ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED BRAKFONTEIN COAL MINE

MDEDET Reference

17/2/3 N-143

DMR Reference

MP30/5/1/1/2/10027MR

VOLUME 1 of 2

11 December 2012

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DIGBY WELLS ENVIRONMENTAL

This document has been prepared by **Digby Wells Environmental**.

Report Title: **Proposed Brakfontein Coal Mine**

Project Number: **UNI1292**

Name	Responsibility	Signature	Date
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Danie Otto	Project Sponsor		17 September 2012

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) has been appointed, by Universal Coal Plc, as the independent environmental consultant to conduct the Environmental Impact Assessment (EIA) and associated specialist studies in support of a Mining Right Application (MRA) for the mining of coal at the proposed Brakfontein Coal Mine. The application was lodged with the Department of Mineral Resources (DMR) in 2011 and acknowledgment and report request was received on the 28 March 2012. In addition, this EIA report is now submitted for public review and to the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) for environmental authorisation of listed activities in terms of the National Environmental Management Act (NEMA), Act 108 of 1998. This EIA report is the environmental document that will be submitted to comply with the required process in terms of the Mineral and Petroleum Resource Development Act, Act 28 of 2002 (MPRDA) as well as NEMA.

Universal Coal Plc has submitted a Mining Right Application to the Department of Mineral Resources (DMR) in November 2011 for proposed coal mining on Portions 6, 8, 9, 10, 20, 26, 30 and the Remaining Extent of the Farm Brakfontein 264 IR. The Prospecting Right for the proposed Brakfontein Project was granted to Unity Rocks Mining (Pty) Ltd on 10 July 2008; the Prospecting Right was issued under the Permit Number MP30/5/1/1/2/1879 PR. Universal Coal has entered into an agreement with Unity Rocks Mining and applied for an extension to the Prospecting Permit in July 2011.

The loss of agricultural soils and the impact on wetlands have been identified as issues of concern with regards to the biophysical aspects of the project area. Since the findings of these recommendations Universal Coal has decreased their footprint of their opencast pits and is investigating high wall mining from the open cast areas to extract coal with limited disturbance of the valuable topsoil and wetland areas.

The social and heritage studies identified potential issues around the project being the presence of graves and the impacts on households within the mining area. The relevant information has been submitted to SAHRA with regards to the buildings on site and Universal Coal has committed to placing a buffer around the graves and fencing these off. The households directly impacted by the project all fall within the land that Universal Coal will be purchasing (i.e. the farmer/landowner and his associated staff and farm workers. These arrangements in terms of resettlement or relocation will be investigated during the sale agreement of the land.

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1 INTRODUCTION

Digby Wells Environmental (Digby Wells) has been appointed, by Universal Coal Plc, as the independent environmental consultant to conduct the Environmental Impact Assessment (EIA) and associated specialist studies in support of a Mining Right Application (MRA) for the mining of coal at the proposed Brakfontein Coal Mine. The application was lodged with the Department of Mineral Resources (DMR) in 2011 and acknowledgment and report request was received on the 28 March 2012.

In addition, this EIA report is now being submitted for public review and to the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) for environmental authorisation of listed activities in terms of the National Environmental Management Act (NEMA), Act 108 of 1998.

This EIA report is the environmental document that will be submitted to comply with the required process in terms of the Mineral and Petroleum Resource Development Act, Act 28 of 2002 (MPRDA) as well as NEMA.

The EIA for the proposed Brakfontein Coal Mine will be submitted to the Department of Water Affairs (DWA) in support of an integrated water use license application.

The Scoping phase undertaken before the EIA was used as a guide for the compilation of this EIA Report and the Environmental Management Programme (EMPR). All registered Interested and Affected Parties (I&Aps) will be afforded the opportunity to review this report in due course.

2 METHODOLOGY

In terms of environmental permitting and licensing, this EIA and EMPR will also be available for public review from **26 September 2012 to 21 November 2012** after which the report will be finalised based on comments received and submitted to the respective authorising authorities as well as being released for final review into the public domain.

In terms of the NEMA and the MPRDA this project required a comprehensive Scoping EIA process to be undertaken.

2.1 Scoping Process

The investigations that were undertaken during the scoping phase included aspects such as the physical, biological and social environment. A general evaluation of the status of the pre-activity environment was also undertaken. The information in the Scoping Report was compiled from various sources, including information from the proponent or applicant, site visits, interviews and meetings with authorities and I&APs, and literature reviews. A screening level assessment was also undertaken before the Scoping phase.

Both the positive and negative potential impacts that the proposed operations will have on the environment were identified and discussed.

The Public Participation Process (PPP) is central to the investigation of environmental impacts as it is important that stakeholders who are potentially affected by the project are given an opportunity to identify issues relevant to them and to ensure that local knowledge, needs and values are understood and utilised. The views of stakeholders were included in the Scoping Report and were used either to validate the appropriateness of the specialist studies that were commissioned or to indicate where additional specialist studies were required to ensure that relevant issues are addressed.

Issues and impacts identified in the Scoping Report are described in detail and assessed in the EIA and mitigation methods are discussed in the EMP, which also deals with the implementation and monitoring of these mitigation measures.

The objectives of the Scoping Phase were to:

- Initiate investigations into the current receiving environment;
- Develop a project description that is adequate in detail to provide sufficient information;
- Identify and initiate consultation with stakeholders;
- Identify possible impacts that may occur as a result of the proposed project; and
- Formulate a plan of study for the EIA, this included the terms of reference for the identified required specialist investigations.

2.2 Environmental Impact Assessment

The EIA uses a rigorous, numerical environmental significance rating process which is based on the accepted impact assessment methodology that uses the probability of an event occurring and the severity of the impact, should an event occur, as factors to determine the significance of a particular environmental risk.

In order to determine the significance of any potential environmental impact, the criteria taken into consideration are the spatial extent of the impact, the duration of the impact and the severity of the impact. The probability of an impact occurring is determined by the frequency at which the activity takes place and by how often the type of impact in question has taken place or takes place in similar circumstances. The values assigned to these factors (weighting) are discussed as part of the EIA.

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of environmental impact assessment practitioners, propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the

assessment team, as well as that of the I&APs and authorities who ultimately provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific enquiry, the severity value assigned to impacts is highly dependent upon the perceptions and values of all involved. It is for this reason that it is crucial that all Environmental Impact Assessments make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent upon perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context.

The EIA assesses environmental and social impacts according to different stages of the proposed project, namely: the construction, operational, decommissioning and post-closure phases. Impact and benefit significance are assessed before and after the application of any mitigation or enhancement measures and refer to effects on both the ecological and social environment.

Lastly, the cumulative impacts of the proposed operation on the environment, with reference to similar operations and activities in the area are discussed.

The main objectives of the EIA Phase are to:

- Determine the sensitivity and ecological status quo of the receiving environment through specialist investigations;
- Identify the activities involved in all phases of the proposed project that may result in a detrimental or positive impact to the receiving environment;
- Determine the significance of identified impacts; and
- Relay findings of the EIA phase to all stakeholders.

2.3 Environmental Management Programme (EMPR)

The EMPR is aimed at addressing all environmental impacts that have been identified in the EIA phase and providing achievable mitigation measures to reduce or enhance the possible negative or positive impacts on the environment.

As the EIA indicates the relative significance of the various environmental impacts associated with these activities, it serves to focus the allocation of resources on environmental aspects and specific impacts requiring mitigation. The aim of the mitigation measures is to minimise the negative impacts and enhance the positive aspects of the project, as well as to inform and involve the local communities through the process.

The main objective of the EMPR is to:

- Provide information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified including cumulative impacts;
- Provide detailed description of the aspects of the activity that is covered by the EMPR;
- Identification of required monitoring programmes;
- Determine associated costs required for rehabilitation and / mitigation.

The EMPR section is divided into the setting of objectives and the planning of management measures. The monitoring and performance assessment section of the EMPR details the monitoring and audits that will be implemented to ensure the effectiveness of mitigation measures. The EMP section will aim to provide all necessary information in terms of Section 39 (1) of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA) and Regulation 33 of the EIA Regulations published in GN R543 in terms of the National Environmental Management Act, 1998 (NEMA).

2.4 Decision-Making Authority

Authorisation of the EMPR in support of a MRA will be provided by the Mpumalanga Department of Mineral Resources (DMR) while the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) will have jurisdiction on the consideration of the application for environmental authorisation under NEMA. The IWULA will be submitted to the DWA.

3 LEGAL FRAMEWORK

The following sections briefly introduce the South African principle legislation in terms of which the proposed project must be authorised before any construction activities may commence.

3.1 National Environmental Management Act, Act No. 107 of 1998 (NEMA)

The Environmental Management Act's (NEMA) as amended, EIA regulations GN R543 ("NEMA EIA Regulations") were published on the 18 June 2010 and came into effect on 2 August 2010. Together with the NEMA EIA Regulations, the Minister also published the following Regulations in terms of sections 24 and 24D of the NEMA:

- Regulation GN R544 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow the basic assessment process as described in section 21 to 25 of the NEMA Regulations;
- Regulation GN R545 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an

environmental impact assessment process as describer in section 26 to 35 of the NEMA Regulations; and

- Regulation GN R546 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process as described in section 21 to 25 of the NEMA Regulations will need to be followed.

3.2 Mineral and Petroleum Resource Development Act, Act No.28 of 2002 (MPRDA)

Universal Coal must be in possession of an approved Mining Right for the mining of coal on the respective farms, before mining operations may commence. In terms of the MPRDA various supporting documentation is required for the proposed project as part of the application for a Mining Right. In accordance with Section 23(5) of the MPRDA, the Mining Right will only come into effect on approval of the Environmental Management Programme (EMPr). Following the submission of the Scoping Report, the EIA and EMPr will be submitted to the DMR, on which a decision is expected to be made.

3.3 National Water Act, Act No. 36 of 1998 (NWA)

In accordance with Section 21 and 40 of the NWA a water use licence application will be submitted to the Department of Water Affairs (DWA). Investigations have to be undertaken in order to determine what activities will take place, as well as the impacts thereof. It is likely a license will be required for the following uses:

- Section 21 a – Abstraction of water;
- Section 21 b – Storage of water for both raw and potable water use;
- Section 21 c – Impeding or diverting the flow of water in a water course for crossing of streams via causeways as there is a stream crossing the mining area;
- Section 21 f – Discharging waste or water containing waste into a water resource through a pipe or canal for the disposal of sewage works effluent (if constructed);
- Section 21 g – Disposing waste or water containing waste in a manner which may detrimentally impact on a water resource for the pollution control dams, overburden dumps, coal stockpiles and discard dumps;
- Section 21 i – Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21 j – Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity for the safety of the people for the dewatering of the mining pits to facilitate mining and to provide a safe mining environment.

Government Notice (GN) R. 704

Regulation 4 of this government notice states that no residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution.

Regulation 5 states that no person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution. Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, while Regulation 7 details the requirements necessary for the protection of water resources.

Where any of GN 704 regulations are contravened, the user should apply for an exemption of regulations 4 and 5 from the Minister.

3.4 National Environmental Management: Waste Act, Act No. 59 of 2008 (NEMWA)

The waste management activities requiring a waste management licence in accordance with section 20(b) of the NEMWA are indicated in two separate categories. These activities are separated into two categories namely Category A and B;

- Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA regulations supporting an application for a waste management licence; and
- Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA regulations supporting a waste management licence application.

It has been determined that the volumes of waste expected at Brakfontein do not exceed the threshold as stipulated in the Act. The proposed sewage treatment plant has been replaced with small conservancy tanks which will be pumped clean twice a week.

3.5 Additional Legislation

The EIA study is not only subject to the terms and regulations of the MPRDA, NEMA, NEMWA and the NWA, but must also comply with other applicable South African statutory requirements and guideline documents relevant to the project. Table 3-1 includes a non-exhaustive list of legislation and guidelines that will be considered during the EIA.

Table 3-1: Additional legislation and guidelines applicable to the proposed Brakfontein Coal Mine.

National Legislation and Associated Regulations:
Water

National Legislation and Associated Regulations:
• Water Services Act, Act No. 108 of 1996; • DWAF: Best Practice Guideline G1: Storm Water Management; • DWAF: Best Practice Guideline G2: Water and Salt Balances; August 2006; • DWAF: Best Practice Guideline A4: Pollution Control Dams (PCD's); • DWAF: Best Practice Guideline GH: Water Reuse and Reclamation, June 2006; • DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998; • DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities; • SA Water Quality Guidelines – Aquatic Ecosystems, 1996, and • SA Water Quality Guidelines – Domestic Water Use, 1996.
Heritage Resources
• National Heritage Resources Act, Act No. 25 of 1999.
Fauna and Flora
• National Environment Management: Biodiversity Act, Act No. 10 of 2004; • National Forest Act, Act No. 84 of 1998; • Mpumalanga Nature Conservation Act 10 of 1998; and • Conservation of Agricultural Resources Act, Act No. 43 of 1983;
Waste
• DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998; and • DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities.
Atmospheric Emissions
• National Environmental Management: Air Quality Act, Act No. 36 of 2004 including Government Notice 220 of 26 March 2010; • DEAT Air Quality Guidelines; and • SANS 1929:2005 Edition 1.1 – Ambient Air Quality Limits for Common Pollutants.
Hazardous Materials

National Legislation and Associated Regulations:
• Hazardous Substances Act, Act No. 15 of 1973; • Occupational Health and Safety Act, Act No. 85 of 1993; • Major Hazardous Installation Regulations (July 2001); and • Regulations for Hazardous Chemical Substances (GNR 1179 GG 16596 of 25 August 1995).
Noise
• National Environmental Management: Air Quality Act, Act No 39 of 2004; and • SANS 10103:2008 The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication.
Roads & Rail
• National Road Traffic Act, Act No 93 of 1996; • National Road Traffic Act Regulations, GN R 225 of 2002; • SANS 10228; • SANS 10231; • SANS 10232-1; • SANS 10229:2005; • SANS10233;
Development
• Development Facilitation Act, Act 67 of 1995; • Electricity Act, Act 41 of 1987; • Electricity Regulations Act, Act 4 of 2006; and • National Building Regulations and Building Standards Act, Act No. 103 of 1977.

4 EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Digby Wells is experienced in environmental management and assessment and is familiar with the requirements for authorisation in terms of the MPRDA, NEMA, NWA and NEM:WA. The company is well known for its integrity and independence and for its skill in assisting I&APs to participate in the EIA process.

Mr. Danie Otto of Digby Wells is the lead Environmental Assessment Practitioner (EAP) for this project. He is a registered Professional Natural Scientist (Reg. No. 400096/02) with seventeen years' experience as a consulting environmental scientist and EIA project manager.

Neither Digby Wells, nor Mr. Otto, has any vested interest in the proposed project or the applicant's company.

CVs of Digby Wells' project team are available on request.

5 PROJECT DESCRIPTION

Universal Coal Plc has submitted a Mining Right Application to the Department of Mineral Resources (DMR) in November 2011 for proposed coal mining on Portions 6, 8, 9, 10, 20, 26, 30 and the Remaining Extent of the Farm Brakfontein 264 IR. The Prospecting Right for the proposed Brakfontein Project was granted to Unity Rocks Mining (Pty) Ltd on 10 July 2008; the Prospecting Right was issued under the Permit Number MP30/5/1/1/2/1879 PR. Universal Coal has entered into an agreement with Unity Rocks Mining and applied for an extension to the Prospecting Permit in July 2011.

5.1 Project motivation

Coal is one of the major primary energy sources in the world, principally because it is affordable to mine and large resources are available. In South Africa specifically, coal is the most abundant source of energy used for electricity generation. As South Africa's electricity utility, Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors. Eskom relies on coal fired power stations to produce approximately 95% of electricity used in South Africa, and uses over 90 million tons of coal per annum. Eskom is thus entirely dependent on the South African coal mining industry to supply it with coal. Coal mining in South Africa is relatively cheap compared to the rest of the world; these low costs have had an important effect on the nation's prosperity and potential for development.

Coal will have a major role in meeting future energy needs, and the demand for coal is set to continue for the foreseeable future. It is estimated that, over the next 30 years, the global energy demand will increase by almost 60%. Two thirds of this increase will come from developing countries, which will account for almost half of the global energy demand by 2030 (www.bp.com).

Changes in the global market are placing Eskom under increasing risk in terms of securing future supplies from the local market, in which the production capacity has not kept pace with increases in both local and international demand. It is critical that local production be facilitated to ensure long term security of supply for electricity production. Additional power stations and major power lines are being built to meet rising electricity demand in South Africa (Eskom Annual Report, 2008). Until such time as alternative sources of energy are successfully and affordably implemented, coal will remain the primary source in South Africa.

The proposed Brakfontein Coal Mine has a gross *in situ* resource of 78 million tonnes (mt) that can be classified as multi-product coal that would yield a significant portion of export steam coal. The anticipated life of mine (LoM) is close to 30 years.

Benefits associated with the proposed Brakfontein Coal Mine project are as follows:

- Coal will be directly supplied to Eskom where it will be burnt to generate electricity to be distributed throughout Southern Africa. Due to increased development and demand for electricity, there is an ever-increasing need for coal mines to continue to produce coal for supply to Eskom;
- Approximately 235 direct employment opportunities will become available, in addition to indirect small-scale economic benefits and employment opportunities;
- Training will be provided to employees resulting in an improvement of the local skills base;
- By means of their SLP, the proponent will invest in social capital and promote sustainable LED in the surrounding areas;
- The local and national economy will be supported through the procurement of goods and services required by the mine; and
- The export of coal will contribute towards South Africa's foreign revenue, and is a means to generate export income.

5.2 Project Applicant

As can be seen in the organogram below (Figure 5-2), Universal Coal Development III (Pty) Ltd is owned by Universal Coal and Energy (Pty) Ltd, a wholly owned subsidiary company of Universal Coal PLC.

Table 5-1: Applicant details

Applicant Name:	Universal Coal Development III (Proprietary) Limited
Company Registration No	2007/032600/07
Contact Person	Mr Mike Seeger / Minah Moabi
Telephone	(012) 460 0805
Physical Address	Universal Coal Head Office 467 Fehrsen Street Brooklyn Pretoria 0181

Postal Address	P O Box 2423 Brooklyn Square 0075

Universal Coals' five potential operations are illustrated below in Figure 5-1.

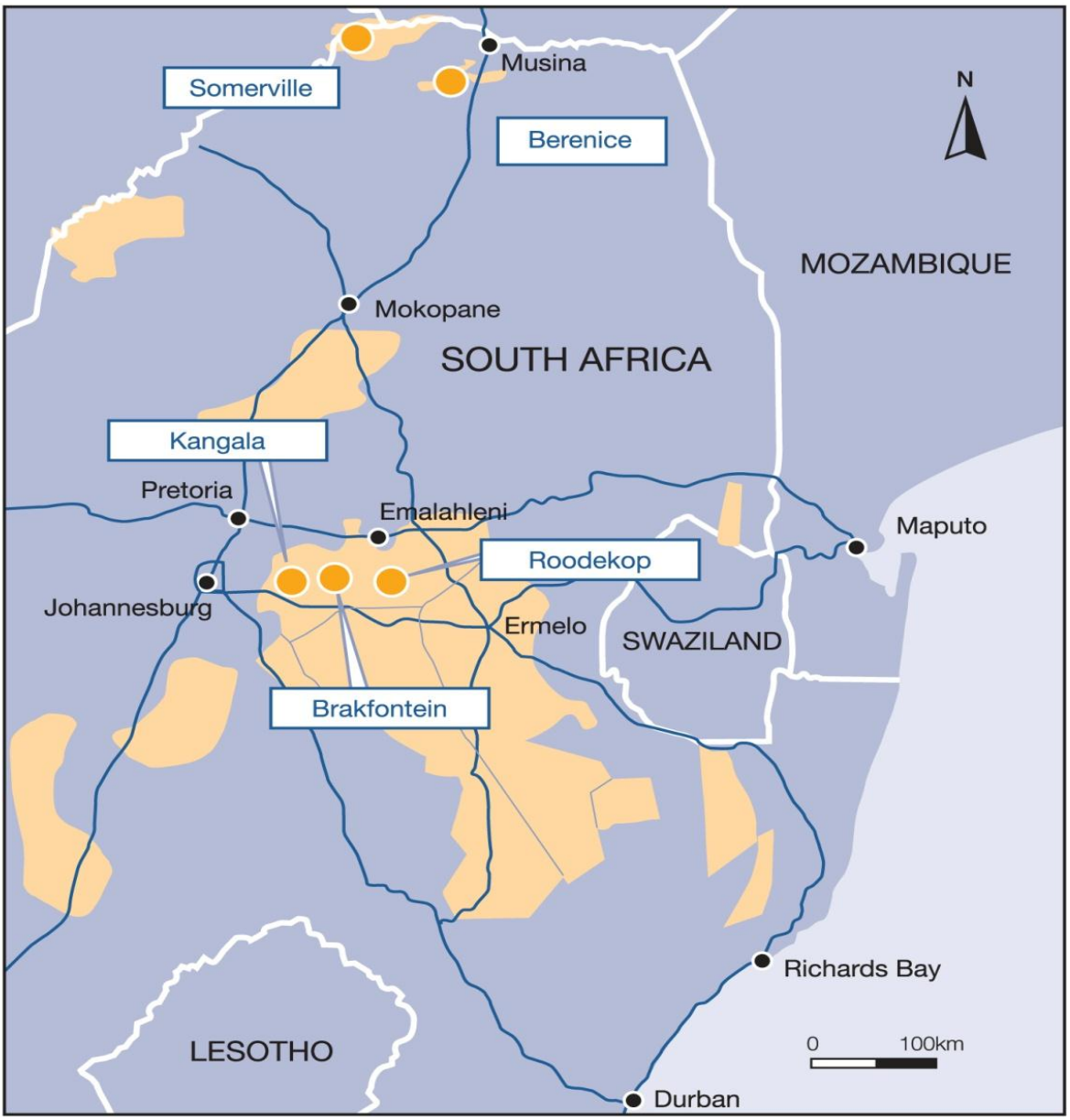
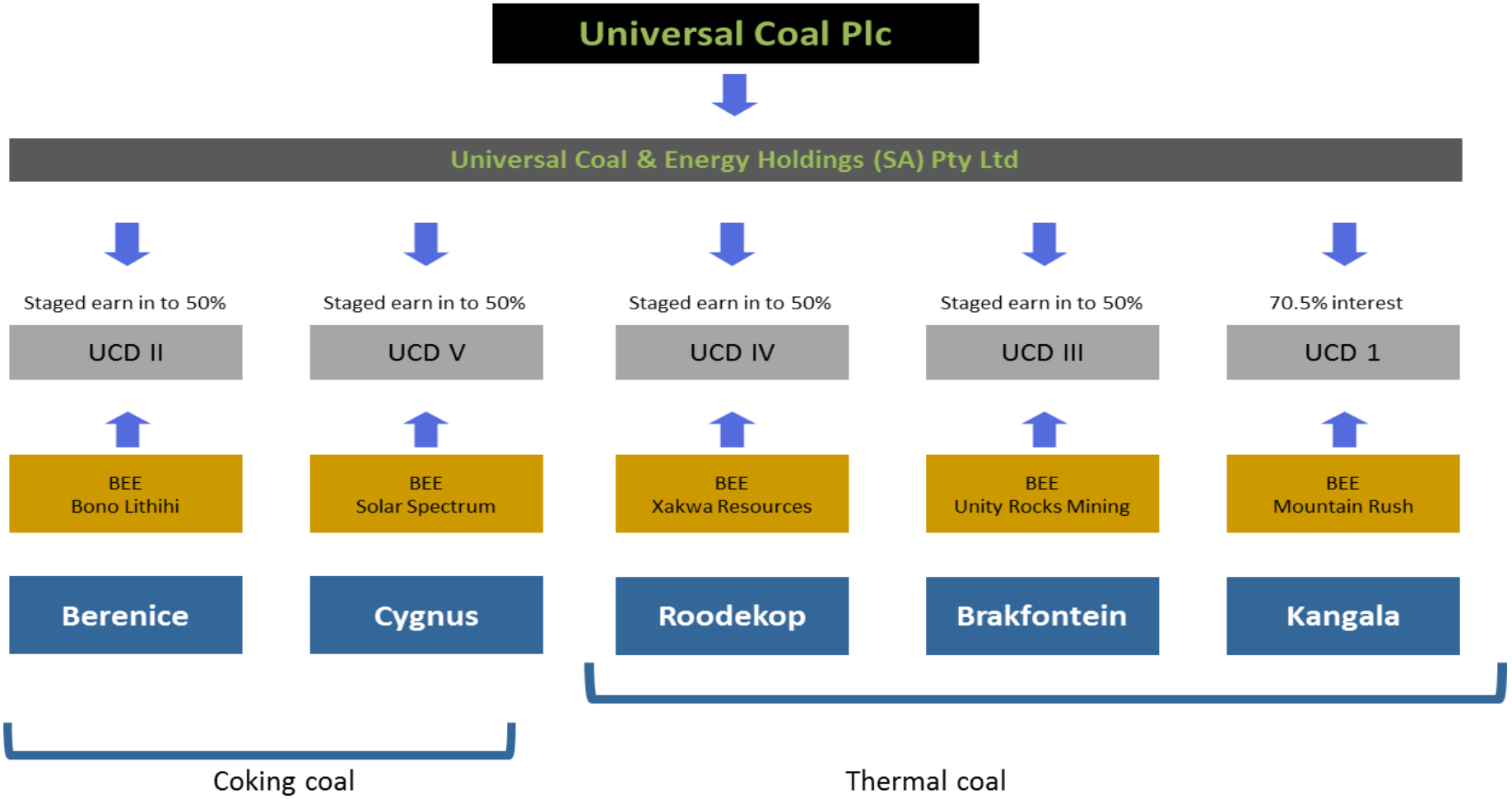


Figure 5-1: Universal Coal Operations

Figure 5-2: Organogram of the Universal Coal company structure



5.3 Regional setting

The proposed project is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye local and Nkangala district municipalities in Mpumalanga Province. The site is located approximately 16km north-east of Delmas town, 14km and 17km north of Devon and Leandra respectively The centre co-ordinate of the largest part of the project area is located at: 28°51'39.698"E: 26°12'31.237"S.

5.4 Catchment information

The proposed project site falls within two quaternary catchments namely B20A and B20E of the Olifants Water Management Area (WMA 02). The greater proportion of the project area falls within B20E (covering 1.7% of the quaternary catchment) while a smaller portion (about 0.02% of the quaternary catchment) is located in B20A. Based on the location of the percentage occupation of the project site over the quaternary catchments, it is anticipated that the impacts may be small over the catchments. The boundaries indicated in Plan 9 (in Appendix A).

The project site is drained by several streams draining from the south to the north. These streams originate from the surrounding municipal areas. A number of the streams have their watershed along the R29, railway line from Devon to Liandra and N17. The stream from southeast originates from Lesedi Local Municipality comprise of two tributaries. The two tributaries are the Wilge River and the Steenkoolspruit. The Wilge River drains through the Delmas Colliery and Ikhwezi Colliery before cutting through the project area. Steenkoolspruit is fed by Holspruit and reaches a confluence with Wilge River close to the Delmas and Ikhwezi Colliery.

An unnamed stream intersects with the Wilge River and originates in the Govan Mbeki Local Municipality. It begins as two tributaries that confluent at the border of Govan Mbeki and Victor Khanye Local Municipalities, the watershed of these streams is the town area of Leandra.

Another stream drains the proposed project area from the south of southeast originating from two tributaries in the watershed around Leandra. The stream reaches a confluence with Wilge River inside the project area which drains to join with other streams from the South East (Kroomdraaispruit and Dieplaagte Spruit) and one from the west. The stream from the west cuts through the northern parts of the project area. Situated on the streams draining from the south are the JC Dam upstream and Kromdraai Dam downstream on the Kroomdraai Spruit as well as Dieplaagte Dam situated on a stream further downstream. The Wilge River eventually drains to the Olifants River further downstream which will then drain into the Limpopo River through Mozambique and into the Indian Ocean.

5.5 Land Ownership

The property under consideration is the farm Brakfontein 264IR, consisting of Portions 6, 8, 9, 10, 20, 26, 30 and the remaining extend (RE). (Land Tenure - Plan 3). The landowners of these portions are listed in Table 5-2.

Table 5-2: Brakfontein Farm Landowners

Portion	Affected	Owners
20	Directly affected	Abundant Development PTY LTD
10	Directly affected	Andries Schoeman (Brakfontein Boerdery Pty Ltd)
30	Directly affected	Andries Schoeman Brakfontein Boerdery PTY LTD
RE	Directly affected	Andries Schoeman Brakfontein Boerdery PTY LTD
8	Directly affected	Confident Concept PTY LTD
9	Directly affected	Koos UYS & Seun Boerdery CC
26	Directly affected	Koos UYS & Seun Boerdery CC
6	Directly affected	Norwesco INV PTY LTD

5.6 Water Uses

Water uses around the project site is characterised by the activities of agriculture (crop and livestock watering), domestic use, mining and industrial use (thermal power stations). There are also mine areas upstream of the project area, the Ikwezi and Delmas Colliery. These existing mining areas are drained by the Wilge River which also drains into the project area. Downstream of the proposed project area is the Kiaton Mine (Appendix A: Plan 6) which with the impacts of the proposed project can worsen the water quality in the Wilge River.

In the upstream, the watersheds in the south of the proposed project area are the towns of Leandra and Devon.

The dams in the sub-catchments of the study area are the Kroomdraai Dam, JC Dam and the Dieplaagte Dam located to the east of the project area. Portable water will be obtained from drilled boreholes. There are also several wetlands present within the study area and within the catchment.

5.7 Mine Infrastructure

The proposed infrastructure includes:

- Parking and offices;
- A conservancy/septic tank (which will not require a Waste Management Licence due to its size);
- Weighbridge;
- ROM pads and PCD's;
- Mine Equipment Workshop and Stores; and
- Washbay facility.

No processing infrastructure will be on site as all crushing and washing etc. will be undertaken at Kangala Coal Mine.

5.8 Mineral Resources

Based on the criteria defined by SAMREC and JORC, the Brakfontein coal resource is classified as Indicated and Inferred. The coal resources are tabulated in Table 5-3 below:

Table 5-3: Brakfontein Mineral Resource

Seam	Density (g/cm^3)	Tonnage (GTIS)	Geological Losses (%)	Tonnage (MTIS)	Classification
5 Seam West	1.5	483,542	15%	411,011	Inferred
5 Seam East	1.5	40,967	15%	34,822	Inferred
5 Seam 02	1.5	871,917	15%	741,129	Inferred
5 Seam 03	1.5	1,403,871	15%	1,193,290	Inferred
4 Seam NC 01	1.68	19,873,772	15%	16,892,706	Indicated
4 Seam NC 01	1.68	17,294,484	15%	14,700,312	Indicated
4 Seam SE 01	1.68	4,559,976	15%	3,875,980	Indicated
4 Seam SE 01	1.68	688,771	15%	585,456	Indicated
4 Seam W 01	1.68	4,246,144	15%	3,609,222	Indicated
4 Seam W 01	1.68	6,489,230	15%	5,515,845	Inferred
4 Seam 02	1.68	1,255,306	15%	1,067,010	Indicated
4 Seam 02	1.68	3,624,841	15%	3,081,114	Inferred
4 Seam 03	1.68	7,219,048	15%	6,136,191	Indicated
2 Seam W 01	1.59	3,569,378	15%	3,033,971	Inferred
2 Seam W 01	1.59	12,041,611	15%	10,235,369	Inferred
2 Seam E 01	1.59	42,347,355	15%	35,995,251	Indicated

Seam	Density (g/cm^3)	Tonnage (GTIS)	Geological Losses (%)	Tonnage (MTIS)	Classification
2 Seam E 01	1.59	1,546,202	15%	1,314,271	Indicated
2 Seam 02	1.59	1,237,715	15%	1,052,058	Indicated
2 Seam 02	1.59	3,900,260	15%	3,315,221	Indicated
Block 2 03	1.59	5,591,436	15%	4,752,721	Inferred
1 Seam	1.69	9,511,351	15%	8,084,648	Indicated
Total		**147,797,176**		**125,627,599**	

5.9 Mining and Processing

The proposed Brakfontein Coal Mine project will be mined in two phases. Phase 1 will entail opencast mining, which will be undertaken during the continued exploration of the underground resources. This phase is proposed for 22 years. Phase 2 will entail underground mining methods and it is proposed for 8 years. The project site consists of four seams for open pit mining and potentially two seams for underground mining.

No crushing or beneficiation will take place on site. The raw material will be off loaded onto ROM pads from where it will be collected by $40m^3$ trucks and transported directly to Kangala Coal Mine, approximately 25km away, for processing.

5.10 Coal seams

The proposed Brakfontein project may be classified as a multiple deposit type and hosts 4 seams for Open Cast mining namely No. 5, 4L, 2U. Seams 4 and 2 are for Underground Mining. The Seam No. 5 has an average thickness of 1.8m being between 0.5m and 2m thick. The Seam No. 4 varies in thickness from 2.5m to 6.5 m. The seam is divided into the No. 4 Lower, No. 4 Upper and No. 4 A zones, separated by sandstone and siltstone/mudstone partings. The mining horizon is restricted to the No. 4 Lower Seam because of the poor quality of the No. 4 Upper Seam where the coal is suitable as power station feedstock. The Seam No. 2 contains some of the best quality coal and can average 3 to 6.5m in thickness and is suitable for the local Eskom market.

The seams are contained in a 100 m thick succession of sandstone and minor siltstone within the Vryheid Formation, Karoo Supergroup.

5.11 Mining method

It is proposed that the Brakfontein reserves will be accessed with two open mini-pits and two underground sections. The annual run-of-mine (ROM) production rate is 1.44 Mtpa to give 0.8 Mtpa of sales.

Opencast Phase

Open pit mining will focus on mining 2 and 1 seams, at an average stripping ratio of 2.48:1.

An initial boxcut will be established during the construction phase of the Project (located in Opencast 1 and followed by Opencast 2 on Plan 4). Topsoil and overburden from the initial boxcut area will be stockpiled at the positions indicated in the plan.

Opencast mining will take place using a conventional truck and shovel operation, assisted by roll-over dozing, to allow for continuous backfilling and rehabilitation of the mined out area. The expected mining conditions are good, due to the favourable geology and good stormwater drainage.

The final void will be backfilled with the overburden from the initial boxcut. Rehabilitation and final closure will be as specified in the EMPR to the DMR. It is planned to use an openpit mining contractor for the mining operations.

Highwall mining

This method is being investigated as an extension of the open cast pits (although the mining will be underground). Narrow horizontal shafts are dug from the base of the highwall of the opencast pit. These underground strips may be used beneath the wetland buffer area so as not to disturb the surface.

Underground

The underground mining section will be developed via the highwall of the openpit operations. This will enable a shorter lead time to get the underground sections started, eliminate hoisting requirements, as well as reduce upfront capital costs.

The mining schedule entails mining 5.6 million ROM tons from 2 sections.

As the openpit reserves are mined, the underground mining operation commences, there will be an overlap of underground and openpit mining, allowing for a 1 year ramp-up period.

The geological characteristics, namely depth and seam height indicate that bord and pillar mining can achieve a high extraction ratio. Total extraction methods include shortwalling. The section will consist of 9 to 11 roadways 6.5 m wide with an average pillar width of 8m. The mining process will include cutting, drilling charges, blasting, loading and support.

5.12 Coal market

Brakfontein Colliery will transport raw ROM coal to the neighbouring Kangala Colliery (another Universal Coal operation) which in turn will produce 2 coal products:

1) C - grade steam coal for export purposes; and
2) D - grade coal for Eskom (power station).

5.13 Timing of Mining Activities

The planned life-of-mine is one year for the construction phase followed by a 30-year operational (production) phase.

The 30-year life-of-mine (production phase) is calculated as follows:

- OC Mineable Resource (31.4 Mt ROM)/1.44 MTpa ROM = 21.8 years;
- UC Mineable Resource (5.6 Mt ROM)/0.72 MTpa ROM = 7.8 years;

Total Life of Mine = 29.6 years.

5.14 Employment figures

Mining will take place on a 2 shift, 6-day week basis, for which the required authorisation will be applied for.

When fully operational, the mine will have a workforce of approximately 209 persons. Of these, 16 will be directly employed by the mine, and the remainder by contractors. The proposed employment structure for the mine can be seen below in Figure 5-3.

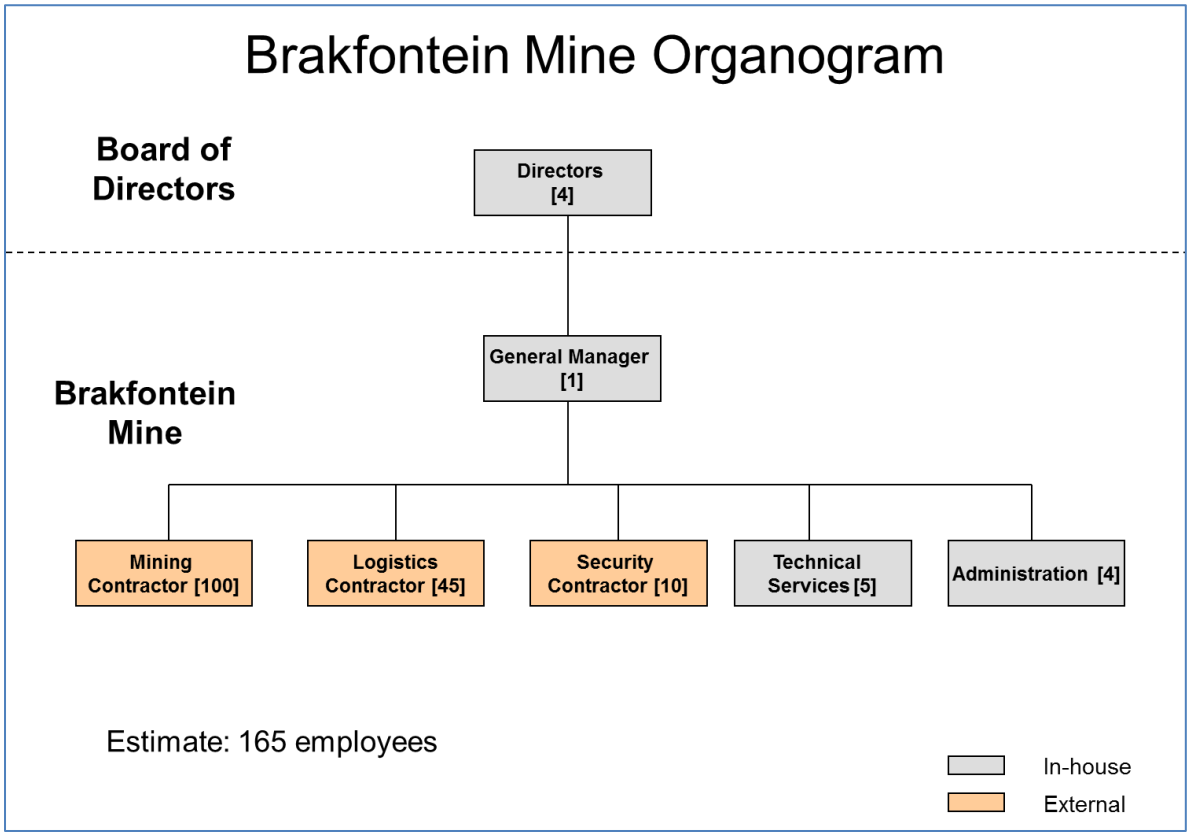


Figure 5-3: Employment structure for Brakfontein

5.15 Transport

Brakfontein is approximately 80 km due east of Johannesburg and 16 km from the town of Delmas on the R555. The R 555 tarred road is passing the proposed mine merely 500m from

its border. Minor changes and upgrades to the existing R 555 is therefore all that is required in order to link the proposed mine with Delmas and the markets. A traffic impact assessment is currently being undertaken by BKS to determine routes and conditions of roads between Kangala and the proposed Brakfontein mine.

Provision has been made for the following roads and upgrades:

- Access roads: The existing turnoff from the R 544 onto the Kangala road is only a farm dirt road. This T-Junction will be upgraded to the applicable standards which will entails tarred slip lanes and a tarred T-road onto the Kangala road. The transporting of the coal with trucks on a dirt road from the loading area to the entrance of the mine will not be viable due to the volume of material to be transported. Therefore provision has been made for a tarred road from the entrance gate to the coal loading area as well at the loading area.
- Haul roads: The haul road from the pit to the ROM pads is to be a 21m wide and 0.8m thick gravel road. Provision for 1.2km of this standard of road has been made.

5.16 Project Activities

The Table below details the list of project activities that have been used for impact assessment.

Table 5-4: Brakfontein list of activities

Phase		Activity
Construction	1	Site Clearing: Removal of topsoil & vegetation
	2	Construction of any surface infrastructure e.g. haul roads, pipes, storm water diversion berms (including transportation of materials & stockpiling)
Operational	3	Operation and maintenance of Infrastructure
	4	Removal of overburden and backfilling when possible (including drilling/blasting hard overburden & stockpiling)
	5	Use and maintenance of haul roads (incl. transportation of coal to washing plant)
	6	Concurrent replacement of overburden, topsoil and revegetation

Decommissioning	7	Demolition & Removal of all infrastructure (incl. transportation off site)
	8	Rehabilitation (spreading of soil, re-vegetation & profiling/contouring)
	9	Installation of post-closure water management infrastructure

6 PROJECT ALTERNATIVES

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

6.1.1 Mining method

The nature of the coal seams determines the preferred mining method and the location of the feasible coal determines the location of the mining operation. These two factors limit mining alternatives that are available. Some options are open cast roll over mining with truck and shovel or dragline, board and pillar underground mining, wall mining and auger mining. The scale of the operations does not allow for draglines and this would not be feasible. Board and pillar underground mining is pursued where the stripping ration dictate and wall mining is limited by physical structures such as the roads, river and geological features. Auger mining could be applied but board and pillar mining from the opencast affords a more effective coal recovery. The only other possible alternative available for mining methods will be the no mining option.

6.1.2 Land use alternatives

When considering the allocation of land for development and in deciding applications for planning permission affecting agricultural land, the agricultural implications must be considered together with the environmental, cultural and socio-economic aspects. In particular, prime quality land should normally be protected against permanent development or irreversible damage.

Consideration of land use alternatives is one of the cornerstones of community planning. Land use decisions must be evaluated in terms of sustainability, broadly defined as balancing environmental, economic and social equity concerns. The primary land use categories that encompass basic functions are residential, commercial, industrial, recreational, institutional, and agricultural uses. Land use is determined by a number of factors. These include climate, resources, population growth, economic activity and topography. When considering a new development for an area, it is required that other land

use alternatives are considered to ensure that the development is justified and viable. In the project area, present land use includes agriculture, residential, and mining.

Possible alternative ***land uses*** in the case that the project is not implemented include agriculture combined with low-density residential (current land use) and low-cost housing. With regards to ***agriculture***, the soils and land use impact assessment has found that the project site is situated on prime agricultural land. The aforementioned study considers the financial impact the proposed project will have on the maize production industry; this impact is therefore not considered again in this study. Due to the increasing prevalence of mining in the surrounding area, the viability of using the proposed project site for ***low-density residential*** purposes is decreasing; other mining operations in the area have resulted in a decreased quality of life for residents located on or surround the project site under consideration in this study. In fact, most surrounding land owners indicated their desire to be relocated elsewhere. Similarly, the viability of ***low-cost housing*** is jeopardised by the presence of other mining operations in the area. Additionally, there is a trend in the local municipal area of individuals moving out of more rural settings into the town of Delmas, in search of employment opportunities and for the sake of better access to services. ***Mining*** thus appears to be the most viable and appropriate land use for the project site from a social perspective.

6.1.3 Mine Plan and Infrastructure Layout

The current proposed mine layout (Mine Plan – Plan 4) is a result of the original plan being re-worked during the scoping phase to reduce the impact on wetlands as well as on surrounding farm owners. The proposed plan illustrates how the opencast areas have been moved out of the wetland and buffer zones and the two isolated farm portions towards the west are no longer to be mined.

6.1.4 No mining option

The current land use is one of agriculture, where land is planted to crops with coal mining on adjacent properties. The no-mining option will result in the continuation of such land use. Although economically viable, the continuation of agriculture may not provide the level of short-term economic growth to the area that mining would offer, such as increased employment of residents in the area, greater economic input into the area allowing better development of the towns and surrounding areas, and greater socio-economic stability in the area. After mine closure and rehabilitation of mined areas, the land capability may return to a state which would allow the continuance of agricultural practices. The mine will also promote sustainable local economic development, to give communities the skills required to remain economically viable and successful after mine closure.

Not mining the coal reserves available on Brakfontein will prevent the use of a coal reserve for the generation of electricity at a time where a much-publicised inability to generate enough electricity to sustain economic growth exists.

7 DESCRIPTION OF AFFECTED ENVIRONMENT

7.1 Climate

Climate data for the Witbank Weather station (station number 0515320 8) was sourced from the South African Weather Bureau, as there is no climate station located in the Delmas area.

7.1.1 Description of the Regional Climate

The area falls under the Highveld climatic zone and is characterised by warm summers with rainfall. Winters tend to be mild to warm during the day to cold at night with sharp frosts.

Delmas has an annual average of between 8 and 10 hours of sunshine per day and is 1553 m above sea level.

7.1.2 Mean Monthly and Annual Rainfall and Precipitation

Precipitation occurs as showers and thunderstorms and falls mainly from October to March with the maximum falls occurring in November, December and January. Rainstorms are often violent (up to 242 mm can occur in one day) with severe lightning and strong winds, sometimes accompanied by hail. The winter months are droughty with the combined rainfall in June, July and August making up only 2.3 % of the annual total (661.2 mm).

7.1.3 Mean Monthly Maximum and Minimum Temperatures

The average daily maximum temperature in February (the hottest month) is 26.6 °C and in July (the coldest month) is 18.4 °C. The mean daily minimum in February is 15 °C and July 4.2 °C but extremes of 3.3 °C have occurred.

7.1.4 Mean Monthly Wind Direction and Speed

Data for 1997 to 2008 from the Witbank weather station was used. Wind speeds, averaged over a one hour period, ranged from 0m/s to 9.8m/s with a period average wind speed of between 1.6 and 3.5 m/s having been recorded. The wind speeds fluctuate from season to season with the strongest winds during the months of September to November. The predominant wind direction is East to East, South East.

7.2 Topography

The elevation of the project area ranges from 1540 – 1580 metres above mean sea level (m.a.m.s.l) which equates to a range of 40 metres between the lowest and highest points of elevation within the project area. The difference in elevation between these points gives rise to a slope percentage of between 0 and 5.5 (at isolated steeper areas). The average slope percentage for the entire project area is approximately 2.5. (Topography Map – Plan 5)

7.3 Geology

The proposed Brakfontein project area is situated at the edge of the Witbank coal field, which forms part of the Karoo basin extensively covering the central areas of South Africa.

7.3.1 Stratigraphy

The basement rocks within the Karoo Basin are overlain by the Karoo Super Group. The pre-Karoo basement in the proposed Brakfontein project area consists of Transvaal Group rocks. Plan 5 shows the surface geological map of the Brakfontein study area (1:250 000 geological maps 2628 East Rand).

The lowermost part of the basement consists of Malmani dolomites and Cherts, which are overlain by ferruginous shale and ferruginous quartzites of the Timeball Hill Formation. Andesite of the Hekpoort Formation rests on the Timeball Hill Formation. Vaalian age diabase later intruded the Transvaal Sequence in the project area.

The basement of the Karoo Super Group, the Dwyka tillites, overlies the pre-Karoo basement. Dwyka tillites are fairly regularly deposited over the basin with the exception of paleo-topographical highs. The Dwyka tillites are overlain by the Vryheid formation which hosts the coal seams. The Vryheid formation consists of various sequences of sandstones, shales and siltstones with the various coal seams located within them. Higher units of the Karoo Super Group are not present within the study area. Recent sedimentary deposits are found wherever surface water features occur. The stratigraphy of the Brakfontein study area is shown in Table 7-1.

Table 7-1 Stratigraphy of Brakfontein

Age	Supergroup / Group	Formation	Lithology
Quatenary, Tertiary			Alluvium
Jurassic			Dolerite
Permian	Karoo	Vryheid	Sandstone, shale, coal beds
Carboniferous	Karoo	Dwyka	Diamictite, shale
Vaalian			Diabase
Vaalian	Transvaal	Hekpoort	Andesite
Vaalian	Transvaal	Timeball Hill	Ferruginous shale; ferruginous quartzite
Vaalian	Transvaal	Malmani	Dolomite, chert

7.4 Soils

A soil, land use and land capability assessment was undertaken, the full specialist report is included in Appendix C.

High potential arable agricultural soil dominates the Brakfontein Coal Project site. Plan 6 (in Appendix A) contains the overview of the land capability, land use and soils present at the Brakfontein Coal project site. Table 7-2 contains information of the dominant soil types occupying the arable areas. However a small area potentially earmarked for opencast coal mining in the far east of the Brakfontein Coal Project area contains shallow cultivated soil.

Table 7-2: Dominant soil forms found in the Brakfontein Coal Project site.

Soil Form	Average Depth (m)	General Characteristics	Agricultural Potential
Hutton (arable)	0.8 – 1.5	Orthic topsoil A horizon overlying a deep, red, well drained, structure less, B horizon underlain by hard or weathered rock.	High due to high rainfall in the region well drained status and high water holding capacity of the soil.
Clovelly, Pinedene (arable)	1.5	Orthic topsoil A horizon overlying a deep, yellow, well drained, structure less, B horizon underlain by hard or weathered rock and signs of wetness.	High
Oakleaf (arable)	0.8 -1.2	Orthic topsoil A horizon overlying a deep, structured neocutanic, B horizon.	High
Longlands, Constantia and Kroonstad (grazing)	0.5 – 1.0	Orthic topsoil A horizon overlying an E horizon underlain by a yellow brown or soft plinthite or G horizon clay layers.	Low, due to high rainfall in the region and, poorly drained status of these interflow soils.
Katspruit (grazing)	0.5	Orthic topsoil A horison overlying a waterlogged G horizon.	Low due to clayey nature and water logged soil conditions.

Organic carbon (C) in the topsoil at the site ranges from 0.51 – 2.46 %. Generally South African cultivated soils contain a C content of around 1%. The texture properties of the soils analysed allow the cultivated soils to be classed as sandy clay loam soils. Sandy clay loam soils are easily cultivated.

7.4.1 Land capability

Arable crop farming activities dominate at the farm Brakfontein. During the time of the field survey the fields were harvested but uncultivated in anticipation of the rainy season. Only the wetland areas contain perennial vegetation potentially available for grazing. The wetland areas at Brakfontein are not fenced off but used for grazing. The land capability was classified using the classification system by Schoeman *et al*, 2000.

The land capability of the Brakfontein Coal Project site is dominated by Arable Class I, while the wetland areas used for grazing is classified as Grazing Class V, see Appendix C for

details regarding the land capability system by Schoeman *et al*, 2000 and Plan 6 (in Appendix A).

7.4.2 Land use

The predominant present land use in the Brakfontein region is arable crop production due to the presence of large areas being occupied by high potential soil. Current land use is estimated at 81 % of the available land being used for arable farming. 19 % of the total available farmland is un-used due to shallow soils and wetland areas. The area is well serviced by tar roads as well as farm roads.

7.4.3 Conclusion

The Brakfontein Coal Project area is located within prime agricultural land. The soil and land capability of the cultivated areas is classified as Arable Class I while the areas used as grazing are classified as Grazing Class V. The land use is dominated by agriculture, mixed arable and grazing but arable is dominating the land use. The affected farms have been cultivated for generations and are producing higher than average maize yields. The 2011/2012 season reportedly generated in excess of 7 000 tons of maize crop for the area while approximately 600 head of cattle is grazed.

7.5 Surface water

A hydrology study was conducted for the project area by Digby Wells, this report has been included in Appendix E.

The proposed project site falls within two quaternary catchments namely B20A and B20E of the Olifants Water Management Area A description of the catchment can be seen in Section 5.3 with the boundaries indicated in Plan 9 (in Appendix A).

A summary of the sub-catchment characteristics is presented in Table 7-3.

Table 7-3: Sub-Catchment Characteristics

Quaternary Catchment	Sub-catchment	Area (km^2)	longest stream (km)	Elevation change between 10 and 85% of stream (m)	Distance to catchment centroid (km)
B20E	sub1	146	19.3	70.3	11.4
	sub2	61.4	15.7	57.8	10.5
	sub3	8.25	2.27	17.9	0.85
	sub4	88.9	19.7	78.3	9.43
	sub5	41.0	8.50	38.7	5.89

Quaternary Catchment	Sub-catchment	Area (km^2)	longest stream (km)	Elevation change between 10 and 85% of stream (m)	Distance to catchment centroid (km)
	sub6	22.8	4.86	20.4	3.14
B20A	sub1	36.2	14.3	39.0	7.59

7.5.1 Surface Water Quantity

In line with the legislative requirements, the constructed infrastructure for containing dirty water should be able to contain the 1:50 year 24 hr flood volume. The water conveyances and containment systems should be designed to convey/contain a flood volume of 51 000 000 m^3 (51 MCM) as a result of the peak flood flow of 598 m^3/s for 24 hr storm. This is applicable to sub-catchments 1, 2, and 3.

It is also vital for the design of the return water dams from the open pit mining areas in sub-catchments 3 to be able to capture the direct 1:50 year flood peak in sub-catchment 3 of – of 100 m^3/s for 24 hr (8 600 000 m^3).

7.5.2 Surface Water Quality

During the scoping phase, 16 sampling sites were identified for surface water quality baseline sampling. The sites were selected at strategic localities where water quality can be monitored optimally. During the site survey and sampling period, 12 out of the possible 16 were sampled since the remaining sites were dry. The locations of the sampling points are shown on a Plan 10 (Appendix A).

The chemical analysis results (Appendix C – Laboratory Results) were evaluated against the SANS 241 (2005) drinking water quality standards (Table 7-4). The presentation of the results is colour coded to present the Class I and Class II water quality respectively. Values that exceeded Class II are colour coded in red shading.

The results indicate an ideal water quality for most the constituents analysed. The exceptions were recorded for samples UCBSW01 (Fe of 0.25 mg/l; Class II), UCBSW11 and UCBSW15 (Mn of 0.18 and 0.15 mg/l respectively; Class II). The slightly elevated Mn and Fe concentration were attributed to upstream mining impacts or historical impacts that have accumulated in the surface water resources. Also, Fe could be associated with the geological characteristic of the site.

The elevated levels of both Mn and Fe in stagnant water of UCBSW01 and UCBSW15 can be associated with the water quality characteristics of pans (where water is filtered through the pan into the ground while there is effect of evapotranspiration which result in the concentration of the elements).

7.5.3 Resource Water Quality Objectives (RWQO)

The DWA performed assessments of water quality and water uses within the stressed Olifants WMA in order to set Water Quality Objectives (WQO). This is aimed at reducing the potential impacts for the most vulnerable water users within the WMA. These WQO were set for the different catchments within the WMA depending on the nature of the most vulnerable water users. In the case of the project site, the Wilge River WQO is relevant. These objectives area more stringent than the SANS 241 (2005) in some cases and where more than one WQO was applicable, the most stringent was used to benchmark the data.

The WQO were also benchmarked against the determined water quality of the various sampling points. Where the water quality exceeded the WQO, the values were colour coded red. Table 7-5 shows the classification with respect to the in-stream WQO set for Wilge River Catchment particularly the Upper Wilge River Catchment (http://www.reservoir.co.za : Accessed 27 June 2012).

The results Table 7-5 indicated that:

- Parameters of concern with respect to the WQO are the F, Cl, Alkalinity, EC, NO_3 and SO_4 which were higher by an order of magnitude ranging from two to 12 times.

Table 7-4: Summary of the surface water quality data benchmarked against the SANS SANS 241 standard

Sample ID		Total Dissolved Solids	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F
Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5-9.5	<0.3	<1	<1
Class II	(Max. Allowable)	2400	20	600	N/S	600	300	100	400	100	2	1	370	4-5 or 9.5-10	0.3-0.5	2	1.5
	Duration (years)	7	7	7	N/S	7	7	7	7	7	7	7	7	0	1	0	1
UCBSW 01		96.0	0.18	35.5	23.2	11.1	9.70	7.84	15.3	2.08	0.25	0.00	20.5	7.64	-0.01	0.08	-0.18
Bridge/UCBSW 02		290	0.14	20.6	224	34.7	44.0	27.3	23.7	5.50	-0.01	0.00	53.4	8.11	-0.01	0.03	0.29
UCBSW 03		189	0.12	20.9	157	-0.13	18.5	18.4	23.7	13.7	-0.01	0.07	38.1	7.63	-0.01	0.02	0.50
UCBSW 04		344	1.61	21.8	198	88.0	41.8	32.6	34.6	5.14	-0.01	0.00	59.3	8.69	-0.01	0.59	0.30
UCBSW 05		294	0.31	16.4	172	76.8	35.6	29.2	29.0	2.84	-0.01	0.00	52.1	8.69	-0.01	0.02	0.27
UCBSW 06		299	0.53	40.1	218	22.3	38.3	30.5	33.7	2.75	-0.01	0.08	55.8	8.36	-0.01	0.11	0.19
UCBSW 07		260	0.49	19.4	147	62.6	28.9	23.0	30.9	6.42	-0.01	0.00	46.9	8.18	-0.01	-0.02	0.39
UCBSW 08		578	0.25	24.5	221	242	66.4	51.8	55.5	4.55	-0.01	0.00	86.8	8.30	-0.01	-0.02	0.29
UCBSW 09		505	0.27	23.9	249	172	53.2	46.7	55.9	3.93	-0.01	0.00	81.0	8.40	-0.01	0.09	0.37
UCBSW 10		436	0.36	24.4	250	110	52.0	41.3	53.9	4.52	-0.01	0.04	73.1	8.63	-0.01	0.05	0.34
UCBSW 11		545	0.30	72.6	295	99.7	69.2	56.5	63.5	6.62	-0.01	0.18	93.7	8.60	-0.01	0.03	0.35
UCBSW 15		321	0.25	20.3	76.4	142	37.9	19.1	35.3	20.9	-0.01	0.15	56.4	7.42	-0.01	0.10	0.48

Table 7-5: Summary of the water quality data benchmarked against the in-stream WQO for the Upper Wilge Catchment

Sample ID	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Conductivity at 25° C in mS/m	pH-Value at 25° C	Free and Saline Ammonia as N	Fluoride as F
In stream Water quality objectivesU: Upper Wilge River Catchment	0.3	15	70	15	35	6.4-8.5	0.2	0.2
UCBSW 01	0.18	35.5	23.2	11.1	20.5	7.64	0.08	-0.18
UCBSW 02	0.14	20.6	224	34.7	53.4	8.11	0.03	0.29
UCBSW 03	0.12	20.9	157	-0.13	38.1	7.63	0.02	0.50
UCBSW 04	1.61	21.8	198	88.0	59.3	8.69	0.59	0.30
UCBSW 05	0.31	16.4	172	76.8	52.1	8.69	0.02	0.27
UCBSW 06	0.53	40.1	218	22.3	55.8	8.36	0.11	0.19
UCBSW 07	0.49	U	147	62.6	46.9	8.18	-0.02	0.39
UCBSW 08	0.25	24.5	221	242	86.8	8.30	-0.02	0.29
UCBSW 09	0.27	23.9	249	172	81.0	8.40	0.09	0.37
UCBSW 10	0.36	24.4	250	110	73.1	8.63	0.05	0.34
UCBSW 11	0.30	72.6	295	99.7	93.7	8.60	0.03	0.35
UCBSW 15	0.25	20.3	76.4	142	56.4	7.42	0.10	0.48

Elevated levels of EC indicate the presence of major ions in these streams mostly as a result of agricultural and mining activities. This is also highlighted in the concentration of Cl ion which is above the WQO. The high levels of NO_3 and NH_4 could be attributed to the agricultural activities taking place within the surrounding area. These include livestock watering which can result in the increase of nutrients in the water. Nitrates could be attributed to the use of inorganic nitrate fertilisers as a significant portion of the catchment is under agricultural irrigation use but could also be from commercial explosives used in mining.

7.5.4 Conclusion

The proposed project could impact on two catchments namely B20E and B20A. The surface water quality baseline indicates that the surface water resources are impacted when compared to the SANS 241 with three samples which fell within maximum allowable Class II for single parameters. When benchmarked against the WQO the water quality indicate poor water quality particularly for the variables F, Cl, Alkalinity, EC, NO_3 and SO_4. The variables of concern exceeded the WQO in magnitude of 2 to 11 times.

Although the area is already impacted upon based on the WQO, it is essential that the management of the proposed project execution ensures that there are minimal impacts to the surface water resources in order to prevent the exacerbation of the quality within the already impacted WMA.

7.6 Groundwater

A Groundwater Study was undertaken and the specialist report is included in Appendix D.

The overall objective of the groundwater study was to assess the potential impacts of the proposed Brakfontein Mine on the groundwater regime, specifically with regard to:

- Mine inflow (and dewatering) rates;
- Local changes in groundwater levels during mining and after mine closure; and
- Local changes in groundwater quality during and after mine closure.

7.6.1 Aquifer Classification and Testing

Four aquifers have been identified for the project area, a minor shallow weathered aquifer, a minor fractured Karoo aquifer, a Dwyka non-aquifer and a major pre-Karoo dolomitic aquifer. Aquifer tests confirmed the classification of the aquifers (as minor or major) with boreholes intersecting the Karoo Supergroup lithologies achieving water strikes with weak yields ranging from dry to transmissivity of 1.7m3/d whilst the pre-Karoo dolomitic aquifer borehole achieved a yield of 361.7m3/d. The testing of the pre-Karoo borehole was limited by the 127mm inner diameter size of the borehole casing which restricted the pump size.

Water levels observed at the Brakfontein site varies between 1535 mamsl (BRABH02) and 1586 mamsl (UNI04). However, localised variations may occur as a result of mining activities and groundwater abstraction for agricultural irrigation purposes in some areas.

The Flow direction of the groundwater in the study area correlates fairly well with the surface topography. The Bayesian correlations for pre-mining conditions are shown in Appendix The water levels observed at the mining area shows a correlation of 79.13% leading to the conclusion that the groundwater flow direction generally mimics the surface topography.

Based on the underlying hydrogeology of the project area, and the corresponding aquifer test results and analyses, the aquifers have been classified according to Parsons and Conrad's system as follows:

- Weathered Aquifer – Minor Aquifer;
- Fractured Karoo Aquifer – Minor Aquifer;
- Dwyka Tillite Aquifer – Non Aquifer; and
- Basement Karst Aquifer – Major Aquifer.

7.6.2 Groundwater Quality

Locations of the groundwater sampling points are indicated on Plan 7 (in Appendix A – Plans).

Groundwater quality varies with majority of the samples and sample constituents indicating acceptable concentrations compared against the South African National Standard (SANS) 241: 2005 guidelines for drinking water. Samples not complying to acceptable standards are described as follows:

- UNI 04 contains elevated to Class II maximum allowable concentrations of nitrate (17.48 mg/l). Nitrates are common in soils and the aquatic environment due to the breakdown of organic matter and tend to increase in shallow groundwater systems associated with agriculture;
- UNI07 contains excessive (above Class II maximum allowable) concentrations of fluoride (1.56 mg/l). Presence of fluoride can be found naturally in groundwater or present from anthropogenic contamination. This is the only borehole located on the left of both the faults, which can suggest that the source of fluoride is localised to this area by the fault. Whether the source of fluoride is natural or anthropogenic is undermined;
- BRABH 01 contains elevated to Class II (maximum allowable) concentrations of aluminium (0.48 mg/l). The elevated concentrations of aluminium can be attributed to the slightly acidic pH of this borehole; and
- BRABH 05 contains elevated to Class II (maximum allowable) concentrations of manganese (0.21 mg/l). The background manganese concentrations are very low for the area as determined by the other groundwater samples indicating an additional

source of manganese is present for this borehole. The source can be natural (intersections with coal layers) or as contamination from historical mine workings.

In general the groundwater has a slightly acidic to slightly alkaline pH range (5.5 to 8.6), with low salinity concentrations (below 550mg/l). Water type for the project area as defined by the Piper diagram (Appendix D) indicates a sodium-potassium bicarbonate to calcium-magnesium bicarbonate with a range in sulphate from 5% to 55%. BRABH 01 and BRABH 03 indicate a calcium-magnesium chloride water type. Variability of sulphate and water type is dependent on individual boreholes and no regional distribution trend could be identified.

7.6.3 Acid Base Accounting

Locations of the groundwater sampling points are indicated on Plan 8 (in Appendix A – Plans).

The acid-base accounting geochemical results indicates all samples are potentially acid generating with negative net neutralising potentials. The average neutralising potential is 0.67 kg/t ($CaCO_3$) and average acid potential is 23.37 kg/t ($CaCO_3$) resulting in an average net neutralising potential of -22.70 kg/t ($CaCO_3$). In general the upper seams (seam 1 and seam 2) indicate the worst results with the lower seam 4 and interburden samples indicating better net neutralising potential results.

7.6.4 Groundwater Numerical Modelling

The potential impact of the proposed mining activities on the groundwater environment has to be qualified, using the baseline geohydrological information and calibrated numerical flow and transport model. The numerical model has been used to simulate the impacts of the open cast areas, underground mine and WRD's on groundwater receptors. The scenarios modelled include:

- Mine dewatering cone of influence after 10 and 20 years of operation (at end of LOM); and
- Groundwater contaminant plumes at end of life of mine (20 years) and 20 years post closure.

The predicted inflow rates for the opencast pits and underground mining over the LoM were calculated. Total predicted inflow rates at the proposed Brakfontein mine will range from a minimum of 6.39 l/s calculated for Year 12 to a maximum of 23.16 l/.s calculated for Year 6.

The model qualified and delineated the groundwater drawdown cone (zone in which the groundwater level is lowered as a result of abstraction) during mine dewatering over time. During the operational phase the cone of depression extends approximately 1100m to the south, 300 m to the west and 500m to the north and east of OC 3, 4 and 5, and approximately 400 – 500m in all directions from OC 1 and 2.

Seepage from the waste rock dumps is likely to have elevated salt load consisting predominantly of high TDS, SO4 and Ca concentrations. The results from the acid base accounting tests suggest that the waste rock material is likely to have a net potential to

generate acid mine drainage. Groundwater numerical modelling predict that seepage water quality diluted to 5% of the input concentration of 100% is likely to migrate up to between 150m and 300m from the discard dumps' footprint (See Figure 7-1).

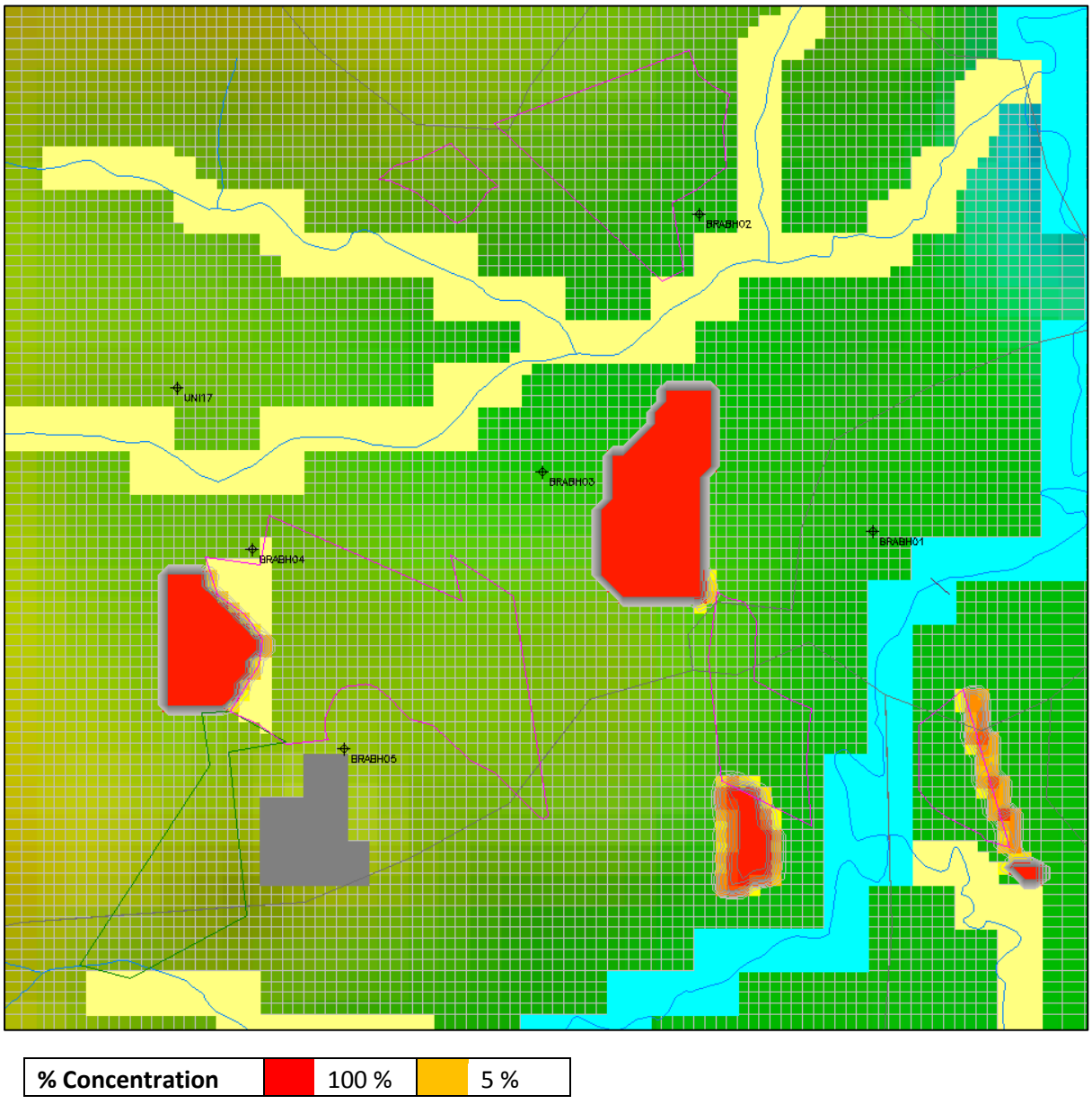


Figure 7-1: Groundwater pollution plume from the discard dumps at end of life of mine

7.7 Fauna and Flora

Digby Wells was commissioned as the ecological specialists to conduct baseline studies in order to assess the terrestrial ecosystems associated with the proposed Brakfontein mining operation. This specialist study is attached in Appendix I.

7.7.1 Vegetation

A total of six habitat units were delineated for the project area, topographic features and current land use were the primary considerations for the delineation of the various units (Plan 14).

Below in Table 7-6, the habitat types identified during the survey are summarized into their individual attributes, as they were recorded they are, topographic setting and ecological functioning.

Table 7-6: Percentages and Hectares of each habitat type

Vegetative Unit	Size in ha (% of total)	Topographic Setting
Grassland	261.51 (25.58)	Hill slopes, Flats
Current cultivation	589.70 (57.69)	Hill slopes, Flats
Alien trees	17.17 (1.68)	Hill slopes, Flats
Pastures	68.97 (6.75)	Hill slopes, Flats
River/ Riparian	79.49 (7.87)	Riparian, bottom lands
Ridges	5.37 (0.52)	Hill slopes

The majority of the exotic tree species encountered such as *Pinus patula, Populus x canescens* and *Eucalyptus camaldulensis* were planted by previous landowners for windbreaks around farm houses, this was evident in the location of most these trees. Habitat type 3 (Alien trees), indicates all the occurrences of alien tree clumps. The species *Populous x canescens* located on the eastern side of the central stream is associated with riparian habitat types and reproduces vegetatively, and are a Category 1 invasive and therefore the removal of these trees are of importance to stop their spread.

The grassland described after field work is one with various threats presently influencing the size and ecological functioning of it. The grassland is currently shrinking because of the anthropogenic threats that are present such as agriculture and mining, because of the shrinking grassland the influence of the edge effect is becoming more pronounced, whereby the area covered by the boundary or ecotone of the grassland is increasing in size.

This ecotone cannot be described as grassland because it contains elements of both the declining grassland and the advancing habitat type, be it maize field or disturbed areas. The other vegetation types present in the study area are a modified version of the original grassland vegetation type, after transformation. The introduction of exotic trees brought about the alien trees vegetation type, the introduction of maize (after grassland removal), brought about the current cultivation vegetation type.

7.7.2 Mammals

No Large and medium sized herbivores were encountered during the dry season field survey, this could be as a result of loss of habitat, or informal hunting practiced on the study site. The very low numbers of actual wild animal sightings (small antelope species)

confirmed this. The drainage lines present on site as well as the pans provide watering points for the existing wildlife, however only bird species were found to congregate in these areas.

With the abundance of maize fields and the subsequent availability of food one can assume the presence of rodents. This and the presence of preferred habitat (reed beds and marshes) could indicate the reason for a small population of these animals surviving. The mammals present on the project site are a direct result of the number and severity of threats present. These threats include shrinking available habitat, hunting, lack of shelter and lack of space to accommodate viable populations. Due to the size and threats present in the area no large herbivores will be able to return to the area, realistic expectations should be to conserve natural habitat.

7.7.3 Birds

During the dry season field excursions 48 bird species were observed, most of which were observed where maize harvesting have taken place on the property. Furthermore, most of the birds were either water birds (Egrets, Cormorants and Ducks) or seed eating birds (Quail, Doves and Guinea fowl), which is to be expected as the dominant land use in the area is maize farms which is a great source of food for seed eaters. The Marsh Owl (*Asio capensis)* was also encountered during night surveys.

Ecosystem services offered to bird species include shelter for bird species in the form of nesting sites within the trees of the alien tree vegetation type. Furthermore the grassland areas could offer space and materials for ground nesting birds to nest. As mentioned earlier the aquatic birds and seed eating birds were common on the property. The large contingent of seed eating birds was however due to the presence of two of the altered vegetation types, which was supplying the birds with food items in the form of seeds from the pastures and discarded maize in the agricultural fields. The alteration of the vegetation types by anthropogenic activities can therefore be altering the bird species composition of the study site.

The Marsh Owl is locally common in much of southern Africa where it is resident but with some local movements as a result of changing availability of food. This bird prefers open country between the coastal marshes and the savannah, inland marshes, moors and even the highlands up to 3 000m. It prefers areas of short vegetation with occasional patches of longer grass and is sometimes seen near human habitation. It is not found in forested areas.

7.7.4 Reptiles

The fact that no reptile species was encountered during the field surveys could be attributed to positioning of the study area in the landscape, with many agricultural activities surrounding the site, however the presence of the grasslands and riparian areas, and their accompanying rodent population suggests that certain reptile species such as snakes could be present.

7.7.5 Amphibians

The presence of amphibian species was investigated and two species were encountered, both of which can be expected to occur in the Mpumalanga grasslands. Because amphibians are ectothermic they are most active when their surrounding temperature stabilizes between 20˚C and 30˚C, which is why they hibernate in burrows or damp retreats during winter times when temperatures regularly fall below 20˚C (Du Preez and Caruthers 2009). After the dry season field visit it was evident that the threats present in the study area were having a serious effect on the population of amphibians. The biggest threat observed was habitat degradation through uncontrolled burning, this practice not only destroys the habitat (plants for shelter and food) but also directly kills the amphibians that cannot avoid the flames.

7.7.6 Conclusion

The area of study was found to be under pressure from surrounding land use, most notably mining and agriculture. Despite these threats it was found that the area of study provided an ecological service to the plant and animal species encountered during the field survey and possibly to the plant and animal species that were identified during the desktop survey.

The vegetation/habitat units identified were all responsible for varied degrees of natural to transformed habitat present, in turn this resulted in mosaic effect with regards to the vegetation which in turn has an effect on the animal species present. The combined effect of the area that is under pressure and the different habitat types are reflected in the results of this study.

Few mammal species were found but this is only a reflection of species present on the specific days of study and not of species that are of a transient nature, therefore the population of animal species that the area supports could very possibly be larger than that which was encountered.

Furthermore, the animal species present are only the species adapted and associated with the limited habitat present, which can survive the anthropogenic pressure exerted on them. The habitat present on the project site is seen to be in an impacted state, due to reasons mentioned above. The result of this is the animal species present are a reflection of this impacted state and is therefore poor.

7.8 Aquatics

Six biomonitoring points were selected to identify trends within the aquatic systems associated with the proposed Brakfontein mining operation as seen in Plan 15. Two sites were selected on the Wilge River (Site 1) and its tributary (Site 2) above the mining operation. A third site was selected immediately downstream of the mining operation on the Wilge River (Site 3). A fourth site was selected within the mining operation area on a tributary of the Wilge River (Site 4). Another site was selected on a tributary upstream the Wilge River on a point below Kromdraai Dam (Site 5). The final site was selected approximately 8.59 km downstream the proposed mining operation and downstream all tributaries flowing through the mining operation. Of the six sites selected in field observation found that only 4 out if the six sites were suitable for biomonitoring analyses.

7.8.1 Habitat Integrity Index (IHI)

Based on the IHI scores, the instream and riparian habitat associated with the study catchment area are in a largely modified state which indicates large disturbances to the system. The assessment of the riparian vegetation and instream channel indicated that anthropogenic activities were having a considerable impact on the system. Land use patterns such as mining and extensive dry and irrigated agriculture had the largest impact on the IHI. Impacts associated with activites such as mining and agriculture will have impacts on the water quality (inputs from effluent and runoff) and water quality (abstraction of water). These were seen to effect the IHI in such a manner so as to ascertain a Ecoclassification of ***Class C/D (Largely Modified).***

7.8.2 Aquatic Macro Invertebrates

During the low flow survey a total of 18 invertebrate families were sampled. Low species diversity was recorded during the survey. At all sites in the study area the invertebrate community consisted largely of species tolerant to pollution. This observation is also reflected in the average score per recorded taxon (ASPT) observed at the various sites. A low ASPT is generally an indication of poor water quality, whereby a low SASS score is largely an indication of poor habitat quality and availability. In this case the ASPT was <5 indicating that the low SASS score is not a reflection of poor habitat availability but is a reflection of poor water quality. The study by Digby Wells in June 2012 confirms this. The low flow conditions experienced at all sites has a compounding effect on the invertebrate communities present and thus a ***Modified*** class is given.

The Macro-Invertebrate Response Assessment Index was implemented for each of the sampled sites (August 2012) and the results of the assessment are presented in Table 3-1 Table 7-7. The macro-invertebrate communities at all sites were determined to be in a seriously modified state (Class E). The various changes in the macro-invertebrate communities from reference conditions at all sites may be as a result of changes in water quality and low flows. Findings from this assessment are similar to findings of the SASS5.

Table 7-7: The findings and ecological category for each sampled site for MIRAI

Component	Site 1	Site 2	Site 3	Site 6
MIRAI (%)	27.995	33.2065	32.0983	34.8701
EC: MIRAI	E	E	E	E
Category	Seriously modified	Seriously modified	Seriously modified	Seriously modified

From these guidelines/findings it can be suggested that there is deterioration of water quality at all sites. This is a distinct possibility as anthropogenic activities such as mining operations and extensive agricultural practices appear to be impacting on water quality. Furthermore, the surface water quality analysis report completed by Digby Wells in June 2012 shows that there is evidence of agricultural pollution with high levels of nitrates, ammonium and sodium

salts. It is further hypothesised that low flow conditions have resulted in an alteration of community structure as species which are intolerant of low flows are not found in the sites sampled. It can be concluded that the low MIRAI values are a reflection of poor water quality however this requires further investigation.

In conclusion the results from SASS 5 (and confirmed by MIRAI) indicate that there is a degradation of water quality.

7.8.3 Fish Assessments

Due to the fact that no fish were recorded and the possibility of the occurrence being climatically driven, the fish assessment components have been altered to include the expected fish species for the catchment area. The fish species expected to be found in this quaternary catchment according to Kleynhans *et al*., (2008) include:

- *Barbus anoplus (*Chubbyhead Barb);
- *Barbus paludinosus (*Straightfin Barb); and
- *Pseudocrenilabrus philander (*Southern Mouth Brooder).

7.8.4 Conclusion

Biotic indices were determined to be in a seriously modified state largely as a result of poor water quality. When the results of this study are compared to the present ecological status (PES) derived by Kleynhans (2000) the current study suggests that there has been negative influences on the environmental integrity of the aquatic systems found in quaternary catchment B20E. The desired ecological status set out by Kleynhans (2000) is a Class C however the current study found that anthropogenic impacts are altering the current environment away from its desired condition. A report completed by Digby Wells entitled “Surface water specialist study for the Brakfontein area” indicated that there is a deterioration of water quality within the project area. Thus habitat quality is not the primary concern rather the focus is on water quality. It has been identified that sites downstream are experiencing dilution and as such an improvement in biotic indices was seen. This conclusion has been drawn but requires further investigation to determine the exact cause of the poor water quality.

7.9 Wetlands

Digby Wells was commissioned to conduct an integrated wetland assessment (Appendix K) of the wetland areas associated with the farm Brakfontein 264 IR for the proposed Brakfontein Mining Project. The wetland areas which were considered for the study are situated in the middle reaches of the Wilge River catchment area.

7.9.1 Wetland Types

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, whereby features such as soil, vegetation and topography were considered. Plans 16 and 17

indicated the delineated wetlands as well as their location relative to the mining infrastructure.

The wetlands in the study area are linked to both perched groundwater and surface water. A total of five different HGM types of natural wetland systems occur within the area assessed. The five HGM units identified for the project area include:

- Seasonal pan wetland;
- Isolated hillslope seepage wetlands;
- Hillslope seepage wetlands connected to a watercourse;
- Valley bottom wetlands with a channel; and
- Floodplain.

7.9.2 Wetland Functions

No ecological services determined to be of high importance were identified for any of the wetland systems (Table 7-7). The highest percentage of services for each HGM unit was determined to be of an intermediate importance. Services considered to be of a moderately high importance were only determined for the two valley bottom wetlands, with 40% of the services identified for systems without a channel determined to moderately high in importance.

Table 7-8: The percentage of each importance class for the provided services

Ecological Services Importance	Seasonal Pan	Hillslope seepage wetlands	Floodplain	Valley bottom with a channel
Low	13%	13%	0%	0%
Moderately low	67%	27%	6%	33%
Intermediate	20%	47%	47%	54%
Moderately high	0%	13%	47%	13%
High	0%	0%	0%	0%

The moderately high important ecological services identified for the hillslope seepage wetlands, floodplain and the channelled valley bottom system pertain largely to water quality enhancement services, such as sediment and phosphate trapping, as well as nitrate and toxicant removal. This is to be expected owing to the diffuse nature of flow in such wetland units.

Both the channelled valley bottom and the floodplain units provide streamflow regulatory services which are of a moderately high importance. The flood plain system is a depositional environment with a gentle slope characterised by typical floodplain features such as ox-bow

lakes, cut-off meanders, backwaters, natural levees, etc. the differences in the hydrological regime within the features of the floodplain create an environment suitable for a high species richness and therefore maintenance of biodiversity. Thus the maintenance of biodiversity for this unit was determined to be of a moderately high importance.

Overall, all four systems provide services of varying importance which should not be considered in isolation, nor can these units be considered individually. The removal or degradation of a unit will inadvertently impose increased stresses on the remaining units.

7.9.3 Conclusion

A total of five hydro-geomorphic wetland units were identified for the project area. The floodplain system identified within the project area is generally considered characteristic of the middle reaches of the Wilge River. The identified channelled valley bottom systems with hillslope seepage wetlands located on the adjacent slopes is characteristic of the wetlands Olifants River Catchment area.

Agricultural practices associated with cropping are largely responsible for the current impacts to the integrity of the identified wetland areas. The project area as well as the surrounding areas on the periphery of the project area is dominated by agricultural activities. This has resulted in the removal of wetland vegetation, impacts to water quality due to phosphate and nitrate loads as well as altered hydrology of the system from damming.

Furthermore the Wilge River flows adjacent to a number of coal mining operations which increases the likelihood of water quality deterioration. The wetland systems of the Olifants River are of considerable importance especially due to their water quality enhancement qualities however these wetlands systems are under considerable pressure as a result of anthropogenic impacts from adjacent land use activities. The hillslope seepage areas have largely been removed or impacted upon by the agricultural activities and as a result provide no important ecological services. The channelled valley bottom system has been impacted upon by damming, canalisation, a too frequent fire regime and altered hydrology, these impacts are considered significant since they affect the manner in which water moves into, through and out of the wetland. These impacts result in the reduction of the water residual time within the wetland and therefore reduce the capacity for water quality improvement. The altered hydrology of the system, caused specifically by the damming of water and concentrated flows across the system have resulted in channels being incised into selected valley bottom areas. The water flow in the channelled valley bottom systems is no longer diffuse and therefore cannot effectively regulate streamflow and trap sediment and toxicants.

In spite of the surrounding impacts, the wetland units do provide a variety of ecological services with varying degrees of importance, with the floodplain systems considered to be the most valuable in terms of services. In spite of the impacts to the integrity and functioning of the system, the underlying hydrology (key driver) supporting the wetlands has not been affected.

The proposed mine plan for the Brakfontein Mining Project is presented in Plan 17. The proposed open cast mining and underground mining operation will impact on the underlying hydrology of the system, resulting in the potential loss of wetland areas due to the altered

geohydrology. The locality of mine infrastructure is designed such that mining activities are located outside of all delineated wetland areas as well as the associated buffer zones. Although mining operations will take place in the grasslands outside the delineated wetland areas, mining activities will still have a considerable impact on the integrity of the wetlands within the project area. The hillslope seepage wetlands receive water input predominantly from perched aquifers as well as interflow where infiltration occurs beyond the boundaries of the delineated wetlands. The loss of infiltration in the grassland due to mining activities will result in the desiccation of the hillslope seepages within the project area.

The valley bottom units receive water inputs from adjacent slopes via runoff, interflow and from a channelled system. Additionally, interflow may be from adjacent slopes, adjacent hillslope seepage wetlands, or may occur longitudinally along the valley bottom. The loss of the infiltration capacity of the surrounding grasslands and the development of mine infrastructure will results in a change in the manner in which water reaches the valley bottom wetlands and therefore altering the hydrological regime of the valley bottom wetlands. The manner in which the water reaches the valley bottom wetland system will change from diffuse flow into peak stormwater floods which may exacerbate erosion in the receiving valley bottom wetlands.

7.10 Noise

The specialist report can be found in Appendix G.

Based on the daytime results from the baseline environmental noise measurements (locations can be seen on Plan 12) it is noted that the L_{Aeq} levels at most locations measured above the SANS guidelines for the maximum allowable outdoor daytime limit for ambient noise in rural districts.

The night time ambient L_{Aeq} levels mostly measured above the SANS guidelines for the maximum allowable outdoor limit for night time ambient noise in rural districts.

The total L_{Aeq} level for all the measurements is 50dBA and the highest maximum during all measurements is 102dBA. As indicated by the time history graph, the highest averages during the 24 hour measurement periods are between 06:00 and 10:00 in the morning and 16:00 and 18:00 in the evening.

The noise sources that were audible during the baseline measurements at the time of the noise survey and that were responsible for the day/night time level are summarised in Table 7-9.

Table 7-9: Summary of noise sources influencing ambient noise levels at noise noise sensitive receivers around the proposed site.

Noise source description			
Day	**Duration**	**Night**	**Duration**
Birdsong	Continuous	Domestic animals	Intermittent

		(dogs)	
Domestic animals (dogs)	Intermittent	Mining activities to the north of measurement location N4	Continuous
Vehicular activity on the R50 and the Goedgedacht road	Intermittent	Vehicular activity on the R50 and the Goedgedacht road	Intermittent
Mining activities to the north of measurement location N4	Continuous		

Mining activities do generate noise from the various sources. The predicted noise levels of the primary noise sources are presented in Table 7-10.

Table 7-10: **Predicted noise levels at source**

Noise source	Noise level at source measured in dBA
Blasting	±127
Dozer	± 95
Front end Loader	± 95
Haul trucks	± 90

The earth moving equipment and haul trucks on site will be the primary source for continuous noise generated during construction, operational and decommissioning phases.

According to the noise dispersion model for the construction phase, the noise from the proposed mining activities will be similar or lower to that of the current ambient noise levels at the indicated noise sensitive receivers. It is also expected that the blasting activities throughout the operational phase will not measure above the current ambient noise levels at any of the noise sensitive receivers because of the noise attenuation effects from the pit walls as well as the overburden dumps and soil berms

7.11 Air Quality

Gondwana Environmental Solutions (GES) was appointed by Digby Wells to undertake the air quality impact assessment which has been included in Appendix F. The findings from this study are summarised below.

An initial baseline assessment was undertaken which included a review of available meteorological data and general regional air quality data. From a review of available

literature, it was established that the most significant pollutant that is generated from a coal mine is particulate matter (PM) (or Total Suspended Particulate – TSP). These particulate emissions will initially consist of dust generated during the construction of the beneficiation plant; the construction and use of access roads; and the preparation of the opencast mining area by stripping of topsoil and overburden. During the operational phase particulate emissions will be generated from drilling and blasting; materials handling operations; vehicle entrainment from unpaved roads; as well as wind erosion from exposed areas of the site.

This region of Mpumalanga Province experiences a wide range of both natural and anthropogenic sources of air pollution ranging from power generation to veld fires, mining activities, industrial processes, agriculture, vehicle use and domestic use of fossil fuels. Different pollutants are associated with each of the above activities, ranging from volatile organic compounds and heavy metals to particulate matter, dust and odours.

Mpumalanga experiences distinct weather patterns in summer and winter that affect the dispersal of pollutants in the atmosphere. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. Summer rainfall also aids in removing pollutants through wet deposition. In contrast, winter is characterised by atmospheric stability caused by a persistent high pressure system over South Africa. This dominant high pressure system results in subsidence, causing clear skies and a pronounced temperature inversion over the Highveld. This inversion layer traps the pollutants in the lower atmosphere, which results in reduced dispersion and a poorer ambient air quality. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

The impact assessment was limited to the impact of airborne particulates. Although the mining activities would also emit other gases, primarily by haul trucks and mining vehicles, it was established that the impact of these compounds would be insignificant and were therefore not included. Although the mining activities would also emit other gases, primarily by haul trucks and mining vehicles, the impacts of these compounds were not included. The sulphur content of South African diesel is too low (0.05% for Sasol TurbodieselTM) and mining equipment is usually too widely dispersed over the mine site to cause sulphur dioxide (SO2) levels to exceed the national standards, even in mines that use large quantities of diesel. For this reason, no detailed study of SO2 emissions from the mine has been undertaken. For the same reason, nitrous oxides (NOx) and carbon monoxide (CO) emissions have not undergone a detailed modelling assessment (Gondwana Brakfontein Air Quality Report 2012).

7.11.1 Emission inventory and values

An emissions inventory has been established to identify the potential sources of pollution during the different phases of the project (Table 7-11 and Table 7-12).

Table 7-11: Potential pollution sources during the construction phase (Gondwana Air Quality Report 2012)

Impact	Source	Activity
Generation of TSP and PM_{10}	Workshops and Offices	Clearing of groundcover
		Levelling of area
		Building construction
		Wind erosion from building materials storage piles
	Preparation of the opencast mining pit	Clearing of vegetation and topsoil
		Blasting and removal of overburden from three or four initial strips
		Loading and unloading of topsoil and overburden
		Wind erosion from topsoil and overburden storage piles
		Tipping onto topsoil and overburden storage piles
		Vehicle entrainment on unpaved road surfaces
	Stockpile sites	Clearing of groundcover
		Levelling of area
		Surface preparation of proposed stockpile areas
	Transport infrastructure Unpaved / gravel roads	Clearing of vegetation and topsoil
		Levelling of proposed transportation route area
Gases and particulates	Vehicles	Tailpipe emissions from construction and haul vehicles at the construction sites.
	Blasting	Emissions released from blasting activities.

Table 7-12: Potential pollution sources during the operational phase (Gondwana Air Quality Report 2012)

Impact	Source	Activity
Generation of TSP and PM_{10}	Mining operations within open pit area	Waste rock removal by shovel and truck
		Ore removal by shovel and truck
	Materials handling operations	Loading of topsoil, soft overburden and waste rock onto trucks; and offloading/tipping onto stockpiles
		Loading ore onto trucks and tipping onto ROM pads
		Loading of coal onto trucks for transport off site
	Vehicle activity on unpaved roads	Vehicles transporting topsoil to stockpile
		Haul trucks transporting overburden and waste from open pit to stockpiles
		Haul trucks transporting ore from open pit to ROM pads
	Wind erosion	Topsoil and overburden stockpiles
		Waste rock dumps
		ROM storage piles
	Drilling and blasting	Drilling and blasting of overburden
		Drilling and blasting of ore
Gases and Particulates	Vehicle activity	Tailpipe emissions from haul vehicles
		Tailpipe emissions from water tankers
		Tailpipe emissions from further transport mediums (buses for employees, private motor vehicles, mine personnel movement, etc.)

Parameters such as drilling information, number of vehicles, moisture and silt content etc. are used to establish the emission values seen in the table below for Brakfontein.

Table 7-13: Estimated annual emissions for the different mining activities at the proposed Brakfontein Thermal Coal Mine without mitigation.

Description	Annual Emissions (t/year)			
	TSP	%	PM_{10}	%
Open pit operations	234	34.6%	141	45.0%
ROM Stockpile	340	50.2%	146	46.5%
Overburden and Waste Stockpile	44	6.4%	13	4.2%
Hauling from the pit	58	8.6%	13	4.0%
Blasting	1	0.2%	1	0.2%
TOTAL	***678***		***314***	

7.11.2 Dispersion modelling

Dispersion simulations of highest daily as well as annual average PM_{10} concentrations were undertaken for the opencast mining at the proposed Brakfontein Thermal Coal Mine. Isopleth plots depicting predicted spatial variations in air pollutant concentrations, occurring due to the opencast mining are presented in the report. The main conclusions from the modelling are as follows:

- PM_{10} (24-hour Average Concentrations) – Without any mitigation measures, the predicted maximum daily concentrations only exceed the national daily standard of 75µg/m^3 in the near vicinity of the operational open pit, haul roads from the pit to the ROM pads, and around the ROM pads.
- PM10 (Annual Average Concentrations) – Without any mitigation measures, the predicted maximum annual average concentrations are well within the national annual average standard of 40µg/m^3.

7.12 Visual aspects

The landscape character and visual resource of the Brakfontein project area has already been transformed in most areas from natural grasslands to agricultural fields interspersed with mining ventures. The area is relatively flat with a range of approximately 70m; this gives rise to a slope percentage of between 0 and 5.5 percent (in very isolated areas).

The current sense of place is influenced by the disturbed landscape and is therefore somewhat industrial, although a passive agricultural sense of place is still perceived from some viewpoints. Due to the topography, the infrastructure associated with the mining operation is likely to have a high visibility (60 555 ha within a 20 km radius of the project area), although the atmospheric haze associated with the weather conditions and already existing industrial activities in the area is likely to decrease the visual exposure of the

proposed infrastructure somewhat. 29 farms have been identified to likely be impacted to varying degrees by the visual impacts associated with construction, operation and demolition of the proposed mine; 10 of these farms are likely to experience the most severe visual impacts as they are located within 2km of the proposed mining activities.

The table below summarises the findings from the visual assessments of the Brakfontein project area. The report can be found in Appendix H.

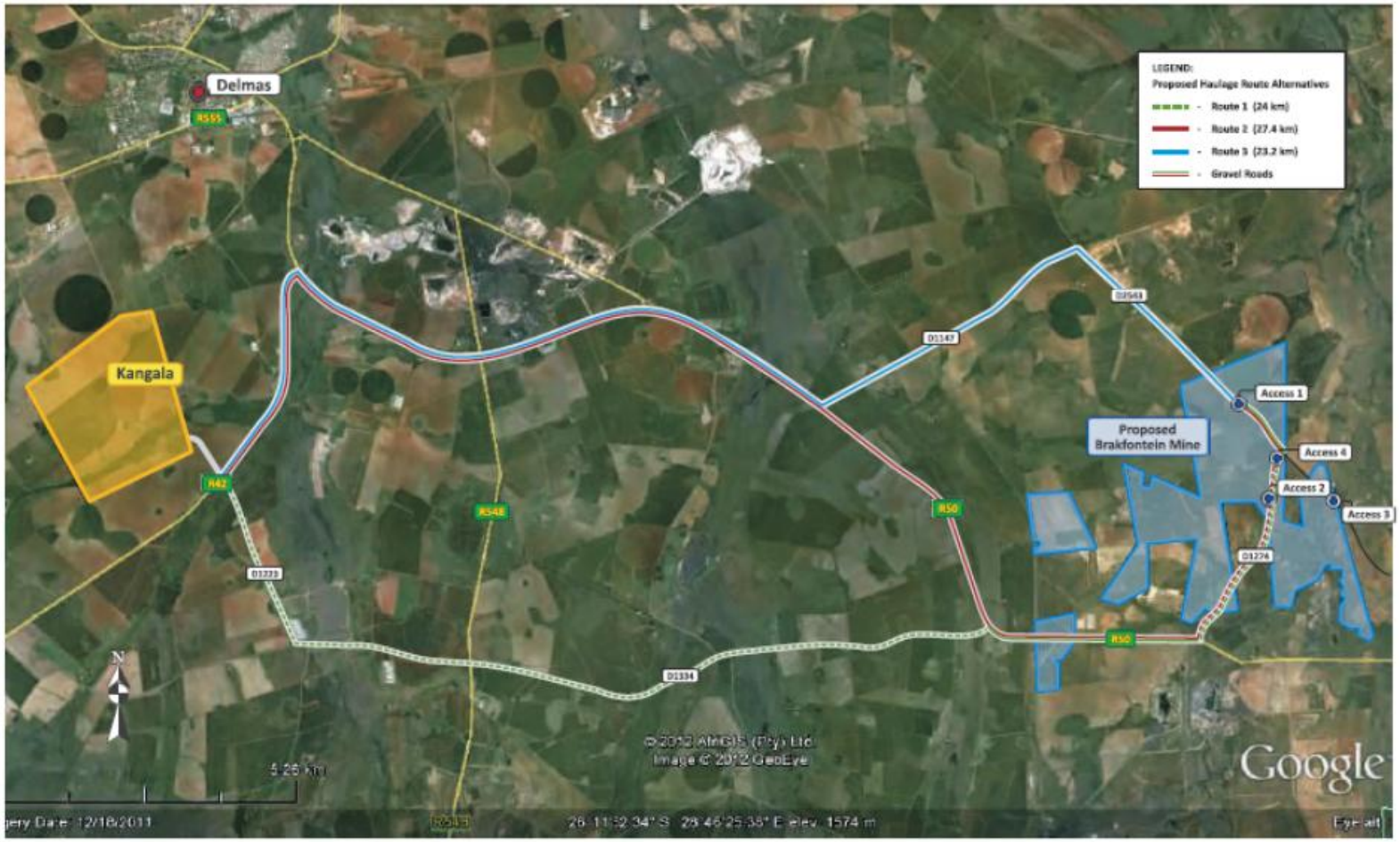
Table 7-14: Summary Table from Visual Assessment

Aspect	Summary / Rating
Topography	1513 to 1590 m.a.m.s.l Slope percentage of 0 – 5.5 in most areas
Landscape Character	Agricultural lands, wetlands and mining operations
Visual Resource and Scenic Quality	Moderate to Low, lacking visual diversity
Sense of Place	Related to mining and extensive agriculture, 'progressively developing' (or exploiting?)
Visual Absorption Capacity (VAC) of the landscape	Higher at a coarser scale and in the context of the current mining activities, lower on a local scale
Potential visual intrusion of the proposed infrastructure	High
Visibility of the proposed infrastructure	4930 ha within 0 to 2km of the proposed infrastructure, 9331 ha within 2 to 5km of the proposed infrastructure, 16056 ha within 5 to 10km of the proposed infrastructure 30238 ha within 10 to 20km of the proposed infrastructure
Visual Exposure	High but decreased by atmospheric and industrial haze, likely to be limited to 10km
Sensitivity of the potential receptors	Moderate to low, based on current landscape context

7.13 Traffic and Safety

A Traffic Assessment is currently being undertaken by BKS to determine the effect of the proposed mining activities (including the transport of coal) on the surrounding roads between Brakfontein and Kangala Coal Mine. Preliminary investigations indicate that:

- Route 3 (R42, R50, D1147, D2543) i.e. the blue route is the preferred route alternative between Brakfontein and Kangala.
- The proposed mine is expected to generate 200 truck trips per day i.e. 10 truck trips per hour and will have a negligible traffic impact on the surrounding road network.
- The proposed mine is expected to contribute a proportion of no more than 25% to the total heavy vehicle traffic volume on Route 3 and will therefore not have a substantial pavement impact on this route.
- Sufficient sight distance is provided at the proposed accesses to the Brakfontein Mine.
- A weighbridge facility will be constructed as part of the Brakfontein Mine to ensure that haulage trucks travelling to Kangala are not overloaded.



TRAFFIC IMPACT STATEMENT: BRAKFONTEIN THERMAL COAL MINE — Locality Map — 1

7.14 Sites of archaeological and cultural interest

The Heritage Impact Assessment (included in Appendix L) was undertaken with the aim of identifying, recording and evaluating heritage resources and impacts on those.

The HIA identified 12 resources with heritage value. These included five burial grounds, six structures and two archaeological/historical sites. These are indicated on Plan 18.

7.14.1 Directly affected Heritage Resources

Heritage resources that will be directly affected include:

- H008 (burial ground) in Figure 7-2

A fenced burial ground containing 11 graves was identified at this point. A total of five formal headstones (cement and granite) were observed and six small cement casket type graves with one large cement casket type grave were observed. The seven cement casket type graves had been placed side-by-side. The dates of the graves range from 1932 to 1978.

Figure 7-2: View of burial ground identified at H008

- H009 (59 year old historical structure),

A small two room structure (4 m x 3 m) was observed at this point. It is a possible storage room, and might be associated with the large house identified at H010 approximately 100 m

away. The structure does not have a roof and glass and metal fragments were identified in the vicinity. It may have been a pen for animals.

- H010 (59 year old historical structure),

Two structures beside each other: a larger one structure approximately 30 m in length and 15 m wide, and a smaller one approximately 15 meters long and 10 meters wide. The larger structure consisted of an entrance hall and a three meter diameter room to the left of the entrance. The walls were constructed from modern bricks with cement plaster. A mud brick structure approximately four meters long and three meters wide existed was located near the entrance. Fragments of glass, metal and building rubble were present.

- H011 (59 year old historical structure),

A plastered stonewall structure measuring approximately 30 meters long and 20 meters wide was identified. The walls were constructed with a combination of daga and cement mortar. The structure comprised three large rooms divided by mud brick walls. A brick and cement structure – possibly a water tower – was located 10 m from the main structure.

- H012 (burial ground) due to activities such as the opencast pit.

An unfenced burial ground was found in close association with the structure identified at H011, approximately 50 m to the south east from the structure.

This site was identified after the physical survey was completed by the soil specialist, this was not verified by the archaeologist. Approximately 9 graves were observed with cement headstones.

7.14.2 Heritage Resources indirectly affected

Heritage resources that will be indirectly affected include H001 (historical structure), H002 (burial ground), H003 (burial ground), H004 (midden), H005 (burial ground), H006 (historical structure) and H007 (historical structure) due to construction and operational activities.

The identified heritage resources H001, H007, H009, H010 and H011 are confirmed to be 59 years old according to the aerial photograph dated to 1953. There is a high possibility that these structures are older than 59 years and are thus protected by legislation.

All burial sites should be considered as significant on historical, social and intangible levels. These graves may have intrinsically different meanings and significance to different people and communities. Burial sites may also relate to land claims. As far as possible, these sites should be managed *in situ* and protected from any impacts – either a direct, primary impact or secondary impact.

The impact of the project as a whole will have a low to medium impact on the cultural landscape of the area, as no regional significant heritage resources were identified during the HIA. However, a chance finds procedure should be developed and implemented during the construction phase of the project.

7.15 Regional socio-economic structure

A detailed Social Impact Assessment in Appendix M presents the baseline profile of the regional Victor Kanye Local Municipality (VKLM) and local (Wards 6 and 7 of VKLM) study areas, set against the backdrop of the Nkangala District Municipality. The following aspects of these study areas are discussed:

- Demographics, including population size, age and gender distributions, as well as ethnicity;
- Education and skills;
- Employment, including levels of employment and employment sectors;
- Economic conditions, including the trade, mining, agriculture and tourism sectors, in addition to economic development targets;
- Infrastructure and services, including housing, household energy, water, sanitation, transport, health, education, safety and security;
- Community needs and challenges; and
- Spatial development and land claims.

7.15.1 Demographic Information

In 2007, an estimated 50 500 people resided in the VKLM, which is a 10% decrease from the estimated population in 2001 (Statistics South Africa, 2007). During the same period of time, the district municipality experienced about a 20% increase in population, mostly attributable to the Emalahleni Local Municipality whose population almost doubled (Statistics South Africa, 2007). Only 4% of the district municipality's population resides in the VKLM, translating into just more than 15 000 households. The study area has a relatively young population, with about one-third of individuals being under 15 years of age.

Figure 7-3 and Figure 7-4 indicate the population composition of the study area as well as the distribution of languages.

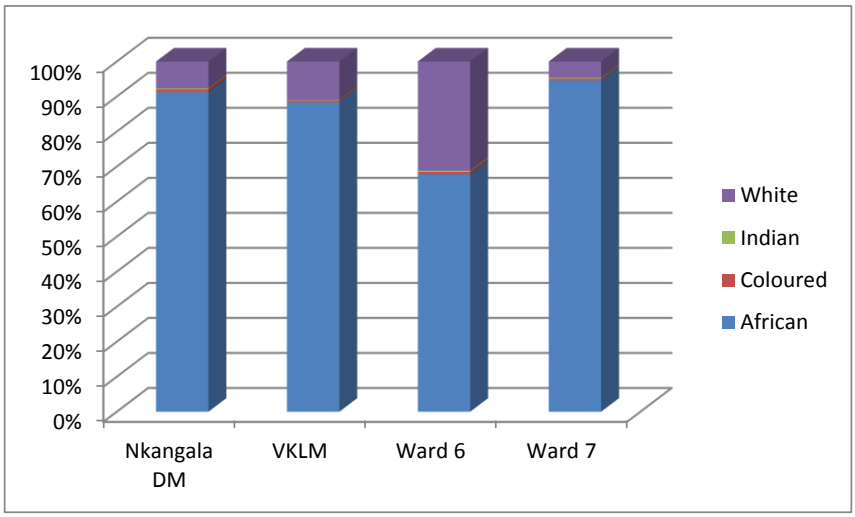


Figure 7-3: Population breakdown in the local and regional study areas

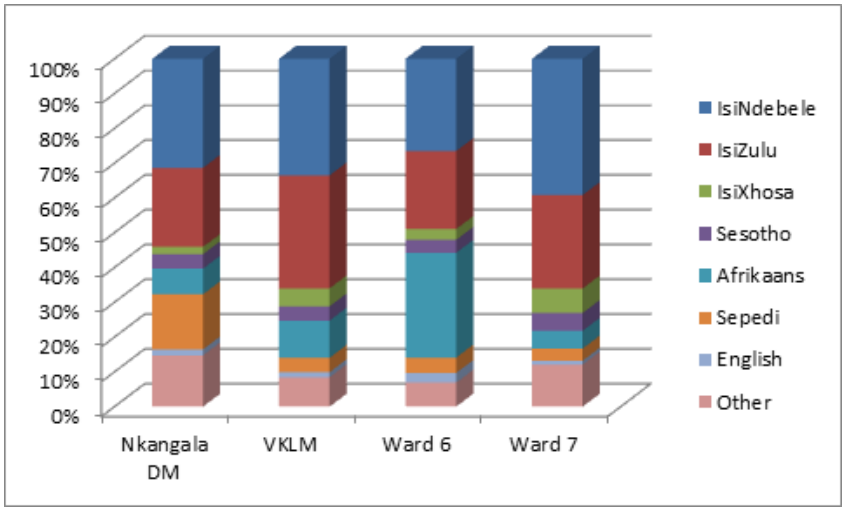


Figure 7-4: Language distribution

7.15.2 Education and skills

As an indication of overall education levels in the study areas, the highest education attained by over-20 year olds in the local and district municipality (as recorded during the 2001 Census) are shown in Figure 7-5below. It is clear from this figure that VKLM does not compare very favourably with the rest of the Nkangala District Municipality: just over one-quarter of adults in the district municipality had Grade 12 or higher education, while in VKLM, this figure drops to 19%. Education levels within the local municipality are unevenly spread, however. In the local study area, just over one-fifth of adults in Ward 6 have had no schooling; in Ward 7, this figure rises to over one-third. Stakeholders consulted for the purpose of this SIA indicated that there is a high level of illiteracy among the local municipal population, and that there is a significant lack of skills among the local population.

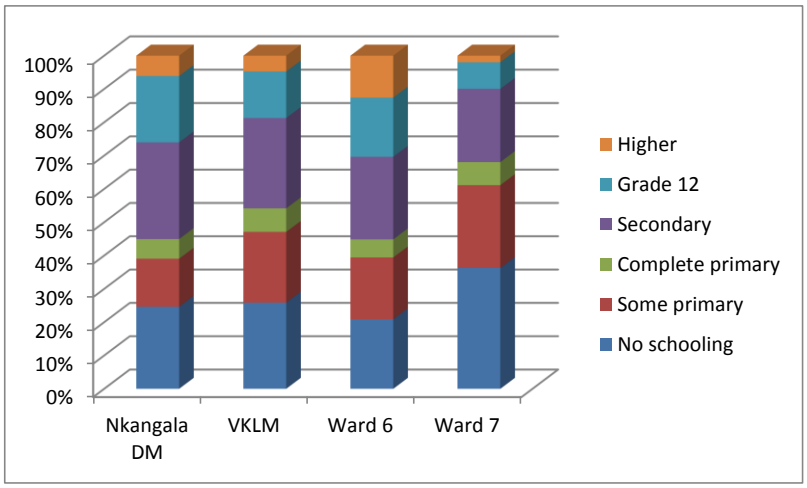


Figure 7-5: Highest education attained by over-20 year olds in 2001

7.15.3 Employment and Income

Unemployment is rife throughout the regional study area; according to 2001 Census statistics, it stood at 43% in VKLM and 44% in Nkangala District Municipality as a whole. The situation was only slightly better in the local study area, with unemployment rates of 33% and 36% in VKLM Wards 6 and 7, respectively. There are indications, however, that the situation has improved significantly in the last decade; at the time of the 2007 Community Survey, the VKLM IDP (IDP, 2011/2012) notes that unemployment in the local municipal area had dropped to 26%. However, stakeholders consulted as part of this SIA indicate that it remains a major problem within the local municipal area.

There is a substantial number of households in VKLM Ward 6 that earn between R10 000 and R50 000 per month (at 2001 prices), while households in this income bracket are much less common Ward 7. In the latter, most households earned less than R1000 per month. The average household income in Ward 7 in 2001 was just over R 3000 per month, which is almost exactly the same as the average household income in VKLM and Nkangala District Municipality as a whole. In Ward 6, by contrast, the average household earned R 5 500 per month.

Among those members of the study area's population who are employed, the most common sources of employment are in the agricultural, community/ social/ personal services, wholesale/ retail, manufacturing and mining sectors.

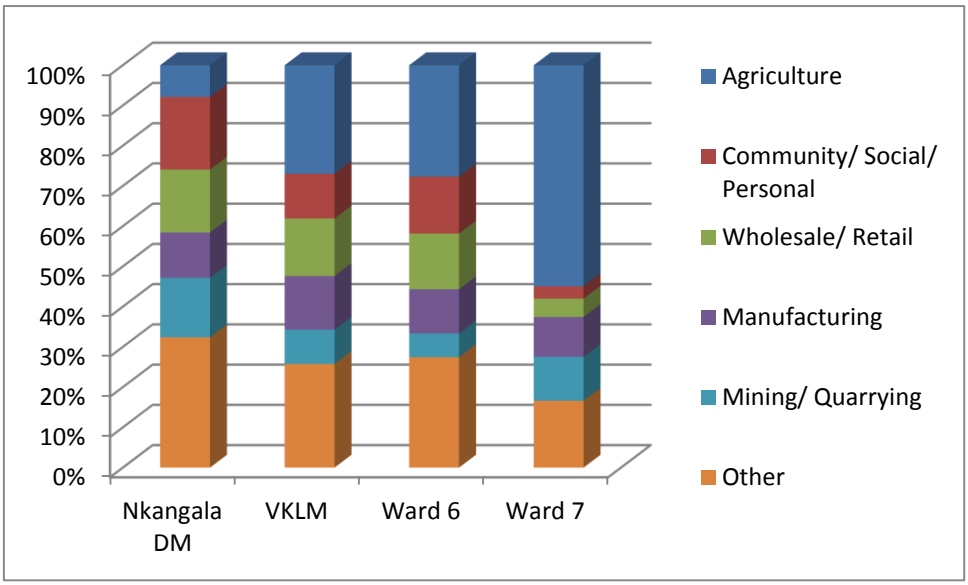


Figure 7-6: Sectoral employment in 2001

7.15.4 Infrastructure and services

Figure 7-7 below gives an overview of access to and utilisation of services in the local and regional study area, as reflected in Census 2001 statistics (Statistics South Africa, 2001). Five types of services are depicted in the figure:

- Housing (the figure showing the percentage of households in the district and local municipalities and the wards constituting the local study area who live in formal houses);
- Household energy (the figure showing the percentage of households who use electricity for lighting);
- Water (the figure showing the percentage of households who have running water in their dwelling or yard);
- Sanitation (the percentage of households who have flush toilets); and
- Transport (the percentage of persons who travel to work or school by car – either as driver or as passenger).

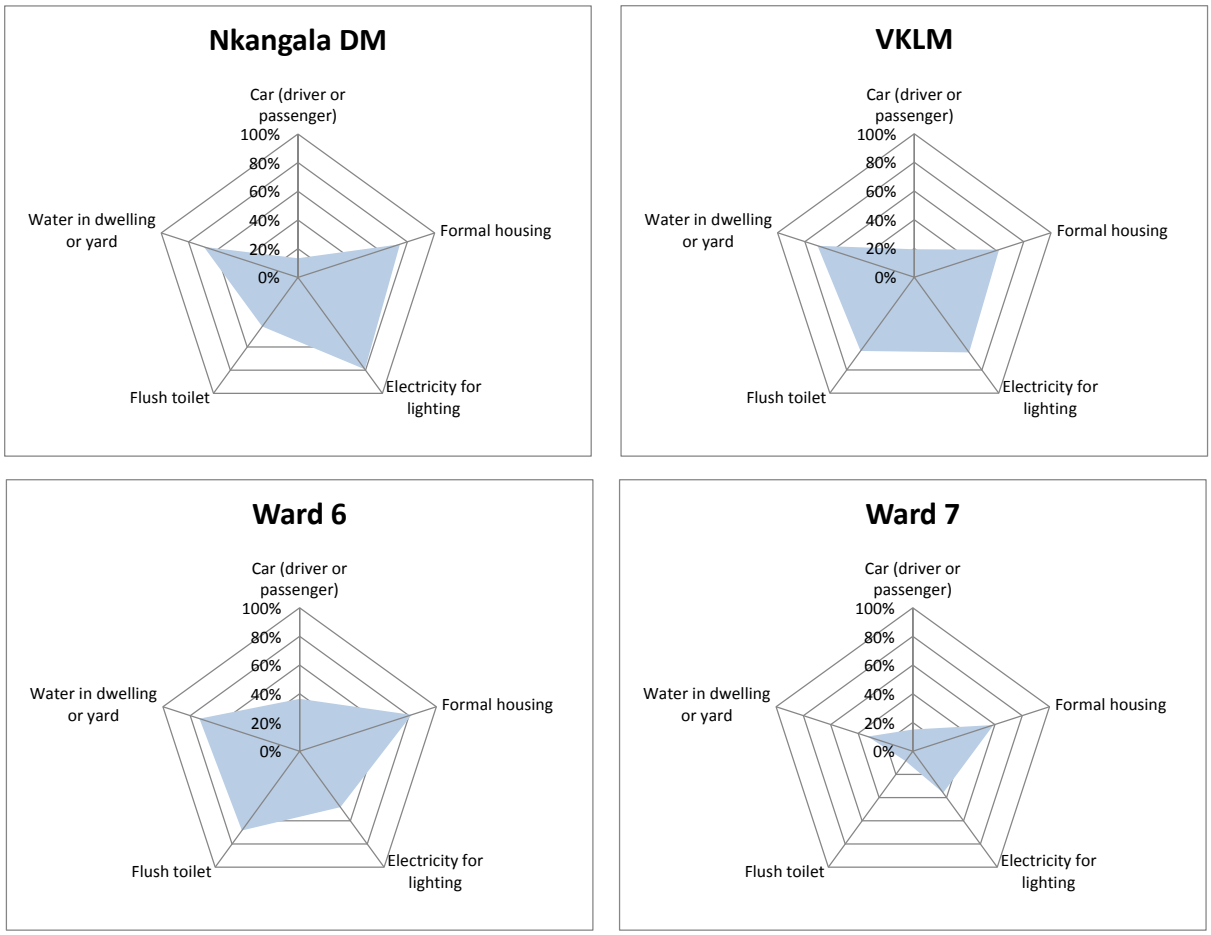


Figure 7-7: Access to services

As can be seen from this figure, the provision of services within VKLM is fairly limited, with only about 60% of households living in formal houses, having access to electricity or water-borne sanitation. Access to water services is only slightly better, with about 70% of households having running water in their dwelling or yard. Furthermore, the provision of services within the municipality is highly uneven, as is reflected in the marked contrast between Wards 6 and 7. In almost all respects, the population of Ward 6 has much better access to services than that of Ward 7.

8 PUBLIC PARTICIPATION PROCESS

Public participation is an essential and legislative requirement for environmental authorisation in a number of the major Acts applicable to this activity. The principles that demand communication with society at large are best embodied in the principles of the National Environmental Management Act (Act 107 of 1998, Chapter 1), South Africa's overarching environmental law. In addition, Section 24 (5), Regulation 54-57 of GNR 543 under the NEMA, guides the public participation process that is required for an EIA process.

The public participation process for the proposed development has been designed to satisfy the requirements laid down in the above legislation and guidelines and is also compliant for the other applicable Acts such as the MPRDA and NWA. Figure 8-1 provides an overview of the EIA technical and public participation process steps, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process. The following sections provide an overview of the public participation activities conducted thus far.

8.1 Objectives of Public Participation in an EIA

The objectives of public participation in an EIA are to provide sufficient and accessible information to I&APs in an objective manner so as to:

During Scoping:

- Assist the I&APs to identify issues of concern, and provide suggestions for enhanced benefits and alternatives.
- Contribute their local knowledge and experience.
- Verify that their issues have been considered and to help define the scope of the technical studies to be undertaken during the Impact Assessment.

During Impact Assessment:

- Verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere.
- Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

Two public meetings were held during the EIA process. A public meeting combined with an open house was held on 20 June 2012 at the Delmas Country Lodge. The purpose of the meeting was to review the contents of the Draft Scoping Report and for stakeholders to provide their comments and to raise issues of concern. A Public Meeting to review the DEIR was held on 24 October 2012.The attendance registers for both meetings are appended. Comments and issues raised at the meetings are included in the comments and Response Report.

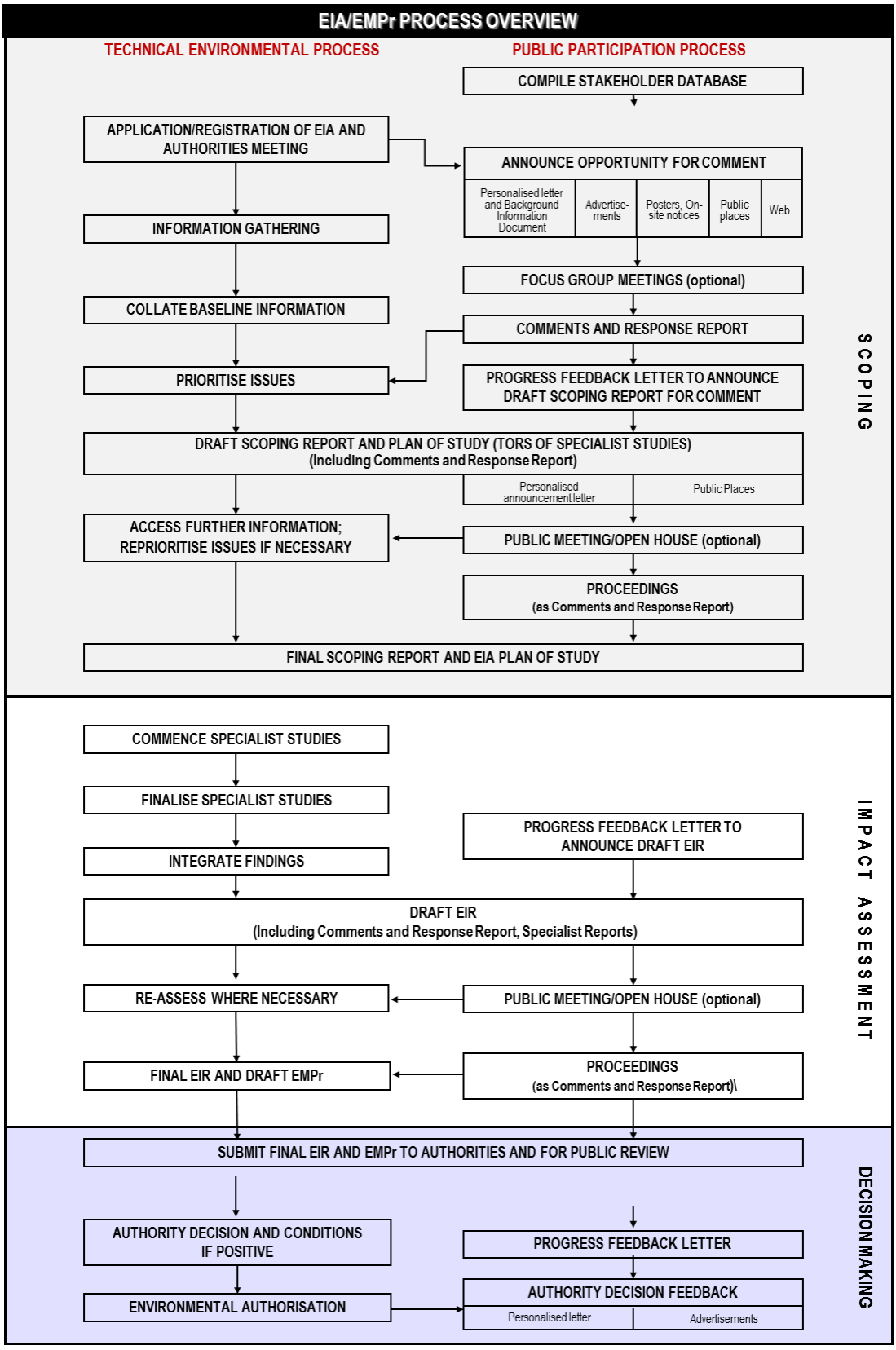


Figure 8-1: Technical and public participation process and activities that comprise the Environmental Impact Assessment for the proposed Brakfontein Coal Mine project

8.2 EIA Application Form and Landowner Notifications

The EIA application form for the proposed project was submitted to MDEDET on 13 March 2012. Subsequent to the submission of the application form a letter notifying potentially directly affected land owners and occupiers were sent via registered mail on 3 April 2012. Proof of the notification letters was submitted to MDEDET. A copy of the letter is attached as part of the Public Participation Appendix B.

8.3 Identification of interested and affected parties

The identification of stakeholders is on-going and refined throughout the EIA process. As the on-the-ground understanding of affected stakeholders improves through interaction with various stakeholders in the area the database is updated. The identification of key stakeholders and community representatives (land owners and occupiers) for this project is important as their contributions are valued.

The stakeholders' details are captured on Maximiser version 12, an electronic database management software programme that automatically categorises every mailing to stakeholders, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from stakeholders are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations under Section 24(5) of NEMA, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of involved I&APs throughout the process (See Appendix B).

Two main I&AP groups were identified:

1) *Regulatory authorities*

Relevant authorities were identified as these departments and divisions form part of the project decision-making process and need to be appropriately informed.

- Department of Mineral Resources (DMR);
- Department of Water Affairs (DWA);
- Department of Public Works, Roads and Transport (DPWRT); and
- Mpumalanga Department of Agriculture, Rural Development and Land Administration (MDARDLA);
- Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET);
- Mpumalanga Tourism and Parks Agency (MTPA);
- Victor Khanye Local Municipality - managers, environmental and social departments.

2) Public

- Adjacent land owners;
- Directly affected land owners (see Table 5-2 below for specific detail);
- Agricultural organisations;
- Environmental groups.

8.4 Announcement of opportunity to become involved

The opportunity to participate in the EIA was announced in April 2012 as follows:

- Distribution of a letter of invitation to become involved, addressed to individuals and organisations, accompanied by a Background Information Document (BID) containing details of the proposed project, including a map of the project area, and a registration sheet.
- Advertisements were placed in the following newspapers as seen in Table 8-1.

Table 8-1: Advertisements placed during the announcement phase

Newspaper	Date
Middelburg Observer	26/04/2012
Streeknuus	26/04/2012
Mpumalanga News	25/04/2012
Witbank News	27/04/2012

- Notice boards were positioned at prominent localities on 17 April 2012. These notice boards were placed at conspicuous places and at various public places. Site notices were placed prominently to invite stakeholder participation Figure 8-2.

Figure 8-2: Site notice boards were put up in the study area

8.5 Obtaining comment and contributions

The following opportunities are available for contribution from the I&APs:

- Completing and returning the registration and comment sheets on which space was provided for comment (included in the BID, Draft and Final Scoping Reports and Draft Environmental Impact Report); Providing comment telephonically or by email and fax to the public participation office; and
- Providing comments at a public meeting which was held on 20 June 2012 to review the contents of the Draft Scoping Report. A meeting will be held on 24 October 2012 to review the contents of the Draft Environmental Impact Report.

8.6 Comments and response report and acknowledgements

The issues raised thus far were captured in a Comments and Response Report – Version 3 (Appendix B). The report will be updated to include additional I&AP contributions that may be received on the Draft Environmental Impact Report. Version 4 of the Comments and Response Report will be appended to the Final Environmental Impact Report. The contributions made by I&APs were and will be acknowledged in writing.

8.7 Scoping Report

The purpose of public participation in scoping was to enable I&APs to verify that their contributions have been captured, understood and correctly interpreted, and to raise further issues.

8.7.1 Draft Scoping Report

The Draft Scoping Report was made available from 23 May to 2 July 2012 for public review. The report was available for review at the Delmas Public Library and electronic copies (CDs) were made available at the public meeting held on 20 June 2012 or on request. The report was also available on the Digby Wells website. Table 8-2 contains the information that was communicated to the stakeholders with regards to the availability and review of the Draft Scoping Report.

Table 8-2: Copies of the Draft Scoping Report can be obtained at the following public places as indicated

	Address		
Person		**Location**	**Contact**
Printed Copies			
Ms Lydia Mehlape	Cnr Sarel Cilliers & Van Riebeek Avenue PO Box 6, Delmas, 2210	Delmas Public Library	(013) 665-2425 (013) 665-4721
Electronic Copies			
Anelle Lotter	359 Pretoria Avenue, Randburg	www.digbywells.com	011 789 9495
Nathalie Kalele	Phone and request a CD copy which will be sent to you via the postal services		011 789 9495

Notification of the availability of the report for public review was posted and emailed to stakeholders on 17 May 2012. Stakeholders were invited to comment on the Draft Scoping Report in the following ways:

- Completing a comment sheet (which was distributed with the notification letter);
- Writing a letter, or producing additional written submissions;
- Sending an email or phoning the public participation office; or
- Attending a public meeting which was held on 20 June 2012.

A public meeting and open house was held at the Delmas Country Lodge on Wednesday, 20 June 2012 from 15:00 to 20:00. The purpose of the public meeting was to present the outcome of the scoping phase, and to allow discussions around the Draft Scoping Report. Recommendations and issues/concerns raised during the meeting were captured and were reflected in the Comments and Response Report.

8.7.2 Final Scoping Report

The Draft Scoping Report and Plan of Study for the EIA was updated based on comments from the key commenting authorities and comments obtained from I&APs. The Final Scoping Report was submitted to MDEDET, commenting authorities and is available for public review from 18 July to 28 August 2012. Stakeholders have also received notification that the Final Scoping Report was available for their review.

8.8 Public participation during the impact assessment phase

Public participation during the impact assessment phase of the EIA mainly involves a review of the findings of the EIA, presented in a Draft and Final EIA report, the Draft and Final EMPR and the volumes of Specialist Studies.

I&APs have been advised of the availability of these reports, how to access them, and the dates and venues of a public meeting where the contents of the reports was presented for comment. A public meeting was held on 24 October 2012 at the Delmas Country Club where a summary of the DEIR and EMPR was presented for comments.

8.8.1 Announcing the Availability of the Draft EIA and EMPR for public review

A letter was circulated to all registered I&APs, informing them of progress made with the specialist studies and that the Draft EIA and EMPR are available for comment. The report was distributed to public places and also presented at a stakeholder meeting held on 24 October 2012 at the Delmas Lodge.

Contributions at the meeting were considered in the finalisation of the EIA.

8.8.2 Announcing the Availability of the Final EIR and EMPr

Stakeholders on the database have received a personalised letter to report on progress, to thank those who commented to date and to inform them that the Final EIA and EMPR have

been submitted to the lead authority for consideration. They will also be provided the opportunity to comment on the final reports.

8.8.3 Announce Authorities' Decision on Environmental Authorisation

The decision of the authorities on whether Environmental Authorisation was granted or not will be communicated to stakeholders as specified in the conditions. It is anticipated that the decision will be communicated through the following methods:

- Personalised letters to individuals and organisations on the mailing list; and
- Advert in local or regional newspapers.

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Methodology

In order to clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of environmental impact assessment practitioners, propose a numerical methodology for impact assessment, one has to accept that the process of environmental significance determination is inherently subjective. The weight assigned to the each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&AP's and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific enquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved.

It is for this reason that it is crucial that all EIA's make reference to the environmental and socio-economic context of the proposed activity in order to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. The methodology employed for environmental impact assessment is divided into two distinct phases, namely, impact identification and impact assessment.

Social, Economic and Heritage aspects have been discussed in separate sections.

9.2 Impact identification

Impact identification is performed by use of an Input-Output model which serves to guide the assessor in assessing all the potential instances of ecological and socio-economic change, pollution and resource consumption that may be associated with the activities required

during the construction, operational, closure and post-closure phases of the project. These activities were listed below:

Phase		Activity
Construction	1	Site Clearing: Removal of topsoil & vegetation
	2	Construction of any surface infrastructure e.g. haul roads, pipes, storm water diversion berms (including transportation of materials & stockpiling)
Operational	3	Operation and maintenance of Infrastructure
	4	Removal of overburden and backfilling when possible (including drilling/blasting hard overburden & stockpiling)
	5	Use and maintenance of haul roads (incl. transportation of coal to washing plant)
	6	Concurrent replacement of overburden, topsoil and revegetation
Decommissioning	7	Demolition & Removal of all infrastructure (incl. transportation off site)
	8	Rehabilitation (spreading of soil, re-vegetation & profiling/contouring)
	9	Installation of post-closure water management infrastructure

Outputs may generally be described as any changes to the biophysical and socio-economic environments, both positive and negative in nature, and also include the product and waste produced by the activity. Negative impacts could include gases, effluents, dust, noise, vibration, other pollution and changes to the bio-physical environment such as damage to habitats or reduction in surface water quantity. Positive impacts may include the removal of invasive vegetation, construction of infrastructure, skills transfer or benefits to the socio-economic environment. During the determination of outputs, the effect of outputs on the various components of the environment (e.g. topography, water quality, etc.) is considered.

During consultation with I&APs perceived impacts were identified. These perceived impacts will become part of the impact assessment and significance rating in order to differentiate between probable impacts and perceived impacts.

9.3 Impact rating

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified by use of the Input-Output model. As discussed above, it has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. This gives the project proponent a greater understanding of the impacts of his project and the issues which need to be addressed by mitigation and also give the regulators information on which to base their decisions.

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

Where

Significance = Consequence x Probability

Consequence = Severity + Spatial Scale + Duration

And

Probability = Likelihood of an impact occurring

The matrix calculates the rating out of 147, whereby Severity, Spatial Scale, duration and probability are each rated out of seven as indicated in Table 9-1. The weight assigned to the various parameters for positive and negative impacts in the formula.

Table 9-1: Impact assessment parameter ratings

Rating	Severity	Spatial scale	Duration	Probability
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.

Rating	Severity	Spatial scale	Duration	Probability
6	Significant impact on highly valued species, habitat or ecosystem.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural process will reduce the impact.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Province/ Region Will effect the entire province or region	Project Life The impact will cease after the operational life span of the project.	Likely The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month.	Local Local extending only as far as the development site area	Medium term 1-5 years	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of

Rating	Severity	Spatial scale	Duration	Probability
				adequate mitigation measures
1	Limited damage to minimal area of low significance, (eg ad hoc spills within plant area). Will have no impact on the environment.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

9.4 Summary of Environmental Impact Ratings

The following are the most potentially significant negative impacts (higher than significance of 75) that have been determined by the above methodology for each phase.

Activity, Phase and Impact				Pre-mitigation						Post-mitigation					
Impacted Environment	Phase impact occurs (C, O, D)	Activity No.	Activity	Duration (7)	Spatial Scale (7)	Severity (7)	Consequence	Probability (7)	Significance (147)	Duration (7)	Spatial Scale (7)	Severity (7)	Consequence	Probability (7)	Significance (147)
Biophysical Impacts															
Soil	C	1	Site Clearing	7	3	7	17	7	119	7	3	6	16	7	112
	D	8	Rehabilitation	7	3	7	17	7	119	7	3	5	15	7	105
Hydrology	C	2	Construction surface infrastructure	6	5	4	15	5	75	3	3	3	9	3	27
	O	3	Operation and maintenance of infrastructure	6	5	6	17	5	85	5	5	3	13	3	39
	O	4	Removal of overburden and backfilling	6	6	5	17	5	85	5	3	3	11	3	33
	O	5	Use and maintenance of haul roads	5	5	5	15	6	90	5	3	3	11	4	44
	O	6	Concurrent replacement of overburden, topsoil and revegetation	6	5	6	17	5	85	5	3	4	12	3	36
	D	7	Decommissioning & Removal of all infrastructure	6	5	6	17	5	85	3	3	3	9	3	27
Groundwater	O	3	Operation and maintenance of infrastructure	6	3	5	14	6	84				0		0
	O	4	Removal of overburden and backfilling when possible	6	3	5	14	6	84				0		0
	O	6	Concurrent replacement of overburden, topsoil and revegetation	6	3	5	14	7	98				0		0

Fauna & Flora	C	1	Site Clearing	5	4	5	14	7	98	5	4	3	12	6	72
Aquatics	C	2	Construction surface infrastructure	6	3	4	13	6	78	2	2	5	9	5	45
	O	4	Boxcut, Removal of overburden and backfilling when possible	4	7	5	16	6	96	4	3	5	12	6	72
Wetlands	C	1	Site Clearing	5	4	5	14	7	98				0		0
	C	2	Construction surface infrastructure	5	4	5	14	7	98				0		0
	O	3	Operation and maintenance of infrastructure	5	4	3	12	7	84				0		0
	O	4	Removal of overburden and backfilling when possible	5	4	3	12	7	84				0		0
Visual / topography	C	1	Site Clearing	5	3	4	12	7	84	5	3	3	11	5	55
	O	3	Operation and maintenance of infrastructure	5	4	5	14	7	98	5	4	4	13	7	91
	O	4	Removal of overburden and backfilling when possible	5	4	5	14	6	84	5	4	4	13	6	78
Air Quality	O	4	Removal of overburden and backfilling when possible	5	3	3	11	7	77				0		0
	O	5	Use and maintenance of haul roads	5	3	3	11	7	77				0		0
	O	6	Concurrent replacement of overburden, topsoil and revegetation	5	3	3	11	7	77				0		0

9.5 Construction Phase

9.5.1 Soil

Activities during early works and construction in the Brakfontein Coal Project area could lead to the following significant impacts on soils:

- Soil compaction and topsoil loss leading to reduced fertility (especially due to the presence of sandy topsoil);
- Soil loss as a result of wind and water erosion and sediment release to land and water (by removing vegetation);
- Alteration of natural drainage lines; and
- The change of land use from natural vegetation and agriculture (primarily mixed arable and grazing) to industrial within the Brakfontein Coal project area.

Limited impacts are expected outside of the Brakfontein Coal Project area, with the exception along unpaved roads within the region, where erosion can impact on adjacent areas. Much of the impacts to soil and land capability cannot be mitigated further because they derive from the land-take footprint from the physical presence of the development, however measures can be implemented to help minimise impacts.

Impacts will definitely occur. They will be permanent in duration, but significance of the impact will decrease when disturbed areas are rehabilitated and re-vegetated during decommissioning of the Brakfontein Coal Project. Intensity will range from low to high as natural functions of the soil will be altered. Impact magnitude will be medium to high given the extent of the area affected. Impact significance to soil resources and land capability pre-mitigation is expected to be high.

9.5.2 Surface water

Surface water quality deterioration could result from spillages of construction material, siltation from dust deposition and soil erosion. Small leaks of hydrocarbon containing material if not detected early could result in major water quality deterioration in the pro-longed LoM.

Negative impacts could arise from the improper use of explosives, spillages from undetonated explosive material (nitrate and ammonia) and waste left behind after detonation. Heavy vehicle movement could result in elevated dust levels which could result in the siltation of nearby surface water resources. The diesel leakages from the tracks and filling station on site could result in the development of surface water contamination should run-off be allowed to flow off-site.

The water quality impacts could arise from the pro-longed leakages or instant spillages of the hazardous and hydrocarbon containing materials. Also see groundwater section relating to mine water.

9.5.3 Air Quality

The construction phase will increase the current dust levels due to increased activity of vehicles and heavy machinery, the construction of a haul road, the stripping of vegetation and exposure of soil layers. Preparation of areas for opencast mining by stripping soil and blasting rock will increase dust levels. Therefore the construction phase will have negative impacts on air quality in the area.

9.5.4 Noise

It is expected that, during the life of mine of the proposed project, the noise levels generated by the mining activities will have a minor significant impact on the ambient noise level at noise sensitive receivers. It is expected that the impact will be of a minor significance because of the relative short duration of the construction phase. During the operational phase the noise levels are expected to impact even less because of the pit walls, soil berms and overburden dumps that will mitigate the noise propagation by acting as natural noise barriers.

9.5.5 Fauna and Flora

All vegetation communities, identified during field that are present within the proposed area of development and will be impacted on. Of concern is the natural areas as the existing vegetation (Grassland, rocky ridges and riparian areas) will be removed to facilitate the construction of mine and related infrastructure. This will include the continuous and complete removal of vegetation on the footprint of the actual pit. This activity is considered to be short term and will occur during the construction phase. The impact will be regional in extent with impacts likely to occur on site. The presence of sensitive habitats does however mean that destruction will be a regional loss of the habitat type. The severity of the impact was determined to be high.

The partial degradation of natural vegetation and habitat for animal life has already taken place within the surrounding environment due to current land use practices. The destruction of the areas with undisturbed natural grassland will result in the permanent reduction of natural habitat of reptiles, birds, frogs, insects and mammals present within the areas. The destruction of the rocky ridges habitat type will be of special concern as these are sensitive habitats. The grassland, rocky areas and riparian vegetation found offers habitat to certain birds, reptiles, frogs, insects and mammals that could be present. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be high.

9.5.6 Aquatics

The clearing of naturally occurring vegetation, levelling of land, creation of hard surfaces and the creation of compacted surfaces to make way for development generates changes to the environment which allows for the alteration of normal drainage patterns. Altered drainage patterns serve to alter the aquatic ecosystems in the following manners:

- Increased runoff due to presence of hard surfaces and removal of vegetation;

- Decreased seepage due to increased runoff;
- Increased erosion due to increased runoff; and
- Increased sediment load of nearby aquatic systems.

Activities associated with the workshop and vehicular movements/maintenance creates the potential for substances such as oils and lubricants to leak into the surrounding environment. Once in the environment these substances can be carried into the aquatic ecosystem via water runoff. These substances are known to contain Poly Aromatic Hydrocarbons (PAH's) which have been shown to be persistent in nature. These substances have shown to decrease ecological integrity. The incidence of increased runoff may produce sedimentation in the local river systems thereby altering habitats in water chemistry thereby lowering the ecological status of the associated river systems.

If these impacts were to occur the following would be observed in the aquatic ecosystem:

- Decreased water quality;
- Altered flow dynamics; and
- Negative impacts on biodiversity.

9.5.7 Wetlands

The removal of topsoil and vegetation to initiate the mining operation and the placement of infrastructure for the proposed mining operation will result in the indirect removal of some wetland areas. The clearing and removal of topsoil will result in the removal of vegetated areas causing areas to become exposed to the elements. This will increase the erosion potential of the cleared areas and as a result increase the potential load of sedimentation of the delineated wetlands during periods of high rainfall and excessive winds. The impact associated with this activity will be for the life of the project and the severity of the impact is considered to be serious. The effects of the impact will extend to the water quality and quantity of the Wilge River and the downstream water users. The likelihood of this impact taking place is definite as it will be required for the mining technique and for the construction of infrastructure.

Mining and the establishment of mining infrastructure in the grasslands outside the wetland areas as well as the recommended buffer zones will restrict aquifer recharge through the destruction or hardening of aquifer recharge areas. The delineated wetlands within the study area are linked to perched aquifers which provide a water source through lateral seepage and interflow. The destruction of the aquifer recharge areas which will result in the loss of the supported wetland areas. This in turn will result in a loss of ecological and hydrological functions that are provided by the wetlands to the catchment. These wetland areas contribute to the recharge of the Wilge River system. This activity will therefore result in a change in the flow patterns from slow diffuse flow to storm water flood peaks. The duration of the activity is anticipated for the life of the project and will cease after the operational phase of the mine. The impact will extend to the downstream water users with increased stormwater flood peaks being noticeable within the Wilge River. The severity of the impact

was determined to be very serious due to the accumulative loss of wetlands within the catchment. The likelihood of the impact being imposed onto the system as a result of the construction and operation of the mine infrastructure is definite.

9.5.8 Visual aspects and Topography

Before construction takes place, the project site will need to be prepared by clearing vegetation (mostly crops in the agricultural landscape) and removing topsoil where infrastructure is going to be built and opencast mining is going to take place. The footprints of the dumps, dams, opencast mining activities and other areas (which will be cleared of any vegetation) will likely have an impact on the drainage line and surface water dynamics.

The current topography may require levelling or cut and fill surfaces on any of the proposed infrastructure during the construction phase, which may have an impact on the local topographical functioning. The construction of these features might also have an impact on the topography by altering drainage lines and changing surface water dynamics. However, the landscape is relatively flat and will therefore not necessitate extensive cut and fill activities.

9.5.9 Sites of archaeological and cultural interest

As described above, five heritage resources will be directly impacted on by the proposed mining activities during the construction phase namely:

- H008 (burial ground) H009 (historical structure), H010 (historical structure), H011 (historical structure) and H012 (burial ground).

Secondary impacts can be expected upon H001 (historical structure), H002 (burial ground), H003 (burial ground), H004 (midden), H005 (burial ground), H006 (historical structure) and H007 (historical structure) which include structural damage resulting from blasting or vibrations, pollution from acid mine drainage or seepage, and vandalism and /or property damage due to the influx of workers.

9.6 Operational phase

9.6.1 Surface Water

Water quality impacts could arise from soil erosion of the stockpiles and the cleared areas which could lead to sedimentation of rivers. The overburden from the mining could resulting in AMD when there is pro-longed exposure to air and water depending on the acid generating potential of the overburden.

Negative impacts could arise from dust generation and settling on the roads, soil erosion and the coal dust settling on the surface water environment. Pro-longed leaks and spillages could result in water quality deterioration.

Water contamination could result from leaching and toxic drainage of particulates and fines from ROM stockpile and from coal mining areas.

Water quality deterioration could result from toxic overburden and from improper handling of the re-vegetation process resulting in siltation and sedimentation from soil erosion.

9.6.2 Groundwater

Rainwater infiltrating through the overburden stockpiles and/or backfilled material and the underlying soils into the groundwater environment could pollute the aquifers, by means of an increased salt load and metals. Acid base accounting tests completed during this investigation indicate a net acid potential in all samples analysed.

The removal of coal will lead to a decrease in water level as water flows into the opencast pit. The impact of the proposed mine on regional groundwater resources and users have been qualified using the numerical groundwater model. The model qualified and delineated the groundwater drawdown cone (zone in which the groundwater level is lowered as a result of abstraction) during mine dewatering over time. During the operational phase the cone of depression extends approximately 1100m to the south, 300 m to the west and 500m to the north and east of OC 3, 4 and 5, and approximately 400 – 500m in all directions from OC 1 and 2.

The storage of hazardous products and mine waste material may have a potential negative effect on ground-water quality should there be a spillage/leaks that could infiltrate through the soils to reach the groundwater table.

Seepage from the waste rock dumps is likely to have elevated salt load consisting predominantly of high TDS, SO4 and Ca concentrations. The results from the acid base accounting tests suggest that the waste rock material is likely to have a net potential to generate acid mine drainage. Groundwater numerical modelling predict that seepage water quality diluted to 5% of the input concentration of 100% is likely to migrate up to between 100m and 150m from the discard dumps' footprint.

9.6.3 Aquatics

The clearing of naturally occurring vegetation, levelling of land, creation of hard surfaces and the creation of compacted surfaces to make way for development generates changes to the environment which allows for the alteration of normal drainage patterns. Altered drainage patterns serve to alter the flow dynamics in the following manners:

- Increased runoff due to presence hard surfaces and removal of vegetation;
- Decreased seepage due to increased runoff;
- Increased erosion due to increased runoff; and
- Increased sediment load of nearby aquatic systems.

Activities associated with vehicular movements/maintenance create the potential for substances such as oils and lubricants to leak into the surrounding environment. Once in the environment these substances can be carried into the aquatic ecosystem via water runoff. These substances are known to contain hydrocarbons and specifically Poly Aromatic Hydrocarbons (PAH's) which have been shown to be persistent in nature. These substances have shown to decrease ecological integrity.

The presence of an open cast mining operation in close proximity to the Wilge River reduces the size of the catchment area and thus the amount of water available to enter into the river system thus adding to the reduced water flow conditions being experienced by the Wilge River system.

As rain water mixes into excavated areas the water is considered contaminated and has the potential to negatively affect the surface water quality.

If these impacts were to occur the following would be observed in the aquatic ecosystem:

- Decreased water quality;
- Altered flow dynamics;and
- Negative impacts on biodiversity.

9.6.4 Wetlands

The removal of coal by means of mining will result in a continuous disturbance to the delineated wetland areas as the operation progresses. In spite of the actual footprint area of the impact remaining outside of the delineated wetlands, the overall extent of the disturbance still impacts on the wetland areas. This impact will be as a result of the loss of aquifer recharge areas located within the grasslands. Additionally, the process of strip mining will also result in the continuous dewatering of aquifers as the mining operation progresses across the landscape, resulting in a draw down cone. Seepage wetlands within the study area are directly linked to the perched aquifers which provide a water source through lateral seepage and interflow. Thus, the reduction in catchment size and the loss of aquifers will result in a reduction in water quantity for the Wilge River system. The duration of the activity is anticipated for the life of the project and will cease after the operational phase of the mine as strip mining will be a continuous process. The impact will decrease the water quantity of the system, being noticeable further downstream in the catchment. The severity of the impact was determined to be moderate due to the relatively small impact area and form of mining proposed. The likelihood of the impact being imposed onto the system as a result of the mining process is definite.

Bare slopes of the soil stockpiles (overburden, top soil stock piles, coal stockpiles) combined with their typical steep slopes (often bigger than 35°) results in excessive erosion of the stockpiles. The eroded sediment material will deposit into the channelled valley bottoms and floodplains. The sedimentation process will consequently smother the receiving wetlands and possibly change the flow patterns though the wetland. If the eroded material is chemically active (such as coal and coal dust) wetland water and sediment contamination will result. This will change the wetlands from water purifying environments into water contaminating environments. The duration of the activity is anticipated for the life of the project and the impacts may persist even beyond the mine existence. The impact will extend to the downstream water users with increased negative water quality implications for the receiving Wilge River. The severity of the impact was determined to be very serious due to the accumulative impacts on water quality within the coal mining region as well as the

catchment area. The likelihood of the impact being imposed onto the system as a result of the operation of the mine is definite.

9.6.5 Air Quality

If exposed soil occurs in the vicinity of infrastructure, then further negative impacts on air quality are expected. Increased human activity and traffic around infrastructure could also add to dust levels in the vicinity of infrastructure. Coal transport along the haul road will also contribute to dust levels. Therefore operation of infrastructure will further negatively impact on air quality.

The proposed opencast mining will negatively impact on air quality, by adding to the dust levels in the area during blasting and movement of earth. The opencast mining, stockpiling of overburden, the on-site stock pile and the loading of raw coal onto the trucks or rail will contribute to increased dust levels in the area.

9.6.6 Visual and Topography

The receiving environment will be negatively affected by the presence, operation and maintenance of the mining infrastructure, since the landscape character (within limited areas) will be altered and the overall visual resource will be reduced. The tall infrastructure will be silhouetted against the skyline and it is likely that a number of receptors will be able to see the mining activities. Additional visual impacts are likely to be experienced at night time due to bright lights that are associated with mining infrastructure.

During the operational phases, large areas of land will be subject to opencast mining; these areas will take a long time to rehabilitate and will very likely lead to landscape scarring as these expanses of land will be incompatible with the surrounding landscape. The visual impacts will be associated with each of the opencast mining areas as they are sequentially mined- they will therefore be restricted to the individual areas and the viewing points of these areas.

9.7 Decommissioning

9.7.1 Soil

The decommissioning of the Brakfontein Coal Project infrastructure will entail the demolition of buildings and removal of infrastructure. During the decommissioning activities, impacts to soil resources may include compaction and contamination and impacts may be significant in the short term.

Stockpiled topsoil will be replaced and subsequent rehabilitation and re-vegetation of the disturbed areas will allow a return to pre-impact land capability for agricultural land use namely grazing. Overall rehabilitation of the site will have a positive, permanent direct impact on the land capability within the Brakfontein Coal project area. The intensity and magnitude is likely to be high as the land capability will be compromised from industrial to a combination of arable and grazing land capability.

9.7.2 Surface Water

Spillage of hazardous substances and hydrocarbon containing material during storage, spillages of material during transportation, dust and erosion form the vehicular movement and the exposed ground respectively could result in water quality deterioration together woth potential mine water seeps.

9.7.3 Air Quality

During decommissioning and mine closure the air quality will be negatively impacted on briefly due to the increased activity of heavy machinery and trucks in the area and the removal of the infrastructure. Mobilisation of exposed soils will also contribute to dust levels in the area. As the dust settles and rehabilitation of the land is completed, the air quality should gradually improve.

Rehabilitation of the opencast areas and the final void should ultimately have a neutral impact on air quality in the region due to the closure of opencast mining and re-vegetation of exposed soils reducing dust creation and ultimately allowing dust levels to decrease to pre-mining levels.

9.7.4 Heritage Resources

During the decommissioning and closure phase of the project, no additional surface disturbance activities or impacts are expected. The majority of heritage resources of archaeological and heritage significance (cultural and natural) will have been recorded, assessed and mitigated or conserved in preceding phases. Conditional to the effective identification, documentation and mitigation or protection of these sites during the construction and operational phases of the project, the significance of impacts anticipated for archaeological and heritage resources during these phases are low.

In the event that mining operations continue for more than 60 years, any infrastructure constructed at the start of the project may be subjected to NHRA requirements during the decommissioning and closure phase.

10 SOCIAL IMPACT ASSESSMENT

10.1 Rating of impacts

The impact rating process is designed to provide a numerical rating of the various social impacts identified. The significance rating process follows the established impact/ risk assessment formula, as shown below:

Significance = consequence of an event x probability of the event occurring

where

Consequence = Type of impact x (Intensity + Spatial Scale + Duration)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

***Type of impact* = +1** (for positive impacts) ***or* -1** (for negative impacts)

10.2 Summary of Social impact Ratings

The pre- and post-mitigation ratings assigned to the various impacts discussed in the report are summarised in Table 10-1.

Table 10-1: Social impact Ratings

Code	Impact	Pre-mitigation:						Post-mitigation:					
		Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Proba-bility	Signifi-cance
C-Empl	Job creation during construction	Medium term	Municipal Area	Low - positive	Slightly beneficial	Likely	Minor - positive	Medium term	Municipal Area	Moderate - positive	Moderately beneficial	Highly probable	Minor - positive
Multi	Multiplier effects on local economy	Project Life	Province/ Region	Moderate - positive	Moderately beneficial	Probable	Minor - positive	Project Life	Province/ Region	High - positive	Highly beneficial	Highly probable	Moderate - positive
Incr mrkt	Increased markets for local entrepreneurs	Project Life	Municipal Area	Low - positive	Moderately beneficial	Probable	Minor - positive	Project Life	Municipal Area	Moderate - positive	Moderately beneficial	Likely	Minor - positive
Restl	Physical and economic displacement	Permanent	Local	Very high - negative	Highly detrimental	Certain	Major - negative	Permanent	Local	Low - negative	Moderately detrimental	Certain	Moderate - negative
Confl	Conflict/ competition between newcomers and incumbent population	Medium term	Municipal Area	High - negative	Moderately detrimental	Highly probable	Minor - negative	Medium term	Local	Moderate - negative	Slightly detrimental	Probable	Minor - negative
Serv	Increased pressure on local services/ resources	Medium term	Municipal Area	Moderately high - negative	Moderately detrimental	Probable	Minor - negative	Medium term	Municipal Area	Low - negative	Slightly detrimental	Unlikely	Negligible - negative
Soc path	Increased social pathologies	Project Life	Municipal Area	Moderately high - negative	Moderately detrimental	Highly probable	Moderate - negative	Project Life	Municipal Area	Moderate - negative	Moderately detrimental	Probable	Minor - negative
Infr stlm	Growth of informal settlements	Long term	Municipal Area	High - negative	Moderately detrimental	Likely	Minor - negative	Long term	Municipal Area	Moderately high - negative	Moderately detrimental	Probable	Minor - negative
Safety	Safety impacts	Project Life	Local	High - negative	Moderately detrimental	Certain	Moderate - negative	Project Life	Local	Low - negative	Moderately detrimental	Likely	Minor - negative
VAA	Visual/ acoustic/ air quality impacts	Project Life	Local	Moderately high - negative	Moderately detrimental	Certain	Moderate - negative	Project Life	Local	Low - negative	Moderately detrimental	Probable	Minor - negative
Frm Lab	Loss of farm labour to the mines	Project Life	Municipal Area	Moderate - negative	Moderately detrimental	Highly probable	Minor - negative	Project Life	Municipal Area	Low - negative	Moderately detrimental	Likely	Minor - negative
O-Empl	Job creation during operation	Project Life	Municipal Area	Low - positive	Moderately beneficial	Likely	Minor - positive	Project Life	Municipal Area	Moderate - positive	Moderately beneficial	Highly probable	Minor - positive
Dvlp	Community development and addressing community needs	Project Life	Province/ Region	Low - positive	Moderately beneficial	Probable	Minor - positive	Beyond project life	Province/ Region	Moderately high - positive	Highly beneficial	Highly probable	Moderate - positive
Econ dep	Economic dependency on operation	Beyond project life	Municipal Area	Moderate - negative	Moderately detrimental	Highly probable	Moderate - negative	Beyond project life	Municipal Area	Low - negative	Moderately detrimental	Probable	Minor - negative
Oppos	Opposition because of perceived negative impacts	Project Life	Municipal Area	High - negative	Highly detrimental	Likely	Minor - negative	Project Life	Municipal Area	Moderately high - positive	Moderately beneficial	Likely	Minor - positive
D-Empl	Job creation during decommissioning	Short term	Municipal Area	Low - positive	Slightly beneficial	Likely	Minor - positive	Short term	Municipal Area	Moderate - positive	Slightly beneficial	Highly probable	Minor - positive

10.3 Significant Social Impacts

10.3.1 Physical and economic displacement

The site-specific study area is currently used for purposes other than mining. Due to its nature and location, the proposed project will likely result in both physical displacement (where people or households have to be relocated to a different location to make way for project infrastructure) and economic displacement (where people lose access to cultivated land or other livelihood resources).

Table 10-2: Potential displacement

Location	Number in Plan 19	Description	Approx. number of individuals / households	Comments
Within footprint	2	Permanent residence of Frans Venter's farm manager	1 household	Will need to be discussed with Universal Coal as part of the conditions of the sale of the land
	3	Permanent residence of Frans Venter's farm workers	30 individuals	Will need to be discussed with Universal Coal as part of the conditions of the sale of the land
	8	Informal residence	1 household	The current conceptual mine plan excludes mining of the two smaller footprint areas to the east of the larger area, thus may not be necessary to include in RAP
	9	Informal settlement	50 households	The current conceptual mine plan excludes mining of the two smaller footprint areas to the east of the larger area, thus may not be necessary to include in RAP

In addition to physical displacement, the proposed project will likely result in three cases of economic displacement as follows:

- Mr Frans Venter, a prominent maize farmer, who will sell all his farm portions in the site-specific study area.
- Mr Johan Geriecke, who is the part-owner and manager of the Brakfontein Meat Market, and also a poultry farmer. The viability of the meat market is jeopardised by high levels of dust and noise resulting from blasting will adversely affect his poultry farming. The meat market has a large and established client base, which may be adversely impacted on both as a result of mining activities and in the event that he is relocated.
- Mr Jan Moolman, owner of the Brakchick poultry farm. This business will not be viable in such close proximity to mining activities, largely due to blasting and the possible impact the project will have on water quality.

10.3.2 Increased social pathologies

An influx of job-seekers may lead to an increase in various social pathologies, particularly theft, the incidence of prostitution, and a resultant increase in sexually transmitted diseases (STDs) and HIV/ AIDS. Such pathologies have increased since the arrival of mines in the area, and pose a concern to local land owners. As the proposed project will likely operate 24 hours a day during its operational phase (as the other mines in the area do), the likelihood of the aforementioned pathologies is increased.

An increase in social pathologies may be aggravated by the presence of a temporary (partially migrant) construction workforce. Although it is not envisaged that labourers will be housed in a construction camp, migrant workers undertaking a job away from home are still often cut off from their social and family networks. Being predominantly males, such workers are frequently prone to engage in promiscuous sexual activity, which can result in increases in STDs and in particular HIV among both the construction workers and their partners. Any employment recruitment that takes place on-site is also likely to exacerbate this impact.

10.3.3 Safety impacts

Safety impacts could emanate from any of the following activities forming part of the proposed project :

- Construction sites (construction phase);
- Blasting (construction and operational phases);
- Stockpiling (construction and operational phases);
- Storage of hazardous products (construction, operational and decommissioning phases);
- Crushing plant (operational phase); and
- Transportation of coal via haul road (operational phase).

With regards to the construction site, stockpiles and crushing plant, safety impacts emanate from the risk of non-mine workers wandering onto site and being exposed to the aforementioned sites without personal protective equipment (PPE) and knowledge of the dangers of these sites. In addition, these sites also pose a risk to the mine workers themselves, while performing their route employment duties.

The safety risks associated with blasting activities emanate from the improper use of explosives and fly-rock that may injure passers-by who are unaware of blasting activities.

The incorrect storage of hazardous products could have potentially fatal consequences as these could explode or seep into the ground, polluting groundwater used for domestic purposes. Also, access to such hazardous products by non-mine employees could be devastating to such individuals.

The transportation of coal via haul road, sections of which is also used by private motorists, pose a risk to the motorists' safety due increased traffic volumes and the presence of HMVs

on the roads. Also, the gradual deterioration of roads as a result of HMV also poses a safety risk for motorists.

It should be noted that in some instances, the social impact experienced may not necessarily be the actual increase of risk to one's safety, but the perceived increase of such a risk, which has the potential to have a debilitating effect on the psychological well-being of the local populace.

10.3.4 Decreased quality of life

The construction and operational phases of the proposed project will represent an intrusion into the surrounding physical environment, which could impact on surrounding communities in various ways, including the following:

- ***Visual impacts***: project infrastructure and stockpiles could affect the quality of the visual environment;
- ***Acoustic impacts***: increased traffic, blasting and other mining activities, as well as activities at the crushing plant will increase noise in the area;
- ***Air quality and dust***: air quality could be affected by blasting activities and excessive dust resulting from mining activities and transporting of coal; and
- ***Water quantity and quality***: blasting and other mining activities could adversely impact on both the quantity and quality of available water in the areas surrounding the project site.

10.3.5 Economic dependency on the project

The level of unemployment in the study area is high, implying an imbalance between the number of job-seekers and available job opportunities. It is expected that the proposed project will continue operations for nearly 30 years, after which employment of its workforce would inevitably have to be terminated. In addition, retrenchments could be necessitated at other times during the operation's lifespan as a result of external forces such as reduced profitability of or demand for coal (although this is unlikely). At such a time, project employees may not be able to secure alternative employment subsequent to downscaling or retrenchment. Retrenchments will lead to loss of income and local expenditure, which could result in increases in social pathologies, such as crime.

The fact that the proposed project will one of many mining operations in the VKLM, the relatively small size of the operational workforce, as well as the small number of local individuals who stand to benefit from the project operations through both direct and indirect job opportunities, minimises the significance of this potential impact when the Brakfontein project is considered in isolation. However, the possibility should be considered that several mining operations in the surrounding area could be nearing the end of their lives at approximately the same time as this project – a circumstance that could result is a significant down-turn in the local economy.

11 CUMULATIVE IMPACTS

11.1 Surface Water

Coal mining presents negative water quality impacts which emanate from the activities in the form of coal waste and coal slurry. These result in deterioration and alterations of the natural wetlands, prolonged risk to aquatic life, heavy metal bioaccumulation in plants and livestock as well as health risks to humans.

The proposed project area water resources have already been negatively impacted upon and the negative impacts from mining will further deteriorate the environment. In order to reduce the deterioration of the water environment, the execution water management strategies and through the implementation of mitigation measures where the impacts arise should be performed.

The most significant impacts relate to the contamination of surface water in the catchment during the operational activities and reduce stream flows through the alteration of the aquifer bed resulting from blasting activities.

Although there will be alteration of the surface hydrology and volume of runoff reporting to the catchment, the minimization of the dirty area will limit the impacts and subsequent contaminated volume of runoff. The backfilling, grading and contouring of the rehabilitated areas should also be implemented to prevent runoff damming and to ensure that the surface runoff reports to the catchment.

11.2 Groundwater

The proposed project area is located close to existing mines and commercial agricultural activities. In the long term, the cumulative impacts of the proposed and existing activities could result in increased negative effects on the groundwater regime.

The following cumulative impacts of concern could include:

- Further deterioration of groundwater quality; and
- An increase in acid mine drainage and associated post closure decant.

11.3 Aquatics

Altered flow conditions, the introduction of pollutants and the alteration of water quantity entering into the Olifants River system will negatively impact the aquatic ecosystems thus adding to the already present stresses of low flow and poor water quality conditions.

11.4 Wetlands

The project area is located in the Wilge River sub-catchment area, approximately 20km south west of the town of Delmas in the Mpumalanga province. Numerous mining operations are currently active in close proximity to the project area, these include the Kangala Mining

Project where the coal processing will take place. Kangala colliery is located 25km away from the Brakfontein Mining Project area.

In addition to this, the proposed underground area could be successfully mitigated in the event that subsidence is avoided. The mined out aquifers will recharge post the operational phase and due to the fact that the mined out area is below the regional water table, the unimpacted wetland areas will again receive interflow from these aquifers.

The majority of South Africa's water resources are under severe pressure. Owing to the extent of mining operations within relatively close proximity to the project area, the severity of the cumulative impact is considered to be severe should no mitigation methods be considered. Owing to the nature of the project (strip and underground mining) as well as the approximate size of the impacted footprint area, the cumulative impact of the project is considered to be moderate should suitable mitigation measures be implemented.

11.5 Fauna and Flora

According to the Mpumalanga Biodiversity conservation plan handbook the Mpumalanga province is categorised in six biodiversity conservation categories for terrestrial ecosystems using systematic biodiversity planning methods In Plan 14 a visual representation of the six categories show that the study area consists of three terrestrial categories, these are Important and necessary, Least concern and No habitat remaining, these categories make up the majority of the province. Furthermore, three riparian areas consisting of wetland vegetation (Ferrar and Lotter 2007), also exist on the area of interest.

The main threat to natural areas/biodiversity is the reduction of viable habitat, which can be contributed to the following, human settlement and urban development, mining, industry and manufacturing, energy, transport, agricultural activities and tourism and recreation (Ekurhuleni SoER 2003). All of the above with the possible exception of tourism and recreation are currently exerting pressure on the study area (area in general) by reducing the viable natural land. The No natural habitat remaining is the category in which most threats can be categorised, and the transformation of the natural habitat from Protected areas to No natural habitat remaining is driven by the seven threats.

11.6 Noise

Cumulative impacts should be considered for the overall improvement of ambient noise levels. The proposed project is considered a causative source of noise pollution of a minor significance that may contribute to the increase of the ambient noise levels in the area.

The existing noise sources in the area of the proposed project is the mining activities 1.5km to the north of the proposed Brakfontein open cast areas 1 and 2 as well as the surrounding agricultural activities.

If the dormant Norwesco coal mine becomes operational and if more coal mines start up in the area then the cumulative impacts in terms of the Brakfontein coal mine may potentially be more significant.

Noise levels from the proposed project must therefore be monitored to determine potential sources of noise, increases and decreases in noise levels, and determine level of mitigation required. A grievance mechanism should be introduced whereby noise sensitive receivers and people in the area can may a complaint regarding noise levels. In this event each complaint is to be investigated to determine the source and possible noise reduction measures. The grievance mechanism forms part of the public participation programme.

After post closure phase of the proposed project, overall ambient levels will decrease to the pre-mining baseline and the cumulative impacts in the area could improve.

11.7 Visual

The visual resource of the proposed project has been described previously in this report; this current context defines the baseline for predicting or assessing cumulative impacts that might occur within the foreseeable future. Actions and activities that have been identified to possibly introduce incremental impacts within the area are displayed and described in Table 11-1 below.

Table 11-1: Actions/activities within the landscape that could introduce/aggravate potential cumulative impacts

Action/Activity	Nature of Potential Visual Impact
Agriculture	Vegetation disturbance
Mining	Vegetation disturbance, dust plumes, change in topography, use of heavy machinery
Power Generation	Vegetation disturbance, dust plumes, change in topography, use of heavy machinery
Vehicular Activity	Dust plumes
Urban Development	Vegetation disturbance, change in landscape character

Adapted from: URS Corporation 2011

The predicted or potential topography cumulative impacts that are associated with the proposed mining project are related to landscape level changes in surface water dynamics and topographical functioning. As industrial, agricultural and mining related activities continue to occur simultaneously within the landscape, habitat fragmentation will increase as will erosion and surface water run-off. The topographical functioning of the landscape in its entirety will be subject more and more to the influences of man-made structures that change the elevation, slope and landscape features.

12 ENVIRONMENTAL MANAGEMENT

The Table below presents the mitigation measures in the form of a Management Plan.

SOIL						
	Activity	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	Impacts of soil stripping	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Plan site clearance and alteration activities for the dry season with dust suppression (May to October); • Restrict extent of disturbance within the Brakfontein Coal Project area and minimise activity within designated areas of disturbance; • Minimise the period of exposure of soil surfaces through dedicated planning; • Stripping operations should only be executed when soil moisture content will minimise the risk of compaction (during dry season); • Aim to minimise (or even cease) workings on windy days; • During stockpiling, preferably use the 'end-tipping' method to keep the stockpiled soils loose; • Ensure stockpiles are placed on a free draining location to limit erosion loss and waterlogging; • Limit stockpile height – a safe height can be regarded as the height at which material can be placed without repeated traffic over already placed material; and • Soil surface (only where top soil is partially removed) can be loosened via tillage/ripping.		Planning or construction designs Emergency response Spill response Plan (spill kits and bioremediation inoculation products such as Enertech1 or Supazorb at had to treat spill areas)	Engineers
	Impacts of accidental leaks or contamination	**Opencast Mine areas** **Haul roads** **Public roads**	• Construction vehicles and equipment should be serviced regularly; • Service areas must be paved; • Construction vehicles should remain on designated and prepared compacted gravel roads; and • Spill containment and clean up kits should be available onsite and clean-up from any spill must be in place and executed at the time of a spillage with appropriate disposal as necessary.			

Operation	Impacts of soil stripping / Prevention of erosion	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Re-vegetate cleared areas and stockpiles to avoid wind and water erosion losses; • Preserve looseness of stockpiled soil by executing fertilisation and seeding operations by hand; and • Soil stockpiles should be monitored for fertility via sampling and testing; and • Monitoring of the condition of all unpaved roads is necessary due to the high rainfall and potential water runoff and erosion of the soils present in the Brakfontein Coal Project area. Water runoff from compacted road surfaces may cause erosion of road shoulders degrading the road surface. Weekly inspections need to be carried out of all unpaved roads especially during the rainy season.		Monitoring or maintenance plan Emergency response Spill response Plan Rehab Plan (App O)	Environmental Co-ordinator
	Impacts of accidental leaks or contamination	**Opencast Mine areas** **Haul roads** **Public roads**	• Operations vehicles and equipment should be serviced regularly; • Service and parking areas must be paved; • Operations vehicles should remain on designated and prepared compacted gravel roads; • Spill containment and clean up kits should be available onsite and clean-up from any spill must be in place and executed at the time of a spillage with appropriate disposal as necessary; • Fuel and heavy hydrocarbon products storage on site should be secured by bunded facilities; and • It is advisable to develop a soil monitoring plan and implement it after construction through collecting and analysis of soil samples within the MOP area.			
Decommissioning	Impacts of rehabilitation	Opencast Mine areas Haul roads Workshop/offices	• Demolition and removal of infrastructure should be restricted to the dry season (May to October); • Opencast mine areas must be reshaped and the soil replaced. Subsoil first then topsoil; • Use of graders instead of bulldozers; • Soils ripped to full rooting depth		Engineer designs Rehab Plan	Engineer

			• Total soil thickness must at least be 1 m (including 0.3 m topsoil) for the arable areas and 0.35 m (topsoil) for grazing land; • Minimize the period of exposure of soil surfaces through dedicated planning; and • Foundation excavations should be filled, fertilised and re-vegetated using local vegetation. • Implementing Rehab Plan			
SURFACE WATER						
	Activity / impact	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	Impacts of Water quality deterioration from dust deposition and spillages of construction material.	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Implement dust suppression strategies; • Ensure trained personnel operate the infrastructure.		On-going implementation of dust suppression; Monitoring of construction and evaluation of training of machine operators	Environmental Control Officer and Site Engineer
Operation	Water quantity impacts as a result of the increased surface runoff falling on cleared ground and not allowed to report to the catchment as well as the diverted stream flows from aquifer bed fractures and storm water management systems.	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Minimise the disturbed area; • On-going rehabilitation of the mined out areas; • Proper blasting techniques to be followed to minimise fractures; • Contouring and vegetation of the rehabilitated areas		Adherence to the Spill Prevention/Emergency response plan; Monitoring of the mine's blasting licences and keeping record of them; and On-going waste management strategies for explosives waste.	Environmental Co-ordinator
	Water quality deterioration could result from blasting activities, from the spillages of explosives (nitrate and ammonia) and river sedimentation	**Opencast Mine areas** **Haul roads** **Public roads**	• Ensure water quality monitoring and allow only trained and certified personnel to conduct the blasting in the correct way utilising the correct quantities of explosives • Separation of clean and dirty areas and minimization of the dirty area	Daily monitoring during the operational phase; Water quality monitoring on		Environmental Co-ordinator

				a monthly basis		
Decommissioning	Reduced water quantity reporting to the catchment.	Opencast Mine areas Haul roads Workshop/offices	• On-going rehabilitation and minimization of dirty areas • Implementing Rehab Plan	During construction and decommissioning phases	Engineer designs Rehab Plan	Engineer
GROUNDWATER						
	Activity / impact	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	Prevent/contain possible hydrocarbon spillages	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Implement traffic rules and train drivers to understand the rules • Implement vehicle maintenance schedule • Install oil collection pans in/under vehicles (spill kits as above)	Continuously	On-going implementation of dust suppression; Monitoring of construction and evaluation of training of machine operators	Environmental Control Officer and Site Engineer
Operation	Prevent/contain contamination from blasting material	**Opencast Mine areas**	• Train staff and implement correct procedures for the handling of blasting material • Only qualified staff should handle these materials	Continuously		Environmental Co-ordinator
	Prevent/contain groundwater pollution as far as practical possible during mining process	**Opencast Mine areas**	• Divert surface flows away from the open pit and stockpile areas through channels, drains, culverts and dykes • In-pit drainage & sumps (these should be automated where possible to prevent issues when personnel cannot access the site due to safety or other reasons) • Interception drainage around the pit and stockpile areas (Key to making this work is to minimize the surface area where operations would contaminate water –smaller disturbed areas mean smaller volumes to manage)	Continuously		Environmental Co-ordinator

Decommissioning	Prevent/ contain pollution as far as practical possible during rehab	Opencast Mine areas Haul roads Workshop/offices	• Pollution control measures could include: • Interception drainage around the pit (Key to making this work is to minimize the surface area where operations would contaminate water –smaller disturbed areas mean smaller volumes to manage); • In terms of groundwater the infiltration to groundwater should be controlled and can be achieved through installation of liners, sufficient surface drainage and surface capping to insulate against infiltration. • Attenuation of groundwater contamination may be achieved by installing slurry walls, grout curtains or sheet piling. These methods should only be employed after source control methods have failed	During construction and decommissioning phases	Engineer designs Rehab Plan	Engineer
Aquatics						
	Activity / impact	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	To prevent direct impacts on the Wilge River and associated river systems; and To prevent indirect impacts on water quality and quantity of the river systems	**Opencast Mine areas** **Haul roads** **Workshop/offices** **Opencast Mine areas**	• Prevent unnecessary removal of vegetation. • Exposed soils must be stabilised with vegetation • A storm water management plan should be implemented during the construction and operation phases. • Creation of pollution control measures to prevent introduction of persistent/toxic pollutants into the aquatic systems from dumps and vehicular maintenance areas. • Ensure no mining activities occur within the 1:100 flood lines of the Wilge River and its tributary. • Ensure the integrity of the Riparian vegetation • Design of pillars/supports of river crossings should be made to ensure adequate flow • 100 metre buffer zone from the Wilge River system • Equipment shall be inspected daily to ensure that leaks or discharges of lubricants, fuels, or hydraulic fluids do not occur. All fuels, lubricants, and hydraulic fluids must be stored and dispensed at least	Continuously	On-going implementation of dust suppression;	Environmental Control Officer and Site Engineer
Operation				Continuously	Stormwater Management Plan	Environmental Co-ordinator
				Continuously		Environmental Co-ordinator
Decommissioning				Bi – annually biomonitoring	Engineer designs Rehab Plan	Engineer

			100m away from the stream bank or outside of the 100-year floodplain • Minimalize in stream equipment activity • Create berms and barriers to prevent flow of contaminated water into surrounding aquatic ecosystems. • Create pollution control measures around dump/storage facilities. • Aquatic biomonitoring programme should be implemented			
FAUNA AND FLORA						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	Limit degradation and destruction of natural environment to designated project areas Restrict alien invasive plant recruitment Maintain top soil biological activity	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Keep the footprint of the disturbed area to the minimum and designated areas only. Vegetate and wet open areas to limit erosion. • Removal of vegetation during construction and operation will be minimised to reduce the risk of open areas occurring. • Soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year • Removal of vegetation during construction of infrastructure will be minimised to reduce the risk of open areas occurring. • Make use of permeable materials for pavements and walk-ways. Introduce a storm water management programme and create flower beds below the street level. • Blasting to be conducted by professionally qualified contractors.	Weekly / Monthly	Removal of lose sediment and rehabilitation Plan	Environmental Control Officer and Site Engineer
Operation	Prevent excess dust creation that could inhibit plant growth.	**Opencast Mine areas** **Haul roads**	• Wetting of the haul road to suppress dust creation as well as cover haul trucks to prevent dust emissions during transport.	Continuously	Rehabilitation	Environmental Co-ordinator
	Reduce areas available for alien infestation	**Opencast Mine areas**	• The footprint of the area disturbed by the mining operation will have natural vegetation restored.	Continuously		Environmental Co-ordinator
Decommissioning	Avoid spillage of hazardous materials, thereby protecting vegetation and soil. Avoid destruction of	Opencast Mine areas Haul roads Workshop/offices	• Removal of vegetation during construction of infrastructure will be minimised to reduce the risk of open areas occurring. The correct and careful handling of the infrastructure housing pollutants and toxicants	During construction and decommission	Engineer designs Rehab Plan	Engineer

	vegetation, the creation of favourable habitat for fast growing invasive plants and ground compaction. Restore natural vegetation Limit the erosion potential of exposed areas.		to prevent spillages and leaks • Vehicles to make use of existing roads and designated areas. Avoid rehabilitated and natural habitat areas as far as possible. • Follow the Re-vegetation steps as per the Rehab Plan which includes species to be used (Rhodes grass, Fingergrass, Kweek and Teff) • The footprint of the area disturbed by the mining operation will have topsoil and overburden replaced to restore the vegetation cover. • Exposed areas will be re-vegetated • Rehabilitation to represent original contours and topography • Removal of excess sediment and low gradient rehabilitation where possible. Use of recommended seed mix. Soil amelioration. • Restore of wetland areas and low gradient rehabilitation to create seepage units. • Maintenance of re-vegetated areas – including plant food and fertiliser, mowing, potential fire break for propagation. • Weed control	ing phases		
WETLANDS						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	Limit erosion of exposed areas and stockpiles as well as sediment load reporting to wetlands Limit reduction in the re-charge of aquifers Limit the wetland areas where soil compaction takes place. All construction activities will be planned and managed to ensure that there will not be a dramatic reduction in catchment size and water	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Keep the footprint of the disturbed area to the minimum and designated areas only. Vegetate and wet stockpiles to limit erosion. Berms created below the piles to trap particles and runoff from the stockpile • Removal of vegetation during stripping and dump operation will be minimised to reduce the risk of the aquifers being drained and not properly recharged. • Construction servitudes should be kept as narrow as possible to minimise the area affected by soil compaction. • Areas that have been compacted should be ripped to break	Daily / Monthly	Removal of lose sediment and rehabilitation Plan	Environmental Co-ordinator

	reporting to the wetland.		up the compacted soil. • This will aid infiltration and decrease run-off, but ripped areas would also need to be re-vegetated in order to reduce the risk of erosion on bare surfaces. • Bench mining will limit recharge of the surrounding aquifers and the impacts will be unavoidable, because of this mitigation will not be possible.			
Operation	All removal activities will be planned and managed to ensure that there will not be a dramatic reduction in catchment size and water reporting to the wetland.	**Opencast Mine areas** **Haul roads**	• The continuous removal of coal will destruct the surrounding aquifer recharge areas and the impacts will be unavoidable, because of this mitigation will not be possible.	Continuously	Rehabilitation	Environmental Co-ordinator
	Limit erosion of the stockpiled soil material as well as sediment load reporting to the valley bottom wetlands	**Opencast Mine areas**	• Stockpiles should be re-vegetated to stabilise the soil, reduce run-off and minimise erosion. Further mitigation measures should include the construction of a low temporary	Continuously		Environmental Co-ordinator
Decommissioning	Restore the natural surface and sub-surface flow dynamics of the system as well as allow for effective seepage for the area Restore the surface flow dynamics to the catchment	Opencast Mine areas Haul roads Workshop/offices	• Soils are to be replaced in the original soil profile. Soils are not to be compacted too much, in order to allow interflow for the system. • Restore the topography of the catchment to represent as close to possible the original topography of the catchment. • Implementing Rehab Plan	During construction and decommissioning phases	Engineer designs Rehab Plan	Engineer
NOISE						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	To prevent the noise emanating from the construction machinery from impacting on the sensitive noise sensitive receivers	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• A noise barrier in the form of a berm should be constructed on the northern boundary of the proposed opencast area 5 as soon as possible, so that it is situated between the main noise source noise sensitive receiver BN2. The berm will help with the attenuation of noise produced by the mining activities. A basic rule of thumb for barrier height is: Any noise barrier should be at least as tall as the	Daily / Monthly	Noise monitoring programme to be followed. Regular vehicle inspections.	Environmental Co-ordinator

			line-of-sight between the noise source and the receiver, plus 30%. So if the line-of-sight is 10m high, then the barrier should be at least 13m tall for best performance (Sound Fighter Systems, 2007). • Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Switching off equipment when not in use; and • Fixed noise producing sources such as generators, pump stations and crushers to be to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible.			
Operation	To prevent the noise emanating from the blasting from impacting on the sensitive noise sensitive receivers during mining or blasting	**Opencast Mine areas**	• Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Switching off equipment when not in use; and • Fixed noise producing sources such as generators, pump stations and crushers to be to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible. A basic rule of thumb for barrier height is: Any noise barrier should be at least as tall as the line-of-sight between the noise source and the receiver, plus 30%. So if the line-of-sight is 10m high, then the barrier should be at least 13m tall for best performance (Sound Fighter Systems, 2007). • As for the blasting operations it is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. • The following with regards to blasting operations is recommended: • The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended (Sengupta, 1993);	Continuously Continuously	Noise and Vibration monitoring	Environmental Co-ordinator Environmental Co-ordinator

			• Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed (Sengupta, 1993); and • Maintaining good public relations with the surrounding communities, i.e warning the local communities in advance before blasts.			
Decommissioning	To prevent the noise emanating from the machinery from impacting on the sensitive noise sensitive receivers	Opencast Mine areas Haul roads Workshop/offices	• Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; • Switching off equipment when not in use; and • Limiting decommissioning activities to daylight hours where possible.	During construction and decommissioning phases	Engineer designs Rehab Plan	Engineer
AIR QUALITY AND DUST						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	To reduce the potential for fugitive dust emissions from the following sources: - Debris handling - Truck Transport - Cut/fill material handling -General Construction	**Opencast Mine areas** **Haul roads**	• Wind speed reduction (using buffers) • Wet suppression • Early paving of permanent roads • Chemical stabilisation	Daily / Monthly		Environmental Co-ordinator
Operation	To reduce the potential for fugitive dust emissions from the following sources: - Material handling - vehicles on unpaved roads - Open areas (pit)	**Opencast Mine areas**	• Mass Transfer reduction (materials) • Drop height reduction • Wind speed reduction through sheltering/enclosures • Wet suppression • Reduction of traffic/speed control • Wet suppression/chemical stabilisation	Continuously Continuously		Environmental Co-ordinator Environmental Co-ordinator

Decommissioning	To reduce the potential for fugitive dust emissions from the following sources: - Debris handling - Truck Transport -General decommissioning	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Wind speed reduction (using buffers) • Wet suppression • Early paving of permanent roads • Chemical stabilisation	During construction and decommissioning phases		Engineer
VISUAL						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction	To minimise visual intrusion of clearing of vegetation To ensure, as far as possible, natural topographical functioning of the landscape To minimise the visual impact associated with construction activities of the infrastructure To ensure, as far as possible, that the integrity of the natural topography of the landscape is kept intact	**Opencast Mine areas** **Haul roads** **Workshop/offices**	• Only the minimum amount of vegetation that is required for the infrastructure should be cleared. An effort should be made to ensure that no additional vegetation is cut down and that the patches of tall standing grass and vegetation are left intact where possible. • Construction activities need to be carried out utilising best practices that aid in reducing topography and visual impacts • Construction should be carried out following best practices and standards and in such a way so to reduce the visual impacts (as far as possible). • Construction should be carried out in such a way that the natural topographical features are kept intact (as best as possible).	Daily / Monthly	Removal of lose sediment and rehabilitation Plan	Environmental Co-ordinator
Operation	To minimise the visual intrusion and exposure of the infrastructure and opencast areas and to decrease, as far as possible, further changes to the agricultural 'sense of place'. To minimise the impacts on local scale topographical functioning. Enhance positive concurrent	**Opencast Mine areas** **Haul roads**	• Maintain materials that are less visually obtrusive or paint the features with a matt coat/finish when required. • Do not clear any more vegetation for maintenance activities except where absolutely necessary • If roads are used frequently, they need to be recurrently wet during dry seasons so to reduce dust plumes created by vehicular movement. • If lighting is required for operation or maintenance, ensure that unintended visual receptors are shielded from the lighting.	Continuously	Rehabilitation	Environmental Co-ordinator

	replacement of overburden, topsoil and revegetation actions		• Initiate traffic monitoring plan. • Initiate rehabilitation plan early on in project life by replacing topsoil and overburden and revegetating disturbed areas			
	Limit erosion of the stockpiled soil material as well as sediment load reporting to the valley bottom wetlands	**Opencast Mine areas**	• Monitor the design and growth of the dumps and ensure that that they relate to acceptable environmental standards in terms of slope and elevation.	Continuously		Environmental Co-ordinator
Decommissioning	To minimise the visual intrusion and exposure of the site waste To strive towards and enhance the positive visual impacts associated with post-closure rehabilitation To attempt to mimic natural landscape topography (as much as possible) post-closure rehabilitation	Opencast Mine areas Haul roads Workshop/offices	• Ensure an efficient removal system of waste rubble as soon as possible after the infrastructure is demolished. Ensure rubble is removed immediately. • Ideally, shape the dumps at an adequate slope at the commencement of the project. If not, during closure phase, level to a slope that integrates more successfully into the natural topography of the visual landscape. • Chose plant species for re-vegetation that will grow quickly to cover the bare earth • Ideally, shape the dumps at an adequate slope at the commencement of the project. If not, during closure phase, level to a slope that integrates more successfully into the natural topography of the functional landscape. • Chose plant species for re-vegetation that will grow quickly to cover the bare earth and prevent soil erosion.	During construction and decommissioning phases	Engineer designs Rehab Plan	Engineer
HERITAGE						
	Activity / Objective	**Areas of the site affected**	**Mitigation/Management measure**	**Frequency**	**Recommended Action Plans**	**Responsible Person**
Construction		**Opencast Mine areas**	• In situ preservation of all burial grounds and graves where: • A 20 m bufferzone be fenced / demarcated around each burial ground within the project area to minimise accidental damage;	Continuously		Environmental Co-ordinator

Operation Decommissioning			• Monitoring must be conducted on the affected burial grounds to assess any damage during blasting; and • Access to the burial grounds is granted to interested and affected parties (I&AP) • Where in situ preservation of the burial grounds and graves is not feasible, grave relocation in terms of Section 26 of the NHRA is required. • Burial Grounds and Graves Survey (BGGS) to pre-empt any consultation required as part of the grave relocation process. Regulation 39 of the NHRA states that every effort must be made to identify the descendants or family members of the person buried. Agreement on the future of the grave must be reach through a process of consultation. If agreement cannot be achieved, a record of the consultations and comments of all I&AP's must be submitted to the provincial heritage resources authority. • A Phase 2 archaeological study on 004 (the ash midden) if the current mine plan changes and development activities are to occur within the vicinity of the site H004; • Application of Destruction Permit for structures older than 60 years (H007, H009, H010 and H011), which will require: • Detailed mapping and recording of structures; and • Watching brief during destruction of structures as graves may be present around these structures. • Chance finds procedure to be developed and implemented during ground clearance.			

13 SOCIAL MANAGEMENT PLAN

In the Table Below are the Mitigation measures that have been recommended during the SIA.

		Activity	Mitigation Measures
Construction phase	Positive aspects	Job creation	- Maximise & monitor local recruitment - Prevent nepotism/ corruption in local recruitment structures - Promote employment of women and youth - Use of labour-intensive construction and mining methods
		Multiplier effects on the local economy	As for maximising employment benefits. Also: - Development of a register of local SMMEs - Linkages with skills development/ SMME development institutions - SMME skills development as part of SLP
		Increased markets for local entrepreneurs	As for enhancing multiplier effects on the local economy
	Negative aspects	Physical and economic displacement	- Determine party responsible for relocation - RAP development- - For non-vulnerable households and individuals, negotiate favourable outcome on a case-by-case basis
		Conflict / competition between newcomers and the incumbent population	- Clearly communicate local recruitment policy - Use of community structures to identify local labour pool
		Increased pressure on local services / resources	As for maximising local employment and discouraging influx - Also, consultation with municipality well in advance
		Increased social pathologies	- Extensive HIV/ AIDS awareness campaign - Cease construction activities before nightfall - Clear identification of workers; prevention of loitering - Liaison with police - Do not recruit labourers on-site
		Growth of informal settlements	-As for conflict/ competition between newcomers and incumbent population
		Safety impacts	- Access control to all project elements, including fencing - PPE for mines workers - Notification of blasting activities - Blasting and storage of hazardous materials to adhere to prescribed regulations - Traffic control to prevent speeding - Road maintenance - Community education

		Activity	Mitigation Measures
		Decreased quality of life	- Impacts on visual environment, noise, vibration, air quality and groundwater are discussed in separate specialist study: as per relevant specialist reports - For sense of place: rehabilitation - For health and well-being: as for displacement
		Loss of farm labour to the mine	- No deliberate recruitment of workers from farms
Operational phase	**Positive aspects**	Job creation	- As for job creation during construction
		Community development and addressing community needs	- Liaison with beneficiaries to ensure needs are met - Representation of women in consultation - Collaboration during implementation - Implement CSR initiatives
	Negative aspects	Economic dependency on the project	-- SLP should be drafted in such a way that will minimise the impact of retrenchments and downscaling - Transparency regarding employment practices and CSR initiatives - Keep communities updated - Presentation of EIA findings in clear and understandable manner
		Opposition because of perceived negative impacts	- Communicate commitments regarding LED - Transparency regarding employment practices - Presentation of EIA findings in clear and understandable manner
Decommissioning	**Positive aspect**	Job creation during decommissioning	As for job creation during construction

14 EMERGENCY RESPONSE PLAN

An environmental management programme and associated management options are intended to minimise environmental risk as far as possible. Should, however, circumstances lead to unacceptable risks, emergency systems and procedures need to be designed and implemented in the case of an emergency to prevent or minimise the consequential environmental damage. The environmental emergency contingency plan must addresses any reasonably anticipated failure (most probable risk) for the entire mining area as well as the additional infrastructure such as transport routes and focuses on incidents that could cause environmental emergencies.

14.1.1 Content

The most crucial aspect of the emergency system is the identification and communication of the emergency to the appropriate persons. Consequently, the names of the appropriate contact person together with their contact numbers would be prominently displayed around the facility. The contact details will be updated on a regular basis. First-party employees (such as security, safety superintendents, mine overseers, environmental officers) will be trained to respond to the responsible personnel in the event of an emergency.

Each person's responsibility would be cleared with him/her beforehand and a copy of the emergency contingency plan would be distributed to each person, including the responsible and/or affected persons not associated with Universal Coal:

- Disaster management and fire fighting agencies;
- Downstream water supply authorities;
- Downstream users that could be affected in the case of an emergency such as neighbouring mines, farmers and local communities;
- Relevant government authorities such as DWA and DMR; and
- Approved professional person (engineer).

It must be ensured that operating and supervisory staff are familiar with the emergency plan, and that the content thereof is understood and familiar to them.

The emergency response plan will be updated as circumstances change or operating procedures are amended, and as a minimum in the event of:

- Any additional recommendations made by a professional engineer (annual safety inspections) or environmental auditors;
- Any change in operational procedures and/or management of the mining activity;
- The identification of any issues of concern or additional risks as a result of regular inspections and/or monitoring results; and
- Any unplanned or unforeseen emergency situation.

14.1.2 Objectives

Emergencies and risks that should be listed here, as a minimum, include: accidents, fires, spillages (hydrocarbon or loss of coal during transportation) and flooding.

If the emergency has the potential to affect surrounding communities, they will be alerted via alarm signals or contacted in person. The surrounding community will be informed of the potential dangers that exist and the actions to be taken in the event of any emergency.

Communication is vital in an emergency and thus communication devices, such as mobile phones, radios, pagers or telephones, must be available around the site. A checklist of emergency response participants must be consulted and the relevant units notified. In this

case, many of the emergency services will be sourced from Delmas or even Middelburg/Witbank. The checklist includes:

- fire department;
- police;
- emergency health services such as ambulances, paramedic teams, poisons centres;
- hospitals, both local and for evacuation for specialist care;
- public health authorities;
- environmental agencies, especially those responsible for air, water and waste issues;
- other industrial facilities in the locality with emergency response facilities;
- public works and highway departments, port and airport authorities; and
- public information authorities and media organisations.

It will be of paramount importance that the plan be reviewed after an incident or accident to ensure that the necessary measures are in place to protect the environment and protect the operators against liability claims that could result. In addition, a yearly review of the emergency response plan will be carried out, irrespective of whether an incident occurred during that year.

15 ENVIRONMENTAL MONITORING PROGRAMMES

15.1 Soil

The opencast coal mine rehabilitation operation requires a high level of monitoring, as many elements are changing on a regular basis. Both during rehabilitation and once they are completed, routine maintenance of structures such as down drains, collection dams and fences is required. In addition the actual re-vegetation operation needs to be monitored as especially performance and completion criteria need to be met. The following should also be undertaken:

- Measurement of soil depth on rehabilitated areas and discard dumps on a regular basis (Chamber of Mines of South Africa, 1981);
    - Most practical to measure when the vegetation monitoring is carried is done. This can be carried out using a soil auger and will establish that the placing of topsoil has been done to the correct depth.
- Soil analyses to ensure that the fertility of the soil is correct for the vegetation being grown. This is also required to calculate the fertiliser required for the next season;
- The basal cover of the vegetation should be measured together with a species composition assessment as well as the biomass of representative sample plots;
- Monitor movement and stability of the topsoil stockpile; and
- Monitor topsoil balance annually for volumes of soil.

Vegetation cover assessments, soil depth and soil fertility testing should be carried out as a combined operation annually, during the growing season and at least one month after rain has fallen.

Erosion assessments should be carried out in the rehabilitated areas to visually check for erosion channels. This should be done twice a year, during the summer growing season, and again after rain events.

Where fresh erosion channels are found, indicating that active erosion is occurring, remediation work will need to be programmed to improve the vegetation cover or divert rain water runoff, as indicated by the specific site conditions.

During the vegetation cover monitoring, the presence of **invasive weeds** should be detected. An active program of weed management, to control the presence and spread of invasive weeds, will need to be instituted, so that any weeds encroaching because of the disturbed conditions are controlled.

15.2 Hydrological

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented.

15.2.1 Surface Water Quality

Various water quality variables will be monitored (

Table 15-1) particularly the Variables of Concern (VoC) identified in the baseline analyses based on the WQO for Wilge River such as Fe, NH_3, SO_4,Cl, NO_3 and EC on a frequency prescribed by the activities (e.g. weekly during construction and decommissioning and monthly during operation). Heavy metals can be monitored on a quarterly basis and from the overburden before it is backfilled since they could result from the overburden as well as coal mining waste. These include Aluminium, Cadmium, Nickel, Selenium, Arsenic, Mercury and Beryllium. Surface water monitoring will be conducted at strategically identified locations.

Table 15-1: Hydrochemical parameters analysed

Total Dissolved Solids (TDS)	Sulphate as SO_4	Sodium as Na	Magnesium as Mg
Nitrate NO_3 as N	Fluoride as F	Calcium as Ca	Potassium as K
Chlorides as Cl	Iron as Fe	Manganese as Mn	Electrical Conductivity (EC*)
Total Alkalinity as $CaCO_3$	pH*-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N

***All units in mg/l except EC (mS/m) and pH in units of pH.**

15.2.2 Surface Water Quantity

Where possible the water quantity and channels geometry will be monitored in extreme flood events to determine any impact of the mining on river channels and water quantity in general, in the catchment.

15.2.3 Objectives of Monitoring Programme

The objective of the monitoring plan would be to monitor the impact of the coal mining, coal waste and its subsequent infrastructure through the continuous analyses of water quality and quantity (where possible).

15.2.4 Monitoring Frequency

The proposed monitoring programme for surface water quality will be implemented at different frequencies over the duration of the project as follows:

Phase	Variables	Frequency
Construction	All	Weekly/2 weeks
Operation	All	Monthly; Where negative impacts are detected (spillage) frequency to be increased to weekly
Decommissioning	All	Weekly

15.3 Groundwater

15.3.1 Monitoring Boreholes

The main objective in positioning monitoring boreholes is to intersect groundwater prior to and moving away from a pollution source and to intercept water levels at select intervals away from a well field used for water supply.

Depending on the final mine plan it is recommended that monitoring boreholes be selected by a qualified hydrogeologist in order to intercept preferential flow paths and select monitoring boreholes within the expected perimeter of the modelled impact zones.

15.3.2 Groundwater Levels

Groundwater levels must be recorded on a monthly basis to within accuracy of 0.1 m, using an electrical contact tape, float mechanism or pressure transducer to detect any changes or trends in groundwater levels.

15.3.3 Water Sampling and Preservation

The following procedures are proposed for sampling:

- 1 l plastic bottles, with a plastic cap and no liner within the cap are required for most sampling exercises. Glass bottles are required if organic constituents are to be tested for. Sample bottles should be marked clearly with the borehole name, date of sampling, water level depth and the sampler's name.
- Water levels should be measured prior to taking the sample, using a dip meter (m mbgl);
- Each borehole to be sampled should be purged (to ensure sampling of the aquifer and not stagnant water in the casing) using a submersible pump or in the event of an obstruction in a borehole, a clean disposable polyethylene bailer. At least three borehole volumes of water should be removed through purging; or through continuous water quality monitoring, until the electrical conductivity value stabilizes;
- Metal samples must be filtered in the field to remove clay suspensions;

■ Samples should be kept cool in a cooler box in the field and kept cool prior to being submitted to the laboratory; and

The pH and EC meter used for field measurements should be calibrated daily using standard solutions obtained from the instrument supplier.

15.3.4 Sample Frequency

A quarterly sampling frequency is recommended for groundwater quality.

15.3.5 Sample Analysis

Water samples must be analysed by an accredited analytical laboratory that uses approved analytical procedures. The following process is recommended for constituent analyses:

15.3.5.1 Comprehensive Analysis

For all new sites and first time monitoring at existing sites, a comprehensive analysis is required. It is essential that accurate background levels, for as wide a range of constituents as possible, be established at the outset. This will usually include a complete macro analysis as well as an analysis for the trace elements that could reasonably be expected to be present within the environment tested.

15.3.5.2 Indicator analysis

Indicator analysis may be performed once comprehensive analyses have been completed. The process may continue until undesirable trends are uncovered. This will keep analytical costs to a minimum, but still provide enough information upon which further actions can be

initiated, if necessary. Depending on the type of waste handled, so-called “pollution indicators” for the project may be identified. This should be reviewed on an annual basis to assess whether it is needed to monitor for additional variables.

Monitoring results will be captured in an electronic database as soon as results become available allowing:

- Data presentation in tabular format;
- Time-series graphs for comparison;
- Statistical analysis (minimum, maximum, average) in tabular/whisker box plot format;
- Linear trend determination;
- Performance analysis in tabular format;
- Presentation of data, statistics and performance on diagrams and maps; and
- Comparison and compliance to legal or best practice water quality standards.

15.4 Aquatic Biomonitoring

The monitoring programme should include sites/locations where biological monitoring has occurred previously. The sites included in this study will be sufficient (Plan 15) to include in future monitoring applications during the high flow season.

The following parameters should be monitored by qualified specialists.

- *In situ* water quality constituents;
- Habitat integrity;
- Aquatic macro-invertebrates;
- Fish assemblages; and
- Riparian vegetation.

The objectives of the monitoring would be to determine the current state of the aquatic ecosystem through the measurement of physical and biological properties. As of this study the baseline data is established and can be used to compare with in future studies as a means to determine if ecological degradation has occurred.

Key performance indicators would include the occurrence of particular fish species and abundance of species diversity.

15.5 Wetlands

According to Blodgett and Kuipers (2002) it is unproven if the use of “buffer zones” will protect hydrologic features as a preventative technique for mining. In spite of this, it is also recommended that no mining take place within a 100m buffer zone of the Wilge River or within the 1:100yr floodline of the Wilge River whichever is largest.

In addition to this, it is further recommended that a buffer zone of 50m be assigned to the remaining wetland areas so as to prevent future impacts to these areas. In order to compensate for the loss of wetland areas due to the destruction of aquifer recharge areas and the subsequent loss of ecological services due to the mining project, a rehabilitation programme is recommended.

Digby Wells is currently compiling a Rehabilitation Plan for Brakfontein, at the request of the applicant, which will also cover the wetlands.

15.6 Fauna and Flora Monitoring

During monitoring of the biological environment the direct and indirect effects of the infrastructure construction of the various phases can be measured. This can be accomplished through monitoring on various areas, more specifically on the construction areas, to measure direct effects, and monitoring within the vegetation communities to measure indirect effects. Three monitoring sites on construction sites areas and four sites per vegetation community will be sufficient. The vegetation communities that must be monitored are the grassland, riparian and wetland and the ridges.

For monitoring purposes it is suggested that a flora and fauna survey be performed by qualified specialists, in order to determine if trends are emerging in the composition of the flora and fauna environment. Any data collected during these surveys could be compared to previous surveys. The following parameters must be monitored within each vegetation community.

Flora

- Species richness;
- Medicinal species;
- Alien invasive species;
- Red data and Protected plant species.

Fauna

- Mammals;
- Birds;
- Herpetofauna;
- Invertebrates.

15.7 Noise

It is recommended that the monitoring plan be implemented to determine potential sources of noise, increases and decreases in noise levels, and determine level of mitigation required. Components to be included in the proposed monitoring plan are discussed below.

Noise monitoring is to be conducted on a quarterly basis throughout the construction phase to determine the impact of the noise levels on the relevant noise sensitive receivers as well

as determine the level of mitigation. Once it is established that the mitigation measures have decreased the specific noise levels from the mining activities, the noise monitoring should be carried out on a bi-annual basis thereafter throughout the life of mine. The noise measurements should be taken as per the baseline noise measurement locations of this report. A report must be compiled quarterly/ bi-annual, depending on the intervals of the monitoring programme then submitted to management to ascertain compliance with the required standards. Mine management should be advised of any significant increase in the ambient sound level as operations continue. At each measurement point the ambient noise level will be sampled in terms of the following parameters:

- The A-weighted equivalent sound pressure level (LAeq) for duration not less than 30 minutes per monitoring point.
- Measurements to be taken during both daytime (06:00 to 22:00) and the night time (22:00 to 06:00).

15.8 Dust Suppression

The main areas where dust suppression should be implemented is where material handing takes place.

Table 15-2: Dust control measures which can be implemented during the operational phase (U.S. EPA, 1995).

Activity	Recommended Control Measure(s)
Material handling (soil, waste rock, ore)	Mass transfer reduction
	Drop height reduction
	Wind speed reduction through sheltering
	Wet suppression
	Enclosures
Vehicle entrainment from unpaved roads	Wet suppression or chemical stabilisation of unpaved roads
	Reduction of unnecessary traffic
	Strict speed control
	Avoid track-on onto neighbouring paved roads
	Design haul roads as far from fence line as possible
Open areas – wind erosion	Reduction of extent of open areas through careful planning and progressive vegetation
	Reduction of frequency of disturbance
	Compaction and stabilisation (chemical or vegetative) of disturbed soil
	Introduction of wind-breaks

16 REHABILITATION PLAN

A rehabilitation plan has been compiled for the Brakfontein site and will be submitted to the DMR and to the DWA. This plan includes the management of water, soil and the rehabilitation of wetlands. The draft version of this plan is included in Appendix O.

The rehabilitation plan details the following:

- Specific actions to be undertaken during construction, operation, decommissioning and closure phases of the mining operation;
- Soil and overburden materials handling, to ensure that materials favourable to vegetation establishment, as well as potential problem materials (such as acid generating, high metal level, saline soils or potentially dispersive material), are placed in the correct sequence;
- Topsoil and subsoil handling procedures, especially those designed to conserve plant, nutrients and soil biota;
- Soil amelioration techniques to create conditions favourable for growth, such as the application of lime or gypsum;
- Any techniques for conserving and reusing vegetation, including mulch, brush matting for erosion protection and introduction of seed and log piles for fauna habitat;
- Landscaping procedures, including the construction of erosion control and water management structures;
- Post mining topography plan;
- Vegetation establishment techniques;
- Weed control measures prior to and following rehabilitation;
- Fertilizer application; and
- Follow-up planting and maintenance programs.

The plan provisions are time-bound and will take into account opportunities for progressive rehabilitation and closure. From a biodiversity conservation and re-establishment perspective, it is particularly important that the extent of planned disturbed areas is minimized at any point in time. The rehabilitation plan should be reviewed periodically as further information on site conditions becomes available and as new rehabilitation procedures are developed.

The plan also details a re-vegetation program, which include details of topsoil sources, stripping depths, volumes, handling methods, placement and scheduling. Areas where soil amelioration is needed will be mapped, and details of what is required described. It describes what plant species and vegetation communities should be established, so that the most appropriate species are used.

From the topography assessment details in terms of the construction of stable landforms are compiled. Landform stability is essential for the long-term sustainability of rehabilitation.

Poorly constructed landforms can result in erosion that severely affects both the re-vegetation and downstream biodiversity.

The rehabilitation plan also addresses soil handling, including the volumes and handling equipment needed, re-spreading depth and any follow-up treatment (such as scarifying prior to seeding). The types and methods of application of nutrients will be based on the soil characterisation studies.

The following recommendations are applicable:

- The liability figures need to be updated on an annual basis as a requirement of the MPRDA. This will ensure that all costs become more accurate over time and will reflect current market conditions; and
- Regular audits should be undertaken by a soil scientist during the soil stripping process. This will guarantee that soil are stripped and stockpiled correctly.

17 QUANTUM OF FINANCIAL PROVISION

The quantum of financial provision for closure for Brakfontein was submitted to the Department of Mineral Resources for their consideration.

17.1 General Closure Objectives

The overall closure objectives for the Brakfontein Coal Mine project are as follows:

- Return land, mined by opencast methods, as far as possible to a land capability to that which existed prior to mining and that the management level required to utilise the rehabilitated land is within the means of the farmer who uses it;
- Ensure that as little water as possible seeps out of the various sections of the mine and where this is unavoidable, ensure that the water is contained or treated if the volume is significant and if it does not meet statutory water quality requirements;
- Remove mine infrastructure that cannot be used by a subsequent land owner or a third party. Where buildings can be used by a third party, arrangements will be made to ensure their long term sustainable use;
- Clean up all coal stockpiles and loading areas and rehabilitate these as far as possible to a land capability to that which existed prior to mining.
- Follow a process of closure that is progressive and integrated into the short and long term mine plans and that will assess the closure impacts proactively at regular intervals throughout project life;
- Implement progressive rehabilitation measures, beginning during the construction phase wherever possible;
- Leave a safe and stable environment for both humans and animals and make their condition sustainable;

- To prevent any soil and surface/groundwater contamination by managing all water on site;
- Comply with local and national regulatory requirements;
- Form active partnerships with local communities to take care of management of the land after mining, where possible; and
- To maintain and monitor all rehabilitated areas following re-vegetation or capping (placement of a layer of material, e.g. clay or sandstone, which prevents/limits capillary movement of water between soil and pollution source) and, if monitoring shows that the objectives have been met, making an application for closure.

17.2 Financial Provision

The Financial provision was calculated by means of the Guidelines for Calculating the Quantum of Financial Provision as published by the DMR and was submitted to the Department as part of the MPRDA process for the Mining Right application.

It is important to differentiate clearly between operational phase and environmental costs and decommissioning. Some rehabilitation has to take place during operation, but after coal mining has ceased, activities will be seen as closure activities. A detailed environmental and social labour plan and other relevant environmental authorisations will be required well in advance of coal depletion or the end of the life of mine.

It will be recommended that the provision be reviewed after the first year of mining and that updated rates are used to give an accurate costing of rehabilitation activities. In addition it is recommended that the financial provision be annually updated as per the requirements of the MPRDA.

18 CONCLUSION

This environmental and social impact assessment study was undertaken to provide detailed information to the applicant and to the authorising departments to assist in making an informed decision with regards to the current state of the surrounding environment as well as the predicted impacts for the proposed Brakfontein Coal Mine.

Significant issues have the potential to occur predominantly during the construction phase if there is not adequate planning and action plans (stormwater management, waste management, engineering designs and rehabilitation) put in place from the beginning.

The loss of agricultural soils and the impact on wetlands have been identified as issues of concern with regards to the biophysical aspects of the project area. Since the findings of these recommendations Universal Coal has decreased their footprint of their opencast pits and is investigating high wall mining from the open cast areas to extract coal with limited disturbance of the valuable topsoil and wetland areas.

The social and heritage studies identified potential issues around the project being the presence of graves and the impacts on households within the mining area. The relevant information has been submitted to SAHRA with regards to the buildings on site and

Universal Coal has committed to placing a buffer around the graves and fencing these off. The households directly impacted by the project all fall within the land that Universal Coal will be purchasing (i.e. the farmer/landowner and his associated staff and farm workers. These arrangements in terms of resettlement or relocation will be investigated during the sale agreement of the land.

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