with the landowner, lawful occupier and any interested and affected party must occur in the prescribed manner and the result of the consultation must be included in the relevant environmental reports (Section 18); and
- The mining right may only be granted if the mining will not result in unacceptable pollution, ecological degradation or damage to the environment and an environmental authorisation is issued (Section 19).

1.2.8 National Environmental Management: Waste Act (Act 59 of 2008) [NEMWA]

The National Environmental Management: Waste Act (Act 59 of 2009) aims 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. Furthermore this Act aims to provide for national norms and standards for regulating the management of waste by all spheres of government. It provides guidance for the licensing and control of waste management activities and gives regulations for the rehabilitation and remediation of contaminated land.

The NEMWA requires that all waste management activities must be licensed and that the licensing procedure must be integrated with an environmental assessment process. On 3 July 2009, GN R. 718 was published with definitions of the waste management activities that require licensing. These activities are divided into Category A

(activities requiring a basic assessment) and Category B (activities requiring scoping and EIA). The basic assessment and scoping and EIA processes as described in the EIA Regulations GNR 543 should be followed.

This Act does not apply to:

a) Radioactive waste that is regulated by the Hazardous Substances Act. 1973 (Act No. 15 of 1973). the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999), and the Nuclear Energy Act, 1999 (Act No. 46 of 1999);
b) Residue deposits and residue stockpiles that are regulated under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
c) The disposal of explosives that is regulated by the Explosives Act, 2003 (Act No. 15 of 2003).

Responsibilities within NEMWA include;

1. Avoid generating waste. If the company can't avoid this, reduce the harmfulness and the amount of waste generated;
2. Re-use, recycle or recover waste;
3. Ensure that the waste is treated before disposing of it in an environmentally accepted way;
4. Manage your waste in such a way that it isn't a danger to anyone's health, the environment, or causes a nuisance through noise, odour or visual impacts;
5. If at all possible, prevent any other person from contravening a provision of the *Act*; and
6. Take reasonable control measures to prevent waste from being used for an unauthorised purpose. An example of an unauthorised purpose would be using containers that previously held chemicals to store clean water.

1.2.9 Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [MHSA]

The main aim of the MHSA is to provide for protection of the health and safety of employees and other persons at mines and, for that purpose-

- to promote a culture of health and safety;
- to provide for the enforcement of health and safety measures;
- to provide for appropriate systems of employee, employer and State participation in health and safety matters;
- to establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research;
- to provide for effective monitoring systems and inspections, investigations and inquiries to improve health and safety;

- to promote training and human resources development;
- to regulate employers' and employees' duties to identify hazards and eliminate, control and minimise the risk to health and safety;
- to entrench the right to refuse to work in dangerous conditions; and
- to give effect to the public international law obligations of the Republic relating to mining health and safety;
- and to provide for matters connected therewith.

The Mine Health and Safety Inspectorate was established in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996), as amended, for the purpose of executing the statutory mandate of the Department of Mineral Resources to safeguard the health and safety of mine employees and communities affected by mining operations.

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

The overarching aim of the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA), within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of 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.

The South African National Biodiversity Institute (SANBI) was established by the 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. 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 a Fauna and Flora Impact Assessment for developments in an area that is considered ecologically sensitive which require environmental authorisation in terms of NEMA, with such Assessment taking place during the EIA phase.

The NEMBA is relevant to the proposed project as removal of overburden and mining 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.

1.2.11 Conservation of Agricultural Resources Act (Act 43 of 1983) [CARA]

To provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

1.2.12 Occupational Health and Safety Act (Act 85 of 1993)[OSHAct]

To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

In Section 8 General duties of employers and their employees it is stated that:
"Every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of the employees."

(2) The matters to those duties refer include in particular:

a. The provision and maintenance of systems of work, plant and machinery that, as far as reasonably practicable, are safe and without risk to health;
b. Taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety and health of employees;
c. Making arrangement for ensuring as far as reasonably practicable, the safety and absence of risks to health in connection with the production. Processing, use, handling, storage and transport of articles or substances;
d. Establishing, as far as reasonably practicable, what hazards to the health or safety of persons are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as reasonably practicable, further establish what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in

order to protect the health and safety or persons, and he shall provide the necessary means to apply such precautionary measures;

e. Providing such information, instruction, training and supervision as may be necessary to ensure, as far as reasonably practicable, the health and safety of employees;
f. As far as reasonably practicable, not permitting any employee to do any work or to produce, process, use, handle, store, or transport any article or substance or to operate any plant or machinery, unless precautionary measures contemplated in paragraph (b) and (d), or any precautionary measures which may be prescribed, have been taken;
g. Taking all necessary measures to ensure that the requirements of this Act are complied with by every person in his employment or on the premises under his control where plant and machinery is used;
h. Enforcing such measures as may be necessary in the interest of health and safety;
i. Ensuring that work is performed and that plant and machinery is used under the general supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures taken by the employer are implemented; and
j. Causing any employees to be informed regarding the scope of their authority as contemplated in Section 37(1) (b).

1.3 Administrative Framework

1.3.1 Department of Mineral Resources [DMR]

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Mine environmental management forms an integral part of the management of mineral resources in South Africa. In order for the department to effectively manage it has to undertake research, develop mine environmental policies (legislation, strategies), provide strategic guidance on mine environmental management, mine rehabilitation, water ingress, mine environmental legacies and on sustainable development.

The heritage of mining which extends for over a century has left a scourge of derelict and ownerless mines which cause serious environmental and health hazards, particularly for communities living around these areas. The department has prioritised management of rehabilitation of these mines as categorised on earlier established data base; to this end a strategy has been developed and will be implemented.

The Department of Mineral Resources (DMR) through its Mineral Regulation Branch (MRB) is responsible for regulating the mining and minerals industry to achieve transformation and contribute to sustainable development. The purpose of the MRB is to administer the MPRDA and other applicable legislation. Its objectives are to ensure

the granting of prospecting and mining rights in terms of the Act and to promote mineral development, urban renewal, rural development and black economic empowerment. It is responsible for co-ordinating and liaising with national, provincial and local government structures for efficient governance. It is also tasked with addressing past legacies with regard to derelict and ownerless mines and enforcing legislation regarding mine rehabilitation. The DMR through its MRB is responsible for authorising the EMP amendment in terms of the MPRDA and liaising with MDEDET in terms of the NEMA EIA authorisation process.

1.3.2 Mpumalanga Department of Economic Development, Environment and Tourism [MDEDET]

The Department of Economic Development, Environment and Tourism were formed after the split of the then Department of Finance and Economic Affairs in 2005. They are the premier Department tasked with the responsibility to drive all economic development and planning initiatives in the province of Mpumalanga. The Department provides oversight role on the work of three agencies which are: Mpumalanga Economic Growth Agency (MEGA), Mpumalanga Gambling Authority and Mpumalanga Tourism and Parks Agency.

The Department of Economic Development, Environment and Tourism is mandated to steer provincial economic growth activities and ensure the preservation of the environment, in order to speed up economic growth and transform the economy to create decent work and sustainable livelihood for the people of Mpumalanga.

In South Africa, EIA is the responsibility of both national and provincial government institutions. Policy formulation and coordination takes place at national level, while approval of EIAs for most development proposals has been delegated to the provinces. In terms the EIA Regulations of 2010 the provinces are defined as competent authorities for environmental authorisation for most of the listed activities, i.e. they are empowered to authorise development activities. Therefore, in terms of the NEMA authorisation process for the activities listed the responsibility for environmental authorisation rests with MDEDET.

1.3.3 Department of Water Affairs [DWA]

The Department of Water Affairs is the custodian of South Africa's water resources. It is primarily responsible for the formulation and implementation of policy governing this sector. It also has an overriding responsibility for water services provided by local government. While striving to ensure that all South Africans gain access to

clean water and safe sanitation, the water sector also promotes effective and efficient water resources management to ensure sustainable economic and social development.

South Africa's scarce water resources are under increasing pressure. Water resources will have to be used efficiently, effectively and wisely if the country wishes to build a sustainable future. In order to do this, one needs to know how much water is used, by whom, and where. Once this is known, one will be able to measure it against how much water is actually available for use. In some areas it could be found that there is still extra water that can be made available for use. In other areas there is already more water being used than the water resources can provide without considerable damage to the aquatic ecosystems.

The National Water Act (Act 36 of 1998) gives the Department of Water Affairs the tools to gather the information that we need for the optimal management of our water resources. The registration of water use is one of these tools. All water users who are using water for agriculture: aquaculture, agriculture: irrigation, agriculture: watering livestock, industrial, mining, power generation, recreation, urban and water supply service must register their water use. This covers the use of surface and ground water.

1.4 Project Motivation: Need and Desirability

South Africa’s coal industry is at a crossroads and unless government makes the right choices, and soon, Eskom will not be able to keep the country's lights on, a new report has shown. The SA Coal Road Map, which was published after years of research into the state of SA's coal mining industry and its likely future, calls for, among other things, urgent improvements in SA's investment climate. Confirming Eskom's claims that it faces a looming coal supply crunch, the report warns that should government delay, or make poor decisions, there will be serious economic consequences. The road map was established under the auspices of the Fossil Fuel Foundation and was compiled with the support of the coal producers, Eskom and the departments of energy and mineral resources. Existing coal supply resources to Eskom are now fast running out, in part because the power stations have been run at higher utilisation rates than originally planned.

Repeated delays on bringing the new Medupi and Kusile stations on line mean that Eskom must keep the old power stations running, and they need new sources of coal to do so. The road map notes: "At present investment in SA is being deterred due to the unfavourable policy and legislative environment and labour risks and better returns in other commodities and geographies." Though some of these investors could be replaced by domestic entities, if the desirability of investing in SA coal mines declines further, this could lead to future reductions in the availability of coal for both local and export markets." During these times of difficulty it must be noted that the proposed Kebrafield Roodepoort Colliery will contribute positively to increased investment in the South African coal mining sector ensuring more coal is available for both the local and export markets.

Mining in South Africa directly contributed to the establishment of the Johannesburg Stock Exchange in the late 19th century, and today it still accounts for a third of its market capitalisation. It is clear how much mining in South Africa has shaped the country politically, culturally, and economically. The South African mining sector has provided the critical mass for a number of industries that are either suppliers to the mining industry, or users of its products. These include energy, financial services, water and engineering services, and specialist seismic geological and metallurgical services. The Kebrafield Roodepoort Colliery will not only contribute directly to the South African economy, but will also contribute to the development and growth of other industries supporting the mining operation.

The Kebrafield Roodepoort Colliery will contribute to the South African mining sector which currently;

- contributes an average of 20% to South Africa's GDP, of which about 50% is contributed directly;
- boasts total annual income exceeding R330 billion;
- is one of the country's major employers, with more than one million people in mining-related employment;
- is the largest contributor by value to black economic empowerment in the economy.

As a coal producer, South Africa currently ranks 5th globally, producing an average of 224 million tonnes of marketable coal each year. Major coalfields are found in the Highveld and Low-veld regions of South Africa, with Witbank and Ermelo being the major mining hubs. Coal provides almost 80% of South Africa's primary energy needs. Coal mining in South Africa plays a significant role in the country's economy as it is responsible for nearly three quarters of Eskom's fuel supply. The industry is also responsible for supplying the coal-to-liquids (CTL) industry, developed by the South African fuel company, SASOL, who produces around 35% of the country's liquid fuel. The Kebrafield Roodepoort Colliery will be directly involved in growing and advancing the South African economy as a coal supplier to the existing markets.

South Africa's most abundant source of energy is coal, which is mostly of low quality with a correspondingly low heat value and high ash content. The majority of the country's coal deposits that are suitable for cheap power generation are found in eastern and south-eastern Mpumalanga and in northern KwaZulu-Natal (KZN). In Gauteng and the northern Free State it is generally found at shallow depths and in thick seams, whereas in KZN, the seams are deeper and thinner, but of a higher quality. Worldwide, coal is one of the fastest growing energy sources. Demand for coal is soaring, especially in the emerging Indian and Chinese markets. With the increase in demand, global coal prices are following the escalating oil price, making various coal reserves now economically feasible to mine. The growth in peak electricity demand in South Africa is increasing. On average, the demand for electricity in South Africa has increased by more than 3% over the last five years. The impact of the growth in demand for electricity is that all the Eskom power stations are being scheduled to operate at their optimum output, with various suppliers providing the required supply of coal.

South Africa's threatened mining sector lost 23 000 jobs in the 12 months to June 2013, and 4 000 of those were lost between April 2013 and June 2013. The Kebrafield Roodepoort Colliery will contribute to creating new direct and indirect job opportunities at this critical point in in time in the mining sector where massive job losses are present. The mining sector has the potential to create hundreds of thousands of new jobs in South Africa and the rest of Africa – provided that governments, business and labour start to see eye to eye. This is imperative as with the strife currently facing the South African mining industry the enormous job creation potential of mining is being overlooked. International research has shown that mining has a massive multiplier effect on job creation. For example, studies show that for each direct job created by the Yanacochagold mine in Peru, 14 additional jobs were indirectly created. Mines spend millions of dollars on equipment, maintenance, food and other services, either through suppliers or local contractors. This translates into many new jobs in support industries linked to the mining sector.

The need to redress past racial and gender discrimination

Kebrafield (Pty) Ltd: Roodepoort Colliery is an emerging coal company and registered as a 30% Black Empowered Company.

Kebrafield (Pty) Ltd: Roodepoort Colliery is committed to the development of the South African workforce and to the availability of the mining operations skills and competence required for the successful mining and production of this commodity.

Socio-economic impact if the proposed project is authorised

The mining activities will have a positive effect on the socio-economic structure of the region. The proposed mining activities will create new employment opportunities, thus impacting indirectly on dependents and the economic environment. Should the application be successful, it will have a positive effect.

The main positive impacts are:

- Employment to a number of people during the construction and operational phases. The numbers of jobs created are significant to the local and regional economy.
- A large capital investment and substantial offshore revenue generation.
- Capital investment in the form of the company payroll.
- Significant amounts paid to the government in the form of local, regional and national taxes and levies.
- Creation and support of service-sector jobs, the annual procurement of large quantities of consumables and the outsourcing of service provision to local service providers.

- The generated produce will go towards Eskom's Power Generation needs and therefor the electricity output needed in South Africa

The positive impacts described above can be even further enhanced in the context of the communities surrounding the project site. Further measures to enhance socio-economic opportunities should focus on the promotion and development of small and medium enterprises in the local communities, especially due to the short timeframe expected. Larger contracts should be broken down into smaller more accessible contracts and local people should be employed where possible.

If this project does not continue, the applicant will be prevented to invest large sums of money reaching a desperate community in the form of salaries, which will have a direct impact on the local community. The presence of the mining activity, the employment of local persons and the utilisation of local services will result in an increased income for local communities and business and an increased tax base for traditional authorities and municipalities. These opportunities will be lost should the project not proceed, and will have consequences on local, regional and national.

Investments already made by the applicant

The applicant made various investments in terms of appointment of specialists to conduct environmental investigations in support of the Environmental Impact Assessment and Water Use License Application.

- A Mining Right have been obtained from the Department of Mineral Resources (Ref: MP30/5/1/2/2/479 MR);
- EMP, EIA and Geo-hydrological studies and impact assessments have been conducted. In South Africa, legislation sets out the legal framework governing mineral exploration and exploitation related activities. These include EIA, EMP and Closure Plans to be submitted with application for a mining right. This ensures adequate management for the anticipated impacts that was identified during the EIA phase;
- Water samples have been taken to determine a reference condition which must be maintained during operation of the colliery.
- Floodline Report has been compiled by Avon Engineering (Pty) Ltd
- Engineer Design drawings for Pollution Control Facilities, Stormwater Management as well as Water Balances have been determined for the Roodepoort Colliery and final lay-out of the mining infrastructure has been based on these designs.
- Wetland Delineations, Ecological Investigations (fauna and flora) have been conducted by Menco
- The Water Use License with all supporting specialist studies and documentation has been submitted to the Department of Water Affairs for evaluation and issuance

- All specialist studies as listed earlier on in the report (table 5 pg 21) have been scoped and appointed, most already complete

2. Description of the Proposed Activity

2.1 General Overview

Section 39(3)(a) of the National Environmental Management Act (Act 107 of 1998) read together with Regulation 50(a) of the MPRDA further requires a description of the proposed activity including all infrastructure and associated activities.

The Kebrafield Roodepoort Colliery will be an opencast mine producing 800 000tons of high grade Bituminous Coal found in a single coal seam (2.5 -3.0m thick) of the Witbank Coal Field at depths varying from 6.5m to 28m deep. The colliery will be covering an extent of approximately 60ha of the 410ha Portion 17 of Roodepoort 151 IS farm (approximately 15% of the farm). The extent of the mining area is predetermined by the extent of the coal seam as has been determined during the prospecting phase of the project. The mining right with reference MP30/5/1/2/2/479 MR has already been awarded to Kebrafield (Pty) Ltd and the Mining Right EIA and EMPR has been approved and stamped on 2011-06-06. An application for the Water Use License is being made concurrently with this EIA to ensure authorisation can be granted at the same time (expected authorisation end 2014) to enable the project to commence.

The larger extent of the mining right entails a life of mine of 30 years and covers various farm portions, although for this particular EIA authorisation only the first phase of the project is being applied for with an estimated life of mine of approximately three years. Future applications for the remainder of the reserve as approved in the Mining Right will be lodged with the Department as separate applications due to the size and extent of the operation making it very difficult to apply for everything at once. The scope and extent of the Kebrafield Roodepoort Colliery therefore has been limited to 60ha on Portion 17 of the Farm Roodepoort 151 IS.

Mining methods vary widely and depend on the location, type and size of mineral resources. Surface mining methods are most economical in situations where mineral deposits occur close to the surface (e.g. coal, salts and other evaporite deposits or road quarry material) or form part of surface deposits (e.g. alluvial gold and diamonds, and heavy mineral sands). For this specific project the mining of coal by means of surface mining methods are viable due to the fact that the resource is situated close enough to the surface to make it economically mineable. Typical surface mining methods include: strip mining and open pit mining, as well as dredge, placer and hydraulic mining in riverbeds, terraces and beaches. The Kebrafield Roodepoort Colliery will be mined by means of open pit or also known as opencast mining methods following a roll over rehabilitation

sequence. These activities always disrupt the surface and this, in turn, affect soils, surface water and near-surface ground water, fauna, flora and all alternative types of land-use (Fuggle & Rabie, 1996; Ashton, 1999).

Besides the rate and method of mining, the location, variety and scale of mine infrastructure also influences the nature and extent of impacts. The Kebrafield Roodepoort Colliery will be mined relatively quickly in a period of one year compared to other mining operations that could last for several years and/or even decades. The fast mining sequence will ensure impact duration during mining is short. Typical mine infrastructure includes: haul roads and spoil dumps; surface facilities (e.g. offices, workshops, car parks and warehouses); tailings and waste rock disposal areas; transport and service corridors (e.g. railway lines, roads, pipelines, conveyers, power and water corridors); product stockpiles; chemicals and fuel storage and housing facilities (Australian Environmental Protection Agency, 1995-1996; Fuggle & Rabie, 1996; Ashton, 1999; Weaver & Caldwell, 1999).

The figures below give an overview of the mine planning as is currently anticipated. This layout will change as specialist investigations and studies are completed and also according to the requirements of the final Record of Decision for both the NEMA and WULA processes. The images below is one technical design drawing which was created based merely on exploration drilling results, while the second image includes an initial high level wetland study and aerial image overlay. Which can be noted already is that a section of opencast has been indicated within the wetland area to the east, although this was initial planning and will be examined by a wetland specialist team to determine the viability of this section of mining. The anticipated result is that the section of boxcut indicated to the east of the main mining layout will not be included in the mine plan as this is too close to the sensitive receptor. The wetland specialist team and ecologists will make their recommendations regarding the required buffer distances which must be adhered to when mining in proximity of sensitive receptors and therefore has been acknowledged in this Draft Scoping report as an element to be studied further during the Environmental Impact Assessment phase.

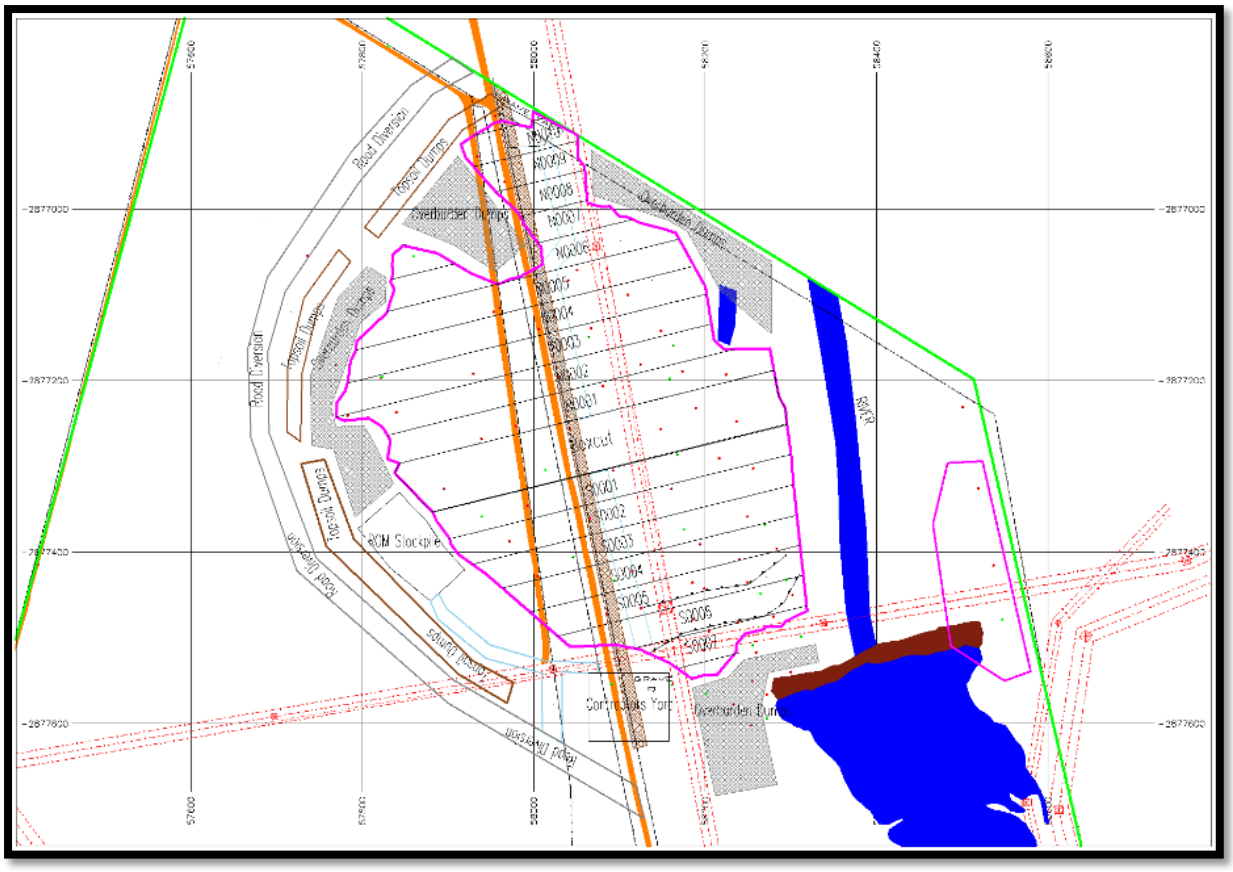


Figure 1: Mine planning layout according to the exploration drilling results

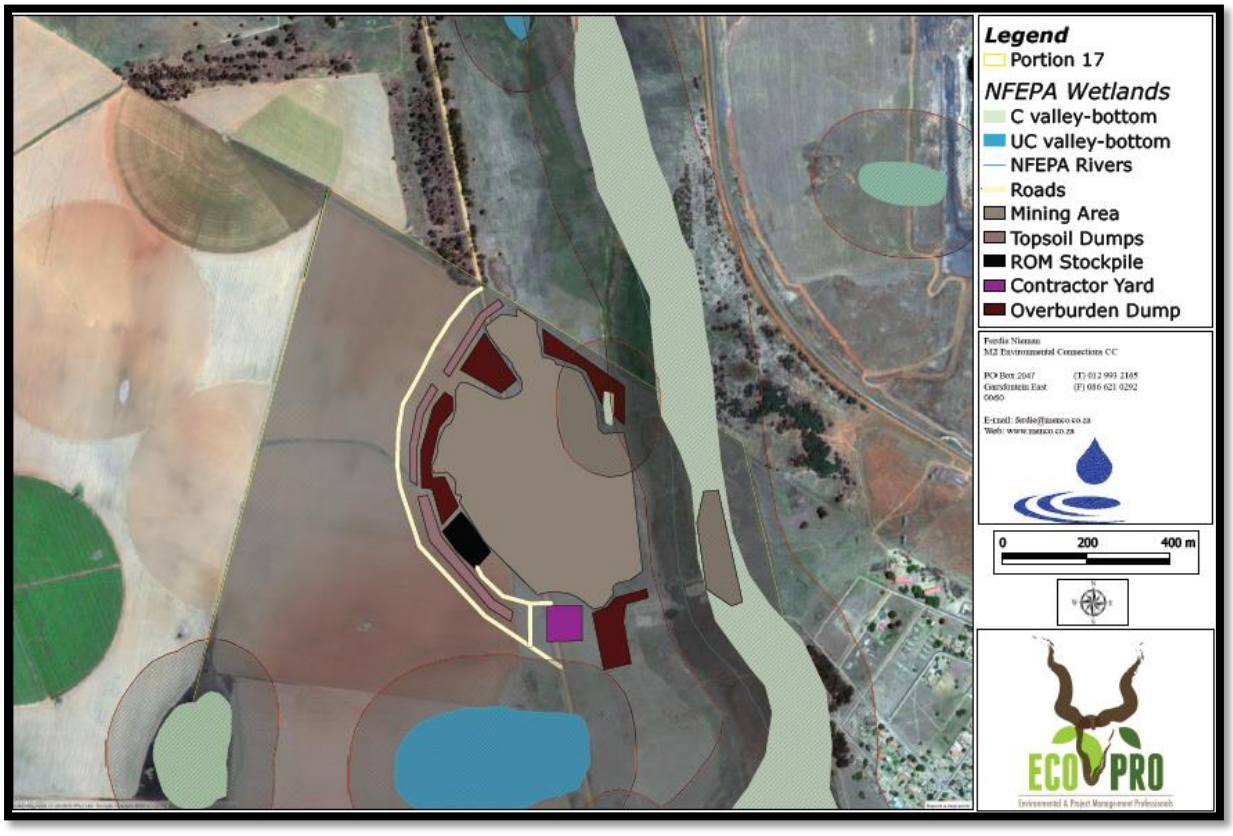


Figure 2: Mine planning layout with Aerial imagery overly

As a summary the following activities will be established and are associated with the proposed Kebrafield Roodepoort Colliery;

- Site preparation;
- Box cut opencast mining with a roll over rehabilitation sequence;
- Crushing and screening of the ROM coal;
- Access road, haul road construction and road diversion of the existing road;
- Semi temporary site offices and security office;
- Semi temporary sanitation and change house;
- Stores and store yard;
- Workshop and maintenance area;
- Bulk fuel storage;
- Pollution control facility/dam(s) (evaporation and dust suppression use);
- Clean and dirty water separation system;
- Trenching;
- Fencing;
- Mine fleet hard park;
- Staff and visitors parking;
- Drilling, blasting and explosives handling;
- Topsoil, subsoil, overburden, discard and ROM stockpiles;
- Weighbridge;
- Waste management;
- Mine closure and rehabilitation.

2.2 Site Preparation

Site preparation mainly deals with the stripping and stockpiling of topsoil prior to the mining activities commencing as this might affect the quality and quantity of available valuable topsoil resources. The main objectives of soil management are to:

- provide sufficient stable topsoil material for rehabilitation (in this case concurrently as mining continues);
- optimise the preservation and recovery of topsoil for rehabilitation;
- identify soil resources and stripping guidelines;
- identify surface areas requiring stripping (to minimise over clearing);
- manage topsoil reserves so as to not degrade the resource;
- identify stockpile locations and dimensions; and
- identify soil movements for rehabilitation use.

In accordance with the objective of providing sufficient stable soil material for rehabilitation and to optimise soil recovery, the following strategies have been adopted:

- stockpiles to be located outside proposed mine disturbance areas;
- construction of stockpiles by dozers rather than scrapers to minimise structural degradation;
- construction of stockpiles with a "rough" surface condition to reduce erosion hazard, improve drainage and promote revegetation; and
- revegetation of stockpiles with appropriate fertiliser and seed in order to minimise weed infestation, maintain soil organic matter levels, soil structure and microbial activity and maximise the vegetative cover of the stockpile depending on the exposure timeframes.

Disturbance areas will be stripped progressively (ie. only as required) so as to reduce erosion and sediment generation, to reduce the extent of topsoil stockpiles and to utilise stripped topsoil as soon as possible for rehabilitation. Rehabilitation of disturbed areas (ie. roads, embankments and stripped mining footprint) will be undertaken as practicable after these structures are completed or as areas are no longer required. Soil surveys over the open cut area, beneath proposed mine waste emplacements and other infrastructure areas will determine the depth of topsoil. It should be noted that it is important that for topsoil recovered from the areas it is required that underlying material is not inadvertently collected since it is unsuitable for reuse in rehabilitation.

Based on the final void having a considerable surface area relative to the total area mined and topsoil being recovered from all areas to be mined, it is considered that a topsoil surplus over the life of mine will occur. However, the Project topsoil budget will be reviewed following completion of topsoil recovery from the deeper profiles within the Kebrafield Roodepoort Colliery.

A general protocol for soil handling is presented below and includes soil handling measures which optimise the retention of soil characteristics (in terms of nutrients and micro-organisms) favourable to plant growth:

- The surface of the completed stockpiles will be left in a "rough" condition to help promote water infiltration and minimise erosion prior to vegetation establishment;
- Topsoil stockpiles to have a maximum height of 3m in order to limit the potential for anerobic conditions to develop within the soil pile;
- Topsoil stockpiles to have an embankment grade of approximately 1V:4H (to limit the potential for erosion of the outer pile face);
- Topsoil stockpiles will be seeded and fertilised; and
- Soil rejuvenation practices will be undertaken if required prior to respreading as part of rehabilitation works.

2.3 Box Cut Opencast Mining with a Roll-over Rehabilitation Sequence

The most economical method of coal extraction from coal seams depends on the depth and quality of the seams, and also the geology and environmental factors of the area being mined. The impact of coal mining processes is generally differentiated by whether they operate on the surface or underground. In this instance the mineral will be won by means of opencast surface mining methods as indicated in the figures above. Coal is mined only where technically feasible and economically justifiable. Evaluation of technical and economic feasibility of a potential mine requires consideration of many factors: regional geologic conditions, overburden characteristics, coal seam continuity, thickness, structure, quality, and depth; strength of materials above and below the seam for roof and floor conditions; topography (especially altitude and slope); climate; land ownership as it affects the availability of land for mining and access; surface drainage patterns; ground water conditions; availability of labour and materials; coal purchaser requirements in terms of tonnage, quality, and destination; and capital investment requirements.

The Kebrafield Roodepoort Colliery operation proposes to use the rollover mining and rehabilitation method. Roll-over opencast mining is typical of small scale opencast mining operations in the Mpumalanga coal fields. The proposed mining entails only opencast methods for this stage of the project. The opencastable reserves will be mined in conventional truck and shovel mining methods using the lateral roll-over technique in a single direction. This would mean mining from the one side of the development footprint in a linear fashion towards the opposite side while backfilling and rehabilitating the area that has already been mined, thus creating the effect that the mining cuts are rolling over in a single direction. Sustainable development applied to mining works necessarily includes rehabilitation with the aim of either restoring the land to its original use, or eliminating or reducing adverse environmental impacts to a long-term acceptable condition. The process is driven primarily by legislation which ensures that the mine owner must comply with the intention of achieving those end conditions, which are defined in broad terms by guidelines.

An initial box cut as well as an access pit ramp into the box will be constructed first. A double box cut has been planned to enable mining in both a northerly and southerly direction, thereby increasing the face length and production rates. The ramp will have a maximum slope of 12˚. Topsoil from the initial box cut will be stripped, where after the subsoil and hard overburden will be drilled, blasted and removed. Topsoil, subsoil and hard overburden will each be stockpiled separately. After removal of the coal from the initial box cut, subsequent box cuts will be made and the initial void filled with the stockpiled hard overburden, subsoil and finally topsoil which will then be seeded and grasses to re-establish vegetation coverage to grazing capability.

The primary procedures that will be implemented during the mining process include;

- Removing and stockpiling of topsoil;

- Construction of the pollution control evaporation dam(s) also used for dust suppression;
- Trenching around the mining footprint to ensure stormwater is diverted away from the open cast pit;
- Blasting, stripping and stockpiling of overburden;
- Excavation of the initial strip of the box-cut;
- Excavation of coal (ROM);
- Crushing, screening and stockpiling coal;
- Backfill rehabilitation concurrently as mine progress forward.

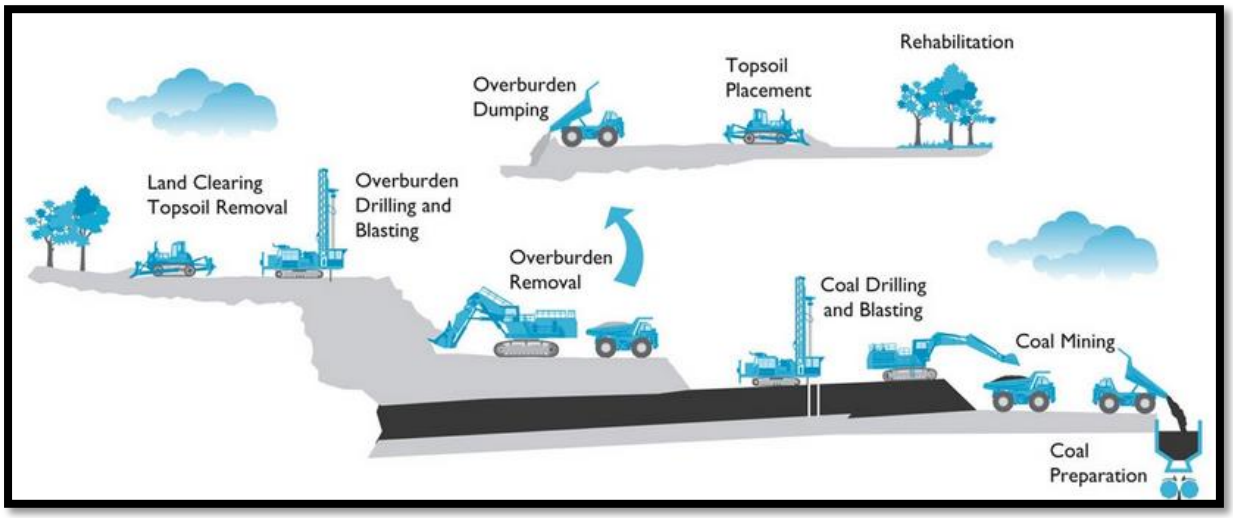


Figure 3: Typical coal surface mining opencast sequence indicating primary procedures

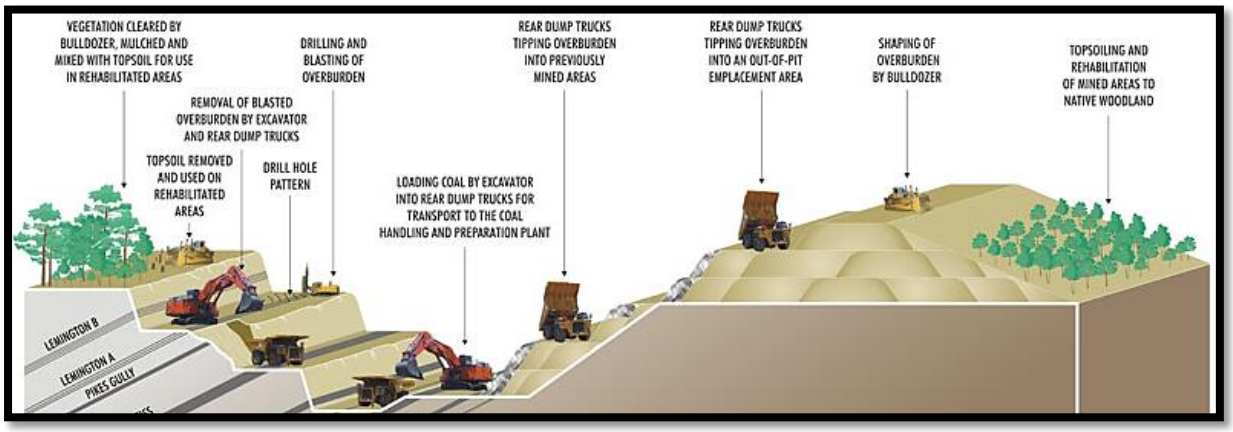


Figure 4: Typical coal surface mining opencast sequence indicating rollover backfill rehabilitation methodology

Figure 5 below indicates the typical mining sequence and can be summarized as; initial removal of the overburden which will then be stockpiled behind the mining area to ensure it can be replaced back in the initial box cut. The physical mining of the coal seam follows which is then placed into trucks to be taken to the crushing and screening facility. From here discard coal will be extracted and replaced in the bottom of the opencast pit, while the product will be taken to the weighbridge via trucks and then removed off site. The overburden is replaced back into the pit as mining progress leaving a minimum area open at a single time. The topsoil which

was stripped and stockpiled separately before mining commenced is then replaced and according to the land capability specialist report prepared to the optimal composition to ensure the field can be restored to grazing land as was the pre-mining land use.

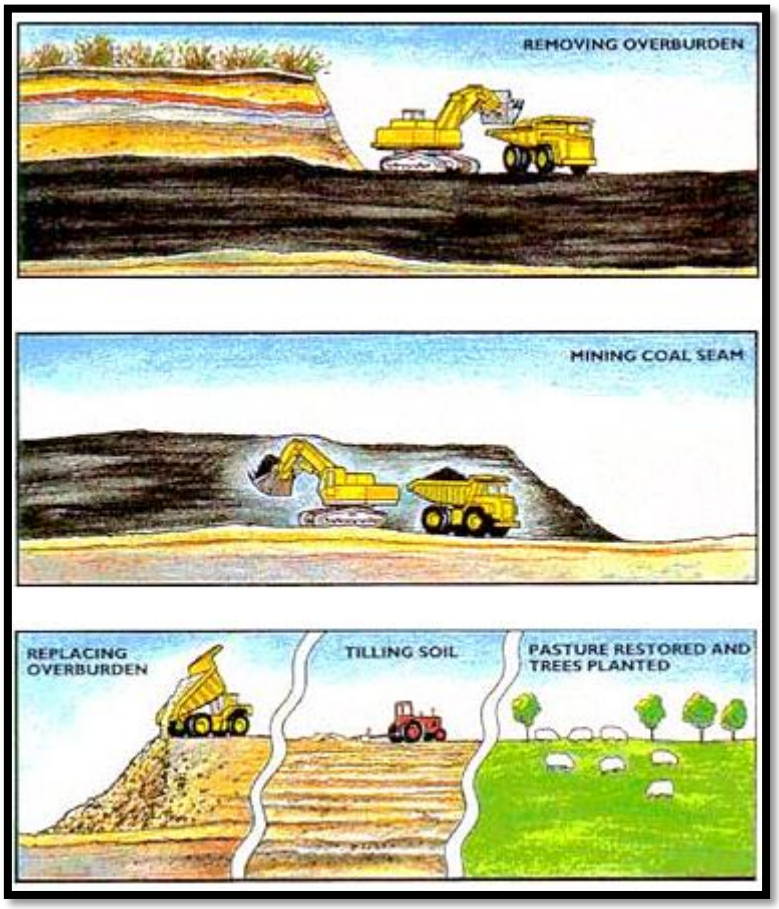


Figure 5: Opencast Coal Mining Sequence

The sequence in figure 6 can serve as a further illustration of the anticipated project. Step (1) is where the topsoil will be stripped and stockpiled separately. After this drilling takes place to enable blasting of the overburden. During step (2) the overburden is then removed by conventional truck and shovel methodology and stockpiled separately within the mining footprint. Step (3) includes the removal of underburden which is typically associated with more hard material than fine material (typical of overburden) and is usually the sandstone layer on top of the coal seam. This material is also stockpiled separately. During step (4) physical extraction of coal or winning of the mineral takes place and step (5) indicates the conventional truck and shovel methodology of removing the material.

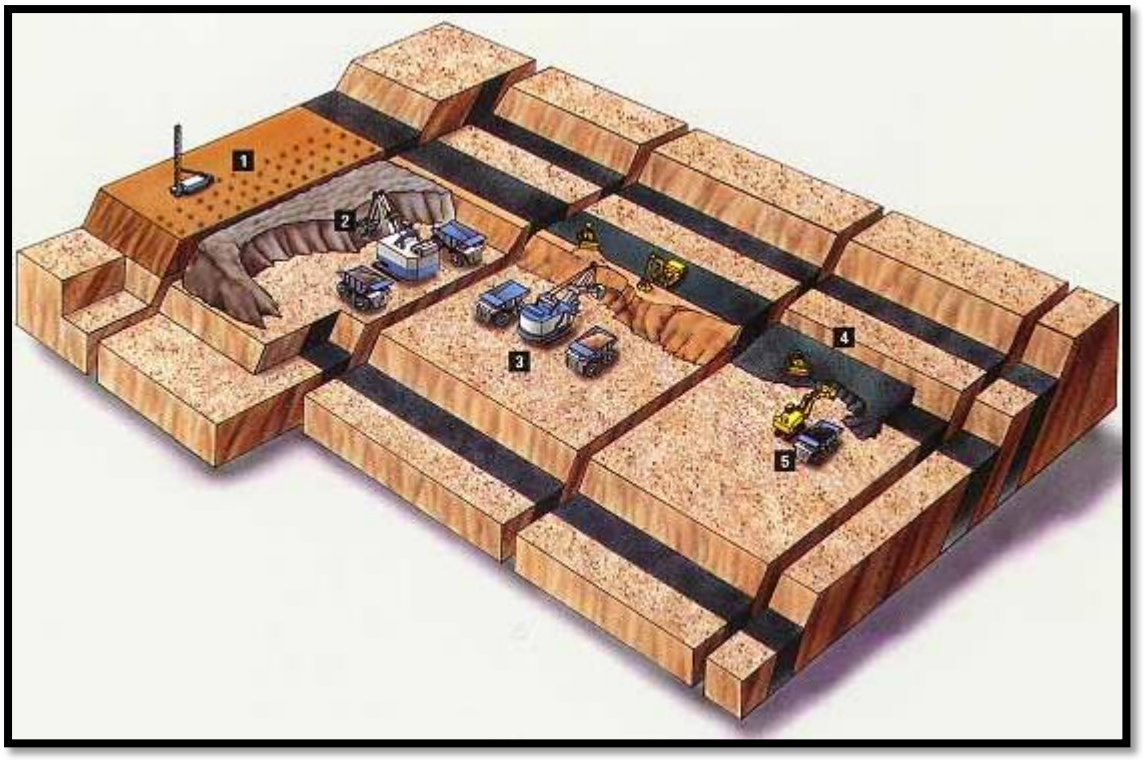


Figure 6: Opencast coal mining typical progressive steps (No 1- 5)

The following basic principles of rehabilitation form the basis of the roll-over mining methodology that entails concurrent rehabilitation as mining progress:

- Prepare a rehabilitation plan prior to the commencement of mining which includes detailed surveys of the pre-mining environment to ensure the landscape can be restored to the pre-mining environment as close as feasible;
- Agree on the long-term post - mining land use objective for the area with the relevant government departments, local government councils and private landowners. The land use must be compatible with the climate, soil, topography of the final landform and the degree of the management available after rehabilitation;
- Progressively rehabilitate the site, where possible, so that the rate of rehabilitation is similar to the rate of mining;
- Prevent the introduction of noxious weeds and alien vegetation (typical to areas of disturbance);
- Minimise the area cleared for mining and associated infrastructure to only what is ultimately required and no additional clearance of unnecessary areas;
- Reshape the land disturbed by mining operations so that it is stable, adequately drained and suitable for the desired long-term land use;
- Minimise the long-term visual impact by creating landforms which are compatible with the surrounding landscape;
- Reinstate natural drainage patterns disrupted by mining wherever possible;

- Minimise the potential for erosion by wind and water both during and following mining;
- Characterise the topsoil and retain it for use in rehabilitation. It is preferable to reuse the topsoil immediately rather than storing it in stockpiles. Only discard if it is physically or chemically undesirable, or if it contains high levels of weed seeds or plant pathogens;
- Consider spreading the cleared vegetation on disturbed areas;
- Deep rip compacted surfaces to encourage infiltration, allow plant root growth and key the topsoil to the subsoil, unless subsurface conditions dictate otherwise;
- Ensure that the surface one or two metres of soil is capable of supporting plant growth;
- If topsoil is unsuitable or absent, identify and test alternatives substrates, e.g. overburden that may a suitable substitute after addition of soil improving substances;
- Re-vegetate the area with plant species consistent with the post mining land use; and
- Monitor and manage rehabilitation areas until the vegetation is self-sustaining.

2.4 Crushing and Screening of the ROM Coal

The coal delivered from the mine that reports to the coal preparation plant (CPP) is called run-of-mine, or ROM, coal. This is the raw material for the CPP, and consists of coal, rocks, middlings, minerals and contamination. Contamination is usually introduced by the mining process and may include machine parts, used consumables and parts of ground engaging tools. ROM coal can have a large variability of moisture and maximum particle size. Crushing reduces the overall topsize of the ROM coal so that it can be more easily handled and processed within the CPP. Crushing requirements are an important part of CPP design and there are a number of different types. Screens in screening plant are used to group process particles into ranges by size. These size ranges are also called grades. Screens can be static, or mechanically vibrated. Screen decks can be made from different materials such as high tensile steel, stainless steel, or polyethelene.

The proposed project entails to make use of a mobile crushing and screening facility to ensure it can be easily moved and also reduce the footprint required for rehabilitation post life of mine. No washing of coal on site is proposed as the final product from the mobile crushing and screening facility will be taken away off site, and therefore significantly reduce the environmental impacts associated with washing of coal. The image below is a typical representation of a crushing and screening plant with associated activities. Coal from the ROM stockpile is loaded into trucks and then hauled to a feed din from where it is fed vis a conveyor into the crushing and screening facility. Coal is then stockpiled according to the required topsizes from where it can be loaded transported to the weighbridge once again via truck hauling, weighed and taken off site. The process in itself is quite simple and straight forward as no washing of the coal will take place on site. During the EIA it is important to consider various aspects associated with crushing and screening which include;

- Baseline air quality and noise in the existing receiving environment to ensure relevant mitigation measures can be implemented;
- The visual impact of the crushing and screening facility and alternative locations to ensure minimal visual disturbance;
- Stormwater management around the plant footprint to ensure clean and dirty water separation takes place and appropriate mitigation measures are in place.

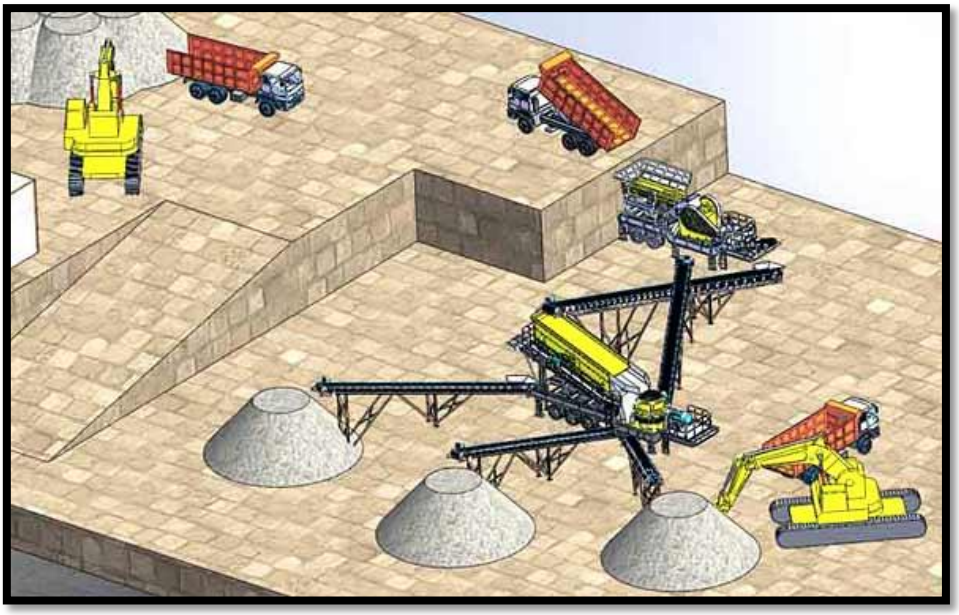


Figure 7: Typical mobile crushing and screening facility illustration with associated activities

2.5 Access Road Construction, Haul Roads and Road Diversion of the Existing Road

The mine access road will lead off one of the dirt roads serving the purpose to only give farmers access to their properties. The dirt road will be upgraded to the applicable standards which includes a gravel road leading into the mine. The road will be used to access the mine offices, workshop complex, and mining area (including mobile crushing and screening facility with ROM stockpiles). Coal transportation trucks will also use this road to enter and exit the mine premises, including travelling to the weighbridge. The weighbridge will be a 22 x 3m, 70ton weighbridge adjacent to the new access road. Several temporary haul roads will also be constructed to access the mine area as well as the ROM stockpiling area. These haul roads will be used by mine personnel to access the mine areas for their day to day duties and the dump trucks will use the road for haulage of coal to the ROM stockpiles. The roads will be constructed to have a width of 8m while dust suppression using water carts with an added chemical dust suppressant (environmentally friendly) product will be employed.

The current mine planning entail diversion of the current gravel road which transect the planned mine footprint. The necessary traffic impact assessment and approvals for this diversion will be undertaken prior to commencement of the activity. The road will be diverted around the western edge of the mining operation (refer

to Figure 1). In order to maintain a gravel road properly operators must clearly understand the need for three basic items:

- A crowned driving surface,
- a shoulder area that slopes directly away from the edge of the driving surface, and a
- ditch.

The shoulder area and the ditch of many gravel roads may be minimal. This is particularly true in regions with very narrow or confined right-of-ways. Regardless of the location, the basic shape of the cross section must be correct or a gravel road will not perform well, even under very low traffic. The figure below illustrates the components of a typical cross section of a gravel road that must be considered.

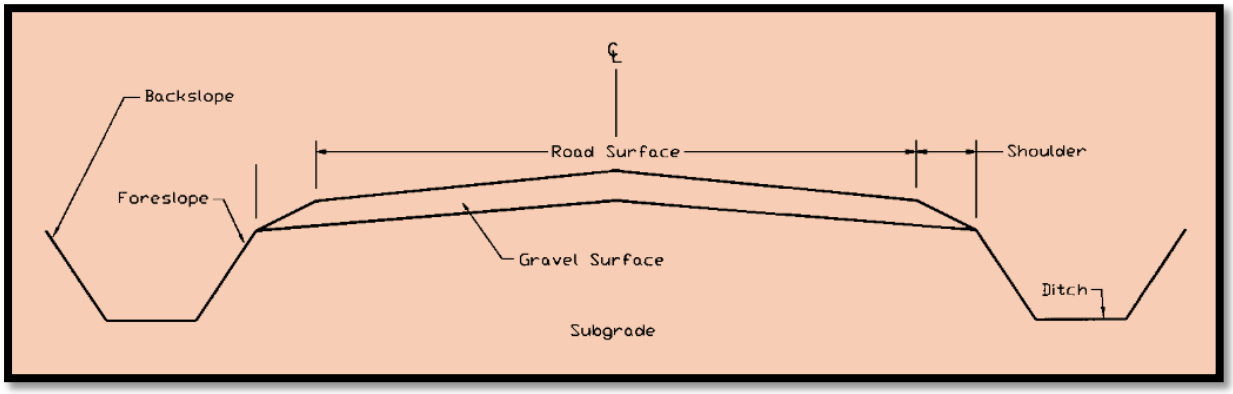


Figure 8: The components associated with a gravel road section

Gravel roads tend to rut more easily in wet weather. Traffic also tends to displace gravel from the surface to the shoulder area and even to the ditch during dry weather. Managers and equipment operators have the continual responsibility of keeping the roadway properly shaped. The shape of the road surface and the shoulder area is the equipment operator's responsibility and is classified as routine maintenance. Keeping the fore-slope and ditch established and shaped is often the maintenance operator's responsibility as well. The main aim of the design and associated maintenance is to keep water drained away from the roadway. Standing water at any place within the cross section (including the ditch) is one of the major reasons for distress and failure of a gravel road.

There is sometimes a need for specialized equipment to do major reshaping of the cross section, especially in very wet conditions. However, the operator of routine maintenance equipment must do everything possible to take care of the roadway. The recommended shape of each part of the cross section will be considered in detail during the road diversion planning stage once authorised in accordance with this EIA. When a gravel road is maintained properly, it will serve low volume traffic well. Unfortunately, most gravel roads will fail when exposed to heavy hauls even when shaped properly. This is due to weak subgrade strength and marginal gravel depths which are often problems with gravel roads. The low volume of normal traffic does not warrant reconstruction to a

higher standard. However, improper maintenance can also lead to very quick deterioration of a gravel road, especially in wet weather. The maintenance equipment operators must always work at maintaining the proper crown and shape. During mining extra maintenance and wetting of the roads to ensure minimal dust generation will be required.

2.6 Semi Temporary Site Offices and Security Office

The site offices for the project, including a small security hut at the entrance of the mining area next to the main entrance road will consist of container-type offices that is commercially available as off the shelve products, as illustrated in the image below. This ensures minimal construction requirements on site and also minimal footprint. Keeping the disturbance area minimal and ensuring ease of mine closure and rehabilitation after life of mine make the temporary offices ideal, especially considering the short duration of the proposed activities and requirement of these offices. The visual impact associated with the structures will also be considered and natural colour paint will be applied to the structures to blend in with the background features.

Stormwater management around the facilities will also be considered and the necessary waste receptacles will be in place for general domestic waste separation and management. Waste skips will be used for waste collection and any domestic waste will be removed from the site to a licensed waste facility by a registered and approved contractor. No housing facilities will be required as personnel will not be allowed to reside on site for the duration of the project but instead live off site from the mine. The security will however be present 24hours a day on the mine for the duration of the project and even longer during the mine closure and rehabilitation period.

Figure 9: Typical semi temporary site offices and security office

2.7 Semi Temporary Sanitation and Change House

Similar to the structure indicated in 2.6 above, will the semi temporary sanitation and change house also be container type facilities which can easily be brought to site and also removed after life of mine. For the change house and ablution facility a septic tank system will be implemented which is temporary of nature and can also

be decommissioned easily. The septic tank system will ensure a 'honey-sucker' type sewage removal vehicle can remove and dispose of sewage at an appropriate facility off site. This ensures no major construction and approval is required for a full scale sewage treatment facility. Mobile chemical toilets will also be used where necessary and supplied by an approved contractor whom will be responsible for the management of these toilets. Water requirements relating to ablutions and drinking water are expected to be minimal and if water cannot be sourced on site from a borehole it will be brought in by a tanker. The current expectation is that 100 employees will require 45liter per person per day (liter pp/day) amounting to 4500liters per day.

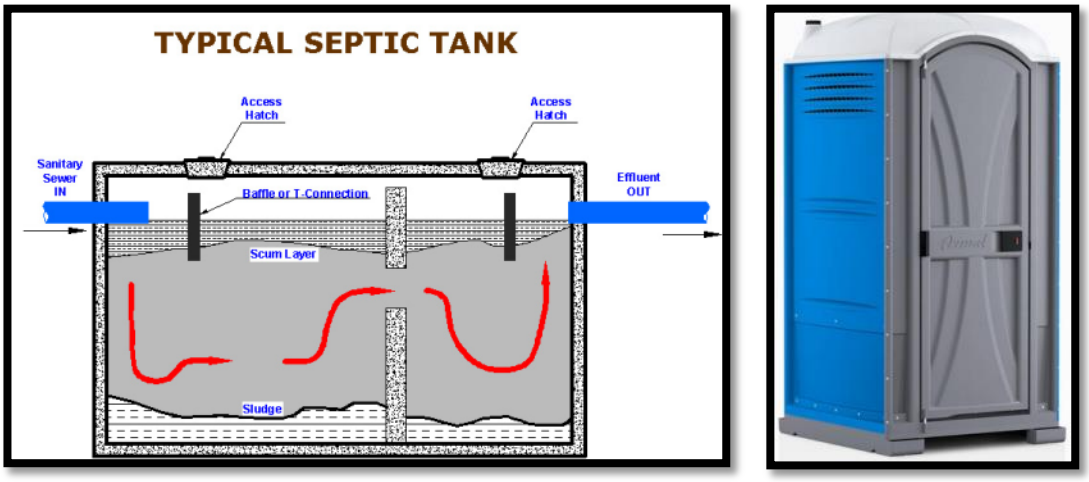


Figure 10: Typical septic tank cross section and chemical toilet illustration

2.8 Stores, Stores Yard, Workshop and Maintenance Area

The stores, stores yard, workshop and maintenance area are all related activities and therefore discussed under one heading. All these facilities will be constructed with heavy steel structural support frames, covered with light steel sheet metal roofing and side panels (typically corrugated iron sheets) to prevent rain water from entering the facilities. These areas will house various hydrocarbon and chemical materials such as oils, greases and paints required for maintenance and operational purposes and therefore the need exist to keep such materials in designated bays designed specifically to ensure no contamination to the receiving environment. The floors of these areas will be constructed of impermeable layers typically concrete.

Stormwater management will be ensured around these areas to ensure clean and dirty water separation. An oil trap (oil-water separator) will be constructed to ensure oils and greases can be separated and oils/grease can be removed by an approved subcontractor for recycling purposes. All harmful materials will be properly stored in a dry, secure environment, with concrete or sealed flooring and a means of preventing unauthorised entry. Furthermore, it will be ensured that material storage facilities are cleaned/maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil. The management of such storage facilities and means of securing them shall be agreed.

The general working of an oil-water separator as illustrated below can be summarized as follow (take note, final design might vary depending on the contracting technology acquired);

1. The oil/water/sludge mixture enters the oil water separator;
2. The heavier sludge and particulates fall out of the fluid and are captured in the sludge hopper;
3. The oil and water mixture with lighter particulates travels up the inclined plates;
4. The inclined plates start to separate the mixture. Some oil rises to the top of the separator and the remainder of the particulates slide back down to the sludge hopper;
5. The remaining oil and water mixture then moves through the coalescing media packs where the majority of the smaller oil particles attach to the media and combine together to form larger oil particles;
6. These larger oil particles become so buoyant that they release from the media and travel to the top of the separator;
7. As the oil volume in the separator reaches a certain level, the oil is drained to through piping to an oil storage tank;
8. The clean water continues over the weir to the clean water chamber where it goes through a final polishing pack and out to the sewer.

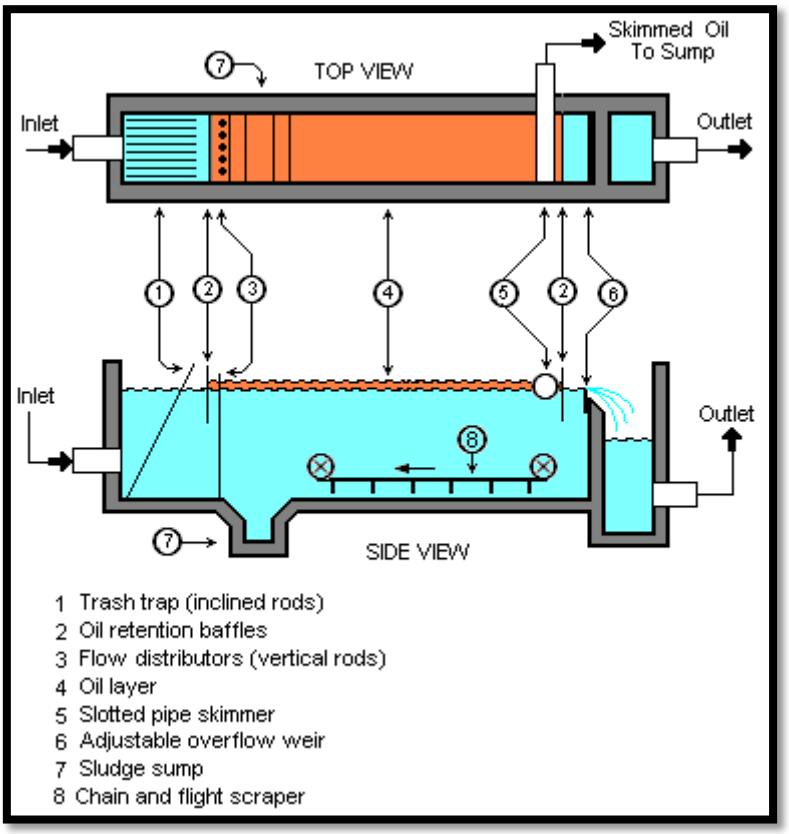


Figure 11: Typical oil trap (oil-water separator) system cross sectional design

The following principles of safe design will be adhered to during the design of the stores, stores yard, and workshop and maintenance area;

Principle 1:	**People with control**	**Safe design is everyone's responsibility** – ensuring safe design rests with all parties influencing the design of a building or structure.
Principle 2:	**The life cycle**	**Safe design employs life cycle concepts** – applying to every phase in the life cycle of a building or structure, from conception through to redevelopment and demolition.
Principle 3:	**Risk management**	**Safe design implements risk management** – through systematically identifying, assessing and controlling hazards.
Principle 4:	**Knowledge and capability**	**Safe design requires knowledge and capability** – which should be either demonstrated or accessed by any person influencing design.
Principle 5:	**Information transfer**	**Safe design relies on information** – requiring effective documentation and communication between everyone involved in the life cycle of a building or structure.

2.9 Bulk Fuel Storage

The activity being applied for in this EIA reads as follow; 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. The main fuel storage will be diesel in above ground storage tanks with an impermeable floor and berms designed to hold 120% the capacity of the tanks. The berms will also have release valves in the case of a spillage to ensure the diesel can safely be removed. An important aspect is to ensure the area is covered to ensure rain water does not enter the bunded holding areas.

2.10 Pollution Control Facility/Dam (Evaporation and Dust Suppression Usages)

Water is typically the prime environmental medium (besides air) that is affected by mining activities. Mining adversely affects water quality and poses a significant risk to South Africa's water resources. Mining operations can further substantially alter the hydrological and topographical characteristics of the mining areas and subsequently affect the surface runoff, soil moisture, evapo-transpiration and groundwater behaviour. Failure to manage impacts on water resources (surface and groundwater) in an acceptable manner throughout the life-of-mine and post-closure, on both a local and regional scale, will result in the mining industry finding it increasingly difficult to obtain community and government support for existing and future projects. Consequently, sound management practices to prevent or minimise water pollution are fundamental for mining operations to be sustainable.

Pro-active management of environmental impacts is required from the outset of mining activities. Internationally, principles of sustainable environmental management have developed rapidly in the past few years. Locally the Department of Water Affairs (DWA) and the mining industry have made major strides together in developing principles and approaches for the effective management of water within the industry. This has largely been achieved through the establishment of joint structures where problems have been discussed and addressed through co-operation.

The National Water Act (Act 36 of 1998) requires that the dirty water originating from the mining operations be kept separate from the clean water systems outside and on top of the mining area. Therefore in-pit water storage cannot be considered for this application and the additional requirements of the NWA will also need to be complied with. Data generated during the geohydrological investigation will guide the civil engineering team to accurately size and design the pollution control facilities, in this case lined dams above ground, to be used as evaporation dams and also for water abstraction for dust suppression carts on the mine. The main concern regarding coal mining is the correct treatment and disposal of water. Sufficient provision will be made in the form of trenches for surface water runoff diversion away from the mining area, to ensure clean and dirty water separation takes place. This way contamination of water can be minimised. Water that has been contaminated and in-pit ingress water will be pumped to above ground pollution control dams which will be lined to ensure no ground water infiltration can take place. The pollution control dam(s) will be constructed, fenced and notices erected to warn the public with regards to safety, at the proposed mining area for the storage of dirty water. The pollution control dam will be designed by a registered professional civil engineer and have capacity to handle all dirty water emanating from the dirty water areas on the mining area.

Pollution control dams (PCDs) form an integral and important part of the water management systems on a mine. Different types of PCDs may exist on a mine site, such as process water dams, storm water dams, evaporation dams and other dams, possibly including excess mine water dams and natural pans.

The purpose of PCDs for the mine and in the water management circuits are to:

- Minimise the impact of polluted water on the water resource;
- Minimise the area that is polluted as far as possible, by separating out clean and dirty catchments; and
- Capture and retain the dirty water contribution to the PCDs that cannot be discharged to the water resource, due to water quality constraints, and manage this dirty water through recycling, reuse, evaporation and/or treatment and authorised discharge.

The design, operation and closure of PCDs are important aspects in the successful operation of a mine, given the inherent safety and environmental risks posed by structural failure, spillage or overtopping of these facilities. It is thus important that practitioners within this field have a good understanding of the management of water, surface and groundwater, when designing and/or operating PCDs. To this end, the Department: Water Affairs

(DWA) have prepared an activity-related Best Practice Guideline to focus on mine water PCDs which will be adhered to during the design and construction of the pollution control dam(s).

Best practice for mine water PCDs is developed from a combination of the following requirements:

- Legislative requirements
- Industry norms and generally accepted good practices
- Technically and environmentally sound design practices
- Life cycle planning for the PCD
- Management of hazards and risks
- Effective water resources management, both for the mine site and within the regional Catchment Management Plan, and
- Other factors, such as site specific conditions.

Effective design, operation, management and closure of PCDs are ensured through adherence to the above requirements. The image below is an illustration of the typical pollution control dam that will be constructed.

Figure 12: Lined pollution control dam illustration

Best Practice water management for PCDs will be based on the following general principles:

- All PCDs will comply with the legal and regulatory conditions within South Africa
- Worst-case conservative assumptions will be made in instances where the quality of water to be contained within the PCD cannot be established with certainty
- PCDs are to be sited, sized and operated to maximise the opportunities for water reuse and reclamation and to minimise the impacts on the water resource

- Designs will adhere to the generally accepted principles of sustainable development and Best Practice Environmental Option (BPEO), as defined in section 2 of NEMA, by integrating social, economic and environmental factors during the planning and implementation and closure phases
- Technical studies and the design of PCDs will be undertaken by suitably qualified personnel (registered civil engineers)
- The full life cycle of the PCD will be considered in the design, operation and closure of PCDs
- Designs will adopt a holistic approach, including:
    - Sustainability
    - Full life cycle of the PCD
    - Water quantity and quality, and
    - Surface water and groundwater

2.11 Clean and Dirty Water Separation System

The clean and dirty water separation on the mine has been discussed to an extent under relevant sections where applicable, although, a detailed surface water management plan will be drawn up as part of this EIA including the determination of flood lines, identification of sensitive receptors and existing surface water systems and flow paths, and civil engineering design reports for the required trenches and water management facilities. The geohydrological investigation will also feed into these designs as the anticipated pollution will be modelled. Trenching around the mining area forms part of the clean and dirty water separation and is to a large extent based on the water balance as calculated by the civil engineering team. The image below is a typical illustration of aspects to consider during the calculation of the opencast mining area water balance.

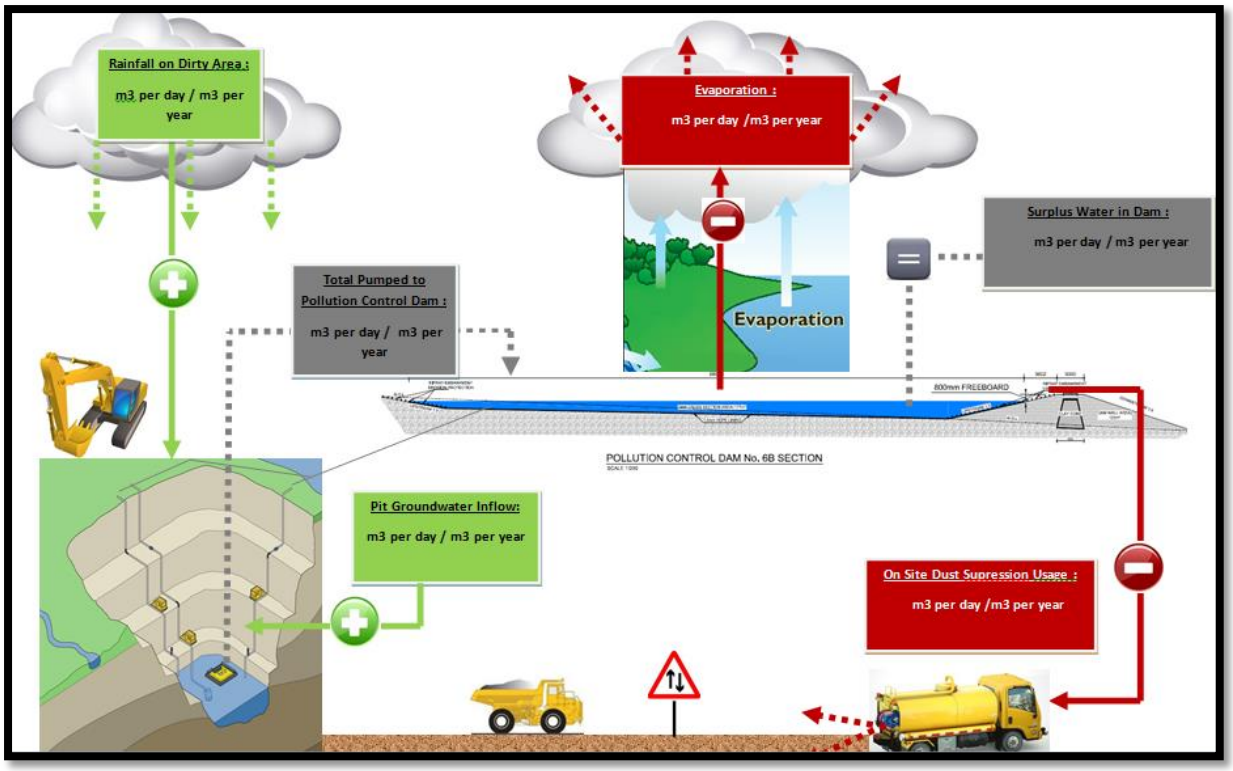


Figure 13: Typical water balance considerations during the design of a clean and dirty water separation system

Further images for clarification purposes have been provided below to indicating cross sections of both the dirty water and clean water diversion trenches which will be constructed around the mining area. These designs will also form part of the final master plan to be implemented.

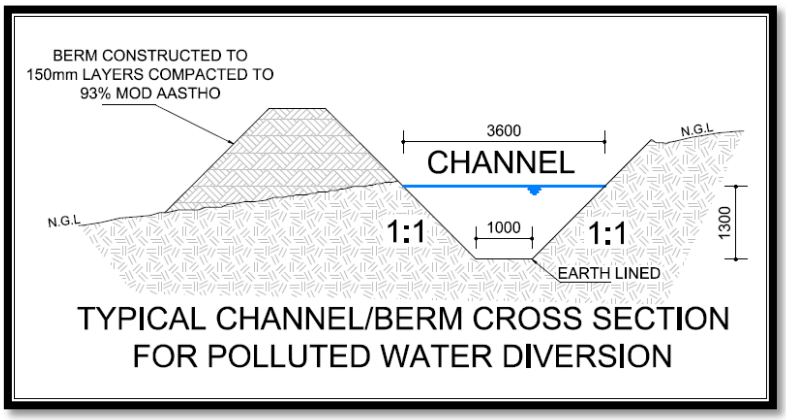


Figure 14: Typical channel/berm cross section for polluted water diversion

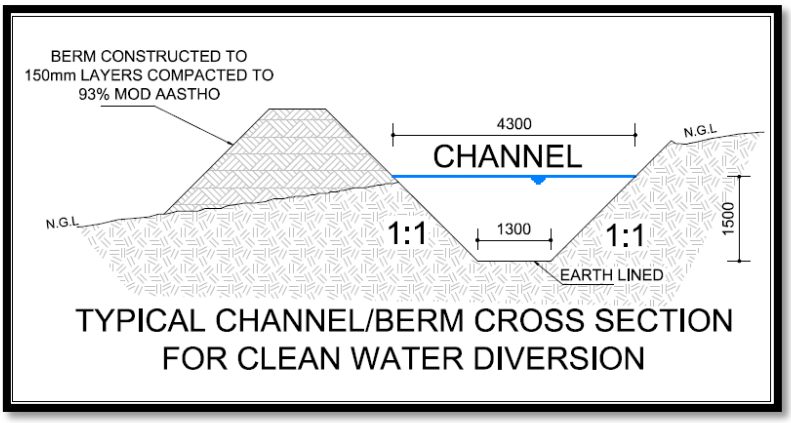


Figure 15: Typical channel/berm cross section for clean water diversion

2.12 Fencing

Fencing of the entire mining area will be required as a means of ensuring safety and also keeping trespassers at bay. The fencing however will be ecologically sensitive to ensure the sound migration of certain smaller species as will be identified in the ecological specialist investigation can still take place. Fences will be clearly demarcated and appropriate signage will be displayed, similar to the signs in the images below. Fencing of the sensitive receptors such as wetlands will also take place ensuring no mining personnel will enter these areas and that it will remain protected for the duration of the project. Sites of archaeological and heritage importance will also need to be fenced off while safe access to these sites will be provided. The necessary signage will also be erected at sites of archaeological and/or heritage importance to ensure visitors can easily and safely access the premises.

Figure 16: Typical mine fence signage

2.13 Mine Fleet Hard Park, Staff and Visitors Parking

Designated parking areas will be constructed by compaction of the subsoil after removal, storage and preservation of the valuable layer of topsoil. Uncovered parking areas for mine fleet vehicles will be constructed in a separate area to the staff and visitors parking as a safety measure as the mine fleet vehicles are very large and pose a safety hazard. The staff and visitors parking will be separate from the latter and possibly covered.

Stormwater management control around these areas will be implemented while the necessary signage will be erected to ensure optimal safety while reverse parking will be implemented at all parking bays. The necessary waste receptacles as well as oil spill kits will be provided at these sites in case of accidental spillage or leakage of hydrocarbon fuel/oil/greases from the vehicles.

2.14 Drilling, Blasting and Explosives Handling

Blasting of mine overburden to allow efficient recovery of the underlying coal can have impacts on the surrounding community. These impacts mainly include vibration through the air (overpressure) and earth (ground vibration) along with the generation of dust and fume. Overpressure and ground vibration limits in place for private residences and heritage structures are prescribed by government based on standards. Blasts are designed and managed to minimise the risk of exceeding these limits, and to minimise impacts they have on the community, surrounding structures and environment.

Due to the nature of the activities associated with open cast activities, blasting will mainly occur during the construction phase of the initial box cut, however, subsequent blasting to remove overburden and gain access to the mineral reserve will also take place during the life of mine. A suitably qualified blasting contractor will be appointed to construct a blasting design and conduct blasting activities. There will be no explosives magazine on site and the blasting contractor will be required to supply the explosives and consumables required to blast.

The risks associated with blasting have been identified and include blast and potential fly-rock. There is a limited risk of air blast due to mining activities resulting in property damage. Blasting controls will include monitoring of blast design, powder factors and stemming levels to minimise the effects of air blast and ground vibrations. The mining area will be evacuated prior to blasting to a radius of >500m while the adjacent property owners will also be informed accordingly prior to blasting events. Eskom has indicated that they also need to be informed well in advance of blasting events as several power lines transect the mining footprint that need to be protected.

A blast management plan must be implemented with the objectives of;

- Ensuring all relevant statutory requirements and company Policies and Standards are met;
- Managing and minimising the impact of blasting from mining operations on the environment and nearby residences;
- Maintaining an effective response mechanism to deal with issues and complaints; and
- Ensuring the results of blast monitoring comply with applicable criteria

2.15 Topsoil, Subsoil, Overburden, Discard and ROM Stockpiles;

Positions of the topsoil, subsoil and overburden stockpiles have been indicated on the mine plan. These locations might change as a result to the range of specialist impact studies and investigations that will be conducted during this EIA process. The locations will be indicated on the final master plan of the mine. The current mine plan however is in accordance with the approved DMR Mining Right EIA and EMPr. All topsoil, subsoil and overburden material will be removed during the mining operation and stockpiled separately for the purpose of backfill rehabilitation as discussed earlier. The stripping, handling and preservation of topsoil have also been discussed earlier in this report as s separate chapter (2.2 Site preparation) due to the importance of topsoil for rehabilitation purposes. The topsoil stockpiles will not exceed a height of three meters which is high enough to reduce leaching impacts of stockpiled topsoil. The subsoil and overburden stockpiles will however exceed this height.

Topsoil will be kept separate from other stockpiles and shall not be used for construction purposes or for maintenance of the access roads. The topsoil shall be adequately protected from being blown away by wind or eroded by the force of water. The subsoil and overburden stockpile areas will cover an area of approximately 5ha and 2ha respectively, of which the topsoil will be stripped and stockpiled separately. The hard overburden stockpiles will contain approximately 50m^3 (bulking factor of 1.1) of blasted overburden material.

The positions of the stockpiles will be indicated on the final masterplan subsequent to the completion of specialist studies. Stockpiles may be used in some instances to provide visual and noise barriers between the mining operations and neighbouring land users. These stockpiles will be constructed from either overburden or from soil and will be in place for the life of mine and will be top-soiled and grasses immediately after their construction. Topsoil removal will take place by means of excavators and hauled with Articulate Dump Trucks (ADT's).

The ROM stockpiling area will be constructed to cover an area of approximately 1ha and will not contain more than 10 000tons of ROM coal at one period. The stockpile will also not exceed a height of 4m. The stockpile will be used to load coal from the mining area as well as to cater for any ceases in production resulting from breakdown or disruption of workings. Dirty water emanating from this area will be diverted to the pollution control dam area.

A weighbridge will be constructed adjacent to the ROM coal stockpile area on a concrete slab footprint. The exact design will be made available once the external service providers have submitted their designs and a decision have been made regarding the procurement of a weighbridge. Below, cross sections of three typical weighbridge designs have been provided for clarification purposes. The impacts associated with these three structures are very closely related and would not significantly change the impact rating or influence the final outcome of the EIA which ever design is implemented.

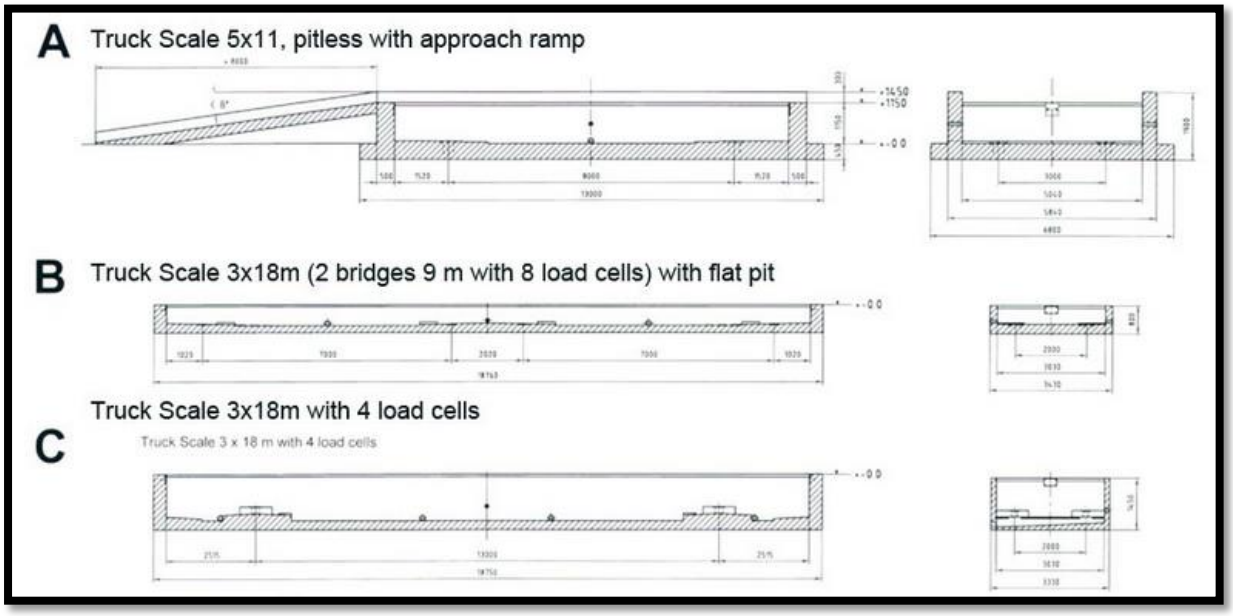


Figure 17: Three alternative weighbridge designs and cross sections

2.16 Waste Management

Waste will be generated from the start to the decommissioning of the 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. A certified and approved external contractor will be responsible for the removal and disposal of the waste at a registered landfill. 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/receptacles 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 integrated waste management plan;
- Dedicated storage areas for various types of waste must be allocated and clearly demarcated;
- 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.

2.17 Mine Closure and Rehabilitation

In planning for closure, there are four key objectives that will be considered:

1. Protect public health and safety;
2. Alleviate or eliminate environmental damage;
3. Achieve a productive use of the land, or a return to its original condition or an acceptable alternative; and,
4. To the extent achievable, provide for sustainability of social and economic benefits resulting from mine development and operations.

Impacts that change conditions affecting these objectives are often broadly discussed as the 'impacts' or the environmental impacts of a site or a closure plan. It is convenient to consider potential impacts in four groupings:

- **Physical stability** - buildings, structures, workings, pit slopes, underground openings etc. must be stable and not move so as to eliminate any hazard to the public health and safety or material erosion to the terrestrial or aquatic receiving environment at concentrations that are harmful. Engineered structures must not deteriorate and fail.
- **Geochemical stability** - minerals, metals and 'other' contaminants must be stable, that is, must not leach and/or migrate into the receiving environment at concentrations that are harmful. Weathering oxidation and leaching processes must not transport contaminants, in excessive concentrations, into the environment. Surface waters and groundwater must be protected against adverse environmental impacts resulting from mining and processing activities.
- **Land use** - the closed mine site should be rehabilitated to pre-mining conditions or conditions that are compatible with the surrounding lands or achieves an agreed alternative productive land use. Generally the former requires the land to be aesthetically similar to the surroundings and capable of supporting a self-sustaining ecosystem typical of the area.
- **Sustainable development** - elements of mine development that contribute to (impact) the sustainability of social and economic benefit, post mining, should be maintained and transferred to succeeding custodians.

The diagram below illustrates the typical requirements and flow of information to reach a point where rehabilitation practices can be implemented. Various forms of information exists that must be integrated in a translation and interpretation process where new definitions subjected to new objectives can be reached. Basically the information gathering process will guide the development of a site specific rehabilitation plan. From the information gathered new rehabilitation and closure objectives can be established. The EIA process will provide guidance through the development of the rehabilitation plan as new information that will be generated

during the EIA and especially all the specialist studies and investigations will define the rehabilitation objectives specific to the site.

The types of information available to be considered include;

- **Descriptive information**
  - Baseline surveys
  - Materials properties
  - Resources
- **Scientific information**
  - Scientific values
  - Quality indicators
  - Threshold values
- **Normative information**
  - Objectives of new ecosystem and end land use

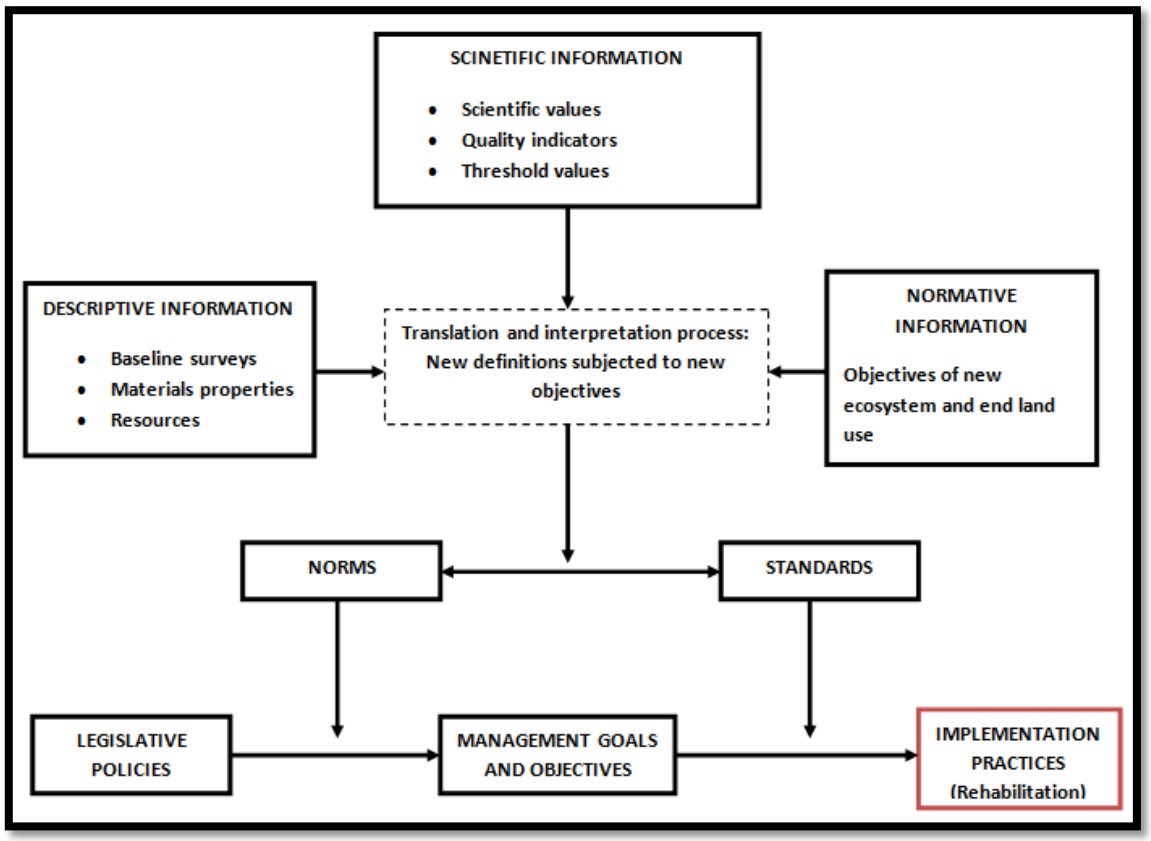


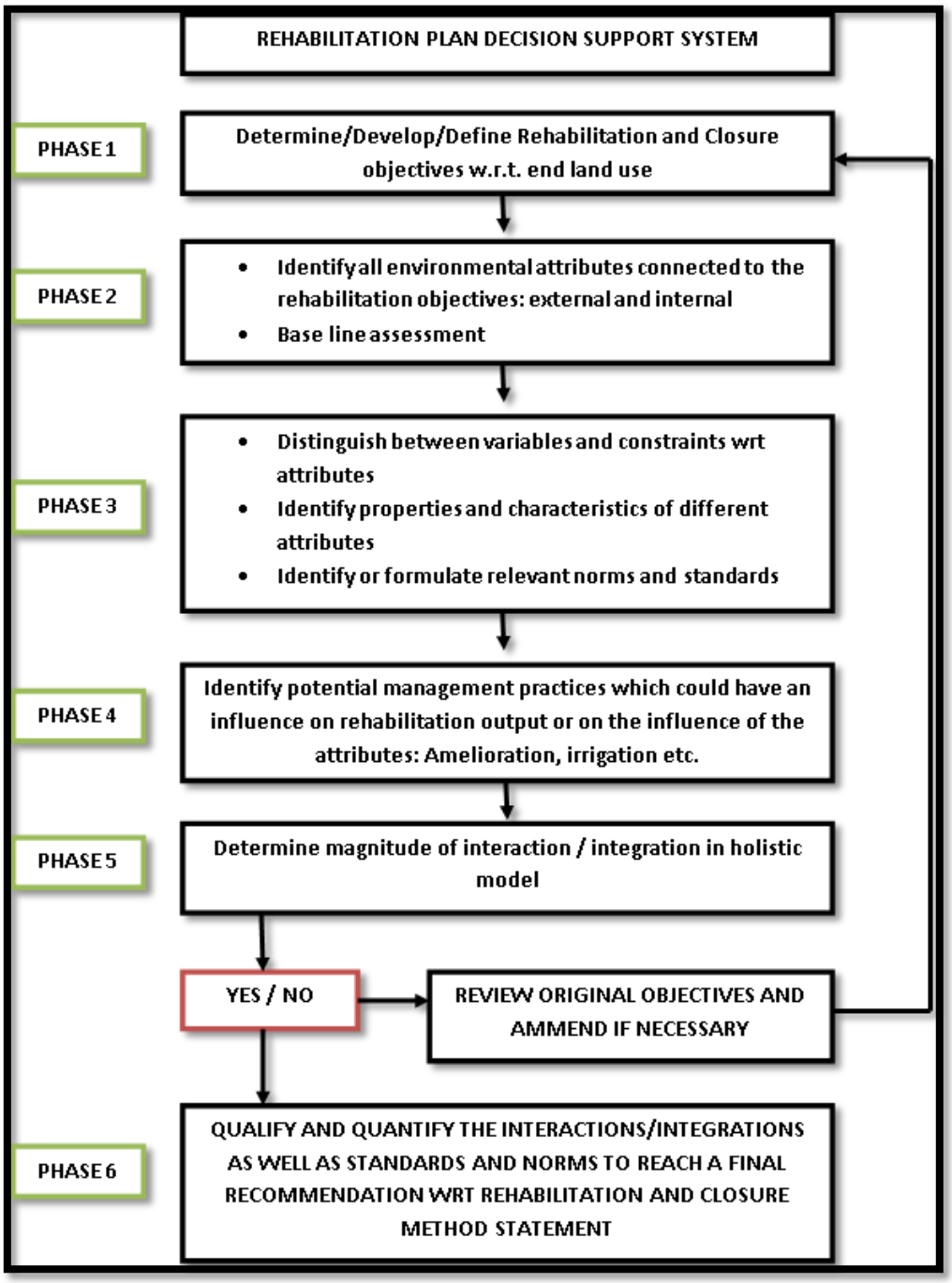
Figure 18: Diagrammatic illustration of rehabilitation plan development

In addition and further to the above diagrammatic illustration of rehabilitation plan development has a rehabilitation plan decision support system been proposed consisting of 6 phases to ultimately reach a rehabilitation method statement which can physically be implemented on site. The current main aspects of the mine closure and rehabilitation plan are to remove all infrastructures at closure. The offices, workshops and other

facilities will be removed and sold for their salvage value in order to be re-used or disposed of as scrap (re-use and recycling). Electrical and water supplies to the mining area will be terminated and made safe. Surface haul roads and compacted surfaces will be ripped, top soiled where necessary and vegetated.

In general, the current planning without the necessary inputs of the specialist studies and investigations include;

- The introduction of both organic and inorganic ameliorants (fertilizers) where required;
- Soil testing will be undertaken to determine the fertility status of the soils, which will then be compared to the baseline levels to determine the ameliorant requirements;
- Topsoil will be replaced, ameliorants added and planted with and appropriate seed mixure.



3. Nature and Extent of the Environment Affected by the Activity

3.1 Locality

Kebrafield Roodepoort Colliery is located on the farm Roodepoort 151IS Portion 17, which is situated on the western border of the town Pullenshope in Mpumalanga. Pullenshope is approximately 5 km west of the N11 between Middelburg and Hendrina. The propsed development is situated south of Optimum Colliery, which supplies coal to the Hendrina power station immediately southwest of Pullenshope. Pullenshope used to be the village of Hendrina powerstation which housed all the employees of the powerstation. Now the properties belong mostly to private owners although not all has been sold off by the powerstation. Coal mining operations forms an integrated part of the Hendrina power generation activities. Big scale coal mining operations occur in the local catchment area of the power station. The image below illustrates the relative position of the proposed project site to other towns in the vicinity of the operation. The farm Roodepoort 151IS Protion 17 of which only the northern section fo the property is proposed for the development is indicated by the reddish polygon to the west of the town Pullenshope.

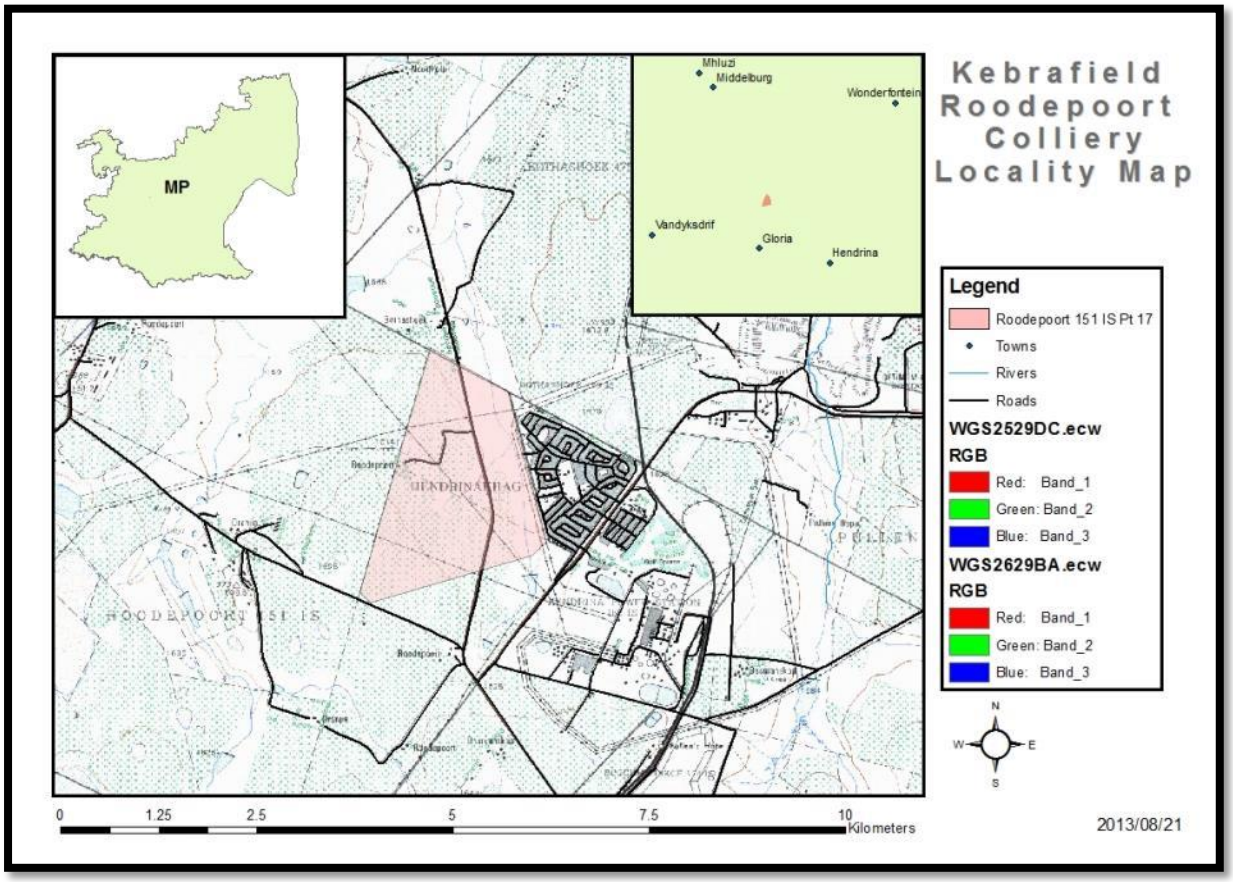


Figure 19: Kebrafield Roodepoort Colliery Locality Map – 1:50 000 Topographical Datasheets WGS2529DC & WGS2629BA

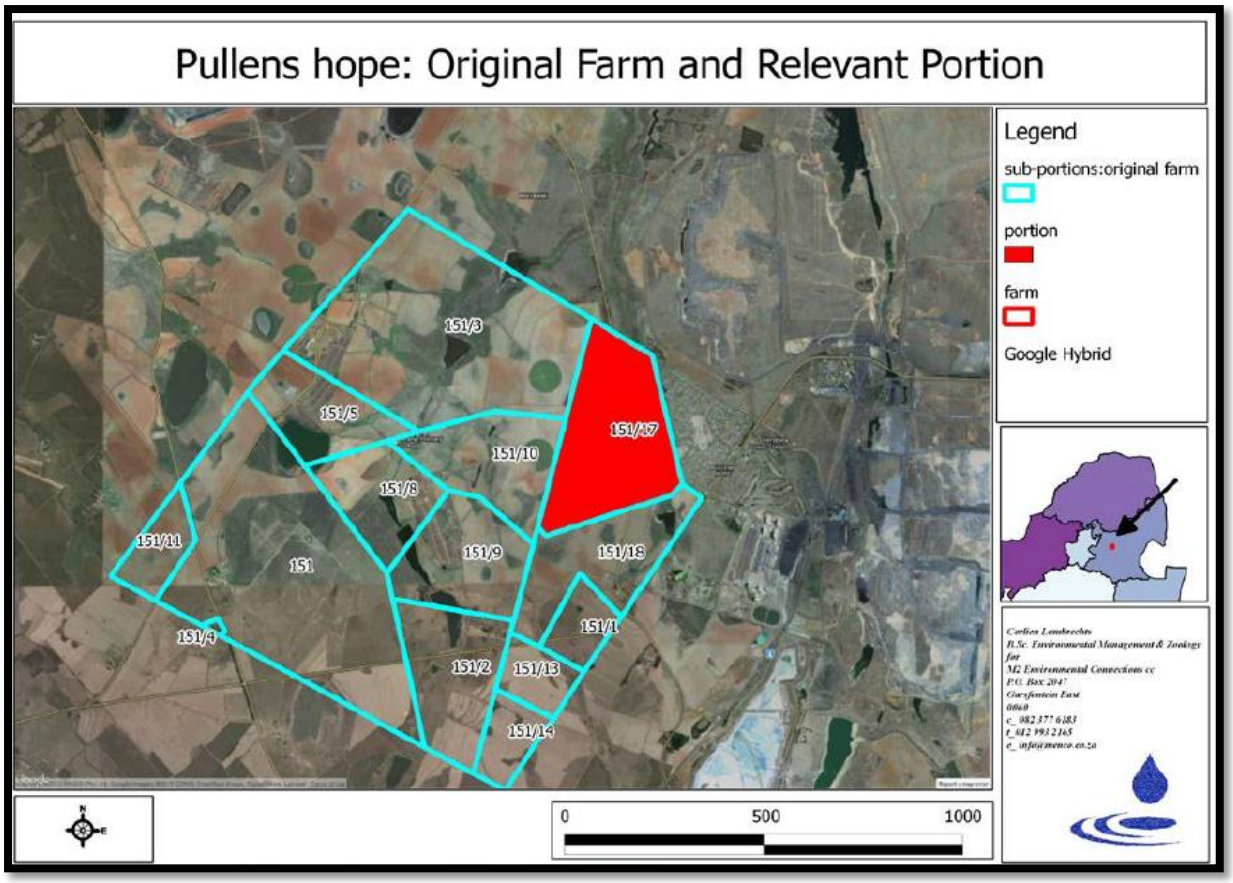


Figure 20: Roodepoort: Original Farm and Relevant Portion

The proposed activities are primarily surrounded by agricultural small holdings, power generation and neighbouring mining operations. Major residential areas in the region include Middelburg (~25km northwest), eMalahleni (~35km west-northwest), Bethal (~45 km southwest) and Ermelo (~60km southeast). Smaller residential areas in the region include Arnot (~20 km northeast), Pullen's Hope (~1 km east), Komati (~12 km southwest), KwaZamokuhle (~17 km southeast) and Hendrina (~17 km southeast) which may include schools and hospitals/clinics. Individual residences (i.e. farm houses) are also in the immediate vicinity of the proposed operations.

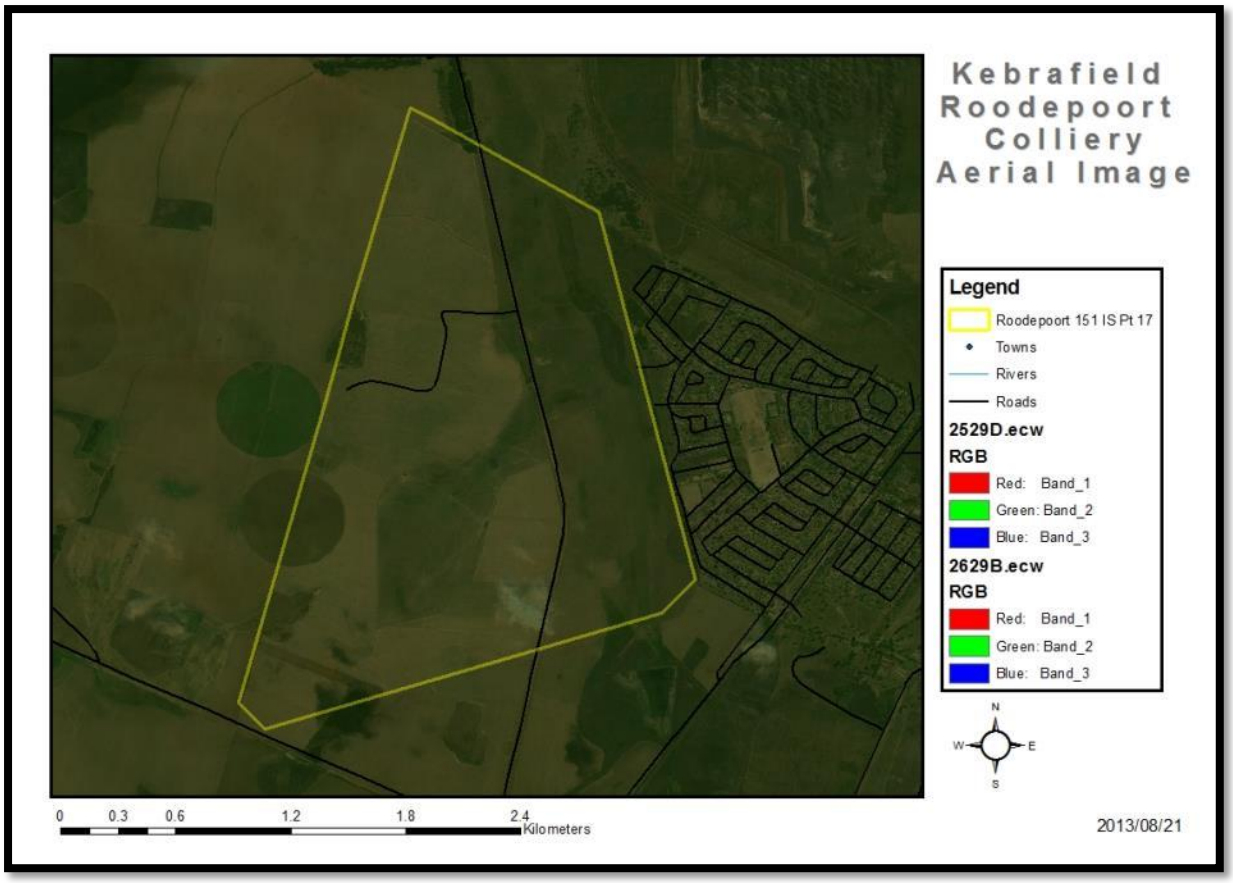


Figure 21: Aerial imagery (2010 Landsat Data) indicating the extent of the farm Roodepoort 151IS Portion 17

3.2 Geology

3.2.1 Regional Geology

The investigated area falls within the 2528 Pretoria and 2628 East Rand 1:250 000 geology series maps and is situated approximately 2 km north-west of Pullens Hope, Mpumalanga. An extract of this map is shown below.

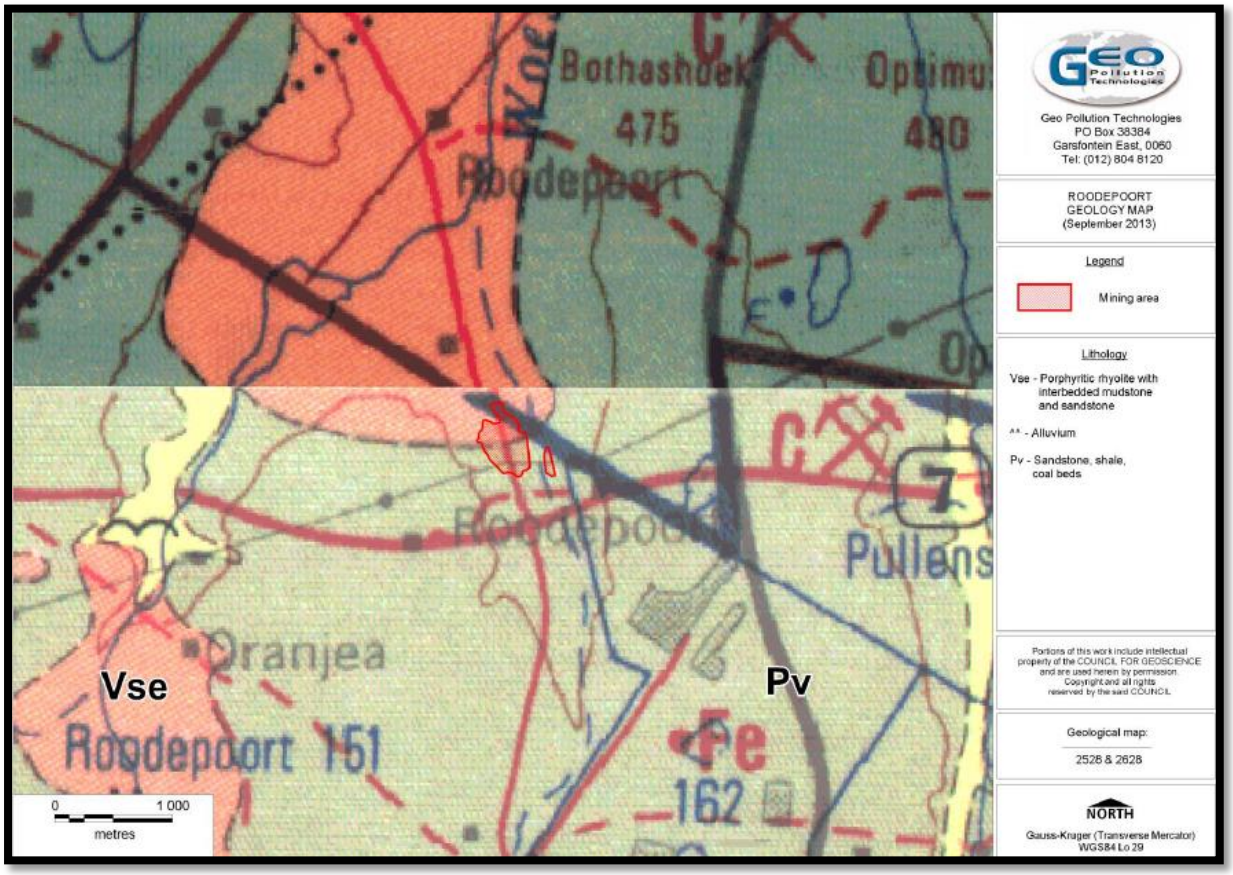


Figure 22: Geology Map

The proposed opencast mining areas fall within the Witbank coalfield, which extends from Belfast in the north-east to Springs in the south-west covering a surface area of approximately 9000 km^2. There are five coal seams present regionally. These coal seams are numbered from 5 (top) to 1 (bottom) and the distribution of these coal seams are affected by the topography of the pre-Karoo basement and the present day erosional surface. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup. It consists mainly of sandstone, shale and coal beds of the Ecca Group (Vryheid Formation) and is underlain by the Dwyka Group. Jurassic dolerite intrusions occur throughout the area in the form of sills and dykes with outcrops found throughout the whole area.

The Ecca Group (Vryheid Formation), which is part of the Karoo Supergroup, comprises of sediments deposited in shallow marine and fluvio-deltaic environments with coal accumulated as peat in swamps and marches associated with these environments. The sandstone and coal layers are normally reasonable aquifers, while the shale serves as aquitards. Several layered aquifers perched on the relative impermeable shale are common in such sequences. The Dwyka Formation comprises consolidated products of glaciation (with high amounts of clay) and is normally considered to be an aquiclude.

The generally horizontally disposed sediments of the Karoo Supergroup are typically undulating. The extent of the coal is largely controlled by the pre-Karoo topography. Steep dips can be experienced where the coal buts against pre-Karoo hills. Displacements, resulting from intrusions of diabase sills, are common. These intrusions comprise sills, which vary from being concordant to transgressive in structure, and feeder dykes. Although these structures serve as aquitards and tend to compartmentalise the groundwater regime, the contact zones with the pre-existing geological formations also serve as groundwater conduits. There are common occurrences of minor slips or faults, particularly in close proximity to the dolerite intrusives. Within the coalfield, these minor slips, displacing the coal seam by a matter of 1 to 2 metres, are likely to be commonplace.

Rocks of the Selons River Formation (Rooiberg Group) and quaternary alluvium are also present regionally. The Selons River Formation consists of porphorytic rhyolite with interbedded sandstone and mudstone.

3.2.2 Local Geology

From the sheet of 2528 Pretoria and the 2628 East Rand geology series map it is evident that the shale, mudstone and coal beds of the Ecca Group as well as the rhyolites of the Rooiberg Group outcrop in the area. The local geology is best concluded from information obtained from borehole logs from the National Groundwater Archive. A generalised geological stratigraphy, as presented in the table below, was derived from borehole log 2629BA00072, which is the NGA borehole with the closest proximity to the proposed open cast.

Table 7: Generalised Stratigraphic Column of Borehole Log 2629BA00072

AVERAGE DEPTH (MBGL)	AVERAGE THICKNESS (METRES)	DESCRIPTION
0 –5.79	5.8	Shale
5.79 -15.84	10.1	Shale
15.84-24.84	8.2	Coal
24.04 – 28.04	4.0	Shale
28.04 – 34.44	6.4	Sandstone
34.44 – 36.57	2.1	Diabase

3.3 Hydrogeology

3.3.1 Regional Hydrogeology

The area of concern is situated in the Olifants Water Management area. On regional scale the hydrogeology consist of intergranular and fractured aquifers of the Karoo Supergroup and Rooiberg Group and locally the

Karoo Supergroup as well as Jurassic dolerite intrusions, with predominantly arenaceous rocks (sandstone). Blow yields of 0.1 – 0.5 l/s can be expected regionally.

The hydrogeology of the area can be described in terms of the saturated and unsaturated zones:

Saturated Zone

In the saturated zone, at least four aquifer types may be inferred from knowledge of the geology of the area:

- A shallow aquifer formed in the weathered zone, perched on the fresh bedrock.
- An intermediate aquifer formed by fracturing of the Karoo sediments.
- Aquifers formed within the more permeable coal seams and sandstone layers.
- Aquifers associated with the contact zones of the dolerite intrusives.

Although these aquifers vary considerably regarding hydrogeological characteristics, they are seldom observed as isolated units. Usually they would be highly interconnected by means of fractures and intrusions. Groundwater will thus flow through the system by means of the path of least resistance in a complicated manner that might include any of these components.

Shallow perched aquifer

A near surface weathered zone is comprised of transported alluvium and *in-situ* weathered sediments and is underlain by consolidated sedimentary rocks (sandstone, shale and coal). Groundwater flow patterns usually follow the topography, often coming very close to surface in topographic lows, sometimes even forming natural springs. Experience of Karoo geohydrology indicates that recharge to the perched groundwater aquifer is relatively high, up to 3% of the Mean Annual Precipitation (MAP).

Fractured rock aquifers

The host geology of the area consists of consolidated sediments of the Karoo Supergroup and consists mainly of sandstone, shale and coal beds of the Ecca Group (Vryheid Formation). Most of the groundwater flow will be along the fracture zones that occur in the relatively competent host rock. The geology map does not indicate any major fractures zones in this area, but from experience it can be assumed that numerous major and minor fractures do exist in the host rock. These conductive zones effectively interconnect the strata of the Karoo sediments, both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit.

The Selons River Formation forms a secondary aquifer that is composed of porphorytic rhyolite with interbedded sandstone and mudstone. Groundwater in this aquifer is generally found at the boundary between weathered and solid rock and along joint and contact zones. These aquifers have a poor potential yield based on the 86 % of boreholes (from available records) with yields of less than 2l/s. The water level in these aquifers is usually between 10 and 30 mbgl.

Aquifers associated with coal seams

The coal seam forms a layered sequence within the hard rock sedimentary units. The margins of coal seams or plastic partings within coal seams are often associated with groundwater. The coal itself tends to act as an aquitard allowing the flow of groundwater at the margins.

Aquifers associated with dolerite intrusives

Dolerite intrusions in the form of dykes and sills are common in the Karoo Supergroup, and are often encountered in this area. These intrusions can serve both as aquifers and aquifuges. Thick, unbroken dykes inhibit the flow of water, while the baked and cracked contact zones can be highly conductive. These conductive zones effectively interconnect the strata of the Ecca sediments both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit on the scale of mining. These structures thus tend to dominate the flow of groundwater. Unfortunately, their location and properties are rather unpredictable. Their influence on the flow of groundwater is incorporated by using higher than usual flow parameters for the sedimentary rocks of the aquifer.

Unsaturated Zone

Although a detailed characterization of the unsaturated zone is beyond the scope of this study, a brief description thereof is supplied. The unsaturated zone in the proposed mining area is in the order of between 2.5 and 15.54 metres thick (based on static groundwater levels measured in the existing boreholes as well as the NGA boreholes) and consists of alluvial sediments at the top, underlain by residual sandstone/siltstone/mudstone of the Ecca Group that becomes less weathered with depth.

3.3.2 Local Hydrogeology

Based on borehole logs obtained from the NGA and literature, the following local hydrogeological description (within the aquifer boundary) from top (surface) to bottom can be deduced as follows:

Shallow weathered aquifer (unconfined)

This aquifer comprises of weathered arenaceous sandstones and shales. The Ecca sediments are weathered below surface throughout the area. The upper aquifer is associated with this weathered zone and water is found deep below the surface, often deeper than this hydrogeological unit. The hydraulic conductivity value for the aquifer is estimated at 1x10-6 m/d to 0.10 m/d

The estimated thickness of the aquifer is estimated to have an average thickness of 6 m. Water levels measured in this aquifer ranged from 2.3 to 2.5 meters below ground level.

Deeper fractured aquifer (confined)

The pores within the Karoo and more specifically the Ecca sediments are too well-cemented to allow any significant flow of water. All groundwater movement therefore occurs along secondary structures, such as fractures and joints in the sediments. These structures are better developed in competent rocks, such as sandstone, hence the better water-yielding properties of the latter rock type.

It should be emphasised, however, that not all secondary structures are water-bearing. Many of these structures are constricted because of compression forces that act within the earth's crust. The chances of intersecting a water-bearing fracture by drilling decrease rapidly with depth. At depths of more than 30 m, water-bearing fractures with significant yield were observed to be spaced at 100 m or greater.

The thickness of the aquifer was estimated at a mean of 18 m. Water levels measured in this aquifer ranged from 8 to 8.6 m below ground level.

Dwyka Tillite occurs at the base of the aquifer. Packer testing of the Dwyka Tillite done by Hodgson (1998) had a permeability distribution as indicated in Table 3. This permeability is very low and therefore can be regarded as a confining layer.

Table 8: Statistics for results on packer hydraulic conductivity testing of the Dwyka Tillite (Hodgson et al., 1998).

Statistics	Dwyka Permeability (m/d)
Mean	0.0034
Median	0.0024
Standard Deviation	0.0034
Minimum	0.0002
Maximum	0.0148

Additionally, the presence of the dense, unfractured rhyolites of the Selonsriver formation may also act as a hydraulic boundary as the conductivities of these igneous rocks are low, with groundwater movement occurring at less than 10-5 m/d, based on available data.

Lateral extent of aquifers

The lateral extent of the groundwater zone is a severely complex issue. The weathered and fractured Karoo aquifers, barring the occurrence of dolerite intrusions and hydraulic boundaries on the scale of the area of investigation can be taken as infinite. It is obvious however that their lateral extent in the study area is highly dependent on the distribution of dolerite dykes and sills.

Ignoring the effects of geological features, the maximum lateral extent of the aquifers is also limited by hydraulic boundaries as formed by major rivers/streams which act as groundwater discharge boundaries, topographical watersheds which act as no-flow boundaries and surface infiltration sources which usually represent constant head influxes.

Recharge

The main source of recharge into the upper aquifer is rainfall that infiltrates the aquifer through the overlying unsaturated zone. Rainfall that manifests as surface run-off and drains to streams may also subsequently enter the shallow aquifer by infiltrating the stream bed (Grobbelaar, 2001). Water impoundments and features such as tailings dams may constitute additional recharge sources in certain areas.

The rainfall ultimately recharging the upper aquifer is estimated at 3–5 %. A higher proportion of infiltration may occur in areas where the natural permeability is increased, such as the increased fracturing associated with high extraction mining. Generally accepted values for recharge in high extraction areas are between 5 % and 7 %.

Recharge of the deep Karoo aquifer occurs from the shallow Karoo aquifer through permeable fracture systems that link the two aquifers. The natural distribution of such fracture systems is highly variable, and the recharge of the deep aquifer is expected to be some orders of magnitude lower than for the shallow aquifer. However, induced fracturing associated with mining can extend from the deep aquifer up to the surface and provides a relatively direct and highly permeable recharge route. The magnitude of recharge by this route depends on the extent of mining and the nature of the induced fracture pattern.

The recharge calculation for the unconfined (water table) aquifer for the study area is calculated below;

Table 9: Recharge calculation for the shallow unconfined aquifer

Recharge Estimation			
Method	**mm/a**	**% of rainfall**	**Certainty (Very High=5 ; Low=1)**
Chloride	64.1	9.2	4
Schematic maps			
Soil	42	5.9	3
Geology	34.7	4.9	3
Vegter	32.0	4.5	3
Acru	20.0	2.8	3
Harvest Potential	25.0	3.5	3

Summary

Based on the data detailed in the preceding sections the following can be concluded:

- Three aquifers are inferred to be present across the site at varying depths;
- The extent and depth of the aquifers is controlled by the sub-surface Karoo formation layering, weathering, geometry and post-Karoo intrusions;
- Flow within the weathered aquifer is thought to be multi-porous and is controlled by weathering, flow within the fractured aquifer is controlled by the fracturing network while the competent host rocks serve as storage;
- Recharge into the weathered aquifer is thought to be directly linked to rainfall while recharge into the fractured aquifer is linked to shallower aquifers.

3.4 Topography

The surface topography of the area is typical of the Mpumalanga Highveld, mainly a gently undulating plateau, varying between approximately 1680 mamsl underneath Ash Dam 4 to 1600 mamsl along the Woest-Alleen Spruit (East) and the lower reaches of the Woest-Alleen Spruit (West). The mining area is situated between the contour lines of the 1600 mamsl to 1610 mamsl. Several man-made features are also of significance at the site. Numerous dams have been constructed for a variety of purposes, the most obvious of which is the man made dam to the east of the study area, situtated right in the middle of a wetland. Various Eskom power lines transect the proposed mining area while there is a gravel road that runs straight through the middle of the mining footprint. These features are indicated in the figure below, 1:50 000 topographical map.

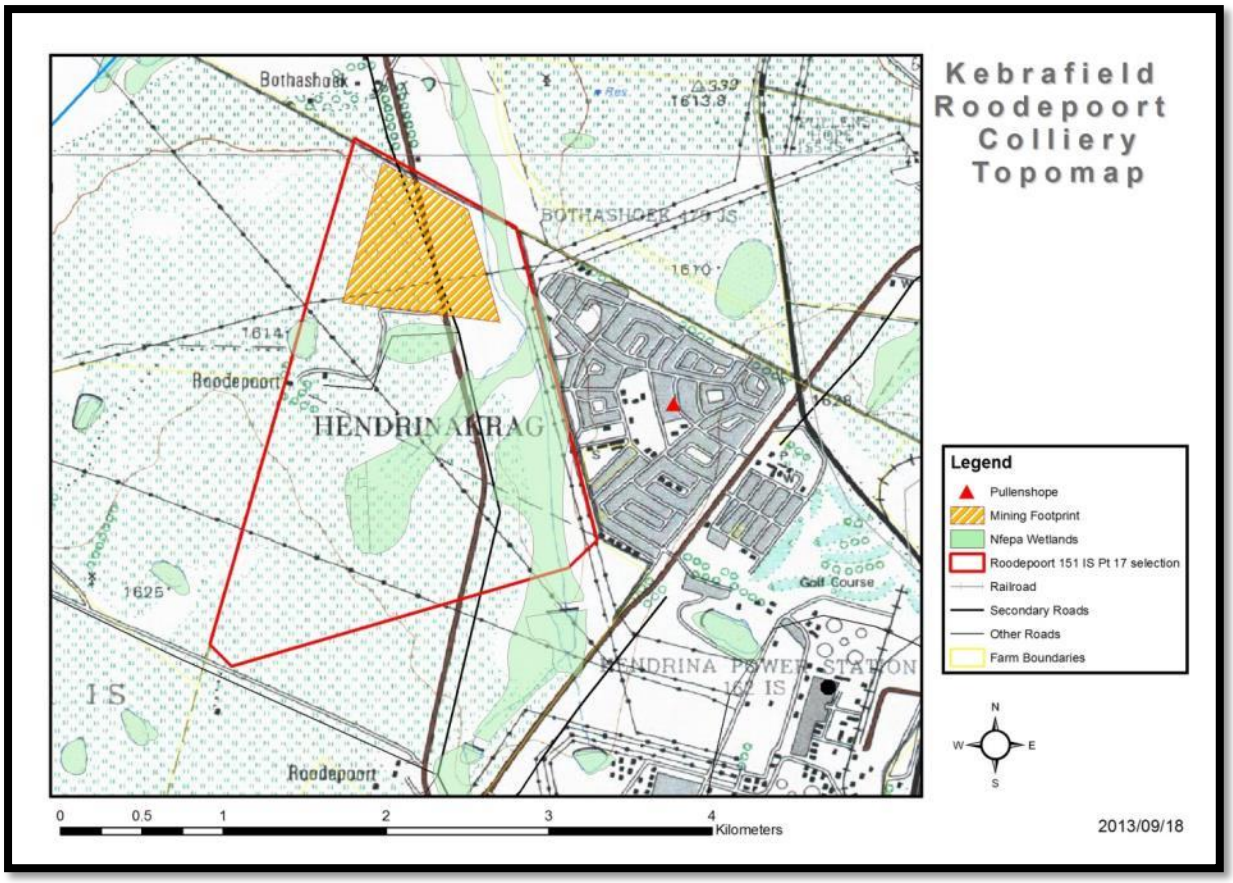


Figure 23: Topography according to the 1:50 000 topographical map

3.5 Climate

3.5.1 Regional Climate

Kebrafield Roodepoort Colliery is situated on the Mpumulanga Highveld. The usual highveld weather conditions prevail with warm summers and cold winters with the main temperature at 14:00 in winter being about 17°C. The climate of the area under investigation is classified as the Highveld region (Region H), which is defined as a climate with a temperate to warm temperature and summer rains.

3.5.2 Rainfall Data

The average annual precipitation in the Highveld region varies from about 900 mm on its eastern border to about 650 mm in the west. The rainfall is almost exclusively due to showers and thunderstorms and falls mainly in summer, from October to March, the maximum fall occurring during January. The winter months are normally dry and about 85% of the annual rainfall falls in the summer months; heavy falls of 125 mm to 150 mm occasionally fall in a single day. This region has about the highest hail frequency in South Africa; about 4 to 7 occurrences may be expected annually at any one spot.

Kebrafield Roodepoort Colliery lies within quaternary sub-catchment B12B of rainfall zone B1B. The average precipitation for this region at weather station 0516 480 is 672 mm.

The average monthly rainfall recorded at weather stations within quaternary sub-catchment B12B is summarised in in the table below and displayed graphically in the figure below. Data from the measurements taken during 70 years (1920 - 1989) were obtained. From the data listed in the table it can be seen that the wettest months (on average) are November, December and January whilst the driest months are June, July and August.

Table 10: Average rainfall recorded at weather station within quaternary sub-catchment B12B.

Month	Average rainfall	
	(516 480)	(516 414)
Jan	115.92	115.75
Feb	87.36	87.23
Mar	72.31	72.20
Apr	42.07	42.00
May	14.92	14.90
Jun	7.73	7.72
Jul	6.45	6.44
Aug	6.85	6.84
Sep	25.00	24.96
Oct	68.54	68.44
Nov	113.43	113.26
Dec	109.67	109.51

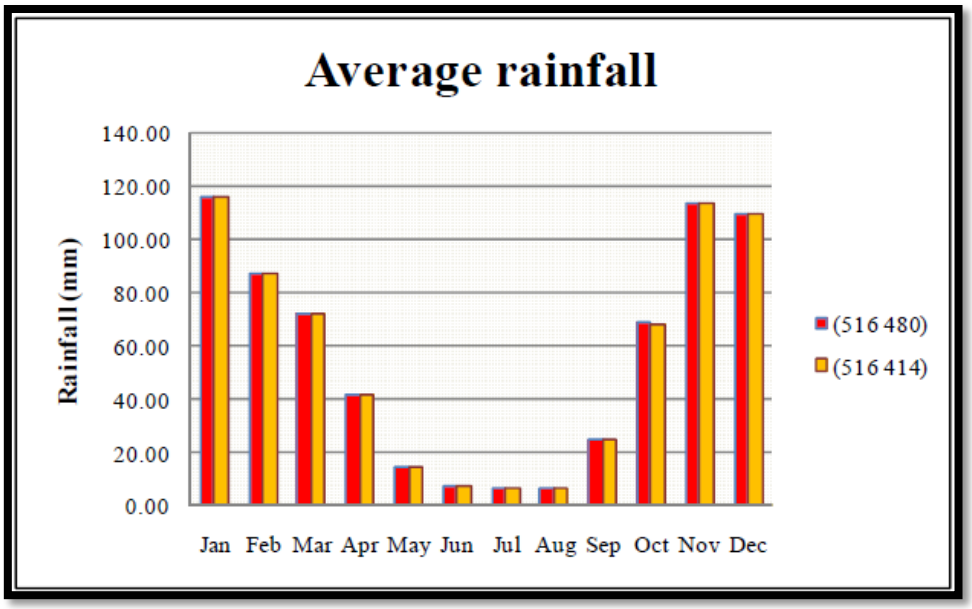


Figure 24: Average rainfall recorded at weather station 0516 480 (Over a period of 70years)

Rainfall represents an effective removal mechanism of atmospheric pollutants and is therefore frequently considered during air pollution studies. Monthly rainfall for the site (2007 – 2009) is given in the table below. Average monthly rainfall for this period is in the range of 306 mm. The study area falls within a summer rainfall region, with over 85% of the annual rainfall occurring during the October to March period.

Table 11: Monthly average rainfall for the site for the period 2007 – 2009

Month	Average rain (mm)	Average No. hours>0.254mm	Average No. days>0.254mm
Jan	973	182	21
Feb	315	87	13
Mar	236	74	12
Apr	107	37	7
May	60	19	3
Jun	23	10	2

3.5.3 Temperature

Average daily maximum temperatures are roughly 27°C in January and 17°C in July but in extreme cases these may rise to 38°C and 26°C respectively. Average daily minima range from about 13°C in January to 0°C in July, whereas extremes can sink to 1°C and –13°C respectively. The period during which frost is likely to form lasts on the average for about 120 days from May to September.

Table 12: Average monthly temperatures. – Climate of SA, WB 42 (1961 – 1990)

	AVERAGE OF DAILY			
	MAX	MIN	MEAN	RANGE
	TX	TN	(TX+TN)/2	TX - TN
J	25,6	13,8	19,7	11,8
F	25,2	13,2	19,2	12,1
M	24,6	11,8	18,2	12,8
A	21,8	8,6	15,1	13,2
M	19,5	4,4	11,9	15,1
J	16,5	0,8	8,7	15,6
J	17,1	1,0	9,0	16,2
A	19,9	3,8	11,9	16,1
S	23,2	7,5	15,3	15,7
O	23,9	9,9	17,0	14,1
N	24,0	11,8	17,9	12,3
D	25,3	13,1	19,2	12,2
YR	**22,2**	**8,3**	**15,3**	**13,9**

Table 13: Average Max temperatures. – Climate of SA, WB 42 (1961 – 1990)

	MAXIMUM (TX) P = 26 Years											
	HIGHEST (TXX)			AVERAGE NUMBER OF DAYS WITH TX						LOWEST (TXN)		
	MAX	YY/DD	MEAN	>=35	>=30	>=25	>=20	>=15	<10	MEAN	MIN	YY/DD
J	33,7	69/13	30,0	0,0	2,0	19,5	29,5	30,9	0,0	18,8	13,1	72/23
F	34,4	83/27	29,5	0,0	1,2	16,3	26,9	28,2	0,0	18,6	13,2	76/12
M	32,6	73/15	28,7	0,0	0,7	15,4	28,8	30,6	0,0	17,4	11,5	67/19
A	30,0	87/04	26,3	0,0	0,0	4,9	22,9	29,0	0,1	14,6	7,9	72/30
M	27,0	83/01	23,8	0,0	0,0	0,4	14,4	28,9	0,1	13,0	7,9	72/12
J	23,5	66/11	20,9	0,0	0,0	0,0	3,2	23,2	1,1	9,5	3,3	84/14
J	24,6	88/17	21,5	0,0	0,0	0,0	4,4	25,5	0,8	9,8	2,5	67/14
A	26,6	65/22	25,1	0,0	0,0	1,4	17,4	28,6	0,6	11,3	6,0	68/10
S	32,0	83/29	28,8	0,0	0,2	12,9	24,0	28,4	0,4	12,2	6,4	88/02
O	33,0	65/31	29,9	0,0	1,7	14,8	25,3	29,8	0,1	14,1	8,0	81/04
N	32,6	68/07	29,4	0,0	1,2	13,5	26,0	29,0	0,2	15,4	6,8	68/11
N	33,0	68/29	29,6	0,0	1,4	18,0	29,2	30,9	0,0	18,0	14,1	73/10
YR	**34,4**	**83/27**	**31,6**	**0**	**9**	**117**	**252**	**343**	**3**	**7,1**	**2,5**	**67/14**

A correlation exists between the temperatures and the evaporation tempo, therefore the highest temperatures and evaporation occurs during the summer.

Table 14: Average Min temperatures. – Climate of SA, WB 42 (1961 – 1990)

MINIMUM (TN) P = 26 Years												
HIGHEST (TNX)			AVERAGE NUMBER OF DAYS WITH TN						LOWEST (TNN)			
MAX	YY/DD	MEAN	>=20	<15	<10	<5	<0	<-5	MEAN	MIN	YY/DD	
18,5	83/29	16,6	0,0	22,2	1,1	0,0	0,0	0,0	9,7	6,5	77/02	J
20,5	79/05	16,6	0,0	22,2	2,4	0,0	0,0	0,0	8,6	5,5	63/28	F
20,1	79/20	15,8	0,0	28,6	6,3	0,2	0,0	0,0	6,6	0,5	74/19	M
15,5	87/05	13,4	0,0	30,0	18,7	3,7	0,2	0,0	2,2	-1,4	88/26	A
12,7	79/04	9,6	0,0	31,0	30,0	17,7	2,1	0,0	-1,3	-3,9	63/31	M
10,5	79/01	6,3	0,0	30,0	30,0	26,7	11,4	0,8	-4,4	-9,2	64/27	J
8,7	83/14	6,1	0,0	31,0	31,0	28,5	11,0	0,5	-4,1	-8,0	64/26	J
11,5	86/28	9,5	0,0	31,0	30,4	18,7	4,2	0,2	-2,8	-7,5	72/02	A
14,8	65/18	12,7	0,0	30,0	22,6	5,9	0,9	0,0	0,4	-4,8	74/08	S
16,9	67/24	14,7	0,0	30,5	13,4	2,1	0,2	0,0	3,7	-1,2	65/21	O
18,0	80/11	15,6	0,0	28,1	5,8	0,4	0,0	0,0	6,6	3,0	69/12	N
17,7	87/21	16,1	0,0	25,2	2,0	0,1	0,0	0,0	8,2	2,6	70/07	D
20,5	**79/05**	**17,3**	**0**	**340**	**194**	**104**	**30**	**1**	**-5,5**	**-9,2**	**64/27**	**YR**

Air temperature has important implications for the buoyancy of plumes; the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise. Temperature also provides an indication of the extent of insolation, and therefore of the rate of development and dissipation of the mixing layer. The diurnal temperature profile for the site (2009) is given in the figure below (Diurnal temperature for site during 2009). Annual maximum, minimum and mean temperatures for the site are given as 25.7°C, 2.2°C and 15°C, respectively, based on the calculated MM5 data for the period 2009. Average daily maximum temperatures range from 25.7°C in December to 12.6°C in July, with daily minima ranging from 16.6°C in January to 2.2°C in July (Figure: Minimum, maximum and average monthly temperatures for the site during the period 2009).

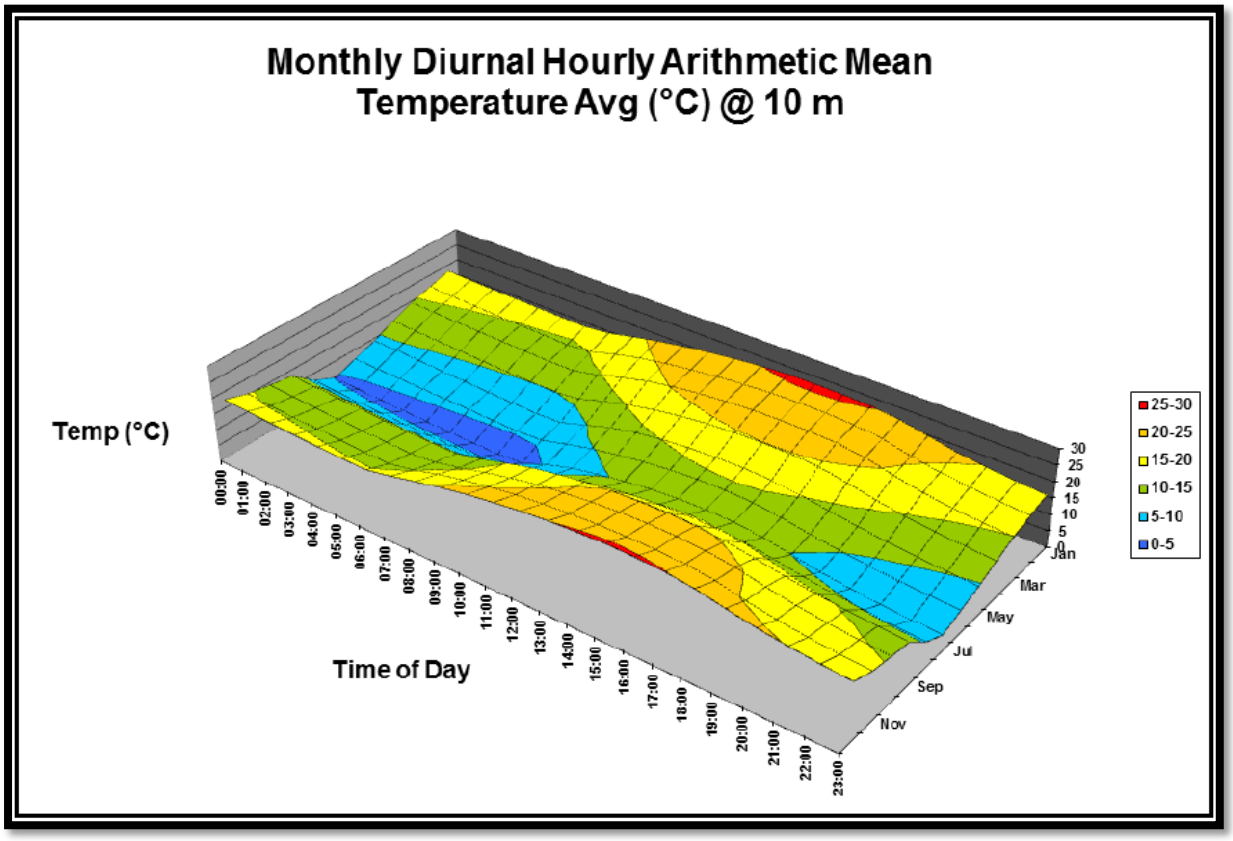


Figure 25: Diurnal temperature profile for the site (2009)

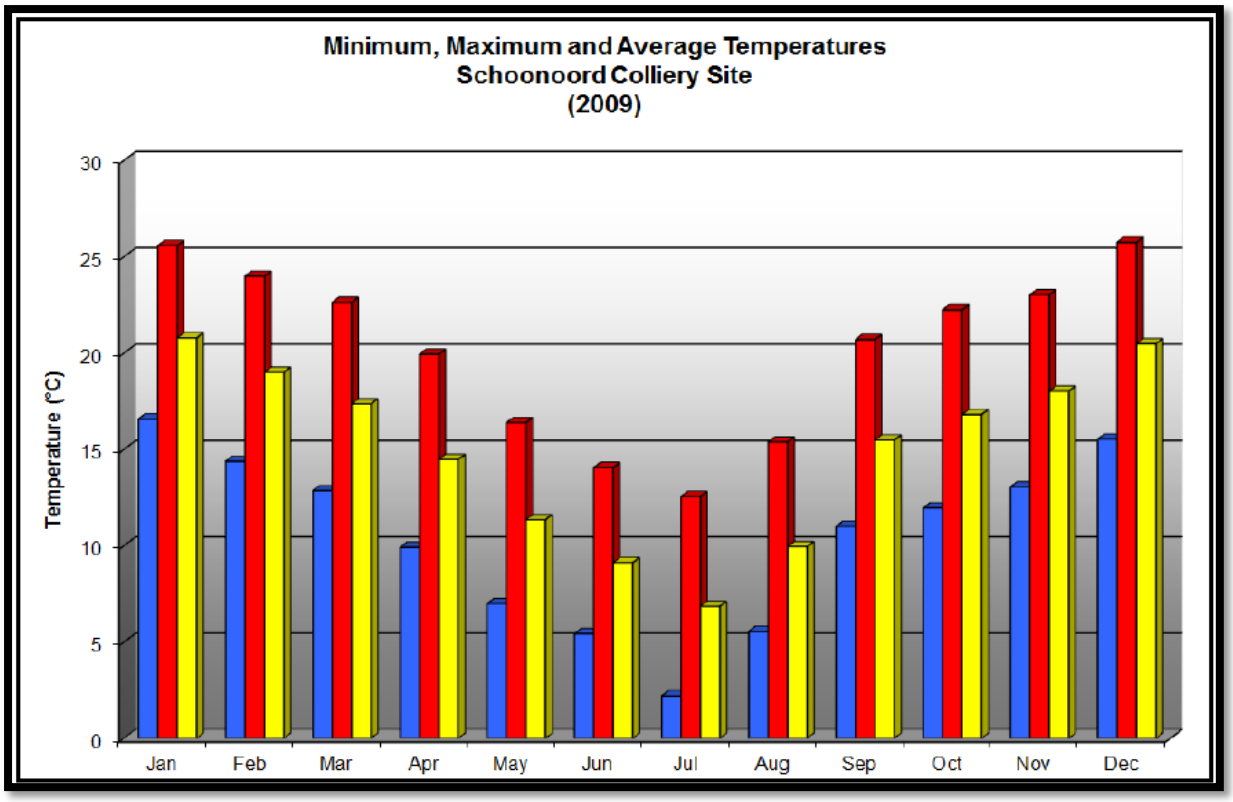


Figure 26: Minimum, maximum and average monthly temperatures for the site during the period 2009

3.5.4 Evaporation

The mean monthly evaporation records are obtained from Hydrological Information Publication No. 13, Evaporation and Precipitation Records, WB42, 1990. These records are listed in the table below.

Table 15: Evaporation data. – Climate of SA, WB 42.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1963	167.6	202.2	117.2	107.2	97.3	60.5	79.2	141.2	176.3	188	151.4	216.7
1964	177	180.6	187.7	123.7	106.9	78.5	94.5	142.5	194.3	160.9	189	158
1965	185.4	179.6	174.2	106.4	105.2	80.3	90.4	137.7	168.7	222	185.7	217.4
1966	187.7	135.1	179.3	128.8	121.2	82.3	115.3	142	181.4	196.3	189	166.4
1967	170.9	115.8	140	87.1	83.6	78.7	80.8	117.9	178.8	199.6	166.9	204
1968	200.5	188	110.2	102.2	78.4	67 8	106.2	137.3	186.9	241.1	155.7	209.5
1969	228.1	162.3	110.2	111.3	70.7	83.2	87.9	131.9	180.2	168.3		
1970		154.7	189	140.1	123.2	92.3		178.2		212	199.7	256.6
1971	163.3	154.1	195.5	123.8	98	93.4	117.7	167	200.8	196		198
1972	153	160.8	137.7	131.3	104.9	101.2	121.6	166.7	209.7	211.9	179.1	264.4
1973	227.4	157.2	188.5	98.6	114	105.6	108	147.4	230.9			190
1974	153.9	161.7	170.9	93.7	104	99.6	103	168.3	213.4	259.4	168.8	218.4
1975	174.5	136.6	138.5	103.2	81.8	66.2	81.9	116.3	142.2	174.6	158	
1976		130.6	100.2		59.5		75.5			157.6	159.7	174.9
1977	179.3	136.4	108.4	103.5	97.7	91.9	85.5	119.2	130.7			
1978					92.8		67.6	124.3	144.9	176	163.6	186.4
1979	178.6	157.1	151.6	117.2	84.9	73.9		104.5		165.5	159.8	164.5
1980	189.3	130.6	130.8	123.3	101.2	66.2	73.1		137.7	198.2	181.2	168.2
1981	156.2	109.5	131.5	102.8	70.8	74.3	72.4	88.8	144.2	148.5	175.7	184.8
1982	174.1		139	92.4	86.8	71.2	76	106	133.3	158.2	140.2	222.8
1983	177.3	153.5	141.9	109.7	102.6	69.9	82.4	104.2	167.4	153.4	169.9	158.5
1984	161.5	144.2	127.1	99.6	96.2	64.4	69.5	108.7	124	153.2	139.9	201.7
1985	164.1	123.5	130.4	116.4	85.5	76.9	82.2	114.6	125.8	169.2	174.5	189.2
1986	196.7	148.8	153.1	108.9	93.4	66.4		127.1	128.4	146.7	143.1	166.1
1987	189	153.2	139.4	123.2	110.3	77.1	87	122	118			184.5
AVE	**179.8**	**151.1**	**147.8**	**111.1**	**94.8**	**79.2**	**89**	**132**	**167**	**186.6**	**167.6**	**195.9**

YEAR AVE : **1702**

3.2.5 Wind Regime

On the whole winds are light except for the short periods during thunderstorms. Very occasionally tornadoes do occur and cause tremendous damage if they happen to a strike a populated area. The figure indicating wind roses below provides period wind roses for the proposed Kebrafield Roodepoort Colliery, with the next figure including the seasonal wind roses for the same site. The predominant wind direction is northwesterly and easterly with a >10% frequency of occurrence. Winds from the southwesterly sectors are relatively infrequent occurring <5% of the total period. Calm conditions (wind speeds < 1 m/s) occur for 11% of the time.

Table 16: Hourly wind analysis. – Climate of SA, WB 42 (Witbank 1993 - 2000)

Hourly Wind Analysis

Percentage frequency (f) for each direction (incl calms) and average speed (s) in m/s

Analysis based on hourly values. - Witbank (1993/11/01 - 2000/12/31)

Month	Calm	N		NNE		NE		ENE		E		ESE		SE		SSE		S		SSW		SW		WSW		W		WNW		NW		NNW	
		f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s	f	s
1	5	9	3	4	3	3	2	4	3	19	4	19	4	7	4	3	4	4	3	3	3	2	3	2	3	5	3	4	3	3	3	5	3
2	4	8	3	4	2	3	2	4	3	21	4	22	4	6	3	3	3	5	3	3	3	2	3	2	3	5	3	3	3	3	2	3	2
3	6	10	3	4	3	3	2	4	2	17	3	17	4	6	3	3	3	4	3	2	3	2	3	2	3	5	3	5	3	5	3	5	3
4	8	11	3	4	3	2	2	2	2	12	3	12	3	6	3	4	3	6	3	3	3	2	3	3	3	6	3	7	3	6	3	5	3
5	8	8	3	3	2	2	2	2	2	7	3	11	3	7	3	4	3	8	3	6	3	5	3	5	3	9	3	7	3	6	2	4	2
6	11	8	3	2	2	1	2	1	3	4	3	8	3	6	3	4	3	9	3	7	3	4	3	5	3	9	3	8	3	7	3	5	2
7	9	11	3	3	3	2	3	2	2	8	4	12	4	7	3	4	3	7	3	5	4	3	3	3	3	7	3	7	3	6	3	6	3
8	7	14	3	5	3	3	2	3	3	9	3	10	3	5	3	2	3	6	3	6	4	3	4	3	3	6	3	6	3	6	3	6	3
9	4	20	3	7	3	4	3	4	3	12	4	7	4	3	3	1	3	3	3	4	4	3	4	2	3	5	3	6	3	6	3	10	3
10	3	19	4	8	3	5	3	4	3	14	5	10	5	3	4	2	3	4	4	2	4	1	4	2	3	5	3	5	3	5	3	8	3
11	3	24	3	8	3	5	3	5	3	11	4	7	4	3	3	1	3	3	4	3	4	2	4	2	3	4	3	5	4	6	3	7	4
12	3	20	3	6	3	4	3	4	3	13	4	9	4	3	4	2	3	3	4	2	4	1	3	2	3	5	3	7	3	6	3	8	3
Year	**6**	**13**	**3**	**5**	**3**	**3**	**3**	**3**	**3**	**12**	**4**	**12**	**4**	**5**	**3**	**3**	**3**	**5**	**3**	**4**	**4**	**3**	**3**	**3**	**3**	**6**	**3**	**6**	**3**	**5**	**3**	**6**	**3**

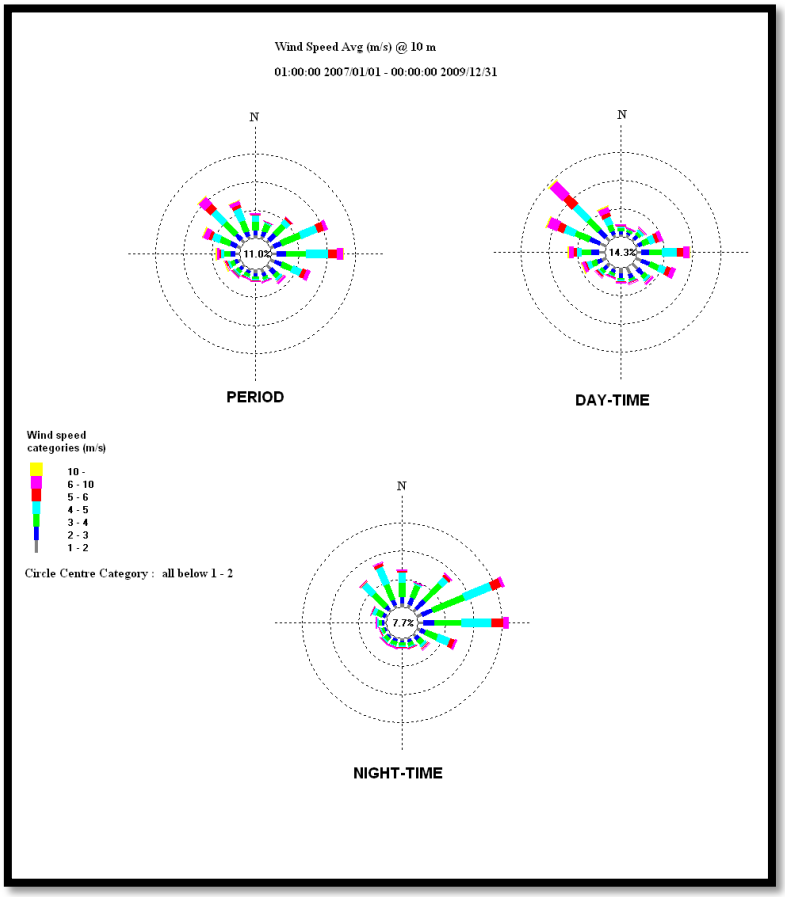


Figure 27: Period, day-time and night-time wind roses for Hendrina Wet Ash Disposal facility (1 January 2007 to 31 December 2009)

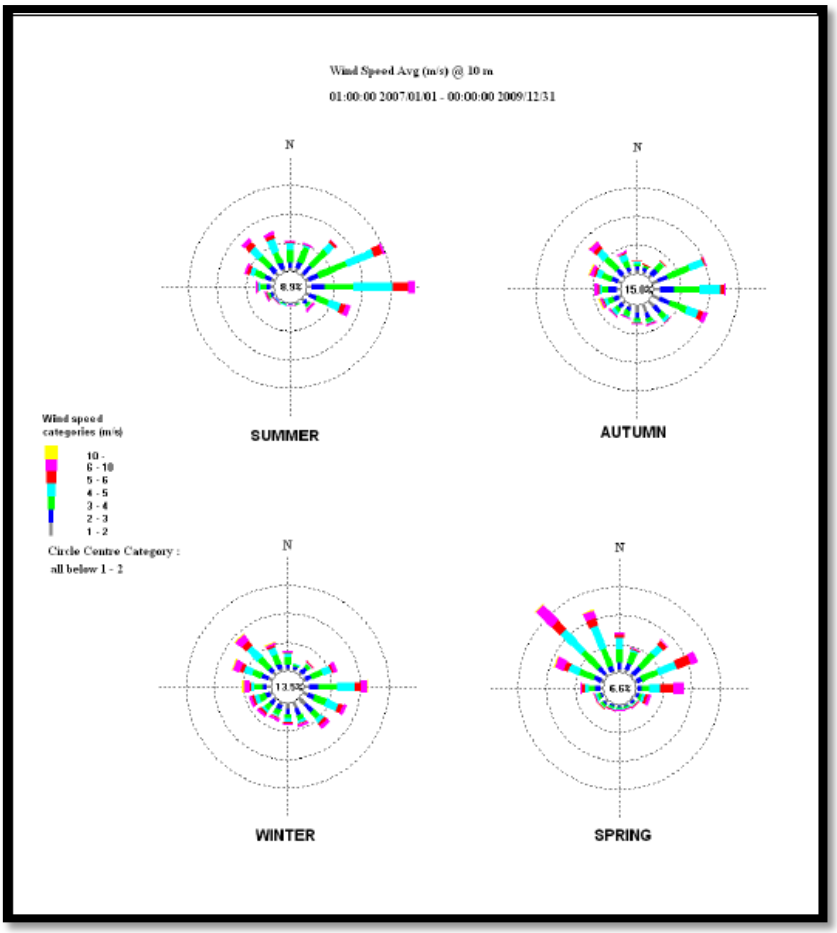


Figure 28: Seasonal wind roses for Hendrina Wet Ash Disposal facility (1 January 2007 to 31 December 2009)

A frequent northwesterly flow dominates day-time conditions with ~15% frequency of occurrence. During the night-time an increase in easterly and east-northeasterly flow is observed with a decrease in northwesterly air flow. During summer months, winds from the east become more frequent, due to the strengthened influence of the tropical easterlies and the increasing frequency of occurrence of ridging anticyclones off the east coast. There is an increase in the frequency of calm periods (i.e. wind speeds <1 m/s) during the winter months of 13.5%. Wind speeds in general range between 0 m/s and 14 m/s, with an average of 3.4 m/s.

3.2.5.1 Atmospheric Stability

The vertical component of dispersion is a function of the extent of thermal turbulence and the depth of the surface mixing layer. Unfortunately, the mixing layer is not easily measured, and must therefore often be estimated using prognostic models that derive the depth from some of the other parameters that are routinely measured, e.g. solar radiation and temperature. During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the extension of the *mixing layer* to the lowest elevated inversion. Radiative flux divergence during the night usually results in the establishment of ground based inversions and the erosion of the mixing layer. The mixing layer ranges in depth

from ground level (i.e. only a stable or neutral layer exists) during night-times to the base of the lowest-level elevated inversion during unstable, day-time conditions. Atmospheric stability is frequently categorised into one of six stability classes. These are briefly described in the table below;

Table 17: Atmospheric stability classes

A	very unstable	calm wind, clear skies, hot daytime conditions
B	moderately unstable	clear skies, daytime conditions
C	unstable	moderate wind, slightly overcast daytime conditions
D	neutral	high winds or cloudy days and nights
E	stable	moderate wind, slightly overcast night-time conditions
F	very stable	low winds, clear skies, cold night-time conditions

The atmospheric boundary layer is normally unstable during the day as a result of the turbulence due to the sun's heating effect on the earth's surface. The thickness of this mixing layer depends predominantly on the extent of solar radiation, growing gradually from sunrise to reach a maximum at about 5-6 hours after sunrise. This situation is more pronounced during the winter months due to strong night-time inversions and a slower developing mixing layer. During the night a stable layer, with limited vertical mixing, exists. During windy and/or cloudy conditions, the atmosphere is normally neutral.

For low level releases, such as due to vehicle entrainment from unpaved roads, the highest ground level concentrations will occur during weak wind speeds and stable (night-time) atmospheric conditions. Wind erosion, on the other hand, requires strong winds together with fairly stable conditions to result in high ground level concentrations i.e. neutral conditions.

3.2.5.2 Regional Ambient Air Quality

The Department of Environmental Affairs (DEA) operates a monitoring network over the Highveld region at the residential areas of Hendrina, Ermelo, Middleburg, Secunda and eMalahleni. The closest monitoring station to the proposed Kebrafield Roodepoort Colliery is located at Hendrina. The highest daily and monthly PM10 concentrations for the period 2008-2010 are given in the following two figures respectively.

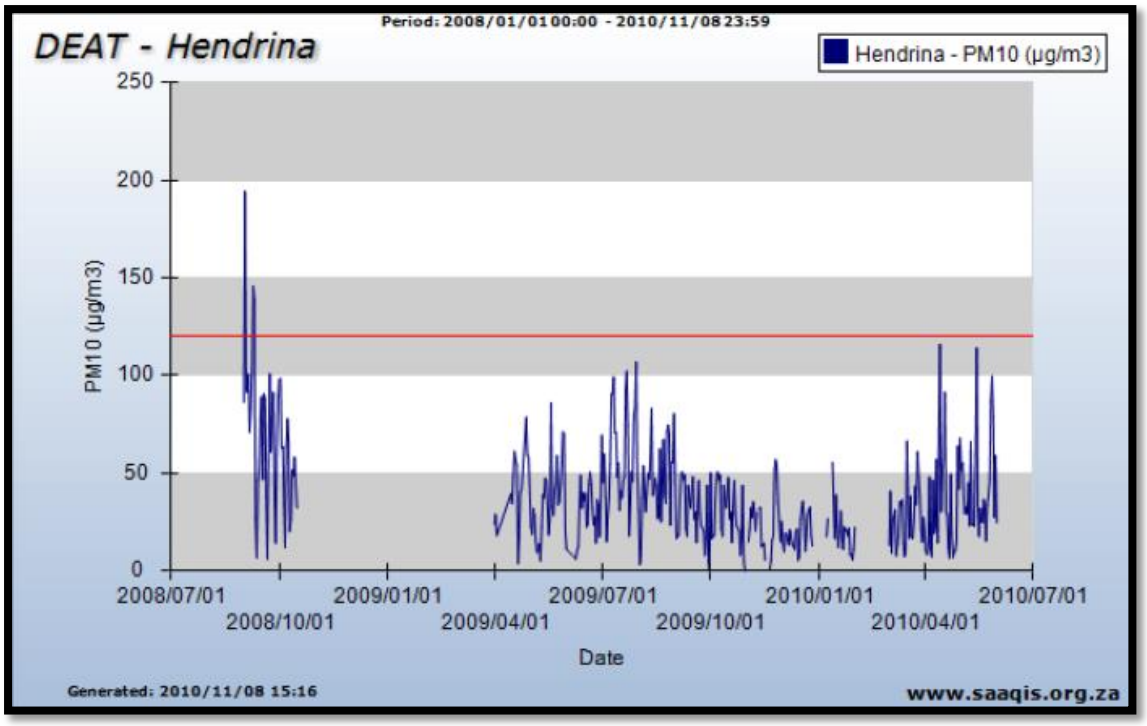


Figure 29: Daily measured PM10 ground level concentrations (µg/m³) at the Hendrina DEA monitoring station (for the period 2007-2010) (as downloaded from the SAAQIS website)

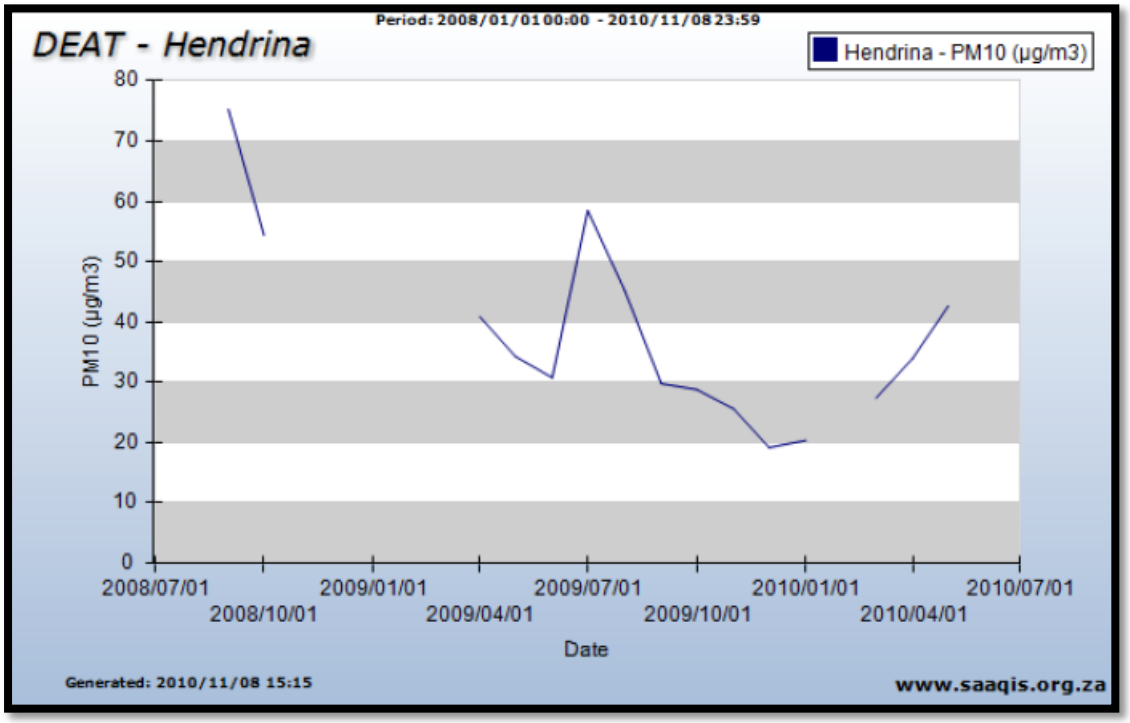


Figure 30: Monthly measured PM10 ground level concentrations (µg/m³) at the Hendrina DEA monitoring station (for the period 2007-2010) (as downloaded from the SAAQIS website)

Exceeding of the SA air quality PM10 limits were found to occur at the Hendrina monitoring station. However, the National Ambient Air Quality Standards (NAAQS) allow 4 daily exceedances per calendar year. When compared

to the NAAQS applicable immediately till 31 December 2014, the predicted PM10 concentrations for the period 2008 – 2010 were found to result in less than 4 allowable exceedances. For the NAAQS applicable from 1 January 2015, the predicted concentrations for the period 2008 – 2010 were found to result in more than 4 allowable exceedances for the period 2009. Annual concentrations were estimated from the monthly PM10 concentrations for the period April 2009 to March 2010.

High ambient particulate concentrations have been found to coincide with low ambient temperatures and low rainfall. Increases in domestic coal burning and poor atmospheric dispersion potentials, together with persistent industrial emissions, combine to produce elevated ambient concentrations during winter months. High concentrations during summer months are usually associated with increases in fugitive dust emissions. Rainfall events result in a reduction of airborne concentrations due to reductions in the potential for fugitive dust emissions and due to the removal of particulates in the atmosphere by raindrops.

3.6 Cadastral Information

The Kebrafield Roodepoort Colliery situated on the Farm Roodepoort 151IS Portion 17 is surrounded by the following holding farms, as indicated in the figure below;

- North – Bothashoek 475
- East – Pullens Hope 155
- South East – Boschmanskop 154
- South – Broodsnyersplaas 25
- West – Roodepoort 151
- North West – Wolwenfontein 471

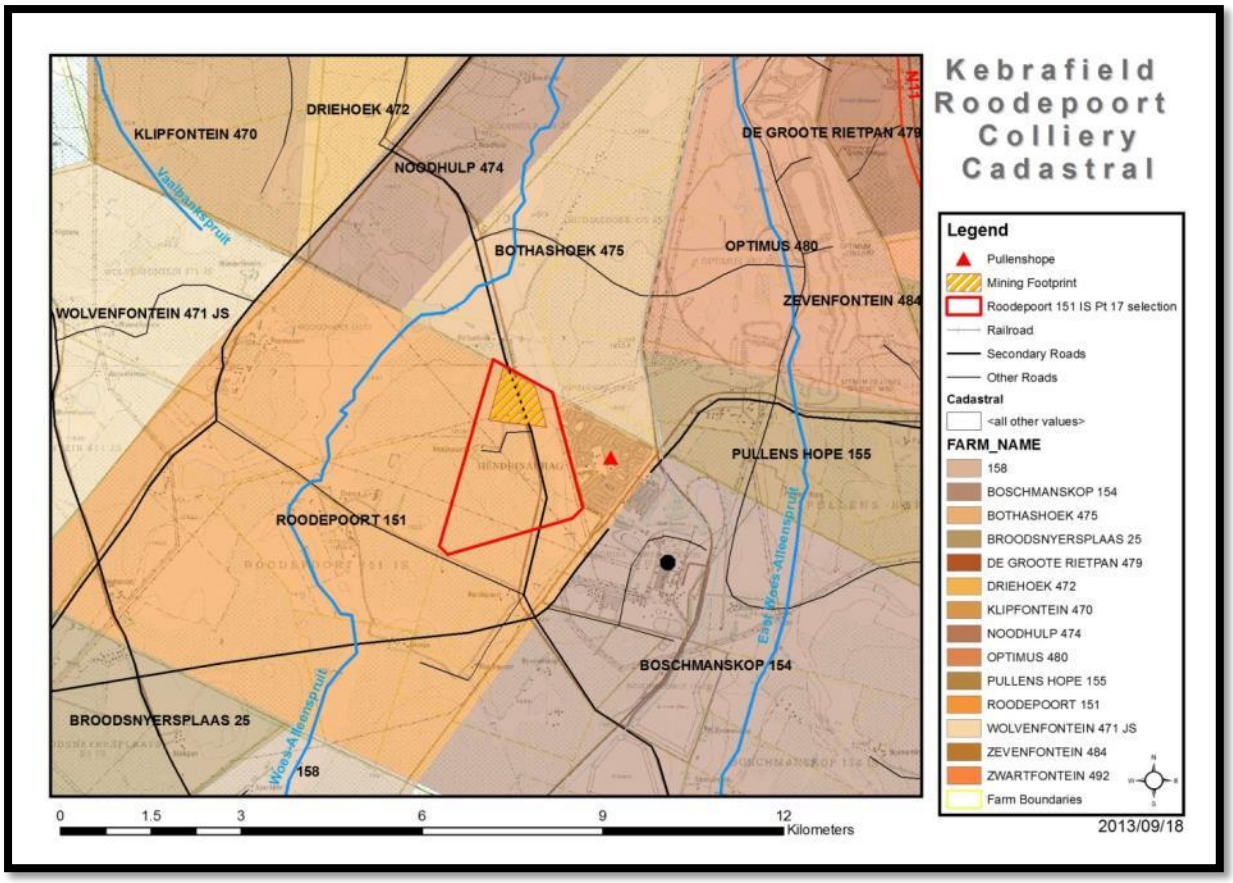


Figure 31: Neighbouring holding farms

3.7 Catchment Description

According to the South African National Biodiversity Institute's (SANBI) Atlas for Freshwater Ecosystem Priority Areas (2011), the project area is not situated within a FEPA with regards to the rivers found in the quaternary catchment (Figure indicating catchment B12B below). However, this is not applicable to the wetlands found within the area, which are considered to be wetlands of national priority. The following sequence of imagery provides data regarding the catchment description for the Olifants Management Area.

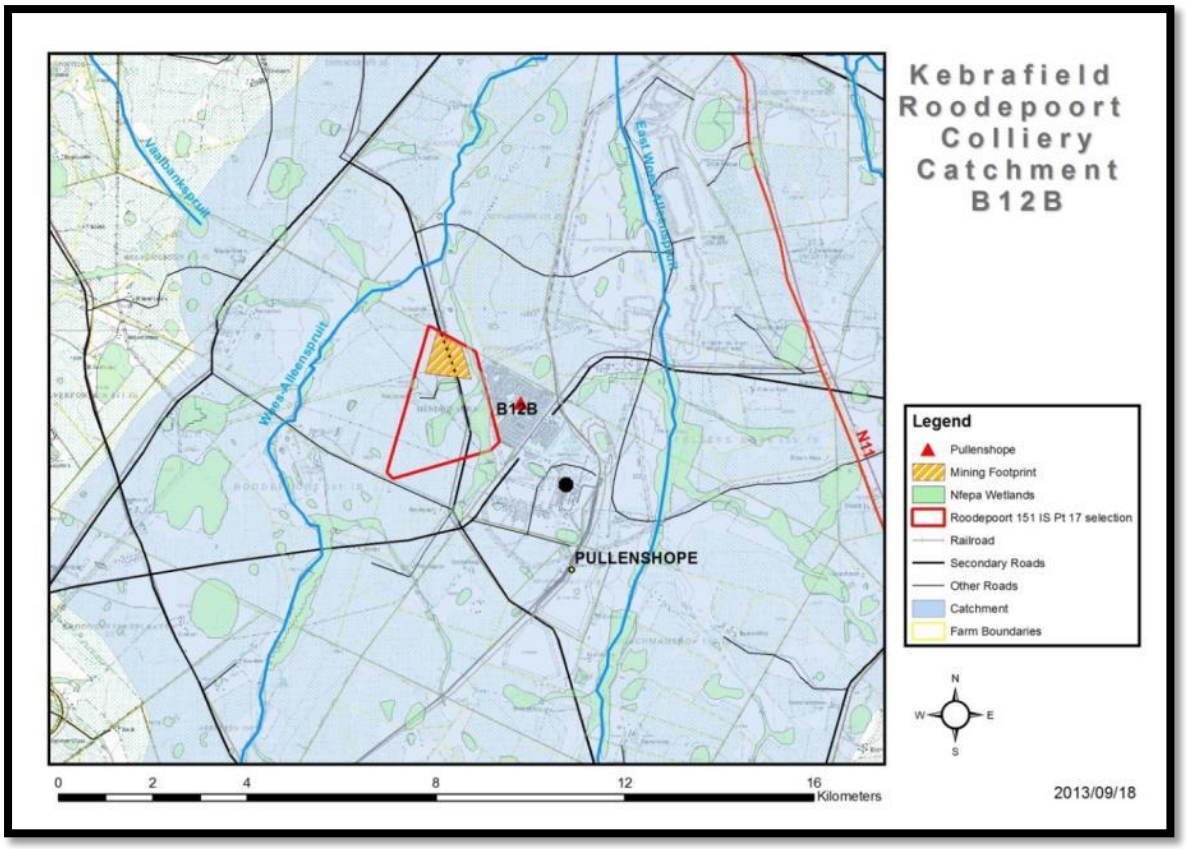


Figure 32: Catchment map – Kebrafield Colliery Situated in Catchment B12B

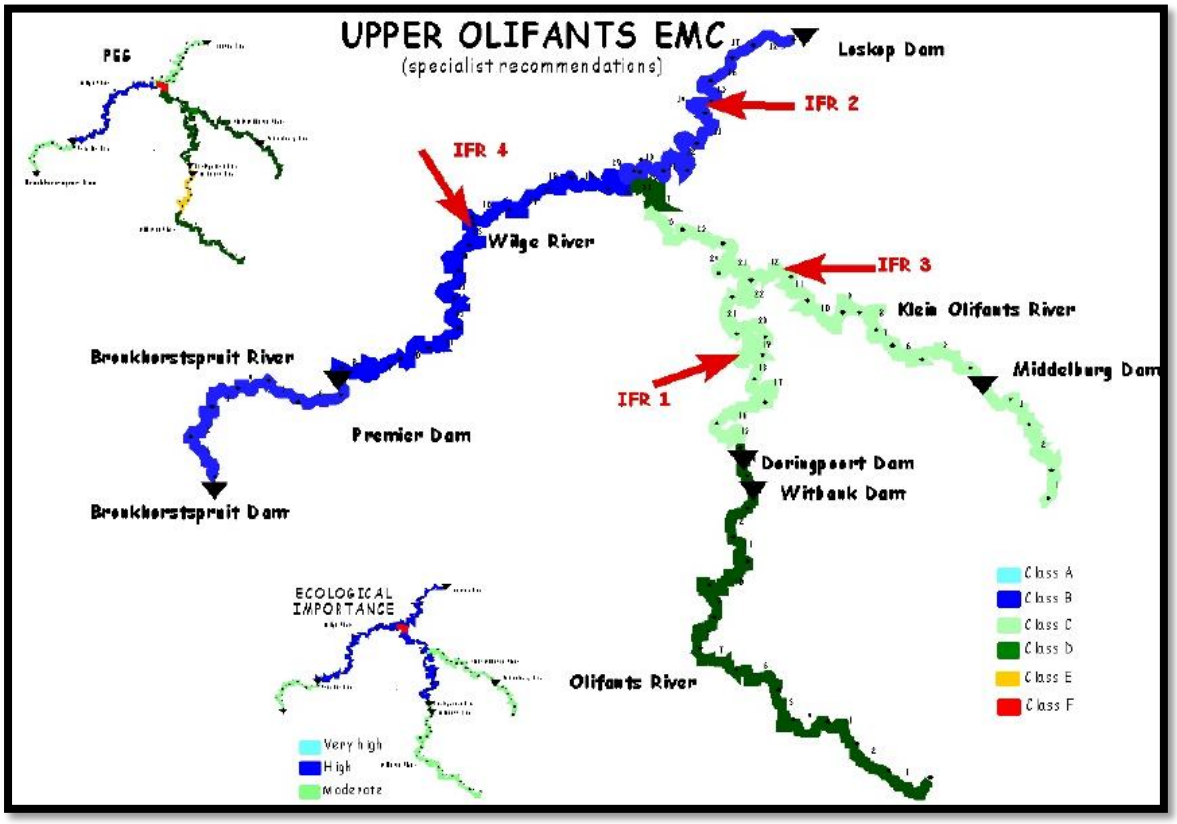


Figure 33: Upper Olifants River Water Management Area, (DWA 2001)

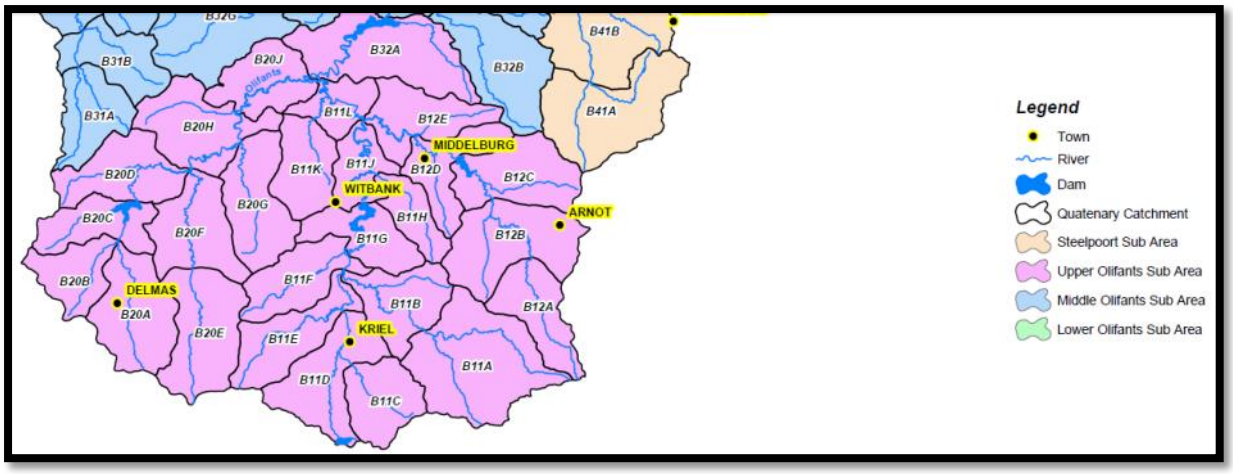


Figure 34: Olifants WMA Management Areas

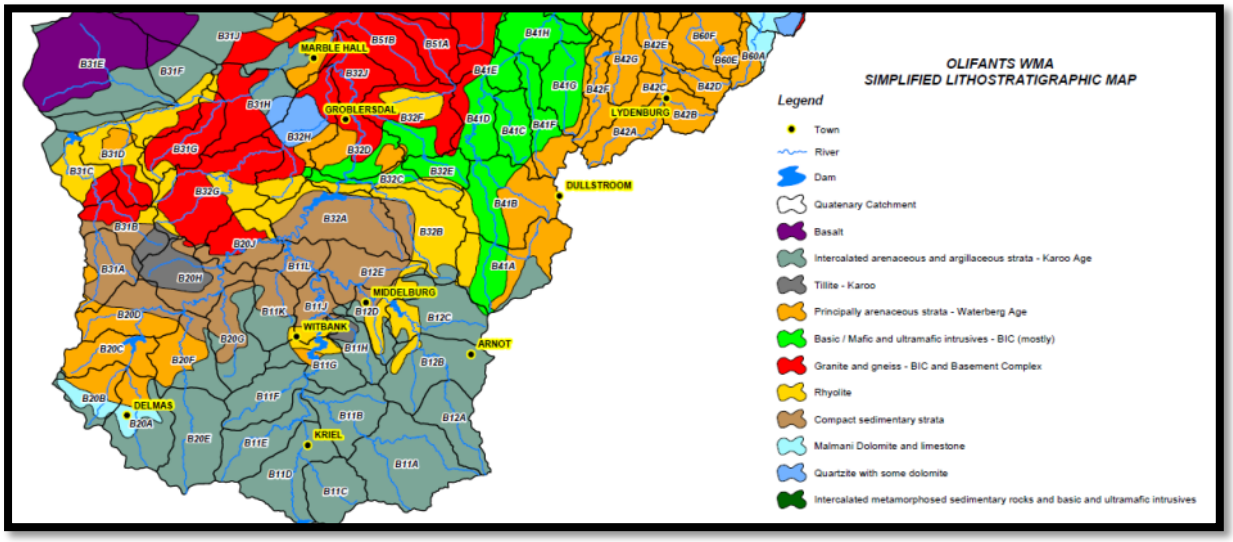


Figure 35: Olifants WMA simplified Lithostratigraphic map

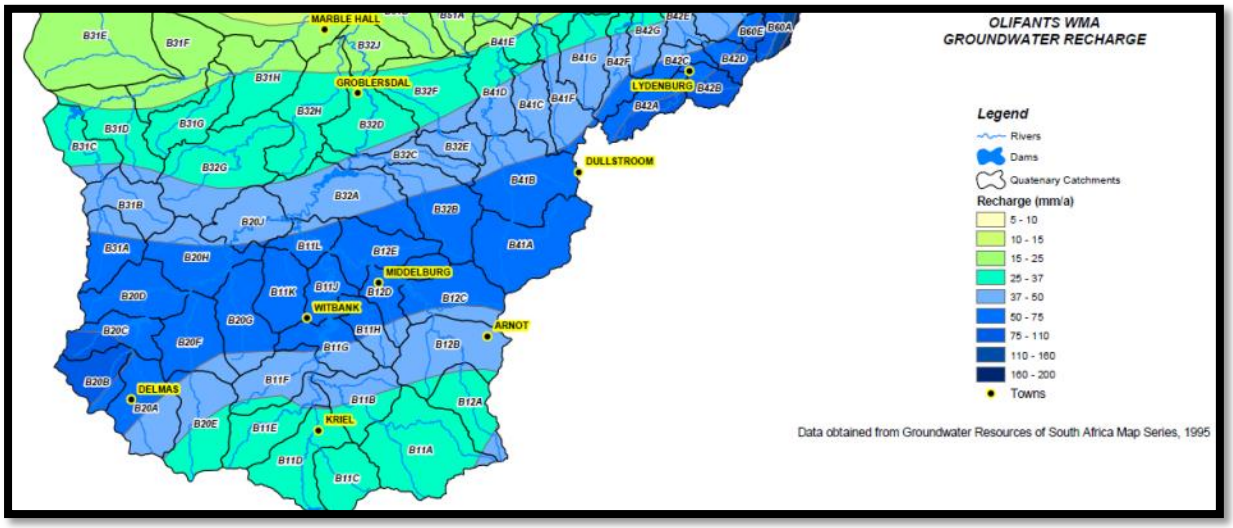


Figure 36: Olifants Groundwater recharge map

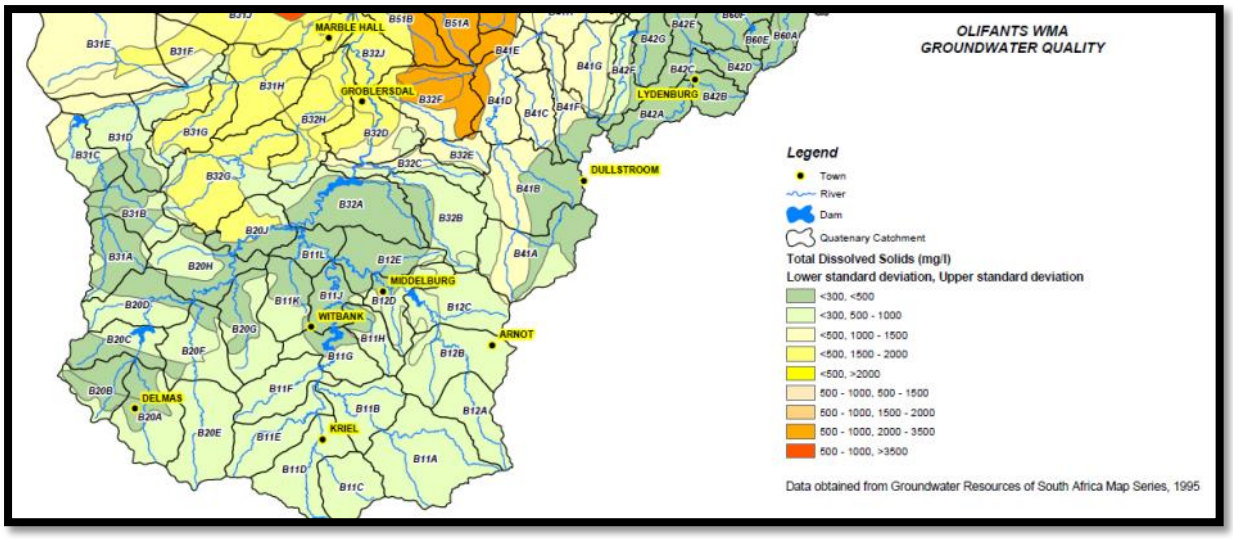


Figure 37: Olifants ground water quality

The study area is located in quaternary catchment B 12B, within the Olifants Water Management Area. The Groundwater Harvest Potential Map of South Africa (Baron et al, 1998) classifies the study area as having an estimated groundwater harvest potential I of 10 000 to 15 000 m^3/km^2/year (i.e. relatively low). The average borehole yield is > 0.4 litres per second (L/s), and the total dissolved solids concentration of the (unpolluted) groundwater is between 200 and 300 mg/l (i.e. relatively fresh). No major groundwater abstractions are shown on the DWA1:500 000 scale hydrogeology map of the area (Sheet 2526 Johannesburg) in the area. The GRA2 data for the quaternary catchment B12B is summarized in the table below below:

Table 18: GRA2 Data Summary for Quaternary Catchment B12B

Area (km^2)	658.5
Average water level (metres below ground level)	8.7
Volume of water in aquifer storage (Mm^3/km^2)	467.7
Specific Yield	0.003
Harvest Potential (Mm^3/a)	14.6
Contribution to river base flow (Mm^3/a)	7.8
Utilizable groundwater exploitation potential in a wet season (Mm^3/a)	9.5
Utilizable groundwater exploitation potential in a dry season (Mm^3/a)	6.3

Most of the upper Olifants River Catchment falls within the Highveld Ecoregion, (elevation of 1250 to 1750 mamsl), characterised by gently undulating grasslands with numerous wetlands, and underlain the Vryheid formation Karroo Series sediments. Median annual simulated runoff per quaternary catchment varies from 10 to 250 mm. The coefficient of variation for annual simulated runoff per quaternary catchment varies between 40 and 160 % (Kleynhans *et al,* 1998).

Table 19: Quaternary catchment description with Integrated Ecological Importance, Resource Stress and Recommendations

Quat	River	Integrated Ecological Importance	Resource stress	Recommendation
B12B	Klein Olifants	D (Low)	Water Quality	EcoStatus 3 Rapid III Address water quality issues to improve RHP monitoring
B12E	Klein Olifants	C (PES, High)	Upstream dam, not fully utilised, water quality problems)	EcoStatus 4 Intermediate ERM

3.8 Wetlands

All wetlands identified on the study site are classified within the Central Bushveld Group 3 wetland vegetation group. The wetland(s) are delineated as channeled valley bottomed wetlands (figures below). It is recommended that all information resources available for decision making regarding the extent of wetlands associated with the study area be utilized i.e. SANBI GIS Database, desktop delineation and field delineation.

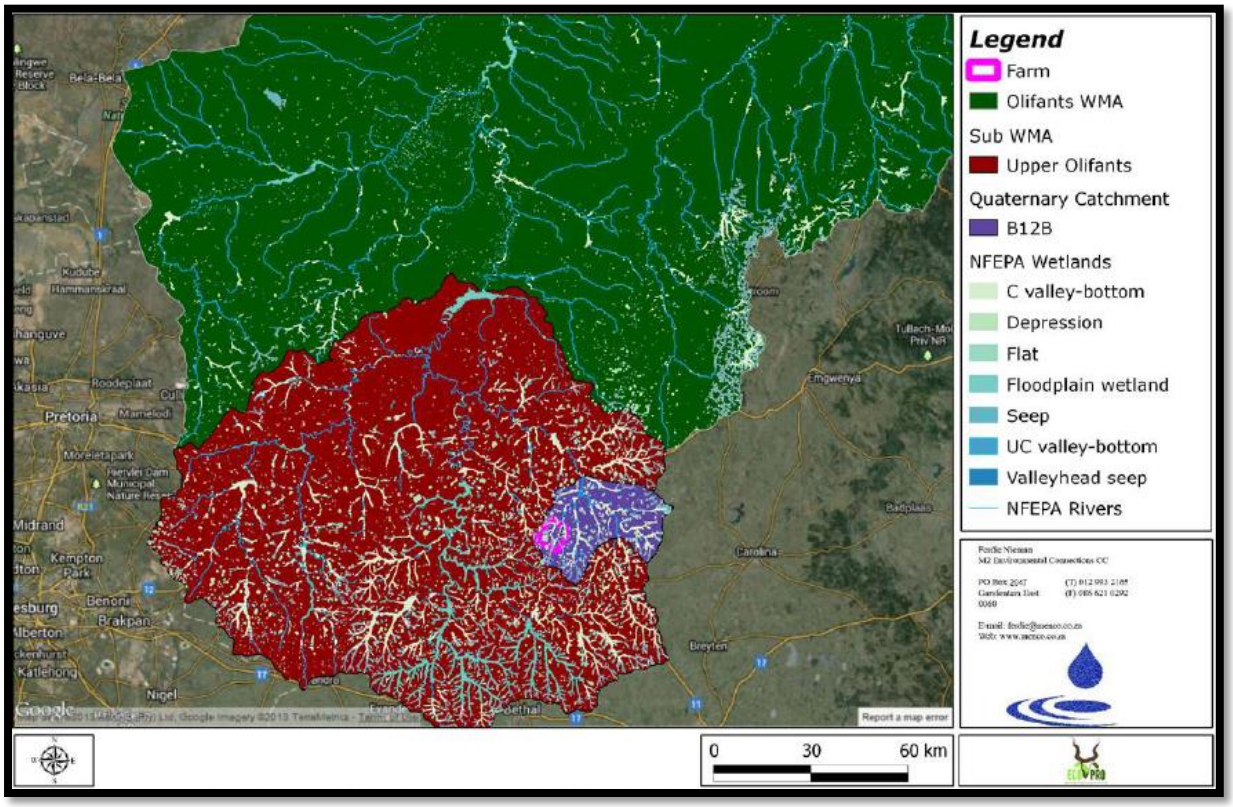


Figure 38: National Freshwater Priority Wetland types applicable to the B12B drainage region

Wetland functionality is defined as a measure of the deviation of wetland structure and function from its natural reference condition. In the current assessment the hydrological, geomorphological and vegetation integrity was assessed for the wetland unit associated with the study site in order to provide a Present Ecological Status (PES) score. The health categories used to describe the integrity of wetlands are contained in the table below.

Table 20: Health categories used for describing Wetlands (WET-Health)

Description	Class Boundary	Health Status
Unmodified natural	>4	A
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of natural habitats and biota may have taken place	>3 and <=4	B
Moderately modified. A moderate change in ecosystem and loss of natural habitats has taken place but the natural habitat remains predominantly intact	>2 and <=3	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred	2	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	>0 and <2	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota	0	F

The present Ecological status (PES) method (DWAF, 1995) was used to establish the integrity of the wetland located on Roodepoort 151 IS. This method is based on the modified Habitat Integrity Approach developed by Kleynhans (DWAF, 2005). Anthropogenic modification of the criteria and its attributes can have an impact on the ecological integrity of the wetland as illustrated.

Wetlands and riparian areas perform many functions that are valuable to society including the supply of water and the improvement of water quality. The habitats created by wetlands and rivers are also important for many plant and animal species. Not all wetlands or rivers develop in the same way and may not perform ecosystem services to the same extent. Where areas of human settlement and development threaten to encroach and impact on wetlands or riparian areas, it is important that the wetland's ecological integrity be assessed.

With reference to the figure below, it is evident that the proposed mining development plan falls within the wetland buffer zone. However, mining in this area could be considered in terms of the impacted system caused by drain water discharge from the Hendrina Power Station. This wetland appears to be largely impacted by

mining and farming activities in close proximity. Sediment input into the system is increased form the natural reference condition due to various roads and mining activities. Roads and channels have impacted the natural flow of the system.

Some of the water is caught up in a dam area within the wetland further impacting on the natural flow. The vegetation of this wetland has been significantly altered, although some natural occurring plants, such as *Phragmites australis,* and *Typha capensis* remain within the centre of the wetland (Permanent zone) the surrounding area has been invaded by various exotic plants and trees such as *Acacia mearnsii* and *Verbena bonariensis.*

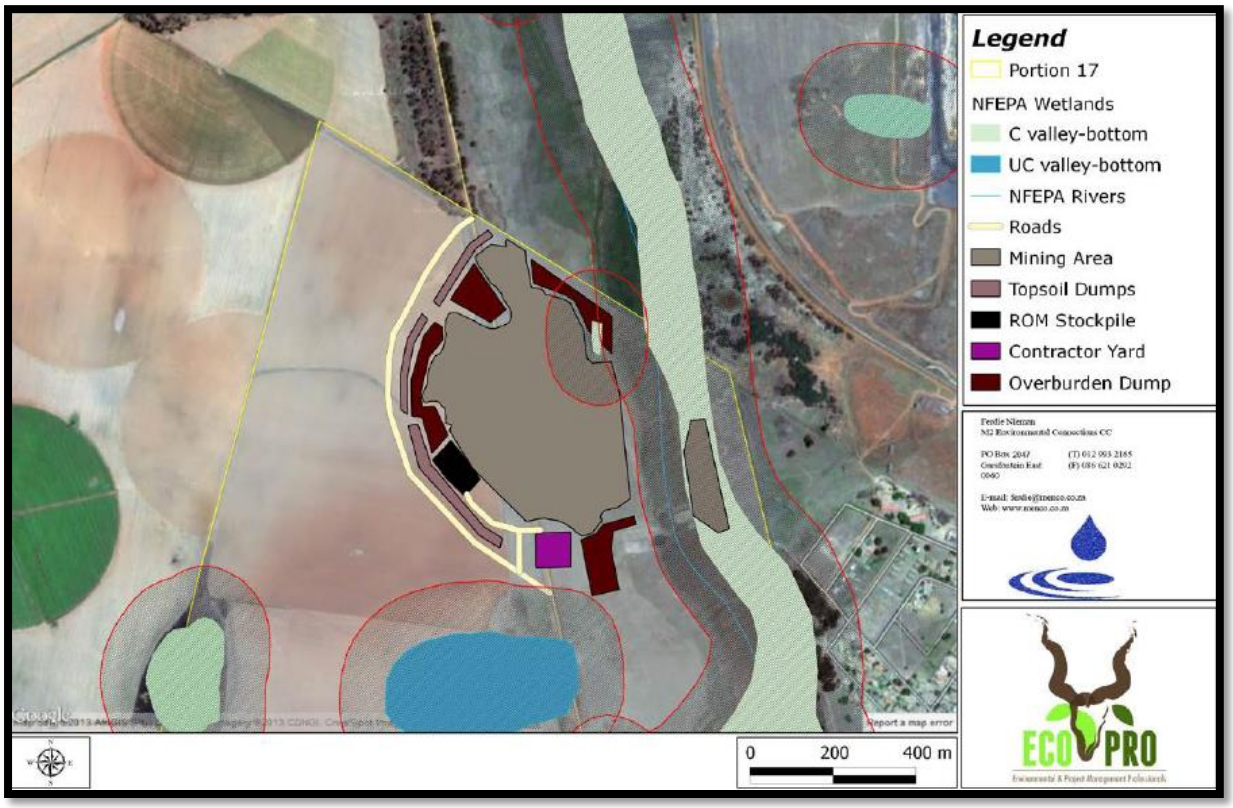


Figure 39: Map indicating the wetlands on the farm Roodepoort, Pullenshope

The project area is located in the B12B Quaternary catchment (Upper Olifants sub-Water Management Area). The property area is located at the head waters of the Klein Olifants River systems. The stream linked to the wetland is an unnamed tributary to the Woestalleen Spruit. The 2008 PES and EIS (desktop) for the main tributaries are:

- Waterval: PES class D (Largely Modified) and EIS low
- Klein Olifants: PES class C (Moderately Modified) and EIS moderate

The field survey has revealed that the wetland soils are permanently waterlogged. PES for the Pullenshope wetland is Class D (Largely Modified). The overall classification in terms of the EIS is Moderate, indicating that the Pullenshope wetland is not considered of National importance. The summarised results of the hydrological benefits provided by the identified wetland units are contained in the table below.

Table 21: Hydrological benefits provided by identified wetland units

Wetland	Generic Hydrological benefits provided by the wetlands							
Hydro-Geomorphic Type	Flood attenuation		Stream flow regulation	Erosion control	Sediment trapping	PO_4	NO_3	Toxicants[1]
	Early wet Season	Late wet Season						
Channeled valley bottom wetland	+	+	++	++	++	++	++	++
Depression	0	0	0	+	++	++	++	++
Rating	0 + ++	Benefit unlikely to be provided to any significant extent Benefit likely to be present at least to some degree Benefit very likely to be present (and often supplied to a high level)						

3.9 Land Cover

The land cover of the proposed mining site as indicated in the figure below is mainly grasslands and cultivated commercial areas. The study area (yellow diagonal lines in the image below) covers only the northern portion of portion 17 of the Farm Roodepoort 151IS (indicated as a red polygon in the image below). A NFEPA wetland is situated to the east of the proposed study area and has been discussed under the previous section under the heading “Wetlands”. The large yellow polygon to the north and east of the study area has been classified according to the ENPAT data set as “Mining and Quarries”. Various previous studies conducted in the study region have acknowledged the fact that the catchment has already been largely transformed by mining activities. The proposed Kebrafield Roodepoort Colliery intends to keep clear of the wetland areas while adhering to a 100m buffer as proposed by the Wetland specialists during an initial prefeasibility study. The majority of the area to the east has been built up by the previous Hendrina Power Station Village, which today has become known as the town of Pullenshope as the majority of land ownership vest with private persons/entities.

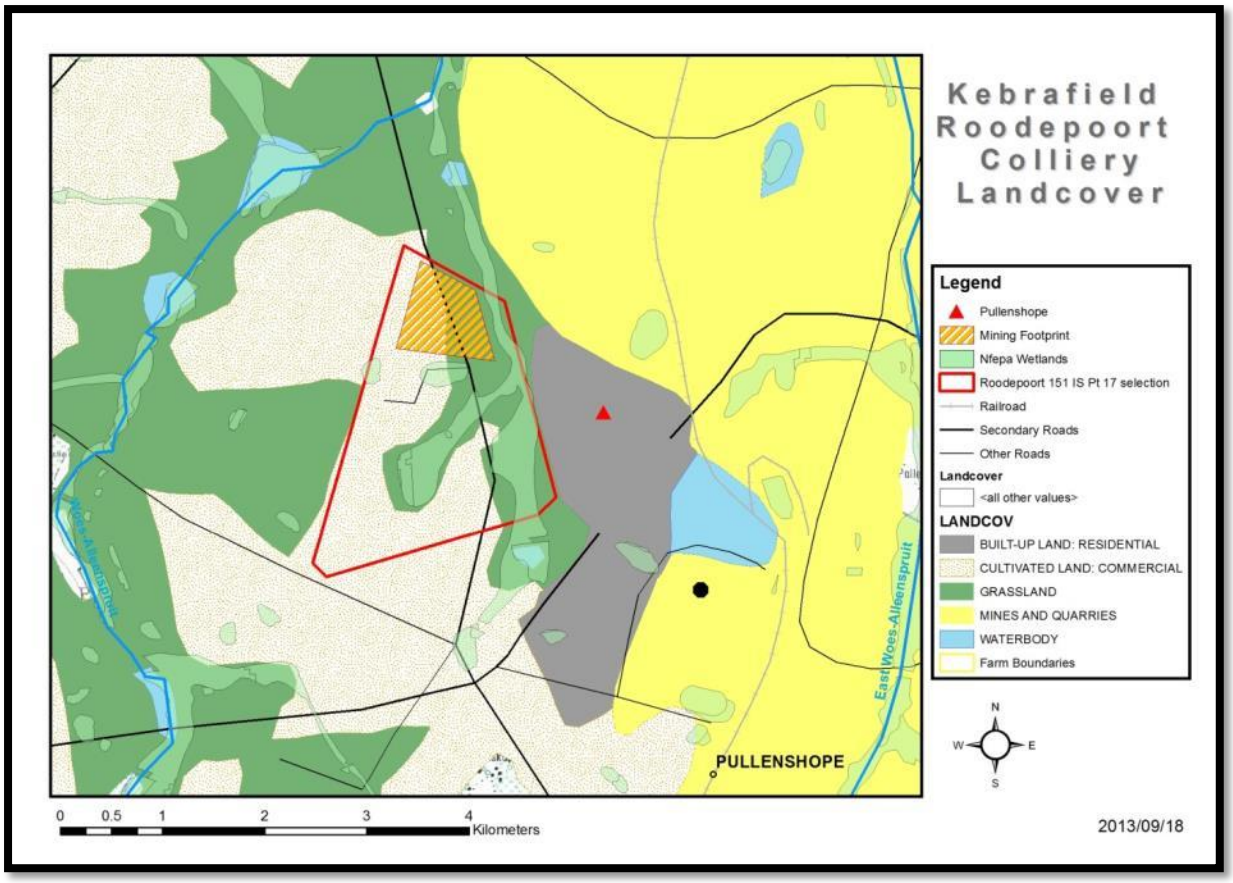


Figure 40: Land Cover map indicating overall land-cover of the study area (NFEPA and ENPAT data sets)

Land cover categories are presented in above. For the purpose of this assessment, land cover are loosely categorised into classes that represent natural habitat and land use categories that contribute to habitat degradation and transformation on a local or regional scale. Areas that are characterised by high levels of transformation and habitat degradation is generally accepted as being suitable for development purposes as it is unlikely that biodiversity attributes of sensitivities will be present or affected by development. Conversely, areas that are characterised by extensive untransformed and pristine habitat are generally not regarded suitable options for development purposes.

The status of natural habitat does however have bearing on the suitability of a site. The region comprises extensive transformed habitat that resulted from agriculture and mining, rendering remaining habitat fragmented and isolated and ultimately relatively sensitive. Little natural grassland habitat remains in the area, the majority being around streams and rivers where ploughing is not possible or soils are poor in nutrients. One of the shortfalls of the Environmental Potential Atlas database (ENPAT) is that it does not reflect the current status of natural habitat within the study area. At this stage of the process it is therefore assumed that all areas indicated to comprise of natural grassland is representative of the regional vegetation types and are in a good condition. While this assumption is unlikely to hold true for most of the study area, an assessment of the actual ecological

status of grasslands within the study area is beyond the scope of this report and will only be compiled during the EIA phase.

3.10 Flora and Biodiversity Conservation

3.10.1 Regional Vegetation

Terrestrial grassland patches that are captured within the respective site alternatives represent the Eastern Highveld Grassland. This vegetation type is Endangered and only small fractions are conserved in statutory reserves. Some 44% is transformed by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact than which is currently indicated by land cover data. The vegetation is short dense grassland dominated by Aristida, Digitaria, Eragrostis, Themeda and Tristachya species. Small rocky outcrops are scattered across the landscape. Wiry grasses and woody species are associated with these outcrops. These include species such as Acacia caffra, Celtis africana, Diospyros lycioides, Parinari capensis, Protea caffra and Searsia magalismontanum (Mucina & Rutherford, 2006). The Endangered status of this vegetation type warrants a medium-high environmental sensitivity. Small portions of the Eastern Temperate Freshwater Wetlands vegetation type are located within the study area.

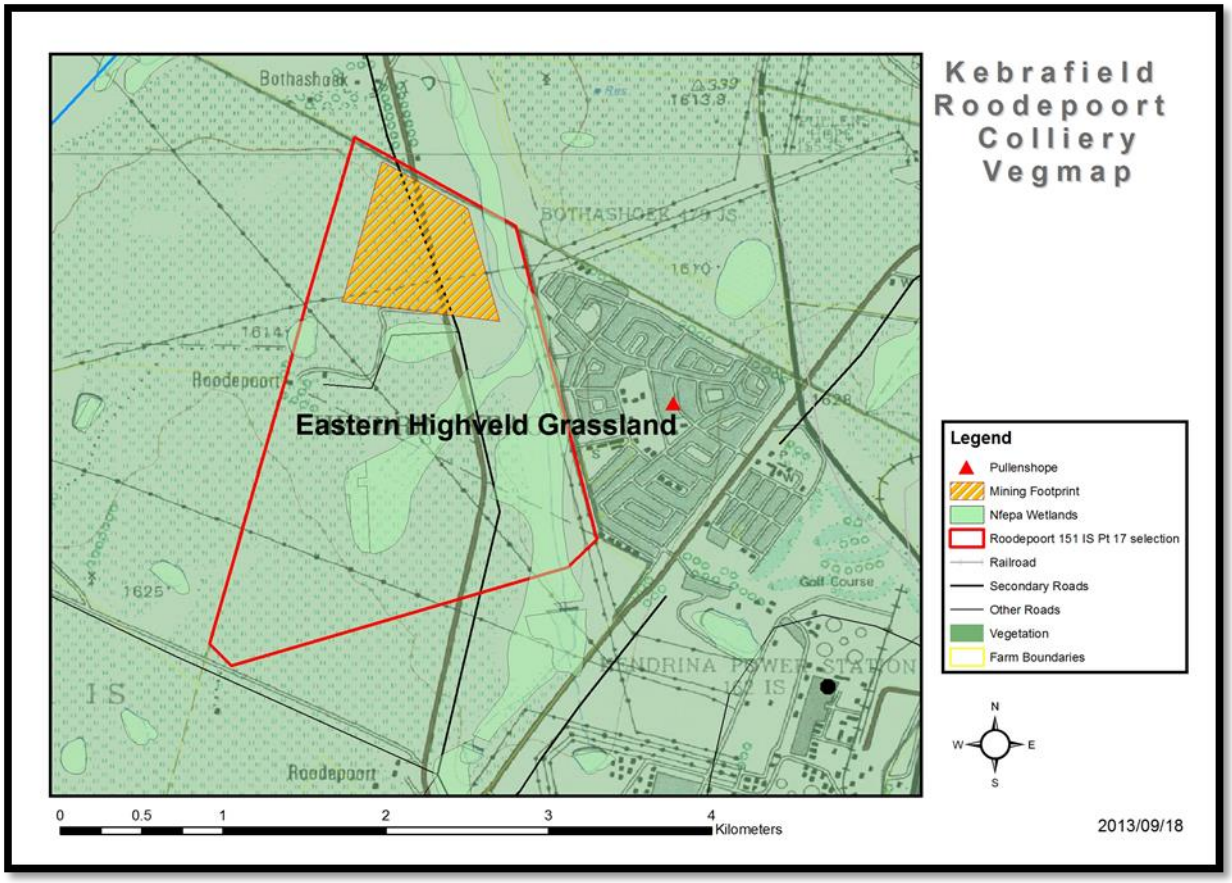


Figure 41: Vegetation map of the proposed Kebrafield Roodepoort Colliery – Eastern Highveld Grassland

3.10.2 Mpumalanga Biodiversity Conservation Plan

Classification of the Terrestrial Biodiversity Classification categories in the study area is as follows:

- **Highly Significant areas** - protection needed, very limited choice for meeting targets;
- **Important and Necessary areas** - protection needed, greater choice in meeting targets;
- **Areas of Least Concern** – natural areas with most choices, including for development;
- **Areas with No Natural Habitat Remaining** – transformed areas that make no contribution to meeting targets.

The only category of note within the site alternatives is **'Least Concern'**, generally conforming to the remaining natural grassland, as depicted in the land cover database as well as wetland and surface water habitats. These areas are generally regarded as moderately sensitive, mainly as a result of the extensive habitat transformation of the general region and the small portions of remaining natural habitat.

No area of restriction is identified within the footprint of the proposed Kebrafield Roodepoort Colliery in terms of the MBCP classification database as illustrated in the figure below.

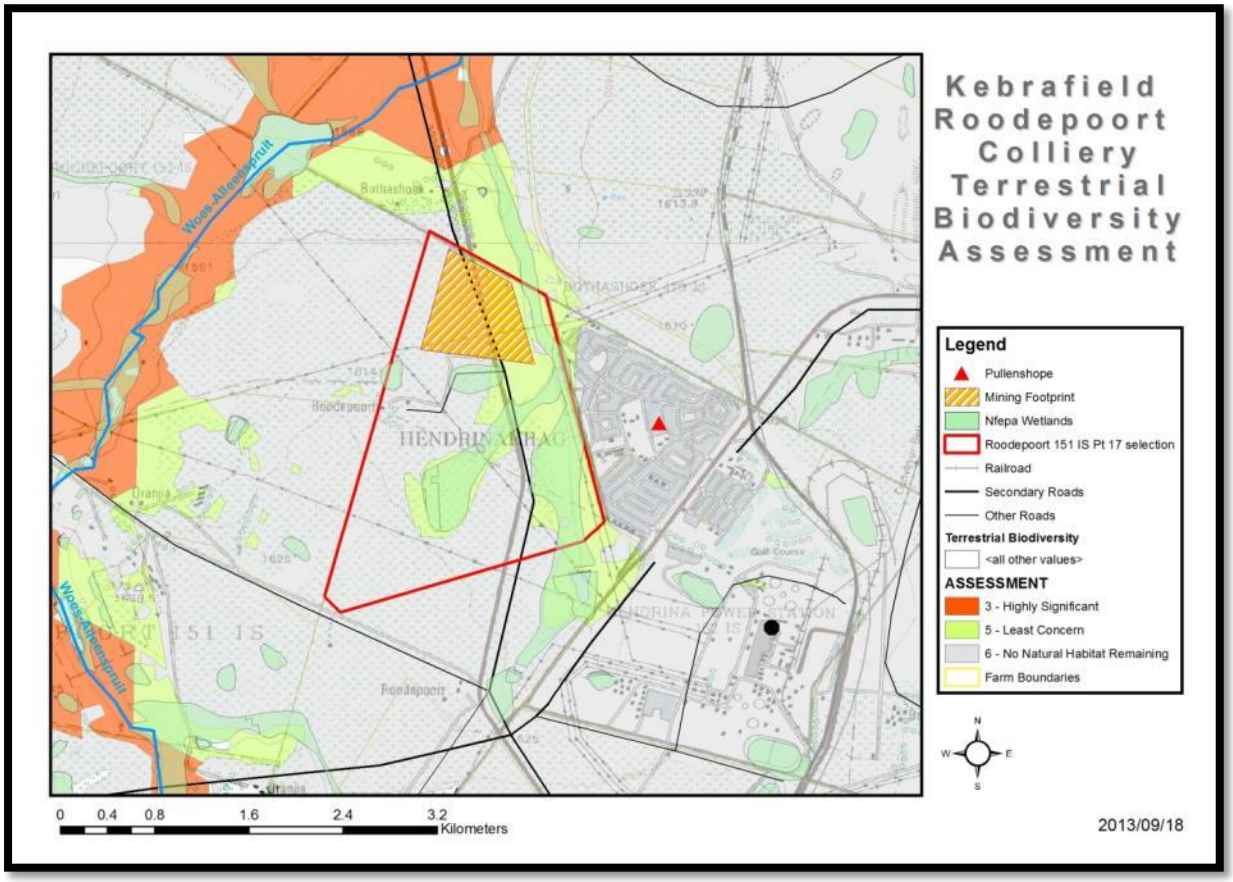


Figure 42: Kebrafield Roodepoort Colliery Terrestrial Biodiversity Assessment Map – Mainly Least Concern Areas

The SANBI database indicates the known presence of only 38 plant species within this particular ¼ degree grid (2629BA). This low diversity is the result of poor floristic knowledge of the area and is not a reflection of a poor habitat and floristic diversity. No floristic species of conservation importance is known to occur in this region, according to the SANBI database. However, all areas of natural grassland habitat and wetland habitat, in particular, are regarded suitable for the potential presence of flora species of conservation importance.

3.11 Fauna

A total of 11 Red Data fauna species exhibit a moderate likelihood of occurring in the region, considering the type and distribution of habitat types. In particular, wetland related habitat is regarded significant for the potential presence of Red Data fauna species and most of the moderately likely species utilises wetland habitat extensively.

The study area is ultimately characterised by a matrix of transformed faunal habitat (maize field etc.) with scattered portions of untransformed grassland and wetland habitats, but little of the original ecological characteristics remain within the larger region.

3.12 Macro Habitats

From initial field investigations the major habitat types that were identified within the proposed site include the following:

- **Agricultural fields** – comprises areas that are currently actively cultivated (mainly maize). Edges are generally characterised by a composition of weeds, invasive forbs and poor quality grasses and herbs. The faunal component of these areas might be relative diverse, but mostly comprises animals that utilises these areas on an infrequent basis or because of the unnatural food source that is presented by agriculture during parts of the year. The composition of animals in these areas are entirely different to that of natural grassland habitat;
- **Natural grasslands** – Fragmented and isolated areas of natural grassland comprise grassland attributes of moderate sensitivity. These areas are frequently also associated with wetland habitat of the region. The species composition of these areas provides indication of the natural status of the grassland remnants. A diverse composition that is typical of the Eastern Highveld Grassland vegetation type comprises an admixture of forbs (particularly geophytes) and grasses. It should be noted that, at this stage of the process, no distinction is yet made between prime grassland and areas where a poor quality is prevalent;
- **Wetlands** – all areas of wetland related habitat as discussed earlier in this report.; and

- **Transformed habitat** – all areas where development has resulted in the decimation of natural habitat. Species generally associated with these areas comprises plants that are used for garden purposes, windbreaks or species associated with habitat transformation.

Sensitivities associated with the latter identified macro habitats;

- **Agricultural fields** – No attributes of natural habitat remains within these areas and a low ecological sensitivity is ascribed to these parts. It is also unlikely that these areas will recover to a natural state;
- **Natural grasslands** – A moderate to high sensitivity (depending on the actual status) is normally ascribed to these parts, mainly as a result of the severe fragmentation and isolation of remaining fragments;
- **Wetlands** – A high sensitivity is ascribed to these parts although the specialist studies will further investigate and aid in sensitivity analysis, currently a 100m buffer is being prescribed; and
- **Transformed habitat** – No attributes of natural habitat remains within these areas and a low ecological sensitivity is ascribed to these parts. It is also unlikely that these areas will recover to a natural state.

3.13 Avifauna

3.13.1 Regional Avifaunal Description

Data on the bird species that could occur in the study area and their abundance was obtained from the Southern African Bird Atlas Project (Harrison et al, 1997). These data provided an indication of the bird species that were recorded in the quarter degree squares within which this proposed project falls.

The table below indicate Red Listed bird species recorded in the quarter degree squares within which the study area is located (Harrison et al, 1997). Report rates are percentages of the number of times a species was recorded by the number of times the square was counted. Conservation status is classified according to Barnes (2000).

Table 22: Red Listed bird species recorded in the quarter degree squares

Total Cards		66	64
Total Species		193	221
Total Breeding Species		44	27
Name	Conservation status	2629BA report rate	2529DC report rate
Botha's Lark	EN	2	-
Southern Bald Ibis	VU	5	14
African Marsh-Harrier	VU	2	-
Lesser Kestrel	VU	3	13
African Grass Owl	VU	2	2
Denham's Bustard	VU	-	2
White-bellied Korhaan	VU	-	2
Yellow-billed Stork	NT	3	-
Greater Flamingo	NT	27	36
Lesser Flamingo	NT	8	17
Secretarybird	NT	3	5
Black Harrier	NT	2	-
Pallid Harrier	NT	-	2
Blue Korhaan	NT	3	2
Black-winged Pratincole	NT	5	2
Black Stork	NT	-	5
White Stork	Bonn	11	14

EN=Endangered; VU=Vulnerable; NT=Near-threatened; Bonn=Protected Internationally under the Bonn Convention on Migratory Species.

The SABAP data lists 1 Endangered, 6 Vulnerable and 9 near threatened species as occurring within the study area. In addition, one species, the White Stork is protected internationally under the Bonn Convention on Migratory Species.

SABAP 2 data was also consulted, with the two pentads in the study area, 2600_2935 and 2555_2935, recording totals of 70 and 78 species respectively. Only one card had been submitted for pentad 2600_2935, while three counts have been conducted in pentad 2555_2935 to date. This represents insufficient data to be considered an accurate indication of species present or absent. It was noted, however, that pentad 2555_2935 had report rates of 33% (i.e. 1 of 3 counts) for both Greater and Lesser Flamingoes.

The 2629BA QDGS, in which the proposed site is located, also incorporates part of an Important Bird Area (IBA) - Amersfoort-bethal-carolina District. Although this IBA falls outside of the 8km study radius, it is known to hold a large proportion (>10%) of the global population of the endangered Botha's Lark (Barnes 1998). This species favors short dense, natural grassland found on plateaus and upper hill slopes. Such habitat was not observed at the proposed site for this project. The majority of the study area comprised of agricultural lands, planted pastures, vleis and dams which are habitats not usually preferred by Botha's Lark.

3.13.2 Avifaunal Micro-habitats

An examination of the micro habitats available to birds was conducted during the initial site investigations. These are generally evident at a much smaller spatial scale than vegetation types, and are determined by a host of factors such as vegetation type, topography, land use and manmade infrastructure. The following micro-habitats were identified in the study area.

- **Cultivated Lands and Pasture**

Arable or cultivated land as well as pastures, represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Arable lands exist in this study area, mostly planted to pasture or corn at the time of site visit. Relevant bird species that will be attracted to these areas include the Denham's Bustard and White Stork.

- **Drainage Lines and Wetlands**

Drainage lines and wetlands are an important form of habitat to numerous species. Drainage lines are often surrounded by natural grasslands, which may provide habitat for species such as African Grass Owl and Botha's lark. Various waterfowl, such as ducks and geese, may make use of these areas.

- **Man-made Dams**

Artificially constructed dams (such as the dam located to the east of the study area in the middle of the NFEPA Wetland) have become important attractants to various bird species in the South African landscape. Various waterfowl frequent these areas and crane species often use dams to roost in communally. Birds such as flamingos and African Spoonbills may make use of these areas, although not identified during the initial field investigations.

- **Open Grassland**

Grasslands represent a significant feeding area for many bird species, as well as possible breeding areas for others such as the African Grass Owl. Specifically, these open grassland patches typically attract the Blue Crane, Grey Crowned Crane (which have been identified in the nearby IBA discussed above) Sothern Bald Ibis, Secretarybird, White-bellied Korhaan, Denham's Bustard and White Stork. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl. This in turn attracts large raptors because of both the presence and accessibility of prey.

- **Stands of Alien Trees**

These areas will mostly be important to physically smaller bird species and passerines, as well as providing roosting for certain raptors and larger species such as Geese and Ibises.

The table below shows the micro habitats that each Red Data bird typically frequents in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis below represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where impacts on those species will be most significant.

Table 23: Preferred Micro-habitats and likelihood of occurrence on site of Red Data species recorded in the relevant QDGS's.

Species	Preferred Micro-habitat	Likelihood of occurrence on site
Botha's Lark	Long, mature natural grassland	Unlikely
Southern Bald Ibis	Grassland	Likely
African Marsh-Harrier	Dams and Wetlands	Possible
Lesser Kestrel	Arable lands and Grasslands	Possible
African Grass Owl	Grasslands	Unlikely
Denham's Bustard	Cultivated lands and Grasslands	Possible
White-bellied Korhaan	Cultivated lands and Grasslands	Possible
Yellow-billed Stork	Cultivated lands and Grasslands	Possible
Greater Flamingo	Dams and wetlands	Possible
Lesser Flamingo	Dams and Wetlands	Possible
Secretarybird	Cultivated lands and Grasslands	Unlikely
Black Harrier	Cultivated lands and Grasslands	Possible
Pallid Harrier	Grasslands and Wetlands	Unlikely
Blue Korhaan	Cultivated lands and Grasslands	Possible
Black-winged Pratincole	Cultivated lands and Grasslands	Possible
Black Stork	Rivers and Kloofs	Unlikely
White Stork	Cultivated lands and Grasslands	Likely

3.14 Surface Water Systems

A characterisation of the rivers in the study area reveals that the receiving Klein-Olifants River is an order three river. Six attributes were used to obtain the PES on desktop quaternary catchment level. These attributes predominantly suggest to habitat integrity of instream and riparian habitat. With this in mind, the receiving Klein-Olifants River and the Woestalleen systems fall within a D-category, which relates to a largely transformed ecosystem state. Biological communities also reflect fair to unacceptable health in these systems (RHP, 2001). The instream habitat associated with the ecoregion in the study area reflects more degradation than adjacent ecoregions (RHP, 2001). According to the desktop PES category from DWAF (2000), the rivers in quaternary catchment B12B fall in a C ecological category, indicating a moderately modified ecosystem with clear community modifications and some impairment of health evident.

The catchment at present is affected by severe erosion, sedimentation, weirs, infrastructural development in the form of power stations and mines, and translocation of species (Labeo umbratus). The EIS (DWAF, 2000) is considered moderately sensitive due to the expected presence of flow intolerant fish species in parts of the catchment, and the system's sensitivity to changes in flow and water quality.

Table 24: Desktop river characterisation of rivers and streams located in the study area (Nel et al., 2004) and DWAF (2000).

	Klein-Olifants River	Woestalleen System
River Order	3	1
Quaternary Catchment	B12B	B12B
Class	Perennial	Perennial
PES (NSBA)	D	D
PES (DWAF)	C	C
EIS (DWAF)	Moderate	Moderate
Conservation Status (NSBA)	Critically Endangered	Critically Endangered

The proposed development site falls within the Upper Olifants Sub-Area of the Olifants Water Management Area (WMA4). The Upper Olifants Sub-Area is the most urbanised of the 4 sub-areas in WMA4. The Upper Olifants covers an area of 11 464 km^2 with a mean annual runoff of 10 780 million m^3 (Midgley et al., 1994). Surface runoff in this area is regulated by a number of large dams, namely Witbank, Bronkhorstspruit and the Middelburg dams (Basson et al., 1997). Majority of the urban population is located in Witbank and Middelburg areas, and it is projected that the population in these urban areas is expected to grow in the near future therefore increasing the water requirement in the Sub-Area. Extensive coal mining activities are taking place in the sub-area, both for export to other provinces and for use in the six active coal fired power stations in the sub-area. Water quality in this sub-area is therefore under threat. Mining activities in the area impact on the natural hydrological system by increasing infiltration and recharge rates of the groundwater. Approximately 62 million m^3 is predicted to decant from mining activities (post closure) every year, creating a need for water quality management plans in this Sub-Area (DWAF, 2004).

Table 25: Reconciliation of water requirements and availability (million m^3/a) for the year 2000 in the Olifants Water Management Area (DWAF, 2004b).

Sub-area	MAR	Local yield	Transfers in	Transfer out	Local requirement	Deficit
Upper Olifants	465	238	171	96	314	1
Middle Olifants	481	210	91	3	392	94
Steelpoort	396	61	0	0	95	34
Lower Olifants	698	100	1	0	104	63

3.15 Sites of Archaeological, Historical and Cultural Interest

The only known significant heritage sites are situated outside of the study area but in close proximity to the proposed development. Due to the fact that the study area is characterised by agricultural, industrial and mining activities it was anticipated that no significant heritage sites will be identified in the area, although graves have been observed during the initial site investigations. A full Heritage impact assessment will be undertaken on the preferred site in the EIA phase of the study. A relatively large graveyard has been identified to the north of the proposed development site, as well as a much smaller grave yard to the south of the study area, both outside of the proposed development site, but in close proximity.

3.16 Social Environmental Aspects

The Kebrafield Roodepoort Colliery is situated in the Mpumalanga Province and within the Steve Tshwete Local Municipality area of jurisdiction. The closest towns include Hendrina and Middelburg with the small community of Pullenshope situated right next to the proposed development site on the eastern border.

The town of Hendrina was proclaimed on 5 June 1916 and is approximately 20 km from the proposed Kebrafield Roodepoort Colliery. Hendrina is the second largest town in the municipality (after Middelburg). The main business / commercial activities in Hendrina include the OTK cooperation and a large manufacturing company.
Pullenshope is situated directly to the east of the proposed project site and is considered to be the fourth largest settlement in the municipal area. The original stands were developed by Eskom to accommodate personnel employed at the Hendrina power station. The current ownership of the community is assumed to be municipal however, this remains to be confirmed as some articles suggest private ownership mainly exists within the town today.

The socioeconomic analysis is specifically aimed at spatial related matters, i.e. demographics, employment and income and economic profile. The 2001 Census figures were used and comparisons were made with the Demarcation Board Data. The latter is based on the 1996 Census data which has been statistically manipulated to coincide with the newly demarcated study area. The following tables below represent and summarize the key social environmental data for the study area.

Table 26: Population Growth in Steve Tshwete Local Municipality

	2001	1996	% Growth	% Average Annual Growth
African	114 371	91 224	25,4	5,1
Coloured	3 547	3 530	0,5	0,1
Indian	1 313	1 900	31,0	6,2
White	23 541	37 747	38,0	7,6
Total	**142 772**	**135 412**	**5,4**	**1,08**

Table 27: Number and Percentage by Gender

	Male	Female	Total	Male %	Female %	Total %
Steve Tshwete	70 596	72 184	142 772	49,4	50,6	**100**
Nkangala	491 225	529 363	1 020 590	48,1	51,9	**100**
Mpumalanga	1 497 325	1 625 985	3 122 985	47,9	52,1	**100**

Table 28: Level of Education in Steve Tshwete Local Municipality

Persons	2001	%
None	15 769	27,8
Pre School	2 063	3,6
School	37 243	65,6
College	958	1,7
Technikon	319	0,6
University	226	0,4
Adult Education Centre	48	0,1
Other	132	0,2
Total	**56 758**	**100**

Table 29: Population Growth Rate 1996 – 2006 in Steve Tshwete Local Municipality

Area	Population Growth		Population 2001	Population Increase 2001 - 2006
	1991 - 1996	1996 - 2001		
Middelburg	1,1	3,3	42 296	49 750
Mhluzi	10,6	1,7	46 011	46 011
Hendrina	1,5	8,9	885	885
Kwazamokhule	17,9	2,0	12 843	14 180
Middelburg NU	12,0	2,3	40 737	45 642
Middelburg (MP 313)	0,7	1,1	142 772	156 468

Table 30: Informal, Formal and Unemployed Workforce 2001 in Steve Tshwete Local Municipality

Area	1996	%	2001	%
Employed	47 423	80,4	41 678	64,6
Unemployment	11 574	19,6	22 798	35,4
Not economically active	-	-	31 619	-
Total labour force	**58 997**	**100**	**64 476**	**100**

Table 31: Individual Monthly Income in Steve Tshwete Local Municipality

Persons	1996	%	2001	%
None	91 608	64,2	54 806	53,7
R1 - R400	6 258	4,4	3 586	3,5
R401 - R800	13 100	9,2	17 642	17,3
R801 - R1600	9 897	6,9	6 257	6,1
R1 601 – R3 200	9 888	6,9	6 057	6,0
R3 201 - R6 400	6 723	4,7	9 666	9,5
R6 401 - R12 800	3 593	2,5	2 957	2,9
R12 801 - R25 600	1 177	0,8	624	0,6
R25 601 - R51 200	278	0,2	285	0,3
R51 201 - R102 400	135	0,1	93	0,1
R102 401 - R204 800	90	0,08	-	-
Over R204 801	25	0,02	-	-
Total	**142 772**	**100**	**101 973**	**100**

Table 32: Annual Household Income in Steve Tshwete Local Municipality

Household	1996	%	2001	%
None	5 578	15,1	1 691	7,1
R1 - R4 800	2 163	5,8	929	3,9
R4 801 - R9 600	5 068	13,7	3 122	13,1
R9 601 - R19 200	6 397	17,3	5 417	22,8
R19 201 - R38 400	6 705	18,1	4 740	19,9
R38 401 - R76 800	5 008	13,5	3 269	13,7
R76 801 - R153 600	3 604	9,7	2 947	12,4
R153 601 - R307 200	1 784	4,8	1 563	6,6
R307 201 - R614 400	479	1,3	113	0,5
R614 401 - R1 228 800	123	0,3	-	-
R1 228 801 - R2 457 600	95	0,3	-	-
Over R2 457 600	39	0,1	-	-
Total	**37 043**	**100**	**23 791**	**100**

Table 33: Growth rates 1996 - 2002

Sectors	1996 - 1999	1999 - 2002	1996 - 2002
Agriculture	0.2	3.4	1.6
Mining	7.5	2.0	2.6
Manufacturing	2.7	7.3	5.0
Electricity	2.9	7.8	5.3
Construction	6.9	2.1	2.3
Trade	3.8	4.1	3.9
Transport	12.6	9.0	10.8
Finance	12.4	7.0	9.7
Comm. services	0.3	0.6	0.4
Total	**4.1**	**4.2**	**4.2**

During the EIA phase the latest statistics will be included in order to determine if the trend that is seen with these figures are still relevant. If major changes did occur within this local municipality it will be reflected in the EIA. It must also be investigated if these trends differ if in actual fact this will have a influence on this project from a social point of view.

3.17 Servitudes

During the mining right EIA various Eskom Transmission lines were identified and Eskom was also invited as an Interested and Affect Party to the EIA process. Eskom will also be informed of the particular NEMA application as the mining right EIA covered a much larger area including various farms and farm protions. For this particular application only the farm Roodepoort 151IS portion 17 is applicable and the preliminary identified Eskom Transmission services are indicated in the mine plan below as yellow dashed lines. Eskom indicated that they will raise no objection to the proposed mining provided that their rights and services are acknowledged and respected at all times.

The road which transects the mining area is indicated in the image below as the orange line and will need to be diverted around the mining area. SANRAL will be informed and the necessary approvals will need to be granted before such road diversion will be implemented. A traffic Engineer, Cobus Havenga has been appointed to liaise with SANRAL regarding the diversion of the road.

Transnet responded to Eco Elementum during the PP process in a formal letter (Ref: PYP/W1/07/05/NC/15963) and indicated that our Background Information Document with reference numbers 17/2/3N-289 and MP30/5/1/2/2/479 MR dated 29 Oct 2013 has reference. Transnet further went on to state that Transnet Pipelines (ex-Petronet), a division of Transnet SOC Limited, is not affected by the proposal as indicated on our Topographical & Overview Maps and Aerial Images.

Figure 43: Servitudes identified within the proposed mining layout

4. Alternatives

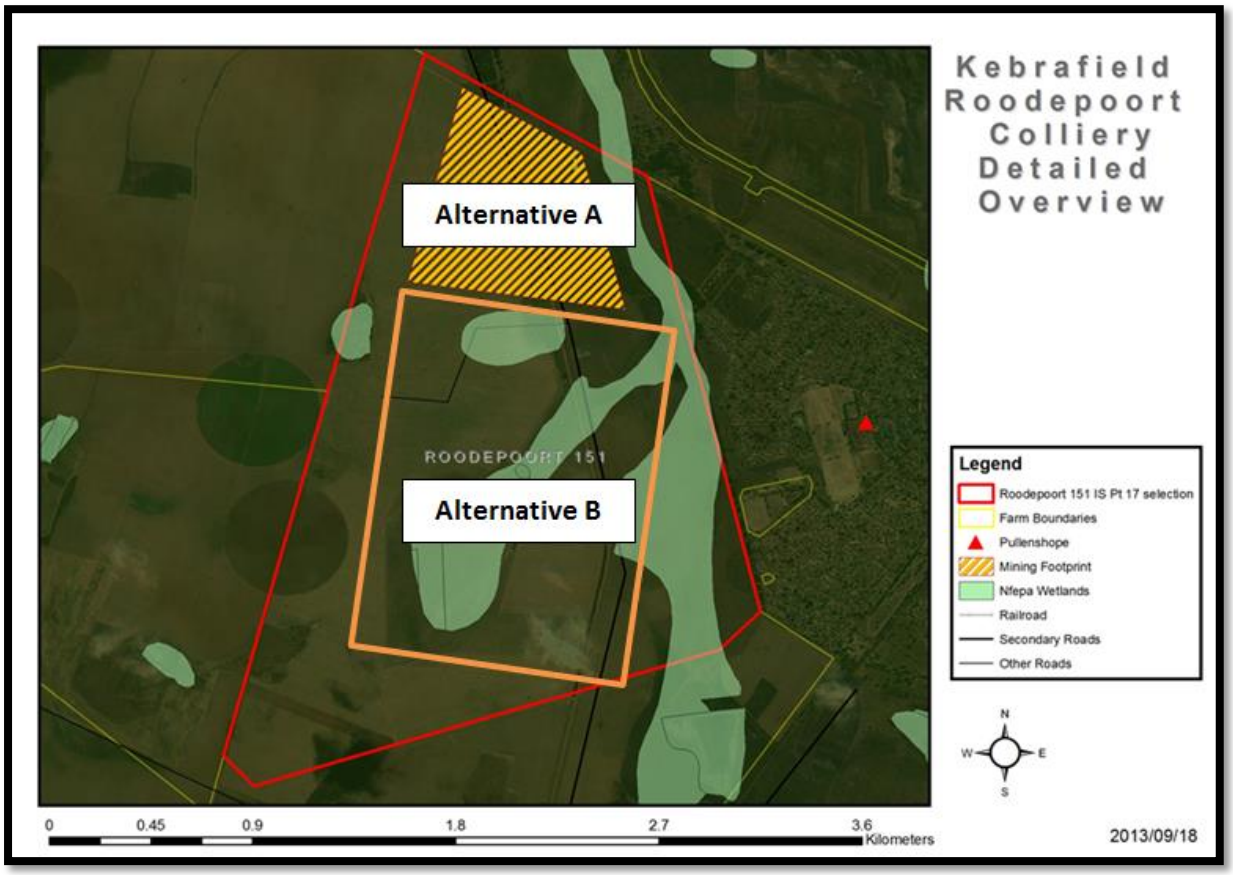
The IEM procedure stipulates that the environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. The various alternatives are assessed 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*".

4.1 Property or Location Alternatives

For the purpose of this EIA farm portion 17 of the farm Roodepoort 151IS was considered due to the positive results obtained during prospecting with regards to the underlying mineral reserve; high grade coal. An initial

desktop survey indicating the NFEPA wetlands were conducted as a pre-feasibility study and it was indicate that various wetland areas do transect this particular farm portion. The only position that was left for the proposed opencast mine was at the furthest northern edge on the farm. This area covers a mere 60ha of the total approximately 410ha farm portion. If viable the proponent would have wanted to mine the entire farm portion indicated in the image below, but as can be observed the wetlands do not allow for alternative layouts and this is the optimal layout for opencast operations. The hatched yellow polygon indicates the proposed opencast area as Alternative A while the orange polygon feature indicates alternative B. Both alternative A and B have been indicated in the figure below with 'text boxes'. A NFEPA wetland transects the area marked as alternative B and therefore it is not viable to mine this section unless a serious offset strategy is in place. The cost associated with off-set strategies will not be viable given the size of the reserve at 800 000ton mineable reserves. Given both the fact that there is sensitive wetland habitat and the cost involved with offset strategies, alternative A is better than alternative B.



4.2 Type of Activity to be Undertaken Alternatives

Alternative A which is suggested is mining of coal due to the results obtained during the prospecting phase, while alternative B would be to use the area for its agricultural potential. Based on the land cover map the area to the east of the proposed mining area is already being mined by various other mines. It might be beneficial to develop this new mine in an area where mining is already taking place and all the auxiliary mining services are

readily available. The coal is also of a very high grade and job creation will be more than for alternative B if agriculture continued. The area is currently being used for grazing land while Alternative A of mining the area will only disturb the grazing land for a period of three years where after it will be rehabilitated back to its original state, which will be grazing once again. The impact on the type of activity which could be undertaken alternatively if Alternative A was decided upon would be temporary and Alternative B would also have the potential to be undertaken after the three year life of mine period. Other alternatives for types of activities to be undertaken could be Alternative C as a residential development. Pullenshope is already to the east of the project area and creating a residential development on portion 17 of the farm Roodepoort 151IS will require its own infrastructure, services and clearance of vegetation. There is a great possibility that wetland crossings will be required to reach the existing Pullenshope town and this will impact upon the wetland system. Alternative A and B do not require any wetland crossings at the moment and propose to protect the wetland areas. Alternative C will have longer term impacts on the environment than alternative A and B from a general and sewage waste generation perspective.

4.3 Design or Layout Alternatives for the Activity

Overburden placement

The first design Alternative A is the current layout as it is depicted in the mine planning reports throughout this report. Alternative B would be to change the placement of overburden towards the eastern edge of the mine instead. This however would pose a risk to the water quality in the receiving wetland area as leachate might occur. The best would be to keep the overburden dumps as far away as possible from the wetland receptors.

Roads

Alternative A is to divert the current road around the opencast mining area to ensure the vehicles do not have to travel through the mining area. Alternative B would be to keep the road in its current position and mine on both sides of the road. Alternative B poses a great safety concern and at the same time will sterilise a lot of the reserve. Alternative A would be preferred as traffic could then be diverted safely around the mine and a greater proportion of the reserve can be mined, ensuring better economic benefits to the local community and the country's economy as a whole.

Boxcut mining methods

Alternative A proposes to use a method of roll-over rehabilitation concurrently as mining progress. This way a minimum area is exposed at one point in time, the overburden dumps are kept to a minimum, the sandbank in the topsoil stay preserved as it is used quickly for rehabilitation and the overall mine closure liability is significantly reduced. Alternative B would be to open the entire reserve at once and close everything only at end of life of mine. This would ensure much better cash flow for the mine as concurrent rehabilitation costs would not

exist during the mining phase, however, the footprint will be much greater, there's a risk that the seedbank will become sterile, there's a risk that the mine closure liability become to great and insufficient provision is in place to close everything at once and the leachate from the overburden dumps and coal footprint areas will be much greater than for Alternative A. Alternative A would be recommended in this regard.

4.4 Technology Alternatives

Alternative A would use technology associated with opencast mining , while alternative B would be to use deep mining/underground methods. Deep coal mining or underground mining is the extraction of resources (coal in this case) below the ground surface. Underground mining takes place where it is uneconomical to remove the overburden from the seam. Deep coal mining is very expensive both to set up (initial costs) and also to run the mine (extraction of water and air regulation). Deep coal mining however has very little effect on any natural habitats and has little surface disruption other than a pit shaft and works (assuming there is no subsidence.) Alternative A however can be considered as the coal is at a depth where it can be mined economically without the requirement to go underground. The coal seam depth varies between 6m to 28m and at a depth of 6m underground mining in accordance with alternative B would not even be viable due to the safety associated with the roof thickness.

Alternative A is open cast mining where the coal seam is relatively close to the surface, thus it is cost effective to remove overlying rocks to access the coal. The coal is then extracted. Open cast mining often has higher tonnage as for alternative B pillars would have been left underground sterilising a proportion of the resource. Open cast (surface mining) affects habitats greatly (either by direct destruction, or indirectly such as blasting. In this case alternative A is preferred as the coal is very close to the surface at sections and due to the fact that it is economically much more viable than underground methods for this particular reserve.

4.5 No-go Alternative

The no-go alternative would entail not mining the reserve and leaving the area as grazing land. Coal is currently becoming a very strategic resource in South Africa and as has also been highlighted in the project motivation coal resources are essential to ensure economic growth in South Africa. By not implementing this project in excess of 100 jobs will not be created and 800 000tons of coal which could potentially have benefitted the economy would become sterilised. The negative impacts on the environment however would not exist should the project not be implemented, although it must also be considered that the present ecological status of the wetland is very low and ecological importance of the proposed mining area is not very significant as the case is currently. This EIA will include an EMP to consider management options to mitigate and in some instances even better

environmental conditions as it currently is for eg. the wetland management plan as part of the wetland specialist study which will form part of the overall EMP.

The main negative effects of the no-go alternative can be summarised as:

- Employment to a number of people during the construction and operational phases will not take place and no new opportunities will be presented to the local community. The numbers of jobs created are significant to the local and regional economy but will not exist if the project does not continue.
- No large capital investment and substantial offshore revenue generation will take place.
- No capital investment in the form of the company payroll will be instated.
- Significant amounts paid to the government in the form of local, regional and national taxes and levies will merely go lost.
- Creation and support of service-sector jobs, the annual procurement of large quantities of consumables and the outsourcing of service provision to local service providers will not take place and poverty will continue existing.
- No produce will be generated to go towards Eskom's Power Generation needs and therefor the electricity output needed in South Africa will not benefit from the project.

5. Public Participation Process

5.1 Introduction to Public Participation

Within Guideline 7 on *"Public Participation in the Environmental Impact Assessment Process"*, published by Department of Environmental Affairs (DEA) in October 2012, it is stated 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 but are not limited to the following:

- Provides an opportunity for Interested and Affected parties (I&APs), Environmental Assessment Practitioners (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 2).

5.2 Public Participation to date

Initial Public Participation has already been conducted during the Mining Right Application Phase (Ref MP 30/5/1/2/2/479 MR) by GEM-Science CC and is captured in the Public Participation Report dated 15 January 2011 in Annexure 2 of this report. This report however was for a mining right over the following properties, also including the property being applied for in this NEMA EIA;

- Bultfontein 187 IS portions 11, 15, 17, 18, 19 and the Remaining Extent,
- Driefontein 153 IS portions 1, 4, 6, 7, 8, 9, 10, 11, 20, 21, 22, 23, 24, 25 and the Remaining Extent,
- Geluk 26 IS portions 1, 2, 3, 8, 10, 11, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25 and the Remaining Extent,
- Wolvenfontein 471 JS portions 4, 10, 16 and 17,
- **Roodepoort 151 IS** portions 1, 2, 3, 5, 8, 9, 10, 11, 13, **17** and 18.

However, for this particular NEMA application only the farm **Roodepoort 151 IS portion 17** is being applied for and therefore a more focussed public participation will be conducted. The mining right public participation was very thorough but extensive in terms of the properties covered. Issues and concerns raised during the Mining Right EIA process will also be incorporated and addressed into this particular NEMA EIA and also addressed in the WULA.

The following PPP tasks were conducted to date for the proposed new Kebrafield Roodepoort Colliery NEMA EIA:

1. Identification of key Interested and Affected Parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties);

2. Formal notification of the application to key Interested and Affected Parties (all adjacent landowners) and other stakeholders;
3. Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments; and
4. Release of the Draft Scoping Report to I&APs and stakeholders for review and comment.

Task 1: I&AP and Stakeholder identification, registration and the creation of an electronic database

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 2) for I&AP and stakeholder database.

Task 2: Formal notification of the application to key Interested and Affected Parties (all adjacent landowners) and other stakeholders

The project was announced as follows:

Newspaper Advertisements;

Middelburg Observer – 22 000 prints

Advertising Representative
Advertensie Verteenwoordiger
MIDDELBURG Observer
Witbank DALLER
Gazette STREEK
Landline: 013 243 1434
Fax: 013 282 7477

Distribution areas for Middelburg Observer: Middelburg , Witbank, Belfast , Hendrina, Mines and Power Stations including Hendrina Power Station and the town of Pullenshope situated directly adjacent to the proposed project area.

Refer to the PPP Report (Annexure 2) for proof of placement of the newspaper advert.

Public notice placement

Notices informing the public of the proposed mining activities and the Open Days to take place and inviting their input, comments and concerns were done by fixing of four notice boards at places conspicuous to the public at the boundary or on the fence of the site where the activity to which the application relates is or is to be undertaken.

Refer to the PPP Report (Annexure 2) 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 40 days to comment and / or raise issues of concern regarding the proposed development. The commenting period expired on the 25 November 2013. However, comments were being received up to 21 February 2014 before the Final Scoping Report was released for a 21 day commenting period.

Refer to the PPP Report (Annexure 2) for a copy of the BID and proof of email notification.

Task3: Consultation and correspondence with I&APs and Stakeholders and the addressing of their comments.

I&APs have the opportunity to raise issues either in writing, by telephone, fax and/or email. Concerns raised, as well as responses to these concerns, are detailed in the Comments and Response Report.

All the issues raised by I&APs during the EIA process will be captured in a Comments and Response Report and I&APs will receive letters acknowledging their contributions.

Task 4: Release of the Draft Scoping Report to I&AP's and stakeholders for review and comment.

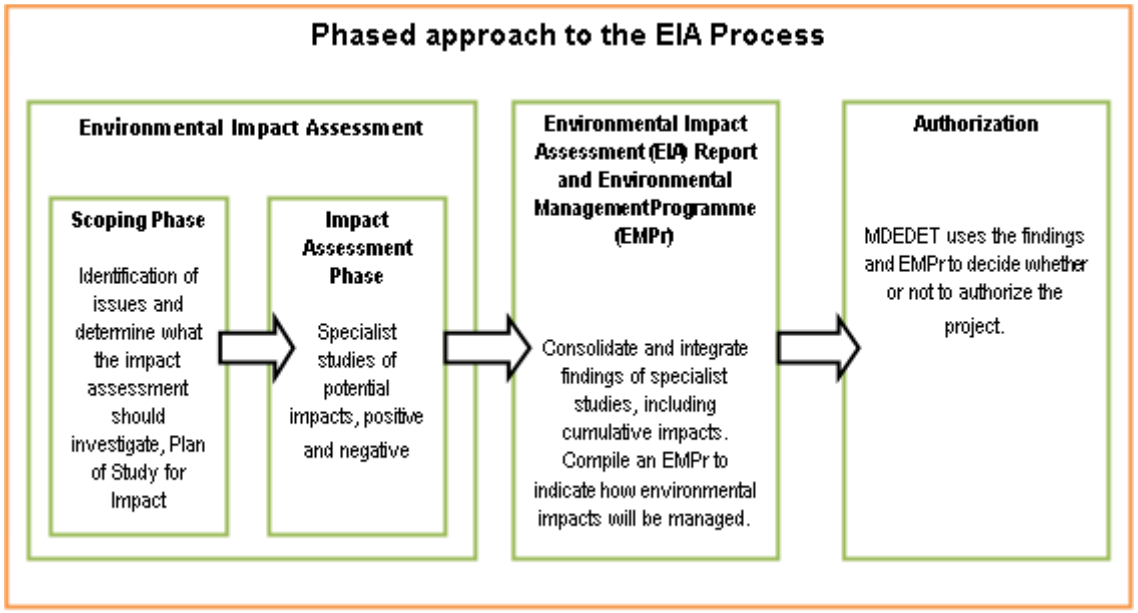
The Draft Scoping Report (DSR) and Plan of Study (POS) were submitted to the Competent Authority on 16 October 2013 as per the requirements of Regulation 56 (4). The DSR and supporting documentation were subsequently released for a period of 40 days from 15 October 2013 to 25 November 2013 for public 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 Pullenshope Public Library; and via email upon request to info@ecoelementum.co.za.

5.3 Public Participation Next Steps

All stakeholders and registered I&AP's will have the opportunity to review and comment on all the documents released in the Final Scoping, Draft EIA and Final EIA phases respectively. All final reports will be released for a period of 21 days for review and comment. The draft EIA will be released for 40 days. During all the PPP phases, hardcopies and CD's of all reports and supporting documents will be submitted to the organs of state and relevant authorities. All the reports will also be placed at the Pullenshope Public Library and via email upon request to info@ecoelementum.co.za.

All comments and responses received and sent throughout the entire process will be updated and included in comments and responses chapter (as attached in Annexure 2). Note that this PPP Report shall be updated at each phase as required.

6. Environmental Impact Assessment Approach and Methodology



6.1 Scoping Phase Process

A scoping study is conducted as the first phase in the EIA process during which:

- Project and baseline environmental information is collated. Baseline information for the scoping report is gathered through visual inspections during field visits of the proposed project area and surroundings, desktop studies and review of existing reports available to the EAP.
- Landowners, adjacent landowners, local authorities, environmental authorities, as well as other stakeholders which may be affected by the project, or that may have an interest in the environmental impacts of the project are identified.
- Interested and affected parties (I&APs) are informed about the proposed project.
- Public meetings are arranged and I&AP issues and concerns are identified.
- Environmental authorities are consulted to confirm legal and administrative requirements.
- Environmental issues and impacts are identified and described.
- Development alternatives are identified and evaluated, and non-feasible development alternatives are eliminated.
- The nature and extent for further investigations and specialist input required in the EIA phase is identified.
- The draft and final scoping reports are submitted for review by authorities, relevant organs of state and I&APs.
- Key I&AP issues and concerns are collated into an issues and response report for consideration in the EIA phase.

6.2 EIA Phase Process

After the initial scoping phase, the EIA phase of the application includes:

- Specialist investigations are undertaken in accordance with the terms of reference established in the scoping assessment (plan of study for EIA appended to the scoping report). The scope for specialist work is determined accordingly to the nature and scale of the project impacts.
- An evaluation of development alternatives and identification of a proposed option.
- An assessment of existing impacts (no-go development option), environmental impacts that may be associated with the proposed project option, and cumulative impacts using the impact assessment methodology.
- Identification of mitigation measures to address the environmental impacts and development of actions required to achieve the mitigation required.
- Consultation with I&APs.
- Incorporation of public comment received during scoping and the draft EIA into the final EIA report.
- Issuing of the final EIA report for review.
- After the draft EIA report was reviewed, comments received are incorporated in the final EIA report and final EMP.

6.3 EIA Programme and Opportunities for I&AP and Authority Involvement

Project Schedule for Scoping-EIR

Tasks to be performed	Number of days	Sep-13 Week 1	Sep-13 Week 2	Sep-13 Week 3	Sep-13 Week 4	Oct-13 Week 1	Oct-13 Week 2	Oct-13 Week 3	Oct-13 Week 4	Nov-13 Week 1	Nov-13 Week 2	Nov-13 Week 3	Nov-13 Week 4	Dec-13 Week 1	Dec-13 Week 2	Dec-13 Week 3	Dec-13 Week 4	Jan-14 Week 1	Jan-14 Week 2	Jan-14 Week 3	Jan-14 Week 4	Feb-14 Week 1	Feb-14 Week 2	Feb-14 Week 3	Feb-14 Week 4	Mar-14 Week 1	Mar-14 Week 2	Mar-14 Week 3	Mar-14 Week 4	Apr-14 Week 1	Apr-14 Week 2	Apr-14 Week 3	Apr-14 Week 4	May-14 Week 1	May-14 Week 2	May-14 Week 3	May-14 Week 4	Jun-14 Week 1	Jun-14 Week 2	Jun-14 Week 3	Jun-14 Week 4	Jul-14 Week 1	Jul-14 Week 2	Jul-14 Week 3	Jul-14 Week 4	Aug-14 Week 1	Aug-14 Week 2	Aug-14 Week 3	Aug-14 Week 4	Sep-14 Week 1	Sep-14 Week 2	Sep-14 Week 3	Sep-14 Week 4	Oct-14 Week 1	Oct-14 Week 2	Oct-14 Week 3	Oct-14 Week 4
EAP to complete Application Form and submit to Department.	7																																																										
If in order, the Department to acknowledge the application.	14																																																										
EAP to compile the draft Scoping Report (SR) (incl. the Plan of Study for EIA).	21																																																										
EAP to notify I&APs (incl. the State departments) (incl. placing notice(s) in the media) of the application as well as the availability of the draft SR.	7																																																										
Department to request comments from the State departments.	7																																																										
Commenting period of 40 days for I&APs and State departments to comment.	40																																																										
EAP to consider the comments received and complete the final SR.	14																																																										
EAP to make the final SR available to the registered I&APs for a 21-day commenting period.	21																																																										
Following the commenting period the EAP to submit the final SR together with any comments received on the final SR to the Department.	14																																																										
Department to acknowledge SR & Plan of Study for EIA.	14																																																										
If in order, the Department to accept the SR & Plan of Study for EIA.	30																																																										
EAP to undertake the EIA and compile the draft EIA Report ("EIAR") (including the draft EMP)	40																																																										
EAP to notify registered I&APs (incl. the State departments) of the availability of the draft EIAR for comment.	7																																																										
Department to request comments from the State Departments.	7																																																										
Commenting period of 40 days for I&APs and State departments.	40																																																										
EAP to consider the comments received and complete the final EIAR.	14																																																										
EAP to make the final EIAR available to the registered I&APs for a 21-day commenting period.	21																																																										
Following the commenting period the EAP to submit the final EIR together with any comments received on the final EIR to the Department.	14																																																										
Department to acknowledge EIR.	14																																																										
If in order, the Department to accept the EIR.	60																																																										
After having accepted the EIR, the Department to decide whether or not to grant or refuse Environmental Authorisation.	45																																																										
The Department to inform the applicant of its decision.	2																																																										
Applicant/EAP to notify I&APs of outcome and if authorised may only commence 20 days after the date of the authorisation.	20																																																										

7. Environmental Impacts

7.1 Potential Environmental Impacts

Potential impacts resulting from the proposed Kebrafield Roodepoort Colliery were identified using input from the following sectors:

- Views of interested and affected parties;
- Existing information;
- Site visit with the project team;
- Guidelines; and
- Legislation.

The following potential impacts were identified:

- Ground and Surface Water contamination;
- Geology, Soil and Land Capability;
- Socio-Economic Issues;
- Waste Products;
- Floral and Faunal Displacement;
- Impacts on the wetland and drainage patterns;
- Dust and Noise Impacts;
- Visual Impacts;
- Blast and Vibration Impacts;
- Identified heritage sites and
- Paleontological Impacts.

Table 34: Detailed breakdown of potential environmental impacts

Detailed Breakdown of Potential Environmental Impacts	
Ground Water Contamination	• During mining ground water can seep through the high walls and become contaminated in the pit when in contact with carbonaceous material • Based on the Acid Base Accounting score for the material that will be mined including the material used for backfill rehabilitation potential water contamination can occur • The drawdown effect can cause water sources in the vicinity of the opencast pit to potentially flow into the pit
Surface Water Contamination	• Open pit mining is associated with surface

	water contamination due to the leaching of stockpiles - also dependant on the characteristics of the stockpiled material • The quality of the water used for dust suppression has the potential to contaminate surface water sources • The clean and dirty water separation system could potentially contaminate surface water sources • Erosion of denuded soil surfaces could potentially increase the total dissolved solids and cause sedimentation of surface water sources
Geology, soil and land capability	• Opencast mining will impact the geology, soil and land capability and must be addressed during the backfill rollover rehabilitation
Socio-economic issues	• A potential positive impact could occur as the mine will create in excess of direct 100 jobs while many more indirect jobs will be created • The mining of the coal resource will positively impact on the economy of the country
Waste products	• General waste will be generated on site • Small amounts of hydrocarbon waste associated with maintenance activities will be generated on site • No washing of coal will take place on site therefore no negative impact from slurry dams
Flora and faunal displacement	• During opencast mining total displacement of flora and fauna will take place within the footprint of the opencast pit
Impacts on the wetlands and drainage patterns	• Potential impacts could arise due to mining in the vicinity of a wetland and therefore a 100m buffer must be adhered to according to specialist investigations. A WULA will however be applied for to authorise mining within the 500m radius from a wetland up and to the 100m buffer line. • Surface water drainage patterns will be altered according to the storm water management plan to ensure clean and

	dirty water separation.
Dust and noise impacts	• Mining is associated with dust and noise impacts as a result of blasting, excavation, stockpiling, crushing & screening and general vehicle movement on gravel roads.
Visual impacts	• Opencast mining is associated with potential visual impacts as a result of the stockpiles and waste rock dumps that is higher than the initial topography before mining
Blast & vibration impacts	• Blasting will be required during the opencast mining operation and potential blast and vibration impacts exist
Identified heritage sites	• Various graves have been identified during the initial site visits on the edge of the mining footprint (not within) that might be impacted due to mining activities
Paleontological impacts	• Based on the findings from the Paleontological investigation can we further determine possible impacts

7.2 Proposed Specialist Studies to Assess the Environmental Impacts

The following specialist studies and investigations are proposed to be undertaken in order to quantify and qualify the potential environmental impacts while also developing appropriate mitigation measures, management plans and monitoring schedules;

Table 35: Specialist Impact Studies

Specialist Impact Studies
Geohydrological Investigation, Impact Assessment and Modelling;
Hydrological/Surface Water Impact Assessment;
Wetland Delineation, Assessment and Impact Assessment (PES and EIS);
River Health Assessment (SASS5);
Floodline Determination;
Civil Engineering Pollution Control Dam Designs and Storm-water Management Plan,
Baseline Ambient Air Quality Assessment;
Baseline Noise Assessment;
Soils and Land Capability assessment;
Visual Impact Assessment;
Traffic Impact Assessment;

Heritage, Cultural and Archaeological Impact Assessment;
Social Impact Assessment;
Blast and Vibration Risk Assessment;
Wetland Management and Rehabilitation Plan;
Ecological, Fauna & Flora Impact Assessment; and
Paleontological Impact Assessment.

7.3 Impact Assessment Methodology

7.3.1 Introduction to Impact Assessment Methodology

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989). Although the ECA EIA Regulations have been repealed, the Guideline Document still provides good guidance for significance determination.

The level of detail as depicted in the EIA regulations were fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

The impact assessment criteria used to determine the impact of the proposed development are as follows:

- ***Nature*** of the impact;
- The ***Source*** of the Impact;
- Affected Stakeholders;
- ***Extent*** - The physical and spatial scale of the impact;
- ***Duration*** - The lifetime of the impact, that is measured in relation to the lifetime of the proposed development;

- ***Intensity*** - The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself;

- ***Probability*** - This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time;

- ***Mitigation*****:** The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

- ***Determination of Significance – Without Mitigation****:* Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required.

- ***Determination of Significance – With Mitigation***: Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the identified mitigation measures.

Previous experience has shown that it is often not feasible or practical to only identify and address possible impacts. The rating and ranking of impacts is often a controversial aspect because of the subjectivity involved in attaching values to impacts. Therefore, the assessment will concentrate on addressing key issues.

The methodology employed will involve a circular route, which will allow for the evaluation of the efficiency of the process itself. The project will be divided into three phases in order to assess impacts related to the Pre-construction, Construction and Operational phases. The assessment of actions in each phase will be conducted in the following order:

a) Identification of key issues;
b) Analysis of the activities relating to the proposed development;
c) Assessment of the potential impacts arising from the activities, without mitigation; and
d) Investigation of the relevant mitigation measures, as well as an assessment of their effectiveness in alleviating impacts.

7.3.2 Assessment of Biophysical Cumulative Impacts

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines and in terms of the Environmental Conservation Act, 1989 (Act No 73 of 1989) [ECA]. Although the ECA EIA Regulations have been repealed the Guideline Document still provides good guidance for significance determination.

Activities within the framework of the proposed development and their respective construction and operational phases, give raise to certain impacts. For the purpose of assessing these impacts, the project has been divided into two phases from which impacting activities can be identified, namely:

a) Construction phase: All the construction related activities on site, until the contractor leaves the site.

b) Operational phase: All activities, including the operation and maintenance of the proposed development.

The activities arising from each of these phases have been included in the tables. This is to identify activities that require certain environmental management actions to mitigate the impacts arising from them. The criteria against which the activities were assessed are given in the next section.

7.3.3 Assessment Criteria

EXTENT: GEOGRAPHICAL	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring properties, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extent beyond the boundaries of South Africa.
DURATION	
Short term	The impact would either disappear with mitigation or will be mitigated through natural processes in a period shorter than that of the construction phase.
Short – Medium term	The impact will be relevant through to the end of the construction phase.

Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
INTENSITY	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
PROBABILITY	
Impossible	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0%).
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.
Highly likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.
Definite	The impacts will take place regardless of any provisional plans, and or mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

7.3.4 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

Determination of Significance – Without Mitigation

Significance is determined through a synthesis of impacts as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

a) **No significance**: The impact is not substantial and does not require any mitigation action.

b) **Low:** The impact is of little importance, but may require limited mitigation.

c) **Medium:** The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.

d) **High:** The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

Determination of Significance – With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

a) **No significance:** The impact will be mitigated to the point where it is regarded as insubstantial.

b) **Low:** The impact will be mitigated to the point where it is of limited importance.

c) **Low to Medium**: The impact is of importance however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.

d) **Medium:** Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.

e) **Medium to High:** The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.

f) **High:** The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Assessment Weighting

Each aspect within the impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it is necessary to weigh and rank all criteria.

Ranking, Weighting and Scaling

For each impact under scrutiny, a scale weighting factor is attached to each respective impact (refer to the figure below). The purposes of assigning such weights serve to highlight those aspects considered most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspects criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Table 36: Description of the biophysical assessment paramaters with its respective weighting

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

8. Evaluation and Recommendations

8.1 Impact Identification Summary

The purpose of this report is to scope and identify the potential impacts associated with the proposed development of the Kebrafield Roodepoort Colliery. Potential impacts were identified in consultation with I&APs, and through the technical expertise and experience of the Environmental Assessment Practitioners.

The report sought to identify the impacts of the proposed development on the environment, of which we humans are part, and the probability of the impacts occurring.

The proposed opencast colliery can pose various risks to the environment as well as the residents in the vicinity of the development, although these risks are likely to be limited in its extent. The issues related to the development were identified and will be assessed and evaluated during the EIA phase in terms of various criteria such as extent, duration, intensity and significance.

Significant impacts to be considered during the EIA phase includes *inter alia*:

- Contamination of surface and groundwater;
- Air pollution caused by fugitive dust and noxious gas emissions;
- Loss of agricultural land;
- Sense of place and visual impacts;
- Socio-economic (positive);
- Traffic Impacts;
- Ecological (Faunal & Floral) Impacts;
- Archaeological and Heritage Impacts
- Blast and Vibration Impacts; and
- Noise impacts from operations.

8.2 Recommendations

A variety of specialist studies have been identified that will serve to suggest mitigation measures to mitigate the scale, intensity, duration or significance of the impacts associated with the proposed new Kebrafield Roodepoort Colliery. These include guidelines to be applied during the construction, operational and closure phases of the project. The Environmental Management Programme (EMPr) which will form part of the Environmental Impact Report will contain more detailed mitigation measures.

It is submitted that the proposed specialist studies will provide adequate mitigatory measures and that the scoping phase, together with the detailed Plan of Study, be approved in order for the Applicant to continue with the EIA phase.

Our recommendation, based on the assessment of the available information, is that application for the proposed development should continue, and that the Applicant be allowed to investigate the development of the Kebrafield Roodepoort Colliery on portion 17 of the farm Roodepoort 151IS. This authorisation should be in line with sensitive planning, design and good environmental management. Development of the proposed opencast colliery, should take the flood lines, wetland and sensitive riparian ecosystem into account, and the identified buffer along this strip must be honoured. The identified sites of archaeological and heritage importance must also be managed and preserved according to the recommendations of the specialist during the EIA phase. The necessary Water Use License must be obtained for all the water uses that will be triggered in terms of section 21 listed activities within the National Water Act. The results of the various studies and how this influenced the location of the opencast colliery will be reported on in the Environmental Impact Assessment Report, once authorisation for the Scoping Report has been received.

The proposed development of the opencast coal mine on portion 17 of the farm Roodepoort 151IS, Mpumalanga Province forms part of the Steve Tshwete Local Municipality. If the concept of sustainable development is considered it is proposed opencast colliery will have a positive impact on the provision of social and economic criteria. With the recommended guidelines which would be provided by the various specialists' studies; the ecological component can also be brought into balance.