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VOLUME 1

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PLAN

FOR

THE PROPOSED DEVELOPMENT OF THE NEW MALONJENI COAL (ANTHRACITE) MINE AND RELATED INFRASTRUCTURE, NEAR DUNDEE, UMZINYATHI DISTRICT MUNICIPALITY, KWAZULU-NATAL

SUBMITTED ON BEHALF OF:

TRANSASIA MINERALS (PTY) LTD

APRIL 2015

REFERENCE NUMBERS:

KZN DAEA: REF DC24/0001/2014: KZN/EIA/0001410/2014

DMR: KZN 30/5/1/2/3/2/1/(MR10021)

DOCUMENT HISTORY

DATE	VERSION	STATUS
10 Feb2015	1.0	Draft
16 Feb 2015	2.0	Final Draft
07 April 2015	3.0	Final

DISCLOSURE

DECLARATION OF INDEPENDENCE

I, Diana Verster, declare that I:

- Was present at the launch of the Environmental Assessment Practitioners Association of South Africa on 7 April 2011, when 802 individuals resolved, as founding members, to form the organisation.
- Acted as an independent specialist consultant and EAP for the undertaking and completion of the Environmental Impact Assessment Process.
- Do not have and will not have any financial interests in the project other than providing environmental and related services should it be required by Transasia Minerals (Pty) Ltd. from time to time; and
- Will provide, to the client, stakeholders and decision making authorities, all information regarding the application, whether such information is favourable to the applicant or not.

Refer to Declaration of Independence attached as **Annexure A** of this document.

DRAFT ENVIRONMENTAL IMPACT REPORT THAT WAS MADE AVAILABLE FOR PUBLIC REVIEW

Notice is given in terms of sections 24 and 24D of the National Environmental Management Act, Act 107 of 1998 (NEMA), as read with the EIA Regulations of GN R543 of 18 June 2010, that the draft Environmental Impact Report for the proposed constructing and operation of the Malonjeni opencast and underground coal (anthracite) mine ***WAS MADE*** available for public review from *Friday 20 February 2015 to Friday 31 March 2015* at the following venues:

- Dundee Public Library
- Endumeni Local Municipality
- The draft Environmental Impact Report is also available from the public participation office.

Interested and Affected Parties (I&APs) WERE encouraged to review the draft Environmental Impact Report and to submit all comments in writing on or **before Friday 31 March 2015 to Batho Earth.** See details of contact persons below. *PLS REFER TO THE PUBLIC PARTICIPATION FOLDER FOR THE COMMENTS RECEIVED.*

NOTICE OF PUBLIC OPEN DAY: 27 FEBRUARY 2015

All individuals or groups interested in or affected by the proposed project *WERE* invited to attend the public open day:

Date: Friday 27 February 2015

Time: Any time between 10h00 – 13h00

Venue: Battlefields Conference Venue

The open day provide I&APs with:

- Feedback on the project and findings of the draft Environmental Impact Report;
- A further opportunity to ask questions and raise concerns regarding the proposed project.

Contact Details: Interested and/or Affected Parties who wish to participate, or who would like to obtain further information, should please contact

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EXECUTIVE SUMMARY

INTRODUCTION

Transasia Minerals (Pty) Ltd. (hereafter referred to as Transasia Minerals) concluded a Feasibility Study (FS) in August 2013 with the aim to determine the viability of constructing and operating an opencast and underground coal (anthracite) mine on the Remainder of Portion 3, Remainder of Portion 4 and Portion 12, 14 and 15 of the farm Hazeldene No. 12649. The coal resources to be accessed are located on the farms;

- Farm Hazeldene (as above)
- Farm Corby Rock 11509,
- Farm Lot W 8601,
- Farm Terrace 3707,
- Remainder and Portion 1 of the Farm Eastkeal 5138 and
- Portion 8 of Winkle 5054.

The extent of the area required for mining is approximately 2 904.1140ha. The footprint of the infrastructure required is approximately 6ha with the mining area being approximately 36ha.

The Malonjeni Anthracite Mine is located in central KwaZulu Natal and is accessed via the Provincial road R68 which connects Dundee and Nqutu. The road intersection into the mining property will be approximately 20km from Dundee. The Project area lies in the centre of the Klip River Coalfield, and the surrounding areas currently support a number of coal mining operations and undeveloped coal resource blocks.

Batho Earth has been appointed by Transasia Minerals (Pty) Ltd as the Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

The project is referred to as the Malonjeni Mine and will involve the design, construction and operation of an opencast and underground coal mine. Specifically the mine will require the construction of terraces, stockpiles and offices, pollution control dam, bulk water pump station and distribution, potable water tank and distribution network, fire suppression water distribution to adit and washing plant site, electrical distribution from sub-station/generators to buildings and masts, buildings incl. admin/security, change house/lamp room and security fencing.

Based on the value engineering completed during the EIA process, the Malonjeni mine will be operational for approximately 15 years and will provide employment to approximately 520 people which would comprise permanent and contractor staff.

The coal reserve on the project area can be optimally mined using both opencast and underground mining methods. This reserve is currently divided into 3 (three) Blocks (Block 1N, Block 2N and Block 2S). The seam referred to is the Gus-Seam with an average seam height of 1.42m. The mine will be a board and pillar operation with access to the GUS seam gained by way of horizontal adit. Both development sections and production sections are at maximum extraction. Planned pillar sizes of the various areas will depend on depth of cover with main developments at > 2, 0 safety factor and production ponds at > 1, 6.

The proposed location of the underground mine access (adit), mine offices and other surface infrastructure is on a saddle in the eastern slopes of the Corby Rock mountain range at an elevation of approximately 15 meters above the coal seam. This location was chosen as the most suitable for

the exploitation of the resource while also minimizing the amount of earthworks and other construction preparation required.

LEGAL REQUIREMENTS

The proposed project must be authorised to the following principle legislation before construction and commencement:

- National Environmental Management Act, Act No. 107 of 1998 (NEMA).
- Minerals and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA). (*Mining right already received*)
- National Water Act, Act No. 36 of 1998 (NWA).

The EIA study is not only subjected to the terms and regulations of the National Environmental Management Act, Act No. 107 of 1998 but must also comply with other applicable statutory requirements and guideline documents that are relevant to the project. A non-exhaustive list of legislation and guidelines that were considered during the EIA Phase of the project has also been investigated.

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd.

In May 2012, Transasia Minerals then submitted a Mining Right Application (for mining) to the Department of Mineral and Resources (DMR) in terms of Section 39 and Regulation 50 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) under the reference number KZN 30/5/1/2/3/2/1/(MR10021) for a new mining permit on the said properties. This right was granted in November 2014.

The proposed mine development and operations requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and Environmental Impact Assessment (EIA) process as listed activities 9, 11, 13 18, 22, under Government Notice No R. 544 as well as listed activities 5, 10, 15 and 20 of Government Notice No R. 545, activities 13 and 14 under Government Notice No R546 of the EIA 2010 Regulations are triggered.

The NEMA application for environmental authorisation was submitted by Citofield (previous Environmental Assessment Practitioner (EAP)) to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA) on 16 January 2014. The department acknowledged the application with a formal letter in which the project was rewarded with REF DC24/0001/2014: KZN/EIA/0001410/2014 as the KZN DAEA project reference number[1].

The Scoping Report was submitted to KZN DAE in terms of the National Environmental Management Act (NEMA), Act No. 107 of 1998 and the new EIA Regulations promulgated on 18 June 2010, and additionally in terms of Regulations 48 and 49 of GN. R527 of the MPRDA. The Final Scoping Report was accepted by KZN DAE on 21 January 2015. On acceptance of the Scoping Report, an Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) (as submitted to the DMR) was compiled.

IMPACT ASSESSMENT METHODOLOGY

It was necessary to utilise a methodology that could scientifically assess and evaluate the impacts and benefits associated with the project as well as reduce the subjectivity involved in making such

[1] Citofield 2014: Draft Scoping Report for the proposed Malonjeni Coal Mine

evaluations. The various environmental impacts and benefits of this project have been discussed in terms of the nature of the impact as well as the status, certainty/probability, duration, spatial extent, intensity, frequency and significance. The significance rating of each impact will determine whether or not mitigation will be required.

The significance of impacts was determined by the following formula:

*Status * (Certainty/probability + Duration + Extent + Intensity) * Frequency = Significance.*

This method for assessing the significance of impacts was repeated for all three project phases i.e. Construction, Operation and Decommissioning.

Mitigation measures, as proposed by the various specialists and the EAP, were discussed for each anticipated impact and are detailed in the EIA/EMP Report.

PROJECT LOCATION

The Malonjeni Mine area is located in a saddle in the eastern slopes of the Corby Rock mountain range at an elevation of approximately 15 meters above the coal seam with respective distances to major towns and communities displayed in table 3 of the report. The proposed property area falls within the jurisdiction of the Endumeni Local Municipality area (ELM) within the greater Umzinyathi District Municipality (UDM) in Kwa-Zulu Natal.

The Malonjeni Block is located some 16kms to the east of Dundee in the Umzinyathi District in the Kwa-Zulu Natal Province of the Republic of South Africa. Access to the site is via the R68 Dundee to Nquthu provincial road. The Project area lies in the centre of the Klip River Coalfield, and the surrounding areas currently support a number of coal mining operations and undeveloped coal resource blocks. The current surface land usage is cattle husbandry.

The study area falls under the jurisdiction of the Thukela Water Management Area 7 in the V32E and V32f quaternary catchment area. Four palustrine wetlands were identified in the study area namely a valley bottom wetland with a channel, a valley bottom wetland without a channel, a hillslope seepage feeding a water course and a hillslope seepage not feeding a water course.

PROJECT DESCRIPTION

The geotechnical evaluation of the various geological formations (roof, seam and floor) for the Malonjeni Colliery indicate that it is technically feasible to safely mine the Top Seam by both surface and underground mining methods that are commonly in use in the Republic of South Africa.

The Malonjeni Resources will be mined using a cut, drill and blast mechanised board and pillar mining method for the first two to three years (open-cast mining), after which the coal will be mined using a new technology referred to as the ADDCAR High-Wall mining method. ADDCAR High-Wall mining technology cuts into the ground and brings the coal to the surface to be loaded onto the stockpiles.

It is planned to start open cast operations from suitable positions around the Corby Rock hill where the Top Seam outcrops will be mined until the strip ratio becomes uneconomic. The hill displays various conditions from rock outcrop above and below the Top Seam, to thick vegetation with possible hill wash covering the out crop.

The mine design criteria are as follows (from the Feasibility Study, Hatch, 2014):

- Treatment of 88 000t of ROM per month with an additional 18% of external waste
- The country rock consists of sandstone with shale lenses and this decomposes when exposed to air.
- Life of mine is 15 years with a steady state production of 960 000 t.p.a
- The anthracite density is 1.68t/m^3 and the sandstone density is 2.4t/m^3

- Discard density is 1.6t/m^3 and the slurry is 0.8t/m^3
- Total volume of slurry for the life of the mine will be 1.53Mm^3
- The total volume of coarse discard is 3.6Mm^3 excluding material from the opencast area
- Co-disposal is the preferred disposal option.
- A Chairlift decline for moving men will be included.

Mineral Deposits:

The proposed Malonjeni Mine area falls within the Klip River Coalfield, which extends from Utretcht in the north to Ladysmith in the south. The resource blocks are situated on the farms Corby Rock, Hazeldene and Eastkeal, where mining had previously been undertaken in the last century. Mining was stopped on account of the low volatiles present, possibly as a result of Dolerite intrusion activity.

Two coal seams are present within the project area, a Top Seam averaging 1.4m in thickness which is underlain by the Bottom seam, about 0.3m in thickness some 10m below, and the distribution of these coal seams are affected by the topography of the pre-Karoo basement and the present day erosional surface. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup. It consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group and is underlain by the Dwyka Formation of the Karoo.

Only one product will be beneficiated from the Malonjeni Resource, namely: Primary product Coal of 27.8 MJ/kg at a weighted average wash density of 1.8 and borehole yield of 84%. Please refer to the table below for the Malonjeni single wash product specification as from the SRK Report dated 29 April 2011.

Malonjeni Single wash product specification

Product	Wash density	Borehold Yield	Practical Yield	Ash	CV	Moisture	Volatiles	Sulphar
Primary	1.8	84.03%	71.4%	18.11%	27.8MJ/kg	1.89%	8.87%	1.97%

The Resource is located from near surface to a depth in excess of 30 to 230 meters below the surface, which is comparable to other active mining operations in South Africa on the same reefs.

The Mineral applied for in the Mining Right Application is:

- Coal;

Water Requirements

The potable water supply will be abstracted from a single borehole with a yield of 27m^3/h, which is more than adequate to meet the daily demand of 105m^3/day based on a per capita demand of 200l/day. A standby borehole should also be provided. Potable water from these boreholes will be pumped to a steel 1Ml reservoir, situated on high ground south west of the plant site from where it will flow under gravity to the change house and other end users. The quality of this groundwater source has been checked by others and found to be suitable for human consumption and the only form of treatment will be by chlorination.

The service water will be obtained from three sources, namely:

- In the early stages of mining when the groundwater flow into the mine is minimal, water will be obtained from a service water borehole, rain water runoff from the plant site and the discards disposal areas;

- As the groundwater flow from the mine increases the service water borehole will be discontinued and only the water from the mine and from runoff will be utilized; and
- In the longer term there will be an excess of water at times and the design of the polluted water dams catching the surplus runoff will need to include treatment to meet the Special Standards for Discharge. It is possible that the Department of Water Affairs will specify that the Special Standards for Discharge will have to be met in which case reverse osmosis treatment will probably be required.

The daily demand for service water in the steady state situation will be 440 m^3 for the wash plant based on 150l of make-up water per ton of anthracite washed and 60m^3 for road watering, giving a daily total of 500m^3. The service water will be stored in the pollution control dam at the infrastructure site from which it will decant into a sump and be pumped to the plant and other usage points. All of the reservoirs and dams will be equipped with level controls and alarms which will be transmitted to the control room.

Electricity Requirements

Electrical power supply to the mine complex will be from the existing Eskom power line to the farm. A switch yard has been allowed for in the vicinity of the existing farm house and there will be underground cables distributing the power around the anthracite storage and washing area. A 22kVA overhead line on wooden poles will transmit power to the plant and to the Adit. The length of this line will be approximately 2km.

- A mini substation will be placed adjacent to the washing plant
- A mini substation will be sited on the Adit terrace to supply power to the ventilation fans, the lighting equipment, pumps in the mine and underground materials handling and mining area.

Eskom also provided confirmation to Transasia that electricity is available (Appendix H).

MINE SURFACE LAYOUT

Construction Phase

A design criteria document for civil, structural and architectural works will be developed and adopted for the project in order to define the codes, standards and specifications for the civil construction applicable to the project and its infrastructural content.

For the purpose of construction the following will be attended to:

- Appointment of construction labour force and contractors;
- Removal of topsoil for the establishment of infrastructure:
    - Only areas where infrastructure will be developed will be cleared of vegetation. The areas will be cleared by means of bulldozers which will enable survey control and ground levels to be established;
    - The topsoil will be stripped and stockpiled using excavators, then subsequently by load-and-haul using dump trucks. Where necessary overburden material will also be removed and dumped using excavators;
    - Overburden could be utilised to construct primary and secondary access roads as well as the “enviro” berms that will act as visual screens and storm water diversion berms around the project site perimeter;
    - Excess overburden material could be utilised as borrow material to level some areas prior to construction;

- Excavation of trenches for underground piping and storm water control;
- Erection of a security fence on the perimeter of the project area;
- Possible spillage of hydrocarbons and the mitigation of the effects;
- The separation and disposal of construction waste;
- Construction of temporary offices;
- Establishment of contractors laydown area;
- Establishment of the permanent buildings and plant equipment;
- Stringing of underground and overhead 132-11kV power lines;

Operational Phase

The proposed mine surface infrastructure layout is presented in this document. It is important to note that the layout plan presented is a conceptual layout and could change as a result of detailed engineering.

The access road is based on an assumed position for the access where the sight distances meet the required Provincial standards. The infrastructure area of 26ha is on split-level terraces with the structures placed in an open layout to facilitate future changes. The discards disposal facility is a single unit as adequate space is available between the road and the expected maximum limit of 100m from the river centre line. It is unlikely that the flood line will exceed the 100m line.

Facilities to be catered for on the surface infrastructure on site are:

- The process plant (per details provided by the client's process designer)
- De-stoning will not be required
- Tramp metal magnets to be installed in 2 places
- Loading area for export product
- Loading area for non-export product
- Three stockpile areas for the duff, nuts and nuggets products
- Pollution control dam
- Change house including lamp room, control room, first aid room and laundry designed for 520 people, (10% of workers are assumed to be women)
- Wash bay
- Stores building, yard and workshop
- Laboratory
- Scrap yard
- Security gatehouse including 4 offices for the owner's team
- Bus, taxi and private vehicle parking outside of the security area
- Recycling/waste handling area
- Re-fuelling area and fuel storage area
- Substation and standby generators

- Service water storage and return water storage
- Potable water storage
- Explosives magazine and detonator store
- Road access is to be via an 8m wide road with shoulders- approximately 3.2km long

Two general layout options are proposed by Hatch as per the Terms of Reference for the feasibility assessment. These two options will be discussed in detail in chapter discussing Alternatives.

PROJECT ALTERNATIVES

A number of alternatives have been considered since inception of the project. These alternatives were investigated in great detail and range from mining alternatives, service delivery and supply as well as technological alternatives. The various alternatives considered are presented in the table below from preferred alternative to least preferred.

Table 1: Mining Alternatives

Aspect/Activity	Alternative 1	Alternative 2	Alternative 3
Surface Layout	HATCH Option 1	HATCH Option 2	
Transport Alternatives	By Truck	By Rail	
Electricity Supply Alternatives	Eskom	Diesel Generators	
Oil Separation Techniques	API Separator	Dissolved Air Flotation Separator	Oil Skimmer
Sewage Treatment Plant Alternatives	Crocette Mine Packaged Sewage Treatment Plant	Biomite Waste Water Treatment Plant	
Labour	Sourcing of labour locally	Outsourcing labour to contractors	Training and re-skilling of local labour
Accommodation of construction workforce	Payment of living out allowances	Housing workers in existing suitable facilities in immediate area	Housing construction workers in contractors camp
Accommodation of operational workforce	Payment of living out allowances	Housing workers in existing suitable facilities in immediate area	
Transportation of workers	Taxis	Busses	Combination of Taxis and Busses

DESCRIPTION OF THE PRE-OPERATIONAL AREA

Topography

The area is characterised by a gentle undulating topography (except for the Corby Rock range which rises steeply) and in the area of the proposed mining site, the slope is more or less in the order of 1:75.33. The surface topography consists of the Corby Rock mountain range. This mountain range strikes in a NNE-SSW direction and is on average 200 m above the general ground surface elevation of 1200 mamsl.

Locally drainage is towards the Dumangezi which is a non-perennial stream that flows from south to north through the Malonjeni block and an unnamed non perennial river that flows into the Buffels Rivier via an unnamed wetland. The unnamed stream and wetland fall predominantly within the farm Hazeldene 12649. On larger scale, drainage occurs towards the generalised flow of the Buffels Rivier.

Geology

The local geology is best concluded from information obtained from exploration borehole logs done for Transasia Minerals and the lithology is best observed in the logs of boreholes drilled at higher elevations, where both coal seams have been encountered. The predominant coal seams located within the mining area are the Bottom and Top seams.

According to information provided by Transasia Minerals, the Corby Rock mountain range is capped with dolerite. This dolerite cap extends to an average depth of 50m. Occurring below the dolerite are interbedded shales and sandstones. The Top Seam (targeted for mining) is associated with the sandstone and sub-outcrops on the site at an elevation of approximately 1200 mamsl. It has an average thickness of 1.5m and is generally consistent in thickness and orientation. The Bottom Seam averages a thickness of approximately 0.3m and is localised under the Top Seam.

Soils

The soil is shallow, derived from shales and mudstones of the Ecca Group of the Karoo Sequence. With a rainfall of 450 mm, it is characterized by subsoils which are either duplex, which renders them potentially highly erodible, or dominated by black clays. The highly erodible nature of the soils warrants the mine exercising considerable care in the conservation and preservation of topsoil during the life of mine. The soil type is particularly suited to grazing and agricultural crop production (as from the report by Hydro Science, 2014).

Flora

Hydro Science conducted a fauna and flora assessment. The results of the study determined that the areas of greatest diversity and therefore ecologically the most significant, are located along the south and south-western boundary of the study area, which include the area currently owned by the mine. The areas along the north and north-eastern boundary had been exploited, resulting in the loss of habitat integrity and diversity and should therefore be considered for the majority of infrastructure associated with the proposed mine.

The proposed Malonjeni Mine infrastructure and mining activities would disturb relatively small surface areas of approximately 36ha due to mining-related activities. The project area is not pristine and the area has been cultivated in some places and is extensively grazed throughout but sensitive areas such as wetlands and rocky outcrops encompass large areas within the site. These sensitive systems must be avoided by allocating buffer zones to them and limiting project activities around these areas.

Before construction can commence an ecological sweep needs to be undertaken. The sensitive areas need to be mapped and overlain with the mine layout plan to ensure that sensitive systems are protected. The sensitivity map needs to be incorporated as part of the environmental monument programme for the mine and held on site during the construction and operational phase of the mine.

Wetlands are of national concern and therefore the proposed mining infrastructure should be located as far as possible from the any drainage lines and Rivers.

Fauna

Birds observed during the site visit included several small graminivorous (seed-eating) birds that typically occur in grassland habitat including Larks, Pipits, Chats and Longclaws. Many swallows, swifts and Martins were also noted (refer to appendix B for a list of birds that have been observed in

the project area). Many water birds were also seen around the small dams in the project area including several duck species, Ibisises, African Spoonbill, plovers and herons. Raptors were also noted during the visit, perching on telephone poles, including falcons and kestrels.

The Bird distribution data of the first Southern African Bird Atlas Project (SABAP1 –Harrison et al. 1997) were obtained from the Animal Demography Unit website (http://sabap2.adu.org.za/index.php) for the SABAP 1 quarter-degree square covering the proposed development area (2830AB) over the atlas period with 173 species being recorded through the submission of 7 atlassing cards.

Data on the distribution of mammals using Smithers' Mammals of Southern Africa (Apps, 2001) indicate that up to 56 mammal species may occur in the greater project area (Hydro Science, 2014). Discussions with local farmers indicate that both small and large buck species occur in the project area including Bushbuck, Grey Rhebuck, Steenbok, Duiker, and Mountain Reedbuck. Other animals known to occur in the area include Water Mongoose, Porcupine, Rock dassie, Slender Mongoose and feline species such as Genet and Lynx.

Alexander and Marais (2007) indicate that more than 50 snake species may occur in the study area with the Southern African Python and the Striped Harlequin Snake being two Red Data species that may occur in the region (Hydro Science, 2014). Other reptilian species that may occur in the study area include Agamas, Chameleons, Monitors, Lacertids (*Skinks*), Cordylids (Crag, Flat and Plated Lizards), Geckos, such as the Marsh Terrapin (*Pelomedusa subrufa*) and Tortoises including the Natal Tortoise, a Near Threatened species. Red data species that may occur in the project are listed in the report from Hydro Science 2014. No reptiles were observed during the site visit although it is likely that many reptilian species may occur in and around the rocky outcrops that characterise the project area.

The surface water bodies in the project area provide suitable habitat for many amphibian species including the Natal Sand Frog (Tomopterna natalensis) as most frogs need standing bodies of water for breeding and may breed in the river.

Although Ezemvelo did not list any amphibia in their database, the following species are known to be Red-listed species that may occur in the project area:

- Breviceps bagginsi is a species of frog in the Microhylidae family. It is endemic to South Africa. Its natural habitats are temperate grassland and plantations. It is threatened by habitat loss. Its Red list status is DD (Data Deficient);
- Whistling Rain Frog (*Breviceps sopranus*) is a species of frog in the Microhylidae family. Its natural habitats are temperate forests, dry savannah, moist savannah, and sandy shores. It is threatened by habitat loss. Its Red list status is DD (Data Deficient); and
- Long-toed tree frog (Leptopelis xenodactylis) is Red-listed as Endangered.

Wetland

Ixhaphozi Enviro Services compiled a Wetland delineation study for the proposed project. Four palustrine wetlands were identified in the study area, namely a valley bottom wetland with a channel, a valley bottom wetland without a channel, a hillslope seepage feeding a water course and a hillslope seepage not feeding a water course.

A variety of wetland types occur in the study area including valley bottom (channelled and unchannelled) and hillslope seepage (isolated and linked to a stream) wetlands. Extensive erosion (15 - 20% of the study area of ~ 3000 ha) of the foot slopes and valley bottoms occur. These erosion features are part of this landscape since the Late Pleistocene and in-channel wetlands have formed in many of these.

Surface Water

The study area falls into the Thukela Water Management Area 7, into two Quaternary Catchments V32E and V32F. The eastern portion of the study area drains into the Buffels River, and the western portion of the study area drains into the Madikazi and Sandspruit.

Groundwater

Groundwater levels were measured in ten boreholes during a hydrocensus conducted in January 2013 for the proposed Transasia underground mine. The depth of the static groundwater level was found to vary between artesian and 16.82m below ground level.

A seasonal aquifer perched on the bedrock probably develops in the upper weathered soil layer, especially after high rainfall events. Flow in this perched aquifer is expected to follow the surface contours closely and emerge as fountains or seepage at lower elevations.

From the chemical analysis of the water samples, it can be deduced that the water quality the proposed mining area is generally acceptable for domestic use according to the DWA drinking water standards. It can be deduced from the water quality of the sampled boreholes that the groundwater has not been extensively negatively affected by historic mining related contaminants.

Air Quality

The surrounding region is mainly utilised by mining companies, smelter operations and numerous residential villages (which use the land for informal cultivation and grazing). Sources identified as possibly impacting the air quality in the region include, but are not limited to:

- Industrial sources;
- Fugitive dust sources;
- Mining emission sources;
- Domestic fuel combustion;
- Vehicle tailpipe emissions;
- Long-range pollutant transportation; and
- Informal Refuse Burning.

Noise

Measurements of the ambient noise level were carried out according to ISO noise measurement procedures. These points are defined and the measurements are reported in the EIA/EMP Report. Existing ambient noise levels are representative of an urban area.

Sites of Archaeological Interest

Archaetnos Culture & Cultural Resources was commissioned to conduct the Heritage Impact Assessment. Please refer to Appendix J for a copy of the Heritage Report and findings. Archaetnos identified thirty (36) sites of cultural significance. Please refer to Figure 14 and 15.

Farm workers and farmers in the area who were consulted indicated that there is a possibility of more grave sites on top of the mountain, but they were unsure of exactly where these are located. It therefore does seem as if there probably are more sites than what were found.

This is an important aspect that needs to be considered during any future activities in the mining area. Any possible identification of additional cultural heritage resources should be dealt with in accordance with the recommendations set out as part of the Heritage Impact Assessment.

Traffic

The coal produced by the mine will be transported to the final destination making use of road transport (trucks). Approximately 5-6 trucks will enter and exit the mine per day. These trucks will make use of the existing R68 for the delivery of the coal to existing facilities in the area.

All consumables will be delivered to site via road by registered carriers. This will also apply to all waste removed from site.

Socio-Economic Environment

The Endumeni Local Municipality is located 360 kilometres south east of Johannesburg and 290 kilometres north of Durban. The area is in the Biggarsberg Valley in the foothills of the Drakensberg. The Municipality is generally accessed by turning off the N3 highway onto the N11 then proceeding onto the R68 into the Municipal area. Endumeni municipal area is one of four local authorities forming the uMzinyathi District Municipality. The local municipalities comprising the District are

- Endumeni (KZ 241);
- Nquthu (KZ 242);
- Msinga (KZ 244); and
- Mvoti (KZ 245).

Endumeni LM has the smallest population but the largest economy of the local authorities in the District, with its focus on the main urban areas of Dundee and Glencoe. The Endumeni Municipality (KZ 241) comprises the towns of Dundee, Glencoe and Wasbank, together with a number of farms astride MR 33, MR 68 and DR 602. It should be noted that no Ingonyama Trust land is located within the Municipal Area. The population of the Local Authority area, as determined in the 2011 census, was 44 862 individuals, of which 70.1% were of African origin. The gender split was relatively evenly balanced at 50.95 for females to 49.02 for males.

PUBLIC PARTICIPATION PROCESS

Citofield as independent environmental consultant, was appointed by the applicant, Transasia Minerals (Pty) Ltd to undertake the required Environmental Impact Assessment (EIA) as part of the authorisation process in terms of the National Environmental Management Act (NEMA) (No 107 of

1998), Sections 24 and 24D of NEMA, as read with the EIA regulations of GNR 543, GNR 545 and GNR 546 as required for the development of the proposed new Malonjeni Coal Mine.

Citofield was only involved during the Scoping Phase of the project and submitted the draft Scoping Report, Final Scoping Report and Final (Amended) Scoping Report to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA) in September 2014.

In October 2014 Batho Earth was appointed to take the study through the EIA Phase as the new independent environmental consultant.

Batho Earth then re-submitted the Plan of Study Report that forms part of the final Scoping Report to the officials at KZN DAEA. The scoping report was subsequently approved in January 2015.

The draft EIA Report *was made* available to the public for a 40 day review period.

The draft Environmental Impact Assessment Report *was made* available for review from 20 February to 31 March 2015. This document will be placed at the following locations:

- Dundee Public Library;
- Offices of the Endumeni Local Municipality;
- Should it be requested, soft copies of the document would be made available.

All comments received on the draft Environmental Impact Assessment Report HAS BEEN incorporated into the Final Environmental Impact Assessment Report prior to the final submissions to the relevant authorities.

POTENTIAL AND CUMULATIVE IMPACTS

Construction Phase

Noise

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.30
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.70

Air quality and Dust

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.20
Comment: Although the calculated average significance rating is medium, the construction activities relating to the footprint clearance and roads is of a medium significance.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.20

Soils, Land Use and Land Capability

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.50
Comment: Although the calculated average significance rating is medium, the activities relating to the opencast and underground mine will be of a high significance. The construction of the facility will require large civil works in order to remove vegetation, valuable topsoil as well as to create the necessary layers and membranes to limited groundwater pollution.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.80

Visual

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.30
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.70

Topography

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-6.90
Comment: Although the calculated average significance rating is low, the construction activities relating to the opencast mine is of a high significance. The construction of the opencast mine will require the clearance of vegetation over a fast area. Simply by clearing vegetation, one increases the flow of water, with the probability that one might impact on natural drainage lines. The further construction of the mine will have an impact on the existing drainage lines, however, the mine will be placed optimally as not to impact on major drainage lines or tributaries. The natural slopes and gradients (general topography) will be altered.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.00

Flora

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.10
Comment: Although the calculated average significance rating is medium, the construction activities relating to the access roads are of a high significance. Depending on the road surface and width, construction activities can have a significant impact on the ecosystem continuum, changing water infiltration and local geohydrology. Furthermore, roads contribute to habitat loss and habitat fragmentation through the removal of vegetation and obstruction of the movement of fauna, which are often critical propagators of plant material. In consideration of the fact, that the areas selected are mainly located in very low to moderate ecological sensitive areas	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8.00

Geology

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-4.50
Comment: Although the calculated average significance rating is low, the construction activities relating to the opencast and underground mine is of a high significance.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.70

Fauna

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-9.30
Comment: Although the average significance rating predicted to be medium, the impact on habitat loss during the construction phase will be of a high significance. This impact will relate to the loss and degradation of untransformed faunal habitat (i.e. loss of savannah, outcrop and wetland habitat) as a direct result of clearing of vegetation and habitat destruction to allow for the construction of mining infrastructure.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8. 00

Health

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-6.00
Comment: The following negative impacts could be changed to positive if the suggested mitigation measures are implemented correctly: • Influx of people with chronic diseases; and • Food inflation, increasing food deprivation, nutrition-related diseases.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.30

Surface water

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.70
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.80

Groundwater:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-2.50

Comment: No mitigation will be necessary.

Wetland

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.10
Comment: Although the calculated average significance rating is medium, the construction activities relating to the access roads are of a high significance. Depending on the road surface and width, construction activities can have a significant impact on the ecosystem continuum, changing water infiltration and local geohydrology. Various wetland systems filter through the study area and can be negatively impacted on.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8.00

Archaeological Sites:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.10
Comment: Although the calculated average significance rating is medium, the construction activities relating to the access roads are of a high significance. Various graves are located within the study area and opencast and underground mine activities should avoid these graves.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8.00

Traffic:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-8.00
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.80

Blasting

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.60

Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.90

Social and Socio-Economic Impacts

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.60
Comment: The negative impact on the social and socio-economic environment is predicted to be of medium significance. These negative impacts could be enhanced through appropriate mitigation measures. The positive impacts were not included in this average calculation as this may skew the results. The positive impacts will relate to: • Employment Opportunities and Skills Inequity; and • Local Economic Contribution. • . • .	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.00

Operational Phase

During the operational phase the following impacts will occur and are tabled below. These impacts are related to the facilities and structures constructed during the construction phase.

Noise:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-6.80
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.00

Air Quality and Dust:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.4
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-2.5

Soils, Land Use and Land Capability

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-6.80
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.50

Visual

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-5.70
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.80

Topography

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-6.90
Comment: Although the calculated average significance rating is low, the construction activities relating to the opencast mine is of a high significance. The construction of the opencast mine will require the clearance of vegetation over a fast area. Simply by clearing vegetation one increases the flow of water with the probability that one might impact on natural drainage lines. The further construction of the mine will have an impact on the existing drainage lines, however, the mine will be placed optimally as not to impact on major drainage lines or tributaries. The natural slopes and gradients (general topography) will be altered.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.00

Fauna:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-9.40
Comment: Although the calculated average significance rating is medium, the operational activities relating to the opencast mine is of a high significance. The mine will impact on the free movement of larger flightless animals. Larger animals will have to change their free movement across this environment	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-4.60

Flora:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-12.00
Comment: Although the calculated average significance rating is medium, the operational activities relating to the access roads are of a high significance. Roads often provide access or areas of migration to alien plants and animals from highly populated areas to less populated areas. During the operational phase, dust will be generated by vehicles utilising the mine access roads and this will have a negative effect on the flora in the vicinity of the roads.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-10.00

Geology

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-4.50
Comment: Although the calculated average significance rating is low, the construction activities relating to the opencast and underground mine is of a high significance.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.70

Health

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-3.30
Comment: Negative impacts that could be changed to positive impacts through mitigation measures include the following: • Road Infrastructure; • Community health facilities; and • Food quality.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-2.20

Surface Water:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.20
Comment: Although the calculated average significance rating is medium, the operational activities relating to the change of the catchment size and character are of a high significance. The catchment area will be reduced due to the continuous waste rock piling, and topsoil removal during operations.. The character of the catchment area will change during the operational phase due to construction and topsoil removal. Catchment change in this context refers to land cover change.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.80

Groundwater:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.20
Comment: Although the calculated average significance rating is medium, the operational activities relating to the change of the catchment size and character are of a high significance. Construction phase of the underground is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality. However, if not mitigated, some boreholes might be negatively impacted by the sulphate pollution plume.	
Impact - Post Mitigation	Significance

Average Impact Significance Rating	-3.80

Wetland

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.10
Comment: Although the calculated average significance rating is medium, the construction activities relating to the access roads are of a high significance. Depending on the road surface and width, construction activities can have a significant impact on the ecosystem continuum, changing water infiltration and local geohydrology. Various wetland systems filter through the study area and can be negatively impacted on.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8.00

Archaeological Sites:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.10
Comment: Although the calculated average significance rating is medium, the construction activities relating to the access roads are of a high significance. Various graves are located within the study area and opencast and underground mine activities should avoid these graves.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-8.00

Traffic:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.20
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-7.20

Blasting

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.40

Comment: The impact of ground vibrations will lessen throughout the operational life cycle of the mine.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.60

Social and Socio-Economic Impacts

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-9.00
Comment: The negative impact on the social and socio-economic environment is predicted to be of medium significance. These negative impacts could be enhanced through appropriate mitigation measures. The positive impacts were not included in this average calculation as this may skew the results. The positive impacts will relate to: • Employment Opportunities and Skills Inequity; • Local Economic contribution; • Capacity Building and Skills Training; • Social Development and Social Services Support and •	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-3.00

Decommissioning and Closure Phase

Noise:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-8.0
Comment: The closure phase will require civil work where structures (steel and concrete) on site will be dismantled.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.0

Air Quality and Dust:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-11.20

Comment: Although the calculated average significance rating is medium, the decommissioning activities relating to the windblown dust will most probably impact negatively on the air quality of the area and nearby communities depending on the wind direction.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-9.30

Soils, Land Use and Land Capability

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-10.50
Comment: The initial impact will be high. However, rehabilitation and mitigation measures will ensure a medium impact rating for the sites, since the chemical and physical properties of the soils will improve through rehabilitation works.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.00

Visual

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-10.50
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.00

Topography:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-12.70
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-12.00

Fauna:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-9.00
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.50

Flora:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-12.00
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-6.00

Geology:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-15.00
Comment: Although the geology of the area will not be affected directly during the decommissioning phase of the project, a residual impact will remain after mine closure as it was impacted on during the operational phase of the project. No mitigation will be possible.	

Surface Water:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-8.40

Comment: The negative impact on surface water is predicted to be of medium significance. These negative impacts could be enhanced through appropriate mitigation measures. The positive impacts were not included in this average calculation as this may skew the results. The positive impacts will relate to: • The change of the catchment size. • Restoring of natural vegetation.	
Impact - Post Mitigation	Significance
Average Impact Significance Rating	-5.40

Groundwater:

Impact

Impact – Pre Mitigation	Significance
Average Impact Significance Rating	-7.50

ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Programme (EMPr) was developed as part of the Mining Right application by assessing all anticipated impacts and then proposing the required management plans. Please refer to **Appendix A** for the EMPr compiled by Hydro Science. The compliance and performance assessment section prescribes that an organisation must implement the necessary measures to mitigate or manage its activities which may cause significant pollution or degradation to the environment. A detailed environmental audit should be undertaken to assess compliance with the approved EMP and environmental legislation. It is recommended that this environmental performance assessment and legal compliance audit be undertaken once a year.

ENVIRONMENTAL MONITORING AND REPORTING

Soils:

Ongoing evaluation of the nutrient status of the growth medium is recommended for the LoM. Soils should be samples and analysed for the following parameters: pH, Phosphorus, Electrical Conductivity, Calcium, Cation Exchange Capacity, Sodium, Magnesium, Zinc, Clay, and Organic Matter Content. Monitoring should be conducted biannually and reporting annually.

Flora:

Additional monitoring in terms of vegetation cover (basal cover tree cover) and vegetation composition (nature of species present within a plant community) will be necessary. Biodiversity Rehabilitation Monitoring will be conducted biannually and reporting done annually.

Fauna:

Fixed sample points and sample periods will be established. Methods will be employed to monitor changes in the faunal communities within the study area. Specifically mammals, birds, reptiles and invertebrates will be monitored. Biodiversity Rehabilitation Monitoring will be conducted biannually and reporting done annually.

Surface Water:

Surface water monitoring will be conducted at monitoring points. Baseline conditions at these points are known and monitoring should continue in order to determine possible surface water degradations

as a result of mining. The elements to be monitored for must include: pH, Conductivity, TDS, Total Acidity, Ca, Mg, Na, K, SO_4, Cl, F, Fe, Mn, Al, N and $CaCO_3$. Monitoring should be conducted on a quarterly basis and a report will be compiled for each sample run. Surface water monitoring will continue for the LoM and at least 3-5 years after mine closure.

Groundwater:

Eleven groundwater monitoring boreholes have been identified. Groundwater must be monitored on a quarterly basis with reporting done on an annual basis. The elements to be monitored for must include: pH, EC, TDS, Ca, Mg, Na, K, Total Alkalinity, Cl SO_4, NO_3, F, Al, Fe, Mn, Cr (total) Cr^{6+}, and NH_4.

Noise:

Noise monitoring should be conducted at the five (5) monitoring points established for baseline monitoring. This should be conducted at the start of construction at quarterly intervals. For the operational phase monitoring should be conducted at least twice a year.

Blasting:

Monitoring should consider ground vibrations and air blast measurement. A Blast Report will be compiled after each blast to report on the extent of ground vibrations.

Social:

Social monitoring will comprise mainly of interviews with contractors, employees, service providers and neighbouring property owners. Social monitoring will be conducted annually during the construction phase, every 5 years during the operational and decommissioning phases. Reporting will be done after each assessment. All positive and social impact, as perceived at the time, will be reported on.

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Figure 4: Land tenure map indicating neighbouring land owners

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Table 6: Noise standards as per SANS 10103

Table 7: Malonjeni Single wash product specification

Table 8: Malonjeni resource classification as at 29 April 2011

Table 9: Project alternatives considered

Table 10: Red List avifauna species (Source: SABAP 1 (Harrison, 1997) and SABAP 2 (http://sabap2.adu.org.za/index.php)

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Annexure C: Geotechnical Design Report

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Annexure I: Social Labour Plan

Annexure J: Fauna and Flora Study

Annexure K: Monitoring Assessment

Annexure L: Geo-hydrology Assessment

Annexure M: Wetland Delineation

Annexure N: Heritage Assessment

Annexure O: Noise Results

Annexure P: Public Participation Report

NOMENCLATURE

ACRONYMS

AMD:	Acid Mine Drainage
BEE:	Black Economic Empowerment
BID:	Background Information Document
CAPEX:	Capital Expenditure
CPR:	Competent Person's Report
DAF:	Dissolved Air Flotation Separator
DMR:	Department of Mineral Resources
DSR:	Draft Scoping Report
DTM:	Digital Terrain Model
DWA:	Department of Water Affairs
DEA:	Department of Environmental Affairs
EAP:	Environmental Assessment Practitioner
EIA:	Environmental Impact Assessment
EIAR:	Environmental Impact Assessment Report
ELM:	Endumeni Local Municipality
EMP:	Environmental Management Plan (NEMA)
EMPr:	Environmental Management Programme (MPRDA)
ESIA:	Environmental and Social Impact Assessment
FEL:	Front End Loader
FGM:	Focus Group Meeting
FSR:	Final Scoping Report
GDP:	Gross Domestic Product
GGP:	Gross Geographic Product
GIIP:	Good International Industry Practice
GLC's:	Ground Level Concentrations
GMS:	Groundwater Modelling System
GN:	Government Notice
GUI	Graphical User Interface
HIA:	Heritage Impact Assessment
HRD:	Human Resource Development
IAIA:	International Association of Impact Assessment
IDP:	Integrated Development Plan
IFC:	International Finance Corporation
IRR:	Issues and Response Register
ISO:	International Standards Organisation
I&APs:	Interested and Affected Parties

LED:	Local Economic Development
LHD:	Load-Haul-Dump
LoM:	Life of Mine
MPRDA:	Mineral and Petroleum Resources Development Act, Act No. 28 of 2002
MQA:	Mining Qualifications Authority
MRA	Mining Right Application
NEMA:	National Environmental Management Act, Act No. 107 of 1998
NEM: AQA:	National Environmental Management: Air Quality Act, Act No. 39 of 2004
NEM: WA	National Environmental Management: Waste Act, Act No. 59 of 2008
NGO:	Non Government Organisation
NWA:	National Water Act, Act No. 36 of 1998
PFD:	Process Flow Diagram
PLC:	Programmable Logic Controller
PM:	Particular Matter
POI:	Point of Interest
PPP:	Public Participation Process
PR:	Prospecting Right
PTO:	Plan, Task, Observation
Ptn:	Portion
Ptns:	Portions
R:	Regulation
RoM:	Run of Mine
RWD:	Return Water Dam
RE:	Remaining Extent
RPL:	Recognition of Prior Learning
SACNSP:	South African Council for National Scientific Professions
SANS:	South African National Standards
SAWQG:	South African Water Quality Guidelines
SCADA:	Supervisory Control and Data Acquisition
SDF:	Standard Design Flood
SHE:	Safety, Health and Environment
SIA:	Social Impact Assessment
SLP:	Social and Labour Plan
SMME:	Small, Medium, Macro Enterprises
SOP:	Standard Operating Procedure
SWD:	Storm Water Dam
SWMS:	Stormwater Management System
TDS:	Total Dissolved Solids

TIA:	Traffic Impact Assessment
ToR:	Terms of Reference
TSP:	Total Suspended Particulates
TSS:	Total Suspended Solids
UDM:	Umzinyathi District Municipality
UFS:	Updated Feasibility Study
UG:	Upper Group
WMA:	Water Management Area
WRC:	Water Research Commission

MEASUREMENTS

g/t:	grams/ton
ha:	hectares
km:	kilometres
ktpa:	kilo tonnes per annum
ktpm	kilo tonnes per month
mcm:	million cubic metres
m:	metre
m^3:	cubic metres
mamsl:	metres above mean sea level
m/mo:	metres per month
mm:	millimetre
MW:	Megawatt
kW:	Kilo watt
tpm:	tons per month
k/ℓ:	kilo litres
kV:	kilo volts
Ml:	Mega litres
Mt:	Million tons
MVA:	Mega volt ampere
MW:	Mega Watt

1 APPLICANT'S UNDERTAKING

I, _____, duly authorised by Transasia Minerals Pty Ltd, the applicant, hereby declare that the information contained in this document is true, complete and correct to the best of my understanding and knowledge. I undertake to implement the measures as described in this document and also understand and acknowledge that this undertaking is legally binding.

Signed on this _____ day of _____ 2015

At _____

_____

Ms Luda Roytblat

Director

2 DETAILS OF THE EAP AND SPECIALISTS

Batho Earth is a growing and dynamic environmental consultancy business offering technical support, assistance with planning applications and developer advice on a range of environmental issues to clients throughout South Africa. The company, which is located in Gauteng, was established in 2008. The EAP has the appropriate professional qualifications and relevant experience to undertake the EIA process, to compile the required project documentation and review specialist study documentations for inclusion in the EIAR/EMP.

The EAP has worked within the Environmental sector for many years. Having previously been involved with a wide range of environmental organisations and projects, the EAP is superbly qualified to give professional advice on a wide variety of topics. EIA studies were undertaken for projects located in: South Africa and Mozambique. All EIA studies were approved by the relevant government authorities overseeing the project.

The EAP has registered with the interim certification board for Environmental Assessment Practitioners of South Africa. The EAP has obtained a Masters degree in Geography and Environmental Management from the Rand Afrikaans University and has 9 years experience in the field.

Specialists were approached to conduct independent specialist studies and were selected based on their experience in the particular field of study.

These specialists are listed below:

Noise Specialist:

Name: -Peter Maroun

Groundwater Specialist (Geohydrologist):

Name: Geo Pollution Technologies

Geotechnical Design Specialist:

Name: DS Minney

Fauna and Flora Specialist:

Name: Hydro Science

Wetland Specialist:

Name: Ixhaphozi Enviro Services

Water and Waste Management Specialist:

Name: Citofield

Monitoring Specialist:

Name: Citofield

Archaeologist:

Name: Archaetnos Culture and Cultural Resources

Public Participation Consultants:

Name: Batho Earth

3 INTRODUCTION

Transasia Minerals (Pty) Ltd (hereafter referred to as Transasia Minerals) concluded a Feasibility Study (FS) in August 2013 with the aim to determine the viability of constructing and operating an opencast and underground coal (anthracite) mine on the Remainder of Portion 3, Remainder of Portion 4 and Portion 12, 14 and 15 of the farm Hazeldene No. 12649. The coal resources to be accessed are located on the farms;

- Farm Hazeldene (as above);
- Farm Corby Rock 11509,
- Farm Lot W 8601,
- Farm Terrace 3707,
- Remainder and Portion 1 of the Farm Eastkeal 5138 and
- Portion 8 of Winkle 5054.

The extent of the area required for mining is approximately 2 904.1140ha. The footprint of the infrastructure required is approximately 6ha with the mining area being approximately 36ha.

The Malonjeni Anthracite Mine is located in central KwaZulu Natal and is accessed via the Provincial road R68 which connects Dundee and Nqutu as indicated on the attached Locality Plan, **Figure 1**. The road intersection into the mining property will be approximately 20km from Dundee. The Project area lies in the centre of the Klip River Coalfield, and the surrounding areas currently support a number of coal mining operations and undeveloped coal resource blocks.

Batho Earth has been appointed by Transasia Minerals (Pty) Ltd as the Environmental Assessment Practitioner (EAP) to conduct the Environmental Impact Assessment (EIA) process.

The project is referred to as the Malonjeni Mine and will involve the design, construction and operation of an opencast and underground coal mine. Specifically, the mine will require the construction of terraces, stockpiles and offices, pollution dam, bulk water pump station and distribution, potable water tank and distribution network, fire suppression water distribution to adit and washing plant site, electrical distribution from sub-station/generators to buildings and masts, buildings incl. admin/security, change house/lamp room and security fencing.

Based on the value engineering completed during the EIA process, the Malonjeni mine will be operational for approximately 15 years and will provide employment to approximately 520 people which comprises of permanent and contractor staff.

The coal reserve on the project area can be optimally mined using both opencast and underground mining methods. This reserve is currently divided into 3 (three) Blocks (Block 1N, Block 2N and Block 2S). The seam referred to is the Gus-Seam with an average seam height of 1.42m. The mine will be a board and pillar operation with access to the GUS seam gained by way of horizontal adit. Both development section and production sections are at maximum extraction. Planned pillar sizes of the various areas will depend on depth of cover with main developments at > 2, 0 safety factor and production ponds at > 1, 6.

The proposed location of the underground mine access (adit), mine offices and other surface infrastructure is on a saddle in the Eastern slopes of the Corby Rock mountain range at an elevation of approximately 15 meters above the coal seam. This location was chosen as the most suitable for the exploitation of the resource while also minimizing the amount of earthworks and other construction preparation required.

It is currently anticipated that the coal will be transported for international export and local market. The primary product is for the international market which will be for thermal and metallurgical coal consumers. Malonjeni Coal Mine therefore, proposes to construct and operate an opencast and underground coal mine with a reserve of approximately 20 million tonnes of coal (anthracite quality).

3.1 Document Presentation

This document has been presented in two (2) volumes. Volume 1 being the EIAR/EMP Report and Volume 2 the various specialist reports reporting on: baseline environmental, social, cultural and heritage conditions, and assessed impacts. It is therefore important to note that this document (Volume 1) should be read in conjunction with the various specialist reports (Volume 2). The most salient findings and recommendations contained in the specialist's reports have been summarised for the purpose of compiling this EIAR/EMP as required in terms of Regulation 31(j) of GN R 543 and Regulation 50 and 51 of GN.R527. However, more detailed information is contained in the various specialist studies and should be considered by authorities when assessing the EIAR/EMP during the decision making process. This document is therefore, based on the knowledge of the EAP and all specialists that contributed towards the assessment of baseline conditions and impacts, a true reflection of the project and all anticipated impacts.

3.2 Proponent Identification

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd. in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd.

The contact information of the project proponent is listed below:

Table 1: Applicant details

Applicant Details	
Name Of Applicant	Transasia Minerals SA
Registration No of Applicant:	2006/020576/07
Name of Mine:	Malonjeni Coal Mine
Contact Person:	Ms Lyudmula Roytblat
Postal Adress:	No. 57, 6th road Hyde park Johannesburg
Physical Adress:	No. 57, 6th road Hyde park. Johannesburg
Telephone Number:	(011) 883 5700
Fax Number:	(011) 881 9580
Cell Phone:	0763816917
E-mail:	luda@transasia.co.za

Figure 1: Locality Map

3.3 Mining Rights Applied For

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd. Please refer to **Figure 2** for the mining right area.

In May 2012, Transasia Minerals then submitted a Mining Right Application (for mining) to the Department of Mineral and Resources (DMR) in terms of Section 39 and Regulation 50 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) under the reference number KZN 30/5/1/2/3/2/1/(MR10021) for a new mining permit on the said properties. Please find attached to **Appendix A** the Environmental Management Plan and Mining Work Programme as submitted to the DMR. This mining right was granted in November 2014. Please refer to **Appendix B** for a copy of the mining right that was issued. Please refer to **Table 2** for the properties included into the mining right.

The proposed mine development and operations requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and Environmental Impact Assessment (EIA) process as listed activities 9, 11, 13 18, 22, under Government Notice No R. 544 as well as listed activities 5, 10, 15 and 20 of Government Notice No R. 545, activities 13 and 14 under Government Notice No R546 of the EIA 2010 Regulations are triggered.

The NEMA application for environmental authorisation was submitted by Citofield (previous Environmental Assessment Practitioner (EAP)) to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA) on 16 January 2014. The department acknowledged the application with a formal letter in which the project was rewarded with REF DC24/0001/2014: KZN/EIA/0001410/2014 as the KZN DAEA project reference number.

Table 2: Schedule of Properties included in the Mining Right Application.

FARM	PORTION NO	AREA (ha)	SURFACE RIGHT OWNER	TITLE DEED	DISTRICT AND PROVINCE
Corby Rock 11509	Remaining Extent	722,18	Mr L.E. Hesom	T14695/180	Umzinyathi - KZN
Hazeldene	Portion 14	110.26	Klopper Family Trust, contact person is Mrs E.J. Klopper	T44498/2007	Umzinyathi - KZN
	Portion 12	187.75	Mr. A.J. Viljoen, Viljoen Broer Boerdery, J. Viljoen	T27099/03	Umzinyathi - KZN
	Portion 15	215.85	Tangeni Boerdery Trust, Mr. Gert Ehlers	T36765/2007	Umzinyathi - KZN
	Remaining Extent of 3	294.8	Mr. A.J. Viljoen, Viljoen Broer Boerdery, J. Viljoen	T27099/03	Umzinyathi - KZN
	Remaining Extent of 4	115.73	Exburg Farms (Pty.) Ltd.	T13003/1980	Umzinyathi - KZN
Eastkeal 5138	Remaining Extent and Portion 1	846.08	Mr. H.B. Klopper	T9907/1976 and T8636/1976	Umzinyathi - KZN
Winkel 5054	Portion 8	162.56	Mrs E.J. Klopper	T33898/01	Umzinyathi - KZN
Lot W 8061		267.12	Mr. H.B. Klopper	T12927/1974	Umzinyathi - KZN
The Terrace 3707		22.67	Mr. H.B. Klopper	T9907/1976	Umzinyathi - KZN

Figure 2: The MPRDA GN R 527 Regulation 2(2) Plan illustrating the proposed Mining Right Area.

3.4 Project Location

The Malonjeni Mine area is located in a saddle in the eastern slopes of the Corby Rock mountain range at an elevation of approximately 15 meters above the coal seam with respective distances to major towns and communities displayed in table (**Table 3**) form below. The proposed property area falls within the jurisdiction of the Endumeni Local Municipality area (ELM) within the greater Umzinyathi District Municipality (UDM) in Kwa-Zulu Natal.

The Malonjeni Block is located some 16kms to the east of Dundee in the Umzinyathi District in the Kwa-Zulu Natal Province of the Republic of South Africa. Access to the site is via the R68 Dundee to Nquthu provincial road. The Project area lies in the centre of the Klip River Coalfield, and the surrounding areas currently support a number of coal mining operations and undeveloped coal resource blocks. The current surface land usage is cattle husbandry.

The study area falls under the jurisdiction of the Thukela Water Management Area 7 in the V32E and V32f quaternary catchment area. Four palustrine wetlands were identified in the study area, namely a valley bottom wetland with a channel, a valley bottom wetland without a channel, a hillslope seepage feeding a water course and a hillslope seepage not feeding a water course.

A number of communities are located within a 16 km radius from the proposed project site. The Public Participation Process (PPP) will however, aim to engage with all neighbouring communities.

Figure 3 3 provides the regional location of the project site in relation to local and district municipal boundaries, as well as some major town centres. The proposed project area is currently zoned for agricultural use and will be rezoned as part of the application process

Table 3: Location of neighbouring towns/communities with respect to the proposed site (Measured from the Mining Complex to the closest community/village border).

Town/Community	Distance (km)	Direction From Project Site
Dundee	16	East
Glencoe	24	East
Ngutu	25	West

The area is generally used for: farming, tourism, and mining activities. The approximate centre coordinates for the project area (mining complex) are as follows:

Latitude: 30˚24'.02''E and Longitude: 28˚ 09'.48''S

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Figure 3: Location of the proposed Mine in relation to administrative boundaries.

3.5 Land Tenure

A land tenure map is included (see **Figure 4**) indicating all surface owners within the mining right area as well as surface right owners in close proximity to the site. The land tenure plan indicates all farm portions that will be part of the Mining Right Application (MRA) but also indicates all neighbouring land owners that might be affected by the proposed project. It was the intent, as far possible, to consult with all neighbouring farm owners to inform them of the proposed project and to obtain their issues and concerns regarding the proposed project.

Figure should be interpreted with Table 2 (Schedule of Properties) which displays the farm portion applicable to the Mining Right applied for in relation to the current surface ownership.

Figure 4: Land tenure map indicating neighbouring land owners.

3.6 Project Background

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd.

In May 2012, Transasia Minerals then submitted a Mining Right Application (for mining) to the Department of Mineral and Resources (DMR) in terms of Section 39 and Regulation 50 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) under the reference number KZN 30/5/1/2/3/2/1/(MR10021) for a new mining permit on the said properties. This right was granted in November 2014.

The proposed mine development and operations requires compliance with the EIA Regulations of 2010, promulgated in terms of the National Environmental Management Act, Act 107 of 1998 (as amended). The proposed activity requires a Scoping and Environmental Impact Assessment (EIA) process as listed activities 9, 11, 13 18, 22, under Government Notice No R. 544 as well as listed activities 5, 10, 15 and 20 of Government Notice No R. 545, activities 13 and 14 under Government Notice No R546 of the EIA 2010 Regulations are triggered.

The NEMA application for environmental authorisation was submitted by Citofield (previous Environmental Assessment Practitioner (EAP)) to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA) on 16 January 2014. The department acknowledged the application with a formal letter in which the project was rewarded with REF DC24/0001/2014: KZN/EIA/0001410/2014 as the KZN DAEA project reference number

This Scoping Report was submitted to KZN DAEA in terms of the National Environmental Management Act (NEMA), Act No. 107 of 1998 and the new EIA Regulations promulgated on 18 June 2010, and in terms of Regulations 48 and 49 of GN. R527 of the MPRDA. On acceptance of this document, an Environmental Impact Assessment Report (EIAR) and Environmental Management Programme (EMPr) has been compiled. The Final Scoping Report was accepted by DEDECT on 21 January 2015. Please refer to Appendix B2.

3.7 Mineralisation

The proposed Malonjeni Mine area falls within the Klip River Coalfield, which extends from Utretcht in the north to Ladysmith in the south. The resource blocks are situated on the farms Corby Rock, Hazeldene and Eastkeal, where mining had previously been undertaken in the last century. Mining was stopped on account of the low volatiles present, possibly as a result of Dolerite intrusion activity.

Two coal seams are present within the project area, a Top Seam averaging 1.4m in thickness which is underlain by the Bottom seam, about 0.3m in thickness some 10m below and the distribution of these coal seams are affected by the topography of the pre-Karoo basement and the present day erosional surface. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup. It consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group and is underlain by the Dwyka Formation of the Karoo. Please Refer to Figure 5: Malonjeni Mineral Resource Map

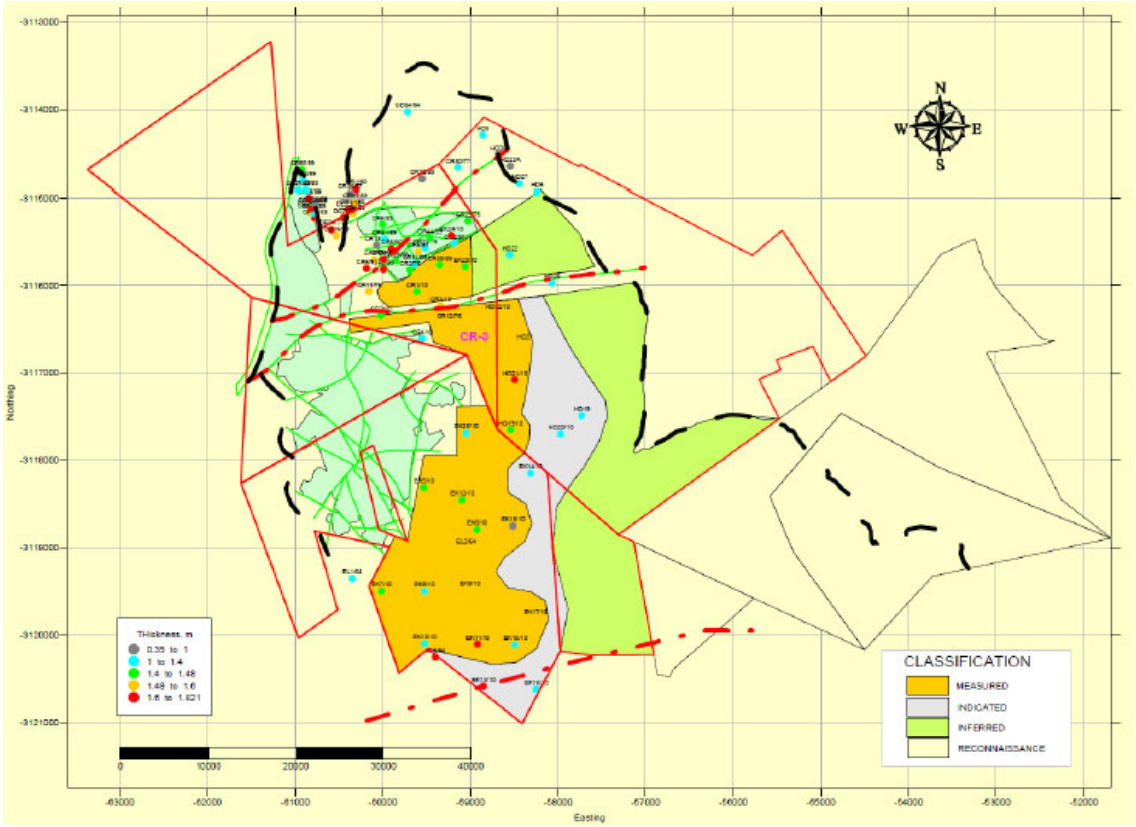


Figure 5: Malonjeni Mineral Resource Map

Only one product will be beneficiated from the Malonjeni Resource, namely: Primary product Coal of 27.8 MJ/kg at a weighted average wash density of 1.8 and borehole yield of 84%. The Resource is located from near surface to a depth in excess 30 to 230 meters below the surface, which is comparable to other active mining operations in South Africa on the same reefs.

The mineral right applied for in the Mining Right Application:

- Coal;

3.8 Exploration

The exploration results over the Malonjeni project are as reported in a Competent Person's Report (CPR) for Malonjeni, dated 30 June 2010 entitled Coal Resources of the Malonjeni Block, Dundee, KwaZulu Natal, South Africa. Please also refer to the Geotechnical Design Report attached to Appendix C.

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd

In May 2012, Transasia Minerals then submitted a Mining Right Application (for mining) to the Department of Mineral and Resources (DMR) in terms of Section 39 and Regulation 50 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) under the reference number KZN 30/5/1/2/3/2/1/(MR10021) for a new mining permit on the said properties. This right was granted in November 2014 – Please find attached as Appendix B1.

4 PROJECT MOTIVATION AND BENEFITS

4.1 Project Motivation

The objective to mine the Malonjeni Coal Reef is guided by economic factors such as the price of coal, the metallurgical characteristics and quality of the coal and the financial feasibility of the Malonjeni project in general.

4.1.1 World Reserves

Coal mines in South Africa play an important role in the country's economy, with 77% of all primary energy needs being provided for by coal. South Africa also exports nearly one quarter of all coal, while coal mines in South Africa, and their direct supporting industries, employ roughly 55 000 people.

According to Eskom, coal mines in South Africa produce 224 million tonnes per year. South Africa is the world's seventh largest coal producer after China, USA, India, Australia, Indonesia and Russia. 31% of all coal mines in South Africa can be found in the central Highveld while Witbank and Ermelo feature 30% and 13, 8% respectively.

4.1.2 Macro Economics

South Africa is one of the seven largest coal-producing and one of the top five coal-exporting countries in the world. More than a quarter of coal mined in South Africa is exported, most of which leaves the country via Richards Bay. Coal is South Africa's third largest source of foreign exchange; platinum being the largest and gold second. Around 15% of the country's GDP (2000 estimate) is spent on energy and 77% of that is derived from coal.

In 2004, the coal and lignite mining industry generated a gross income of R39 billion and directly employed 50,000 people. The Witbank Coalfield accounts for 40% of South Africa's coal production.

4.1.3 Micro Economics

The development of the project will make a significant contribution to the local, regional, and national economies. The mine will provide employment during its construction, operation and decommissioning phases, which will contribute significantly towards poverty alleviation considering a LoM of approximately 15 years.

4.2 Project Benefits

Additionally the economic benefits associated with the mine will include the income generated through the mining and processing of the coal, including the use of coal as a source of electricity. This will contribute toward maintaining the productivity and profitability of the coal mining industry in South Africa and will contribute significantly to the GDP of both the Kwa-Zulu Natal Province and South Africa as a whole.

The development of the mine will contribute toward expenditure in the area through employment and the procurement of goods and services. Through employment, (should large numbers of locals be employed) the mine will contribute significantly to local poverty alleviation, additionally the procurement of local goods and services will assist with the development of entrepreneurial and small and medium business (SMME) opportunities. There will also be an increased demand on secondary engineering support industries in the area.

In the event that the mine could assist in the development and upgrading of infrastructure in the region such as water and electricity supply, it could enhance the project benefits.

4.3 Project Drawbacks

Should the project be approved, there are a number of potential drawbacks that have been identified. These drawbacks can be discussed in terms of the affected receiving social and natural environments.

In terms of the natural environment, the area is known for its degrading water and air qualities. A project of this nature has the potential to place additional pressures on the receiving environment if not managed correctly. The purpose of the specialist studies and this EIAR will therefore be to assess the project in terms of the receiving social and economic environment with measures indicated to mitigate, manage and reduce these negative risks.

In terms of the receiving social environment, projects such as this can create a number of social problems relating to: the influx of job seekers, illegal immigrants, and the establishment of informal settlements. Social problems are known to occur and will require mitigation in terms of recruitment policies and sourcing labour from local neighbouring communities where possible.

An ongoing policy of open and direct communication with all stakeholders in a climate of mutual respect is at the foundation of the mitigation of drawbacks, not only in the EIAR stage but throughout the life of the mine.

5 ENVIRONMENTAL LEGAL REQUIREMENTS

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

In terms of the amendments made to NEMA and the Mineral and Petroleum Resources Development Act (No.28 of 2002 – MPRDA), NEMA has become the primary legislation through which environmental assessments of mining-related activities will be undertaken. In terms of Section 24C(2A) of NEMA, the competent authority, who is charged with evaluating environmental impacts and making decisions as to whether to grant or refuse environmental authorisations for mining activities, remains the Minister of Mineral Resources. As a result the environmental assessment process must adhere to the requirements of NEMA and the MPRDA.

The National Environmental Management Act, Environmental Impact Assessment Regulations, GN. R543 ("NEMA EIA Regulations") were published on 18 June 2010 and came into operation on 2 August 2010. Together with the NEMA EIA Regulations, the Minister also published the following three Regulations in terms of sections 24 and 24D of the National Environmental Management Act:

- Regulation GN. R544 which sets out a list of identified activities which may not commence without environmental authorisation from the competent authority and which must follow the basic assessment procedure as provided for in regulations 21 to 25 of the NEMA EIA Regulations;
- Regulation GN. R545 which sets out a list of identified activities which may not commence without environmental authorisation from the competent authority and which must follow the scoping and EIA procedure as provided for in regulations 26 to 35 of the NEMA EIA Regulations;
- Regulation GN. R546 which sets out a list of identified activities per geographical area, which may not commence without environmental authorisation from the competent authority and which must follow the scoping and EIA procedure as provided for in regulations 26 to 35 of the NEMA EIA Regulations.

The application for environmental authorisation was submitted to KwaZulu-Natal Department of Agriculture and Environmental Affairs (KZN DAEA), and needs to include the following identified activities:

Table 4: Application for Environmental Authorisation based on identified activities

Indicate the number and date of the relevant notice:	**Activity No (s) (in terms of the relevant or notice):**	**Describe each listed activity:**
Activities identified in terms of Listing Notice 1: GN R544		
R 544 of 2010	2	The construction of facilities or infrastructure for the storage of ore or coal that required an atmospheric emissions license in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004)
R 544 of 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – i. With an internal diameter of 0.36 metres or more; or ii. With a peak throughput of 120 litres per second or more, Excluding where: a) Such facilities or infrastructure are for bulk

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice):	Describe each listed activity:
Activities identified in terms of Listing Notice 1: GN R544		
		transportation of water, sewage or storm water or storm water drainage inside a road reserve; or Where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
R 544 of 2010	11	The construction of: i. Canals; ii. Channels; iii. Bridges; iv. Dams v. Weirs vi. Bulk storm water outlet structures; vii. Marinas; viii. Jetties exceeding 50 square metres in size; ix. Slipways exceeding 50 square metres in size; x. buildings exceeding 50 square meters in size; or xi. Infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line
R 544 of 2010	12	The construction of facilities or infrastructure for the **off-stream storage** of water including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.
R 544 of 2010	18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from: i. A watercourse; ii. The sea; iii. The seashore; iv. The littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater – but excluding where such infilling, depositing, dredging, excavation, removal or moving i. Is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant authority; or Occurs behind the development setback line
R 544 of 2010	22	The construction of a road, outside urban areas, i. With a reserve wider than 13.5 meters or, ii. Where no reserve exist where the road is wider than 8 metres, or For which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Notice 545 of 2010.
R 544 of 2010	26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004).
Activities identified in terms of Listing Notice 2: GN R545		

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant or notice):	Describe each listed activity:
Activities identified in terms of Listing Notice 1: GN R544		
R 545 of 2010	3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.
R 545 of 2010	5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case that Act will apply.
R 545 of 2010	10	The construction of facilities of infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following: i. water catchments, ii. water treatment works, or iii. impoundments. Excluding treatment works where water is to be treated for drinking purposes.
R 545 of 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;

The new EIA Regulations, GN. R543 of 18 June 2010, as promulgated on 2 August 2010, requires the following:

- An application for environmental authorisation to (KZN DAEA (Regulation 12 – 20 of GN R543);
- Compilation and submission of the Scoping Report (Regulation 26 – 35 of GN R543). The Scoping Report must, at the very least, include the following;
    - Details of EAP and expertise of the EAP to carry out scoping procedures;
    - A description of the proposed activity;
    - A description of any feasible and reasonable alternatives that have been identified;
    - A description of the property on which the activity is to be undertaken;
    - A description of the environment that may be affected by the activity and the manner in which the activity may be affected by the environment;
    - An identification of all legislation and guidelines that have been considered in the preparation of the scoping report;
    - A description of environmental issues and potential impacts, including cumulative impacts, that have been identified;
    - Details of the public participation process conducted in terms of regulation 27(a) of the act;
    - A description of the need and desirability of the proposed project;

- A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and community that may be affected by the activity;
- Copies of any representations and comments received in connection with the application of the scoping report from I&APs including minutes of meetings held;
- Responses by the EAP to those representations, comments and views;
- A plan of study for environmental impact assessment which sets out the proposed approach to the environmental impact assessment of the application;
- Any specific information required by the competent authority; and
- Any other matters required in terms of section 24(4)(a) and (b) of the act.

- Undertake a public participation process as set out in Regulation 54 of GN. R543. At the very least, the following will be required;
  - Fixing notice boards at places conspicuous to the public and on or at the borders of the proposed site;
  - Give written notice to –
    1. Owner or person in control of the land;
    2. The occupiers of the site where the activity is to be undertaken;
    3. Owners and occupiers of land adjacent to the site;
    4. The municipal councillor of the ward in which the site is situated;
    5. The municipality which has jurisdiction in the area;
    6. Any organ of state having jurisdiction in respect of any aspect of the activity; and
    7. Any other party as required by the competent authority.
  - Placing advertisements in the local and provincial newspaper;
  - Registration of I&APs as per Regulation 55 of GN. R543;
  - Allowing I&APs to comment on submission as per Regulation 56 of GN. R543;
  - Reporting of comments of I&APs in report to be submitted as per Regulation 57 of GN R543;
- Compilation of EIA Report in terms of Regulation 31 of GN. R543;
- Compilation of EMP in terms of Regulation 33 of GN. R543;
- Appoint specialist to conduct specialist studies in terms of Regulation 32 of GN. R543.

5.2 Minerals and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA)

The Mineral and Petroleum Resources Development Regulations, GN R527, as promulgated on 23 April 2004, requires the following:

- An application for a mining right be lodged in terms of Regulation 10 to DMR. The application for a mining right needs to be accompanied by;
  - Mining Work Programme (Regulation 11)
  - Social and Labour Plan (Regulation 41 – 46)
  - Documentary proof of financial and technical competence;
- The undertaking of a public participation process (Regulation 3 of MPRDA)
- Compilation of a Scoping Report as contemplated in Regulation 29 of the act (Regulation 49 of GN R527). The Scoping Report needs to contain, at the very least, the following information;
  - Methodology applied to conduct scoping;
  - Existing or pre-mining environmental status;
  - Anticipated environmental, social and cultural impacts, including the cumulative effects, where applicable;
  - Identification and description of reasonable land use or development alternatives to the proposed operation, alternative means of carrying out the proposed operation and the consequences of not proceeding with the proposed operation;

  - Description of the most appropriate procedure to plan and develop the proposed mining operation;
  - Description of the process of engagement of identified interested and affected persons, including their views and concerns; and
  - Description of the nature and extent of further investigations required in the environmental impact assessment report.
- Submission of Scoping Report to Authorities (Regulation 49(2) of GN. R527);
- Compilation of EIA Report (Regulation 50 of GN. R527);
- Compilation of EMP Report (Regulation 51 of GN. R527); and
- Calculating the Mine Closure Quantum in terms of section 41 of the MPRDA (Regulation 53 – 54 of GN R 527).

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

In accordance with Section 21 of the NWA a couple of water uses are listed. In terms of section 40(1) of the NWA "a person who is required or wishes to obtain a licence to use water must apply to the relevant responsible authority for a licence." These water uses, in terms of Section 21, are summarised below:

a) Taking water from a water resource;
b) Storing water;
c) Impeding or diverting the flow of water in a watercourse;
d) Engaging in a stream flow reduction activity;
e) Engaging in a controlled activity;
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i) Altering the bed, banks, course or characteristics of a watercourse;
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people, and
k) Using water for recreational purposes.

In accordance with Section 21 (water uses) and Section 40 (application for a licence) of the NWA an Integrated Water Use Licence Application (IWULA) will be submitted to the Department of Water Affairs (DWA). The WULA will be supported by a Technical Report and Integrated Water and Waste Management Plan (IWWMP) (**Appendix D**) with detailed design drawings of all water related infrastructure including infrastructure that could potentially contaminate the receiving environment.

Section 19 of the NWA and Section 28 of NEMA imposes a duty of care on all responsible persons whose operations have the potential to cause water pollution or environmental degradation to take reasonable measures to prevent it from occurring, continuing or recurring. Regulations (Government Notice No. 704, of 4 June 1999) for the use of water for mining and related activities, aimed at the protection of water resources, should be utilised as a guide for the management of water resources at the mining site.

The notice also sets out the requirements for technical investigation, monitoring, offences and penalties. The requirements set out in the notice must be clearly considered when undertaking the environmental impact assessment for the proposed Malonjeni Mine.

DWA has issued a number of best practice guidelines that cover a wide range of mining-related activities, including the management of: mine residues, pollution control dams, water management in underground mines, and stormwater management. These guidelines must be considered during the design,

construction and operational phases of the Project and their recommendations must be implemented when addressing water resource management issues.

Hydro Science was appointed by Transasia to undertake the required Water Use Licence Application for the Malonjeni Mine. The WULA was already submitted to DWA (**Appendix E**) and comments received form DWA also forms part of the public participation process.

5.4 National Environmental Management: Air Quality Act, Act 39 of 2004 and the Atmospheric Pollution Prevention Act, Act 45 of 1965 (NEM:AQA)

The National Environment Management: Air Quality Act (No.39 of 2004) provides the basis for the management of air pollution in South Africa. The remaining provisions of NEMAQA came into effect on 1 April 2010 in terms of GN R220 of 26 March 2010. Section 21 of the Act enables the Minister to publish a list of activities which result in atmospheric emissions for which an Atmospheric Emission Licence (AEL) is required. Such a list and associated emissions standards have been published in GN. R248 (in GG 33075) which commenced with effect from 01 April 2010. This regulation, with particular reference to Regulation 14 (Subcategory 5.1: storage and handling of ore and coal) is not applicable and since no beneficiation will be taking place on site the application for an AEL is not required for the Project.

However, the emission of dust is addressed in Government Notice GN. R1210 (in GG 32816), which sets National Ambient Air Quality Standards in terms of Section 9(1) of the Air Quality Act. Dust is addressed in terms of the standards set for the emission of particulate matter (PM_{10}) in Regulation 3.1 of GN R1210, which is presented below.

Table 5: National Ambient Air Quality Standards for PM_{10}

Averaging period	Concentration	Frequency of exceedence	Compliance data
24 hours	120 µg/m^3	4	Immediate – 31 December 2014
24 hours	75 µg/m^3	4	1 January 2015
1 year	50 µg/m^3	0	Immediate – 31 December 2014
1 year	45 µg/m^3	0	1 January 2015
The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341			

Part 6 of NEMAQA addresses measures in respect of dust. Section 32 enables the Minister to prescribe measures for the control of dust in specified places or areas. Section 33 requires that the owner of a mine must inform the Minister (in writing) within five years of the cessation of mining operations. The Minister should also be informed of any plans to rehabilitate the area and prevent pollution of the atmosphere by dust.

Section 34 of the Act enables the Minister to set national standards for the control of noise either in general or by specified machinery or activities. Currently, the noise standard applied in assessing the potential noise impacts of a proposed activity is the South African National Standards (SANS) 10103 (The measurement and rating of environmental noise with respect to annoyance and to speech communication, 2006) which are presented below.

Table 6: Noise standards as per SANS 10103

Type of district	Day-night (dB)	Day time (dB)	Night time (dB)
(a) Rural	45	45	35
(b) Suburban – with little road traffic	50	50	40
(c) Urban	55	55	45
(d) Urban – with some workshops, business premises and main roads	60	60	50
(e) Central business districts	65	65	55
(f) Industrial districts	70	70	60

Standard 10103 (a) and (b) will be applicable to the proposed project area.

Noise Assessment for Malonjeni Mine is attached as Appendix D..

5.5 National Environmental Management: Waste Act, Act 59 of 2008 (NEM:WA)

The National Environmental Management Waste Act, Act No 59 of 2008 (NEMWA) was accented to on 10 March 2009 and came into effect on 01 July 2009. This Act repeals the sections in the Environment Conservation Act, Act 73 of 1989 that previously dealt with the licensing of general and hazardous waste storage facilities. The Act was established to regulate waste management for the protection of human and environmental health.

Section 19 of the NEMWA authorises the Minister to publish a list of waste management activities which would require an environmental assessment and waste management licence. On 3 July 2009 the Minister published a schedule of waste management activities in respect of which a waste management licence is required in accordance with section 20(b) of NEMWA (GN R718, GG 32368). Activities listed under Category A of GN R 718 for which a waste management licence is required, are equivalent to those that require a Basic Assessment process as stipulated in GN. R544 of June 2010. Category B activities are equivalent to those that require a full EIA process as stipulated in GN. R545 of June 2010.

The list of activities identified below MAY be applicable to Malonjeni Mine and needs to be relooked at once the mining layout has been finalised.

5.5.1 Schedule of listed activities

Category A:

- Storage and transfer of waste:
    1. The storage, including the temporary storage, of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of waste in lagoons.
    2. The storage including the temporary storage of hazardous waste at a facility that has the capacity to store in excess of 35m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons.
- Reuse, recycling and recovery:

Not applicable

- Treatment of waste:

  Not applicable

- Disposal of waste:

  Not applicable

- Construction, expansion or decommissioning of facilities and associated structures and infrastructure:

  18. The construction of facilities for activities listed in Category A of the Schedule.

Category B:

- Storage of waste:

  Not applicable

- Reuse, recycling and recovery of waste:

  Not applicable

- Treatment of waste:

  7. The treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic metres or more.

- The disposal of waste on land:

  Not applicable

- Construction of facilities and associated structures and infrastructure:

  11. The construction of facilities for activities listed in Category B of the schedule

The application for a Waste Licence for the sewage plant needs to be investigated and further discussed with KZN DAE.

5.6 National Environmental Management: Biodiversity Act, Act No. 10 of 2004

The National Environmental Management: Biodiversity Act, Act No.10 of 2004 (NEMBA) addresses a number of issues relating to biodiversity and how it should be protected and managed in whilst development activities are being undertaken. Please refer to the Fauna and Flora section of this report, mitigation measures are proposed to reduce the loss, if any, of protected and endangered species.

5.7 Other Legislation

Besides the main sources of environmental legislation governing the EIA study for the proposed Malonjeni Mine, there are numerous statutory requirements and guideline documents that are relevant to the project. The following includes a non-exhaustive list of legislation and guidelines that were considered during the scoping phase of the project:

National Legislation and associated Regulations:

- Constitution of the Republic of South Africa Act, Act No. 108 of 1996;
- Environment Conservation Act, Act No.73 of 1989;
- Hazardous Substances Act, Act No. 15 of 1973;
- Mine Health and Safety Act, Act No. 29 of 1996;
- National Heritage Resources Act, Act No. 25 of 1999;

- National Forest Act, Act No. 84 of 1998;
- Promotion of Access to Information Act, Act No. 2 of 2000;
- Promotion of Administrative Justice Act, Act No. 3 of 200, and
- Water Services Act, Act No. 108 of 1997.

Guideline Documents include:

- DEAT Air Quality Guidelines;
- SANS 10103:2006 - The Measurement and Rating of Environmental Noise with Respect to Land Use, Health, Annoyance and to Speech Communication;
- SANS 1929:2005 Edition 1.1 – Ambient Air Quality Limits for Common Pollutants;
- 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 Waste Disposal by Landfill, 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.

6 METHODOLOGY APPLIED TO CONDUCT EIA AND EMP

6.1 Impact Assessment Methodology

In order to adequately assess and evaluate the impacts and benefits associated with the project it was necessary to develop a methodology that could scientifically achieve this, the method used would reduce the subjectivity involved in making evaluations. For proper decision making it is necessary to assess all legal requirements and clearly defined criteria in order to accurately determine the significance of the predicted impacts or benefits on the surrounding natural and social environment.

This section will aim to discuss the methodology to be followed that will determine, assess and describe possible impacts that would result from project implementation. Impacts will be discussed in terms of the construction, operational and decommissioning/closure phases of the project. The evaluation of impacts is conducted in terms of the criteria discussed below. The various environmental impacts and benefits of this project will be discussed in terms of: the nature of the impact, the status of the impact, certainty, duration, magnitude, extent, intensity, frequency and, significance. The significance rating of each impact will determine whether or not mitigation will be necessary.

Additionally, the EIA will aim to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project;
- Assess the study area in terms of environmental criteria;
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts, and
- Successfully analyse all public issues raised to date in order to recommend appropriate mitigation measures for all social and environmental related concerns.

Impacts and benefits are assessed before and after the application of mitigation measures.

Status of the Impact

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of what causes the effect, what will be affected and how will it be affected. The nature of the impact can be described as negative or positive and can be derived from the significance rating of the impacts.

RATING	DESCRIPTION	QUANTITATIVE RATING
Positive	A benefit to the holistic environment	1
Negative	A detriment to the holistic environment	-1

Probability of the Impact

The certainty or probability of the impact describes the likelihood of the impact actually occurring.

RATING	DESCRIPTION	QUANTITATIVE RATING
Improbable	In all likelihood the impact will not occur	1
Low Probability	Possibility of the impacts to materialise is very low	2
Probable	A distinct possibility that the impact will occur	3
Highly Probable	Most likely that the impact will occur	4
Definite	The impact will occur regardless of any prevention measures.	5

Frequency of the impact

The frequency of the impact refers to the temporal scale of the impact or benefit, in terms of the period of time that the surrounding environment will be affected or altered by the proposed project. This is determined by the following scale:

RATING	DESCRIPTION	QUANTITATIVE RATING
Continuous	• Daily	1
Frequent	• Less than daily (hours)	0.8
Infrequent	• Moderate frequency (weekly)	0.5
Occasional	• Less than weekly (Once or twice per month)	0.2

Spatial Extent of the impact

The extent of the impact refers to the spatial scale of the impact or benefit of the proposed project and the area over which it extends. A description is provided for whether the effects are limited in extent or affects a wide area or group of people. The extent is rated according to the following scale:

RATING	DESCRIPTION	QUANTITATIVE RATING
Site Specific	• Effects occur within the site/servitude boundary	1
Local	• Effects extend beyond the site boundary • Affects immediate surrounding areas	2
Regional	• Widespread effect • Extends far beyond the site boundary • Effects felt within a 50km radius of the surface lease area	3
National	• Effects felt beyond the 50km radius	4

Intensity of the impact

The severity or intensity of an impact attempts to quantify the magnitude of the impacts and benefits associated with the proposed project. The severity scale accounts for extent and magnitude, but is subject to the value judgement of the report writer. The following scale is useful when measuring severity and benefit.

RATING	DESCRIPTION	QUANTITATIVE RATING
Very Severe	• Substantial deterioration/improvement • Irreversible or permanent • Cannot be mitigated	4
Very Beneficial	• Permanent improvement and benefit	4
Severe	• Marked deterioration • Long term duration • Serious and severe impacts • Mitigation is very expensive, difficult or time consuming	3
Beneficial	• Large improvement • Long term duration	3
Moderately Severe	• Moderate deterioration • Medium term to long term duration • Fairly easily mitigated	2

Moderately Beneficial	• Moderate improvement • Medium to long term duration	2
Slight	• Minor deterioration • Short to medium term duration • Mitigation is easy, cheap or quick	1
Beneficial	• Minor improvement • Short to medium term duration	1

Duration of the impact

The duration of the impact refers to the temporal scale of the impact or benefit, in terms of the period of time that the surrounding environment will be affected or altered by the proposed project. This is determined by the following scale:

RATING	DESCRIPTION	QUANTITATIVE RATING
Short Term	• 0 – 5 years • Less than the project lifespan	1
Medium Term	• 5 – 10 years	2
Long Term	• Life of project • 15 – 40 years	3
Permanent	• Where the impact will be irreversible and will remain	4

Significance of the impact

After the assessment of an impact in accordance to the preceding six criteria, the significance of an impact can be determined through a synthesis of the aspects produced in terms of their status, probability, duration, frequency, extent and severity. The significance of an impact is an expression of the cost or value of an impact to society. The focus of EIA's must be a judgement as to whether or not impacts are significant, based upon the value system of society, or groups of people (Thompson, 1988, 1990).

This subsection presents the criteria used to define significant effects on the environment. A high ranking for natural and cultural impacts will result in a significant negative impact on the existing environment. A high ranking for social impacts will give the indication that the impact will be positive. The rankings of each of the different impacts [health, safety, environment and community (social)] relates to the maximum and minimum totals that can be achieved for each possible impact.

The totals were used to calculate the threshold "classes" to determine the significance of the impact.

RATING	DESCRIPTION	THRESHOLD OF SIGNIFICANCE (NEGATIVE)
High	• Negative long term/permanent change to the natural and social environment	**13– 18**
Medium	• Medium or long term effects to the natural and social environment • These effects are real and mitigation is possible, difficult and often costly	**7 – 12.9**
Low	• Short term effects on the natural and environment • Effects are not substantial and are often viewed as unimportant • Mitigation is cheap, easy, quick or seldom required	**0 – 6.9**

Some impacts will prove to be positive and a benefit to the social and or natural environment. Although these impacts will be rated in accordance with the methodology provided above, high significance values could be obtained. The nature or status of the impact then proves to be the key indicator. Should the nature of the activity, as assessed, be positive the significance threshold will be reversed and the impact will be beneficial to the holistic environment.

RATING	DESCRIPTION	THRESHOLD OF SIGNIFICANCE (POSITIVE)
High	• To the greater benefit of the social and/or natural environment • No mitigation or monitoring needed	**13 – 18**
Medium	• A benefit to the holistic environment • Monitoring is needed • Some mitigation is needed	**7 – 12.9**
Low	• No real benefit to the holistic environment • Mitigation and monitoring is needed	**0 – 6.9**

An example of the Impact Assessment methodology is provided below. The significance is determined by the following formula:

*Status * (Probability + Duration + Extent + Intensity)*Frequency = Significance.*

This method for assessing the significance of impacts will be repeated for all three project lifecycle phases i.e. Construction, Operation and Decommissioning. Impacts were also assessed in terms of the project activities. The reason for this is that different environmental impacts can be expected for various project activities. This approach allows for a more adequate assessment of the impacts and additional mitigation measures that should be identified and implemented per project related activity.

6.2 Environmental Management Programme

The Environmental Management Programme (EMPr) was developed as part of the Mining Right application by assessing all anticipated impacts and then proposing the required management plans. Please refer to **Appendix A** for the EMPr compiled by Hydro Science.

7 PROJECT DESCRIPTION

7.1 Project Overview

A mining right application (for prospecting) was submitted by Umsobomvu Coal (Pty) Ltd in terms of Section 22 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) and was accepted (DMR10) on 09 December 2011. Transasia Minerals is the holder of this mining right as previously held by Umsobomvu (Pty) Ltd

In May 2012, Transasia Minerals then submitted a Mining Right Application (for mining) to the Department of Mineral and Resources (DMR) in terms of Section 39 and Regulation 50 of the Minerals and Petroleum Resources Development Act 2002 (Act 28 of 2002) under the reference number KZN 30/5/1/2/3/2/1/(MR10021) for a new mining permit on the said properties. This right was granted in November 2014 – Please find attached as **Appendix A.**

7.2 Mineral Deposit

The proposed Malonjeni Mine area falls within the Klip River Coalfield, which extends from Utretcht in the north to Ladysmith in the south. The resource blocks are situated on the farms Corby Rock, Hazeldene and Eastkeal, where mining had previously been undertaken in the last century. Mining was stopped on account of the low volatiles present, possibly as a result of Dolerite intrusion activity.

Two coal seams are present within the project area, a Top Seam averaging 1.4m in thickness which is underlain by the Bottom seam, about 0.3m in thickness some 10m below and the distribution of these coal seams are affected by the topography of the pre-Karoo basement and the present day erosional surface. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup. It consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group and is underlain by the Dwyka Formation of the Karoo.

Only one product will be beneficiated from the Malonjeni Resource, namely: Primary product Coal of 27.8 MJ/kg at a weighted average wash density of 1.8 and borehole yield of 84%. Please refer to Table 5 for the Malonjeni single wash product specification as from the SRK Report dated 29 April 2011.

Table 7: Malonjeni Single wash product specification

Product	Wash density	Borehold Yield	Practical Yield	Ash	CV	Moisture	Volatiles	Sulphar
Primary	1.8	84.03%	71.4%	18.11%	27.8MJ/kg	1.89%	8.87%	1.97%

The Resource is located from near surface to a depth in excess 30 to 230 meters below the surface, which is comparable to other active mining operations in South Africa on the same reefs.

The mineral right applied for in the Mining Right Application:

- Coal;

7.3 Estimated Reserves and Extent of the Target Area

Measured, Indicated and Inferred Mineral Resource estimates have been calculated for as at 29 April 2011. Please refer below to Table 6 for the resource statement. The target area extends over several hectares as indicated in the Schedule of Properties as included in the MRA. However mining will dominantly be mined on Portion 3, 4, 12 and 14 of the Farm Hazeldene. Please also refer to Table 1.

Table 8: Malonjeni resource classification as at 29 April 2011

Classification	Area, ha	Ave. Thickness, m	RD	GTIS, Mt	TTIS, Mt
Measured	540	1.42	1.54	11.8	10.6
Indicated	246	1.32	1.54	5.0	4.6
Inferred	666	1.36	1.54	13.9	11.1
Total	1,452			30.7	26.2
Reconnaissance	458	1.43	1.54	10	7.5
Total Inventory				40.7	33.6

7.4 Mine Design Criteria

The geotechnical evaluation of the various geological formations (roof, seam and floor) for the Malonjeni Colliery indicate that it is technically feasible to mine safely the Top Seam by both surface and underground mining methods that are commonly in use in the Republic of South Africa.

The Malonjeni Resources will be mined using a cut, drill and blast mechanised board and pillar mining method for the first two to three years (open-cast mining). After which the coal will be mined using a new technology referred to as the ADDCAR High-Wall mining method. ADDCAR High-Wall mining technology cuts into the ground and brings up the coal to be loaded onto the stockpiles

It is planned to start open cast operations from suitable positions around the Corby Rock hill where the Top Seam outcrops will be mined until the strip ratio becomes uneconomic, believed to be 1:20. The hill displays various conditions from rock outcrop above and below the Top Seam, to thick vegetation with possible hill wash covering the out crop. Please also refer to **Appendix C** for a copy of the Geotechnical Design Report.

The mine design criteria are as follows (Appendix F) (from the Feasibility Study, Hatch, 2014):

- Treatment of 88 000t of ROM per month with an additional 18% of external waste
- Country rock: This country rock consists of sandstone with shale lenses and this decomposes when exposed to air.
- Life of mine is 15 years with a steady state production of 960 000 t.p.a
- The anthracite density is 1.68t/m3 and the sandstone density is 2.4t/m3
- Discard density is 1.6t/m3 and the slurry is 0.8t/m^3
- Total volume of slurry for the life of the mine will be 1.53Mm^3

- The total volume of coarse discard is 3.6Mm³ excluding material from the opencast area
- Co-disposal is the preferred disposal option.

7.5 Mine Schedule and Production Rate

The approval of the Environmental Management Programme will precede the construction and development period of the mine, which will take about a year. The construction and development of the mine will be commissioned in such a way that two (2) production sections can be deployed at the beginning of year 1 of Life of Mine (LOM). It is assumed that the necessary surface infrastructure will be established in conjunction with the sinking of the declines. This includes a blind sink ventilation shaft which will be required for mine ventilation requirements.

Steady state production will be achieved in year two and will last until year nine. The first section will be closed in year ten with the remaining sections in year 11 and 12 as the resource is depleted. Please refer below to figure 6 for the production forecast for each year over the life of mine period.

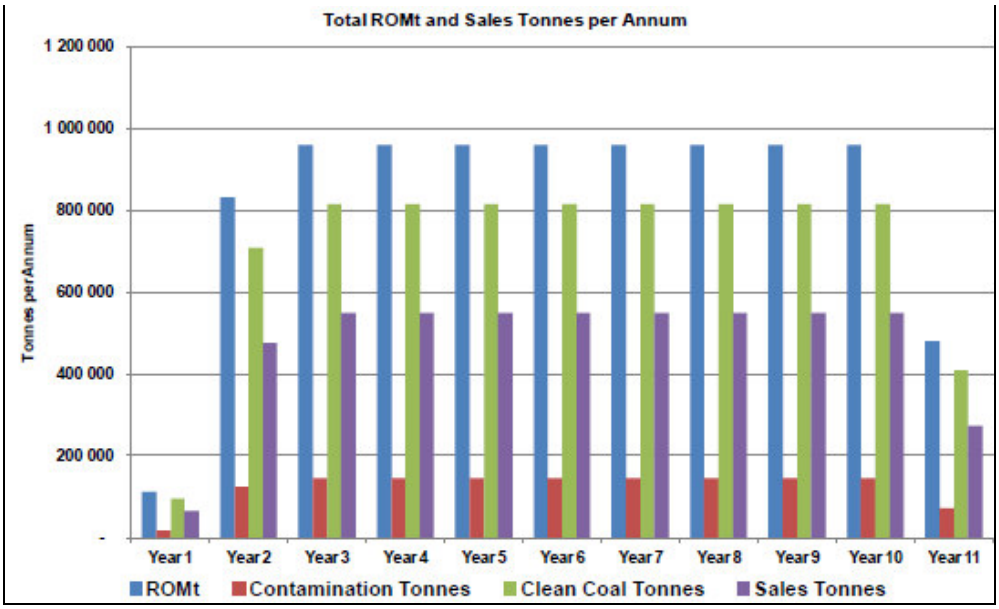


Figure 6: Drill and Blast Section Production over LOM.

The Production Forecast over the Life of Mine is as follows:

Category	LOM Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Section 1	245600	56 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000
Section 2	245600	56 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000

Category	LOM Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Section 3	2096000	-	176 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	-
Section 4	2096000	-	176 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	240 000	-
Total	910400	112 000	832 000	960 000	960 000	960 000	960 000	960 000	960 000	960 000	960 000	480 000

7.6 Planned Life of Mine

The LoM will be approximately 15 years and is based on the Resource Estimate.

7.7 Construction and Construction Related Activities

7.7.1 General Overview of Construction Activities

A design criteria document for civil, structural and architectural works will be developed and adopted for the project in order to define the codes, standards and specifications for the civil construction applicable to the project and its infrastructural content.

For the purpose of construction the following will be attended to:

- Appointment of construction labour force and contractors;
- Removal of topsoil for the establishment of infrastructure:
    - Only areas where infrastructure will be developed will be cleared of vegetation. The areas will be cleared by means of bulldozers which will enable survey control and ground levels to be established;
    - The topsoil will be stripped and stockpiled using excavators, then subsequently by load-and-haul using dump trucks. Where necessary overburden material will also be removed and dumped using excavators;
    - Overburden could be utilised to construct primary and secondary access roads as well as the “enviro” berms that will act as visual screens and storm water diversion berms around the project site perimeter;
    - Excess overburden material could be utilised as borrow material to level some areas prior to construction;
- Excavation of trenches for underground piping and storm water control;
- Erection of a security fence on the perimeter of the project area;
- Possible spillage of hydrocarbons and the mitigation of the effects;
- The separation and disposal of construction waste;
- Construction of temporary offices;

- Establishment of contractors laydown area;
- Establishment of the permanent buildings and plant equipment;
- Stringing of underground and overhead 132-11kV power lines;

7.8 Start up Phase

An initial start-up phase to the project is recommended. This will benefit the project by minimising the time and cost required to commence with mining. The start-up phase is described below:

Roads

The intersection to R68 as well as the main access road from the provincial road up to the entrance to the opencast pit will need to be constructed in order to access the reserve and transport material out of the open cast section of the mine. A road will also be required to the site of the potable water tank as well as access to the explosives magazine.

Offices

The existing farm house will be used for office space initially, with container based facilities added as additional space is required. Container facilities will be used for ablutions and change houses, the security building and gatehouse.

Services

Sewage will be disposed of by means of conservancy tanks that will be periodically emptied via truck and the contents disposed of at the nearest approved treatment works. Connection to Eskom power will be required, but the full demand will not be realised until the plant has been constructed. Potable water will be required, and the planned 1Ml ground reservoir will be constructed as well as pipework and pumps from the borehole to the reservoir, from the reservoir to the farmhouse and from the reservoir to the box cut. The explosives magazine and detonator store will be constructed at start-up. The perimeter of the start-up phase will need to be fenced in.

7.9 Mining Method and Access to Workings

The Malonjeni Resources will be mined using a cut, drill and blast mechanised board and pillar mining method for the first two to three years (open-cast mining). After which the coal will be mined using a new technology referred to as the ADDCAR High-Wall mining method. ADDCAR High-Wall mining technology cuts into the ground and brings up the coal to be loaded onto the stockpiles. Thus both opencast and underground mining method will apply. The mining right also provides for both options.

The geological data have resulted in a decision to mine the anthracite through an adit. Access to the anthracite seam will be from the east side of the Malonjeni Mountain.

Malonjeni will be mined starting in an opencast “strip” of 1500m by 150m, from which the high wall will be developed. It is planned to start open cast operations from suitable positions around the Corby Rock hill where the Top Seam outcrops and this will be mined until the strip ratio becomes uneconomic, believed to be 1:20.

The hill displays various conditions from rock outcrop above and below the Top Seam, to thick vegetation with possible hill wash covering the out crop.

7.10 Adit

The groundwater that will be developed in opening up the mine will be collected in a sump at the Adit and pumped to the polluted water sump in the processing plant area from which it will be used for dust suppression or in the process plant. As more pit room is opened in the mine, this water will probably be stored in underground dams (Feasibility Report Hatch, 2014).

The operational requirements from the Adit are summarized as follows:

- An anthracite stockpile conveyor for Run of Mine (RoM) product
- An access road to transport personnel to and from the underground workings
- Ventilation facilities for the underground mine
- Essential services access e.g. potable water, service water and electrical power
- A pump column to remove groundwater from the mining area
- A sump to collect water from the open pit and water exiting from the mine
- Ablution facilities.
- Lamp room.

7.11 Mine Surface Layout

A conceptual Mine Surface Layout has been developed. This conceptual layout or mine block plan is presented in **Appendix F** of this document.

7.11.1 Surface Infrastructure – Construction Phase

Construction contractors will provide: all necessary on site offices, change houses, ablution facilities etc. for personnel for the duration of the plant construction activities. Most of these structures are temporary and will be removed at the end of the construction phase in order to allow for the establishment of more permanent infrastructure.

It is currently not anticipated that contract workers will be housed on site as local contractors will be utilised.

7.11.2 Surface Infrastructure – Operational Phase

The proposed mine surface infrastructure layout is presented in Appendix F of this document. It is important to note that the layout plan presented is a conceptual layout and could change as a result of detailed engineering.

The access road is based on an assumed position for the access where the sight distances meet the required Provincial standards. The infrastructure area of 26ha is on split-level terraces with the structures placed in an open layout to facilitate future changes. The discards disposal facility is a single unit as adequate space is available between the road and the expected maximum limit of 100m from the river centre line. It is unlikely that the flood line will exceed the 100m line. This layout is shown Appendix F

Facilities to be catered for on the surface infrastructure on site are:

- The process plant (per details provided by the client's process designer)
- De-stoning will not be required
- Tramp metal magnets to be installed in 2 places
- Loading area for export product
- Loading area for non-export product
- Three stockpile areas for the duff, nuts and nuggets products
- Pollution control dam
- Change house including lamp room, control room, first aid room and laundry designed for
- 520 people, (10% of workers are assumed to be women)

- Wash bay
- Stores building, yard and workshop
- Laboratory
- Scrap yard
- Security gatehouse including 4 offices for the owner's team
- Bus, taxi and private vehicle parking outside of the security area
- Recycling/waste handling area
- Re-fuelling area and fuel storage area
- Substation and standby generators
- Service water storage and return water storage
- Potable water storage
- Explosives magazine and detonator store
- Road access is to be via an 8m wide road with shoulders- approximately 3.2km long

Two general layout options are proposed by Hatch as part of the feasibility assessment. These two options will be discussed in detail in the alternatives section of this report.

Transasia will ensure that the Environmental, Health and Safety Policy, as developed for all its operations, be erected on site to be followed by each contractor and staff member. The contents of this policy will be explained to all contractors and staff during a detailed induction programme. No contractor will be allowed on site if he or she has not completed the induction programme. This programme will aid as a training programme on all site specific conditions. An emergency action plan will also be presented in order to train employees and all site personnel on actions to be taken in the unlikely event of an emergency. During the construction phase emergency contact numbers will be erected at strategic points on site

7.11.3 **Construction of Roads and Terracing**

The CAPEX estimates in this report provide for un-surfaced access roads to the process plant and associated buildings and to the adit. These roads are typically 8m wide with sufficient layerworks to allow for the predicted wheel loading of the coal transport vehicles. The distance from the Provincial road to the Adit is 2.5km. Routes have been selected to minimize the length of new road works from the existing road network to and on the mine. The intersection point with the Provincial Road is based on the survey data provided and its extrapolation using Google. This allowed calculation of sight distances. The access point has been taken as the existing farm access on the assumption that this has been previously accepted by the Provincial Roads Department. The plan and long-section are shown on drawing number H344476-01-400-001 of Appendix F.

7.11.4 **Drainage**

There will be clean water cut-off berms and drains on the up-stream perimeter of the infrastructure area to minimise the volume of polluted water that will need to be handled. The combined pollution control dam for the infrastructure area and the discards dump will be positioned between the discard dump and the access road. The clean water will be reticulated into the natural water courses. The open channels carrying the polluted water need to be lined and it is intended that these should be constructed of cemented stone pitching, which has the added benefit that they can be constructed and maintained using local labour.

7.11.5 Raw Coal Stockpile

A footprint area for a 6500t conical raw coal ROM stockpile is provided at the perimeter of the process plant area. The maximum height of the stockpile as designed is 12m. A semipervious terrace for the stockpile is allowed for with a collector drain on the downstream side. Controlled drainage of surface runoff water to a pollution control dam is included in the form of cut off berms and lined open channel drains. The recovery of coal from this stockpile will be by a Buffalo Feeder. Loading of coal from the emergency stockpile area will be handled by front-end loaders and normal road trucks if necessary.

7.11.6 Lamp Room and change house

A lamp room (40m^2) to house lamps and battery chargers for four working sections is provided at the infrastructure area in modified containers so that these can be provided immediately at minimum cost and can be up-lifted and used elsewhere on completion of mining. An added benefit of this approach is that the cost of restoring the area to its original state is minimized. The change house will cater for the 520 persons (400 u/g) expected to work on the site for two shifts per day and will also be constructed in modified containers. It is intended that these will be connected via an outfall sewer to a package sewage treatment plant as it is expected that the DWA regulations will not allow septic tanks.

7.11.7 Offices and Workshops

The offices might be prefabricated buildings or modified containers. The prefabricated buildings will provide a more pleasant working environment without significant additional costs. Provision has been made for workshops which will be modified containers under a structural steel frame with an IBR roof.

7.11.8 Access Control and Security

The infrastructure areas will be fenced with 2.1m high diamond mesh perimeter security fences to control access. Six meter wide security gates controlled by security staff housed in modified container guard houses will be placed at the entrance to the area.

7.12 Mechanical Equipment

7.12.1 Conveyors

Two conveyors, that are outside of the washing plant area, are included in the study area:

- The main coal exit conveyor delivering coal from the underground workings via the adit to the ROM coal stockpile. The length of this conveyor is 1.5km.
- A second main conveyor will transport waste from the washing plant to the discards disposal facility. The length of this conveyor is 365m.

The mechanical flow diagram for option 2 is provided as drawing H344476-01-600-002 of Appendix F.

7.12.2 Ventilation Fan

The underground will require air flow and there will need to be space provided in the Adit area for the installation of the ventilation fans. The ventilation design did not form part of the scope of this study. Details of these fans are not currently available and no costs have been allowed for these. It is recommended that a ventilation study by specialists should be carried out in future.

7.12.3 Miscellaneous Items

The CAPEX estimate provides for the following miscellaneous items:

- A 23 000ℓ diesel storage tank on surface and pipework to convey diesel to a supply bowser that would normally be required at a mine of this size is allowed for. Containment bund walls are provided on surface for the tank, which will be provided by the preferred supplier.

- A surface self-bunded container will be provided for the storage of oils and greases
- A weighbridge is proposed at the entrance to the infrastructure area to measure the tonnages of coal being removed from site and also to measure the tonnages of materials such as fuel, stone dust, cement, magnetite and other bulk supplies being delivered.(If easy access is available to a "public" weighbridge, it is possible to avoid the expenditure for this structure)

7.13 Materials and Consumables

The following consumable materials are expected to be used on site:

- Water;
- Lubricants;
- Diesel;
- Cement;
- Oils;
- Steel;
- Electrical;
- Building Material; and
- Oxygen.

7.14 Transport

Mine personnel will commute to and from the proposed site using taxis, buses and private cars. Parking and drop-off facilities will be provided for.

The coal produced by the mine will be transported to the final destination using trucks. Approximately 5-6 trucks per day will exit and entire the mine. These trucks will make use of the existing R68 for the delivery of the coal to existing facilities in the area.

All consumables will be delivered to site via road by registered carriers. This will also apply to all waste removed from site.

7.15 Water Requirements

7.15.1 Water Supply

The potable water supply will be abstracted from a single borehole with a yield of 27m³/h, which is more than adequate to meet the daily demand of 105m^3/day based on a per capita demand of 200l/day. The supply of potable water for ablutions is an emotive issue in mining environments and it is recommended, and this has been costed, that a standby borehole should also be provided. Potable water from these boreholes will be pumped to a steel 1Ml reservoir, (see drawing H344476-02-510-002 of Appendix F), situated on high ground south west of the plant site from where it will flow under gravity to the change house and other end users. The quality of this groundwater source has been checked by others and found to be suitable for human consumption and the only form of treatment will be by chlorination.

The service water will be obtained from three sources, namely:

- In the early stages of mining when the groundwater flow into the mine is minimal, water will be obtained from a service water borehole, rain water runoff from the plant site and the discards disposal areas

- As the groundwater flow from the mine increases the service water borehole will be discontinued and only the water from the mine and from runoff will be utilized
- In the longer term there will be an excess of water at times and the design of the polluted water dams catching the surplus runoff will need to include treatment to meet the Special Standards for Discharge. It is possible that the Department of Water Affairs will specify that the Special Standards for Discharge will have to be met in which case reverse osmosis treatment will probably be required.

The daily demand for service water in the steady state situation will be:440 m^3 for the wash plant based on 150l of make-up water per ton of anthracite washed and 60m3 for road watering, giving a daily total of 500m^3. A conceptual water balance of the service water is shown on **Appendix G**. The service water will be stored in the pollution control dam at the infrastructure site from which it will decant into a sump and be pumped to the plant and other usage points. All of the reservoirs and dams will be equipped with level controls and alarms which will be transmitted to the control room.

7.15.2 **Fire Suppression Water**

The fire suppression proposal is to place fire hydrants at appropriate positions around the infrastructure site and at 60m intervals, with the intention of suppressing fires that might occur in the buildings and the transfer towers. It is not the intention that the conveyor routes be provided with a deluge system. Based on the NPFA 15 recommendations, the storage volume will be sufficient to operate three hydrants for a period of 90 minutes at a flow rate of 1200 litres per minute. This volume will be 324m^3.

The steel potable water reservoir will have two abstraction points with the lower one being for fire suppression. This design ensures that the fire water does not become stagnant and that the design volume is always available. Fire hydrants will be supplied by booster pumps at the Adit sump and polluted water sump. Electrical and stand-by diesel operated pumps were included in the design.

7.15.3 **Polluted Water Dams**

Contaminated surface runoff from the Infrastructure area will be piped to the polluted water dam designed to contain and evaporate the water as required by the regulations of the Water Act. Untreated water from this dam will be used for make-up water in the washing plant.

The current available data on groundwater flow into the mine workings has been given by the client's mining engineer as 400m^3/day. This abstracted water will have to be stored in a polluted water dam positioned at the Adit, but as the detailed study of the Adit terrace is not part of this scope the final sizing of this structure has not been addressed. It is recommended that the sizing and design of the dam together with a hydro-geological investigation be done prior to finalizing of the CAPEX estimate. The sump situated at the Adit must be sized based on the following design criteria:

- Retain the run-off from a 1:50 year flood
- Retain the excess water from the underground workings that will be pumped to the polluted water dam.

These dams will also have to be licensed by DWAF in accordance with the Water Act. The licensing process is protracted and detailed designs and construction drawings have to be completed as part of the application. It is therefore recommended that sufficient time is built into the planning process to accommodate this regulatory requirement. The polluted water dam north of the plant will be 60Ml and excess water is to be pumped to the polluted water dam at the discards disposal facility.

Please refer to **Appendix E** for a copy of the Water Use Licence Application as submitted to DWA.

7.15.4 **Water Balance**

A detailed wet (summer) and dry (winter) water balance was developed by HATCH as part of the preliminary mine design. The detailed water balances are included as part of **Appendix G** of this document.

7.16 Discards Disposal

The recommended method of disposal of the coarse discards and slurry (fine discards) is co-disposal. The footprint area of this site has been based on a maximum height of 12m as the initial geotechnical investigation indicated that the soil conditions may not support a higher disposal site. The effect of the lower height is that the disposal site extends over the boundary of Portion 12. The final size can only be determined once a more detailed geotechnical investigation has been carried out.

The construction of the discards dump will entail grading the site evenly and then placing a fully welded 2mm HDPE liner directly on the soil provided that all projecting stones have been removed. A bedding layer will then be placed over the liner to protect it from the impact of the rock fill, sourced from the opencast mining area, that will be placed on top of it.

The liner needs to be placed under the entire site including the starter wall and the seepage collection drain so that any water that finds its way onto the liner will flow into the drain that will surround the facility. Within the rock fill a compartment will be formed for the placing of the fine slurry. This compartment will not be separately lined, thus allowing the slurry to drain.

It is feasible to form two compartments for the slurry and so making it possible for one to be drying while the other is in operation. It will create an opportunity to sell the dried slurry thus generating more income and more space for future slurry disposal. The coarse discards and slurry levels will be increased at the same rate and the delivery of the coarse discards will be via conveyor and then truck while the slurry will be pumped from the thickener.

The quantities of these wastes that will be generated during the life of the mine are estimated as:

- Coarse discards – 5.75Mt at a density of 1.6t/m3, giving a volume of 3.59Mm3.
- Slurry – 1.22Mt at a density of 0.8t/m3 giving a volume of 1.53Mm3.

Seepage from the slurry and rain water that falls on the entire area will be collected in the drain that surrounds the facility from where it will drain into the polluted water dam and pumped to the plant as service water.

7.17 Electricity Power Requirements

Electrical power supply to the mine complex will be from the existing Eskom power line to the farm. A switch yard has been allowed for in the vicinity of the existing farm house and there will be buried cables distributing the power around the anthracite storage and washing area. A 22kVA overhead line on wooden poles will transmit power to the plant and to the Adit. The length of this line will be approximately 2km.

- A mini substation will be placed adjacent to the washing plant
- A mini substation will be sited on the Adit terrace to supply power to the ventilation fans, the lighting, pumps in the mine and underground materials handling and mining.

Eskom also provided confirmation to Transasia that electricity is available. Please refer to **Appendix H** for a copy of the letter from Eskom.

7.18 .Waste and Waste Management

An Integrated Water and Waste Management Plan (IWWMP) was developed for the Malonjeni mine as part of the Water Use Licence Application, please refer to Appendix D of this report.

Waste sources identified as part of the mining activities will include:

- Tailings (slurry);
- Reagent packaging;
- Contaminated process water;
- Scrap metal;
- Waste Rock;
- Used oils and grease;
- Dirty (wash) water;
- Contaminated stormwater;
- Process water;
- Aerosol cans;
- Batteries;
- Office and domestic waste;
- Sewage; and
- Fluorescent tubes.

The section below aims to discuss management principles to be employed to manage the various types of wastes to be produced.

For the purpose of this report the various types of waste streams have been classified as: Hazardous Waste, General Waste, Mining Waste, and Dirty Water.

7.18.1 Mining Waste

7.18.2 General and Industrial Waste

Minimal domestic waste will be produced by the proposed project. Sources of domestic waste will include: maintenance workshops and administration buildings. Domestic waste will be sorted at source and disposed of according to the principles of re-use, reduce or recycle. Waste that cannot be recycled will be stored in bins, prior to disposal, at the nearest registered landfill site in an environmentally responsible manner and within the requirements of applicable legislation.

No permanent domestic and industrial waste disposal facilities will be constructed on site. All waste will be sorted and stored temporarily at a dedicated waste management facility before being removed to a registered waste disposal facility for final disposal. The waste facility will make allowance for waste classification, separation and reuse of waste, however, the principle of separating waste at the source will also be implemented on the mine. The domestic waste facility will have a demarcated area for the temporary storage of hazardous waste.

Mine waste produced at Malonjeni includes coal slurry and coal discard. Slurry from the washing plant is disposed of to an existing void area. Coal discard from the screening plant are used to backfill open cast pits.

7.18.3 **Hazardous Waste**

All hazardous waste will be collected on site and stored at a temporary storage facility. The hazardous waste will be collected by a registered hazardous waste carrier and disposed of at a registered H:H site.

Oils and grease from the workshops as well as engine and transformer oil are separated from the water by means of an oil skimmer and stored for off-site removal. All hazardous chemicals are disposed of at a permitted hazardous waste disposal facility.

So called “Oily” water contains some levels of oil and grease (leaks from vehicles, washing of oily floors, accidental spillages, etc.) as well as low levels of sulphates (probably from washing of dirty vehicles that move around mined area). Hazardous waste storage area will be clearly demarcated, fenced and sign posted with restricted access. The majority of hazardous waste will mostly be stored in containers which will be marked with the accompanying Safety Data Card.

7.19 Sewage Facility

Sewage treatment plants serving facilities with high peak loads, such as are produced by change houses, are usually designed with a balancing tank to level out the peak flows. This balancing tank could be used as a conservancy tank in the short term, so as to minimize initial capital expenditure.

The preferred method of sewage treatment is activated sludge. The sewage plant proposed for Malonjeni is known as a multi reactor system or also known as a sequential batch reactor (SBR) system.

The sewage plant will be supplied and erected as a new package sewage plant. The plant is designed to process 32m³/day of raw sewage for 180 persons, discharging from a coal mine complex.

The plant’s design capacity should always be greater than the total expected volume input. Allowance for an increase on Transasia requirement of 150 persons @ 180 litres per person, to 180 persons per day, should also be taken into account.

The design offered is for a SBR type Batch Reactor, Activated Sludge Process Plant, as specified by Sasol, Eskom and various hotel groups in South Africa and worldwide. There are 12 SBR Sasol Secunda coal plants in operation, beside others, serving the coal mine industry, all meeting DWA Standards.

The design offered is based upon the plant being operated within the plant’s maximum design criteria, (40m³/d), and the raw inflow sewage being free from all substances which could have a detrimental or toxic effect to the process and operating criteria of the plant. DWA specify that NO rain water may enter the sewage plant.

The plant is designed to handle normal waterborne domestic sewage complying with the Department of Water Affairs (DWA) General Standards as described in GAZETTE No. 216187 of 26 March 2004, SECTION 21 (f) and (h). Please refer to Appendix H of this report providing full details and method statement on the proposed sewage plant.

7.19.1 **Storm Water Management**

Government Notice No. 704, published in terms of the National Water Act (Act No. 36 of 1998) requires the following, which will be adhered to:

- All clean water systems must be designed and operated in such a manner that they are at all times capable of handling the 1:50 year flood event on top of their mean operation level without spilling;
- Any water arising from an area, which causes, has caused or is likely to cause pollution of a water resource, including polluted storm water, must be contained within a dirty water system. In order to reduce the volume of polluted water, contaminated areas should be minimised. While clean water should be diverted to natural water courses, polluted water should be re-used wherever possible, thereby reducing the use of clean water; and
- Design, construct, maintain and operate any dam or tailings facility that forms part of a dirty water system to have a minimum freeboard of 0.8m above full supply level.

The entire site, will be equipped with appropriate stormwater controls, providing for clean and dirty water separation systems. These areas will have upslope diversion berms to direct clean water around the sites. All water falling within infrastructure footprint areas will be classified as “dirty water”.

The contamination of water at the mechanical workshop areas is possible as a result of oil/diesel spillages. Water contaminated by hydrocarbons will be contained at the source. Contaminated water will be directed to a sump where it will then be collected and pumped to drums for final disposal. Hydrocarbons can also be separated from the water at the source by means of various oil separation techniques. The oil separation techniques and alternatives considered are discussed in greater detail under project alternatives.

Regular sampling and analysis will be done at nearby surface water bodies in order to determine possible contamination via stormwater run-off.

The PCDs will be constructed to accommodate a 1 in 100 year flood event which will reduce the possibility of surface water contamination.

7.19.2 **Construction Waste**

Construction waste will be limited but a dedicated area will be earmarked for construction waste only. Construction waste might include:

- Scrap steel off-cuts;
- Building rubble;
- Cement;
- Electrical Cable off-cuts;
- Rubbers and plastics; and
- Wooden and plastic containers.

Construction waste will be removed by the various construction contractors.

7.19.3 **Fugitive Dust**

7.19.3.1 Construction

Fugitive dust will be generated as a result of initial site earthworks and blasting as well as the use of gravel roads by contractors and staff. Earthworks, will be a significant source of fugitive dust. Areas not earmarked for development will not be earth cleared with the aim to reduce this impact. Dust can also be expected from exposed topsoil and overburden dumps. The aim will then be to vegetate the dumps as

quickly as possible during the construction phase as to limit the amount of dust originating from these dumps. This will also aid in avoiding the loss of valuable topsoil for future rehabilitation purposes.

7.19.3.2 Operations

During the operational phase of the facility, fugitive dust will originate mainly from the coal stockpiles, and secondary access roads which will not be tarred.

Mechanisms to reduce the fugitive dust sources will be implemented, this will include mist sprayers at the crushing and screening plant and dust suppression on gravel roads. Dust control is will be aimed at re-using polluted water from a dirty water dam

7.20 Construction Workforce

Malonjeni intends to commit to a recruitment and employment programme that will ensure advancement in the social and economic welfare of its workforce, labour sending areas and its associated communities. Approximately 80% of its employees will be sourced from the Kwa-Zulu Natal Province with the aim to recruit as many from the local labour sending areas.

The final labour compliment for construction can only be finalised on the appointment of the mining and civil construction contractors after completion of the detail designs. Detailed engineering will commence on the approval of this report by the Authorities.

7.21 Operational Labour Force

The mine aims to recruit 80% of its employees from Kwa-Zulu Nata Province, but will mainly focus on the local residents residing in the Endumeni Local Municipality and uMzinyathi District Municipal area. It is anticipated that by the time Malonjeni reaches steady state, approximately 560 job opportunities would have been created.

The method of operation planned for the Project is to use an experienced contractor/s to manage and execute all production related and service related activities.

A full complement of management, supervisors, service staff and production staff will report to the owner's team responsible for the overall strategic planning of the operation.

The total manpower requirements have been departmentalised as follows:

- General Management;
- Human Resources;
- Safety and Health;
- Resources and Geology;
- Accounts, Stores and Logistics;
- Outsourced Services;
- Metallurgy;
- Engineering Services;
- Logistics Services;
- Stoping Direct;
- Raising and Ledging Direct; and
- Development Direct.

In line with the black economic empowerment policies in place in South Africa the outsourced services will be contracted to suitably qualified companies at agreed monthly rates. Please refer to **Appendix I** for the Social and Labour Plan.

7.22 Capital Cost Estimates

The Malonjeni CAPEX schedule is summarised as follows:

Category	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ROMt	**9104 000**	1120 00	832 000	960 000	960 000	960 000	960 000	960 000	960 000	960 000	960 000
Contamination Tonnes	**1365600**	16800	124 800	144 000	144 000	144 000	144 000	144 000	144 000	144 000	144 000
Clean Coal Tonnes	**7738400**	95200	707 200	816 000	816 000	816 000	816 000	816 000	816 000	816 000	816 000
Sales Tonnes	**5200205**	63974	475 238	548 352	548 352	548 352	548 352	548 352	548 352	548 352	548 352
Sales Price (R/t)	**8400**	R700	R700	R700	R700	R700	R700	R700	R700	R700	R700
Revenue	**3640143360**	R44 782 080	R332 666 880	R383 846400	R383 846400	R383 846400	R383 846400	R383 846400	R383 846400	R383 846400	R383 846400

7.23 Construction and Implementation Timeframes

After completion of all regulatory processes and receipt of the necessary authorisations, it is anticipated that the proposed project will commence in 2015. The mine is planned to be in full production in 2017. Applicable milestones and timeframes are summarised below:

- Issue of Environmental Authorisation– June 2015;
- Commence with Construction – December 2015;

7.24 Decommissioning and Closure

The current LoM is planned for 15 years. However, the decommissioning and closure phase of the project will entail the following:

- Downscaling of production;
- Downscaling and retrenchment of contractor and permanent staff;
- Rehabilitation of all mining and mining related areas such as;
- The use of overburden to backfill all excavated areas;
- The spread of topsoil and a suitable seed mix to re-vegetate all affected areas; and
- The use of waste rock to backfill excavated areas.

A skills development programme will be followed during the course of mining in order to re-skill and train employees for the unlikely event of down scaling and retrenchment.

8 CONSIDERATION OF PROJECT ALTERNATIVES (COMPARATIVE ASSESSMENT)

8.1 Alternatives Considered

Since the inception of the project, a number of alternatives have been considered. These alternatives were investigated in great detail and range from mining alternatives, service delivery and supply as well as technological alternatives. The various alternatives considered include:

- Surface Mine Layout;
- Transport Alternatives;
- Electrical power supply;
- Oil separation techniques;
- Sewage treatment plant;
- Labour; and
- Accommodation of workforce.

Alternatives assessed were based on the following: available information, existing practices, discussions with service providers, discussions with community and business representatives, and outcomes of preliminary and technical investigations. Mining alternatives were based on the following criteria:

- Location of Mining Right Area;
- Surface ownership;
- Mineable resource;
- Findings of the geological and rock engineering investigations;
- Early reef access;
- Outcome of geotechnical investigations;
- Existing infrastructure and servitudes within the Mining Right Area;
- Flood lines, drainage lines and sensitive ecosystems; and
- Dykes and fault lines

Each aspect with its relevant alternatives will be discussed in further detail below. Table below summarise the alternatives considered under each aspect.

Table 9: Project alternatives considered

Aspect/Activity	Alternative 1	Alternative 2	Alternative 3
Surface Layout	HATCH Option 1	HATCH Option 2	
Transport Alternatives	By Truck	By Rail	
Electricity Supply Alternatives	Eskom	Diesel Generators	
Oil Separation Techniques	API Separator	Dissolved Air Flotation Separator	Oil Skimmer
Sewage Treatment Plant Alternatives	Crocette Mine Packaged Sewage Treatment Plant	Biomite Waste Water Treatment Plant	
Labour	Sourcing of labour locally	Outsourcing labour to contractors	Training and re-skilling of local labour
Accommodation of construction workforce	Payment of living out allowances	Housing workers in existing suitable facilities in immediate area	Housing construction workers in contractors camp
Accommodation of operational workforce	Payment of living out allowances	Housing workers in existing suitable facilities in immediate area	
Transportation of workers	Taxis	Busses	Combination of Taxis and Busses

8.2 Surface Layout

Base Case:

The access road is based on an assumed position for the access where the sight distances meet the required Provincial standards. The infrastructure area of 26ha is on split-level terraces with the structures placed in an open layout to facilitate future changes. The discards disposal facility is a single unit as adequate space is available between the road and the expected maximum limit of 100m from the river centre line. It is unlikely that the flood line will exceed the 100m line.

Option 1:

This layout has a smaller infrastructure area of 15ha, with split terraces and smaller emergency and other stockpiles and reduced number of buildings at the wash plant. The access road is aligned on the existing farm access which results in the discards disposal facility being split into two sections to minimize the future transport cost if the facility was moved as a single item to the west of the access road. This layout is shown on drawing number H-344476-01-100-004 as part of **Appendix F.**

Option 2:

The infrastructure site is the same area as Option 1, but has been moved to the north where the geotechnical conditions and surface contours are more favourable. This has allowed the existing farm buildings to be incorporated into the infrastructure and these can be used as offices and/or stores. The discards disposal facility differs from Option 1 in that there is only one facility and it is on the north-western side of the access road. This position for the infrastructure has the benefit of moving the

infrastructure area further away from the blasting that will take place in the opencast mining area. This option is shown on drawing number H-344476-01-100-005 as part of Appendix F.

Note: Future consideration should be given to mirroring the infrastructure site, which could have the effect of reducing the area generating polluted water and lessen the movement of haul trucks within the anthracite processing area.

8.3 Transport Alternatives

Two main alternatives exist in terms of transporting the coal from the mine to the international and power generation markets. They are via Rail or Truck.

Road Transport:

The CAPEX estimates in this report provide for un-surfaced access roads to the process plant and associated buildings and to the adit. These roads are typically 8m wide with sufficient layerworks to allow for the predicted wheel loading of the coal transport vehicles. The distance from the Provincial road to the Adit is 2.5km. Routes have been selected to minimize the length of new road works from the existing road network to and on the mine. The intersection point with the Provincial Road is based on the survey data provided and its extrapolation using Google. This allowed calculation of sight distances. The access point has been taken as the existing farm access on the assumption that this has been previously accepted by the Provincial Roads Department.

Railway Transport:

The closest rail siding to the mine viz. Malonjeni Siding, currently used for agricultural purposes, was investigated for the loading of product for export through Richards Bay. The cost to upgrade the current rail siding infrastructure for loading of coal was deemed extremely high and hence unfeasible.

As existing facilities are available at Talana Siding in Dundee it would be prudent to enter into an agreement with the owners, Messrs. Forbes Coal, at least in the interim with objective to reduce CAPEX. This would allow starting-up production and selling product without incurring immediate financing costs.

8.4 Electricity Supply Alternatives

No alternatives regarding electricity supply exist in the current metal and power price and cost environment. During the very project infancy stages the option to utilised 10MW diesel generated power for the early mine development was considered but were eliminated due to cost implications. Eskom has committed to electricity supply as from the very early project development stages and hence this alternative was discarded. Please refer to Appendix H copy of the letter from Eskom.

8.5 Oil Water Separator Alternatives

The Oil Water Separators are fabricated engineering products used for separating water and oil. These devices come in both above and underground systems to treat oil contaminated water.

These Oil filters are typically constructed using concrete, and act as a type of retaining vault. The baffles or coalescing plates results in the slowing down of the influent water speed and allows the oils to float to the surface of the tank. Oil water separators are divided into two sections by the coalescing plates. An inlet pipe is used to bring the water into the tank where the sediments get settled. When the oily water passes from the vicinity of the coalescing plates, the oil begins to float on the surface. At this point the oil is attracted away from the water. Oil is removed from the surface by using a floating skimmer. Floating oil skimmers consist of various pumps that draw oily water in and pump clean water out.

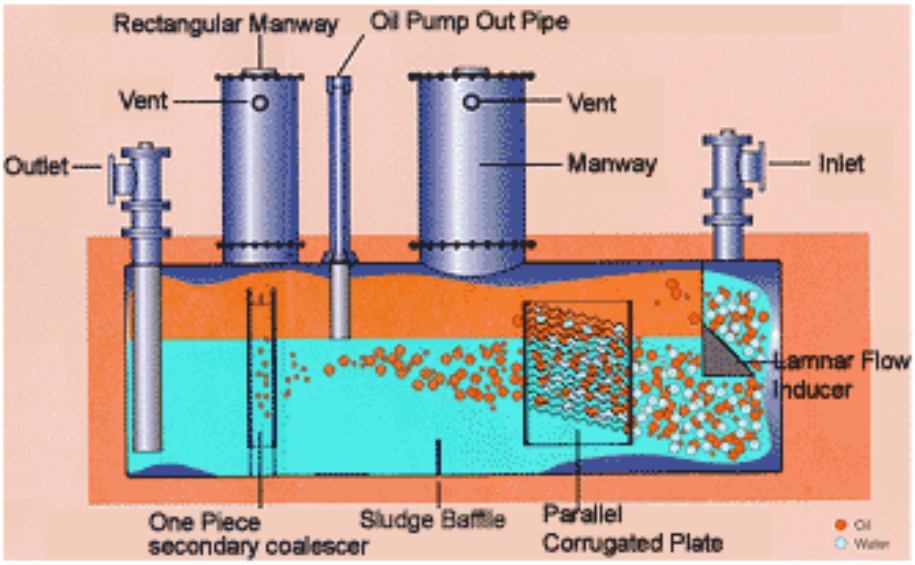


Figure 4: Typical design of an Oil Water Separator (Source: www.thewatertreatmentplant.com)

There are three different types of Oil Separators available for consideration:

- API Separators;
- Dissolved Air Flotation Separators; and
- Oil Skimmers.

API Separators

The API separator is a gravity separation device, which is used to separate oil and water. The equipment works on the principle of Stokes Law that defines the rise velocity of a particle of oil based on its size and density. Generally, the specific gravity difference between the oil and water is much closer than the specific gravity of water and suspended solids. Therefore, the design of the API separator is based on the specific gravity difference between the oil to be separated and wastewater. With this design criterion, a majority of suspended solids will settle in the unit. Once the suspended solids and oil are removed from the wastewater in the API separator (the middle phase) water is then directed on for the advanced treatment in various refinery wastewater treatment plants.

Usually, the oil layer is skimmed-off and afterwards re-processed or disposed of, and the bottom sediment layer is removed by a flight and chain scraper (or a similar device) and a sludge pump. The layer of water is sent for further treatment that usually consists of a dissolved air flotation unit that allows for the further removal of any residual oil. After this, it is also sent to a biological treatment unit for the removal of undesirable dissolved chemical compounds.

Some of the typical applications of an API separator include:

- Groundwater Remediation;
- Bilge Water Treatment;
- Mobile Separation System;
- R.O. Filter Pre-treatment;
- Power Plant Water Treatment;

- Oil Spill Recovery;
- Trench Water Treatment;
- Aircraft Wash Racks;
- DAF / Clarifier Pre-treatment;
- Vehicle Wash water Treatment;
- Refinery Process Water;
- Hydraulic Fluid Tank Dewatering;
- Machining Coolant Oil Removal; and
- Tank Farm Tank Bottoms.

Dissolved Air Flotation Separators

The Dissolved Air Flotation Separator (DAF) is an oil / water separator, which is used for the removal of suspended solids and emulsified oil from liquids. To remove the emulsified oil, the emulsion is first broken by the addition of chemicals. For this, the additional flash mixer and flocculation units are provided upstream of the dissolved air flotation tank. Flotation of solids is achieved by the introduction of millions of microscopic bubbles into the process water. This is attained by drawing a component of the effluent from the downstream end of the dissolved air flotation tank and pumping the recycled effluent and atmospheric air to an adequate pressure saturation vessel/retention tank. The recycled effluent gets saturated here at an increased pressure in the pressure tank. The air-saturated stream is then blended with raw wastewater in the dissolved air flotation tank. When the pressurized flow is restored to atmospheric pressure in the tank, millions of microscopic bubbles are released that attach themselves to the suspended particles in the flow and lift the particles to the surface for effective removal.

The important components of a dissolved air flotation separator include the following:

- Oil Skimming Device;
- Mixing unit;
- Flocculation unit;
- DAF tank;
- Pressure tank; and
- Associated equipment, such as pumps, compressors, piping, valves, instrumentation etc.

Some important features and benefits of the Dissolved Air Flotation Separators are given below:

- High overflow rate;
- Excellent TSS removal;
- Small footprint;
- Handles settled solids effectively;
- High float concentration;
- Low cost;
- Easy to cover;

- Effective oil and grease removal;
- Tolerant of large flow changes; and
- Tolerant of large concentration changes.

Oil Skimmers

Oil skimmers are oil / water separators that have proved to be a very cost effective way to remove oil from water. A comprehensive range of oil skimming equipment for both the rectangular and circular tank configurations are available on the market that suit the different conditions of skimming in both manual as well as automatic operating units.

The different types of oil skimmers are listed below:

- Roto skimmer;
- Scraper type power skimmer;
- Spiral skimmer;
- Circular skimmer;
- Roll skimmer; and
- Belt skimmer.

8.6 Water Clarifier Alternatives

Clarifiers are used for the purpose of clarification of wastewater. Clarification is the widely accepted and the oldest used method in the effective treatment of water and wastewater. This operation includes the removal of: sediment, floating material and turbidity from raw wastewater.

The following types of clarifiers exist:

- Circular Clarifier;
- Reactor Clarifier;
- Rectangular Clarifier; and
- Flocculator Clarifier.

Circular Clarifier

The circular clarifier is the most famous design of clarifiers and it is preferred for secondary classification. It is used for both primary and secondary units in smaller plants. The design of the circular clarifier must consider a balance between the necessities to dissipate energy while assuring that the flow to the clarification zone is balanced. The Circular clarifier provides continuous removal and separation of suspended solids from water and wastewater. The cost associated with these clarifiers is relatively low.

The following Circular Clarifiers are available on the market:

Circular Centre feed Clarifier

This system operates with the effluent entering through a centre stilling well. It ensures proper residence time of the water in the clarifier to allow for the settling of the solids. The water rises and exits through a wall mounted weir.

Circular Peripheral Flow Clarifier

This Circular Peripheral Flow Clarifier operates with the water flow entering the system at the periphery/edge. The water flow is distributed evenly and spirals down around the annulus of the clarifier. This is done by means of a specially designed baffle skirt. This configuration provides maximum settling of solids toward the sludge pick-up.

Reactor Clarifier

This unit provides for the most economical solution to the clarification and precipitation requirements of wastewater treatment. This clarifier unit eliminates the need for multiple tanks and associated piping and pumping as it provides for the following: mix, coagulation, flocculation, solids recirculation, clarification, and positive sludge removal in a single basin. The main purpose for which these units are used is for softening, turbidity removal, and taste and odour removal applications.

This system provides an effective means for the removal of suspended solids and other related impurities. A benefit of the reactor clarifier is that it has a much smaller footprint size in relation to other clarifier units.

Rectangular Clarifier

Rectangular clarifier provides for a layout friendly option in the primary treatment for water and wastewater applications. The rectangular clarifier is used for the handling of sludge removal. They provide for minimum dead space between the units, and these units can be placed on the common wall. The mechanisms involved with rectangular clarifier can be provided with non-metallic components including: chain, sprocket and scrappers. They ensure easier erection due to the decreased weight and also provide longer life. These scrappers are driven through the chains on both ends of the tank.

The rectangular clarifier can be used with travelling bridge scrappers. The scrappers are mounted on the bridge that moves on the steel rails along the length on top of the tank wall. A drive is used for the bridge, which takes the electrical supply through an independently supported festooning cabling system. They can be placed either above the tank wall or along the tank according to the requirements. The scrapper moves the settled solids towards the discharge section in the forward movement. During the reverse movement of the bridge, the scrapper is lifted up to the water level and then it moves the floating scum in the reverse direction for further disposal.

The circular clarifier units are preferred over the rectangular clarifier units due to the following reasons:

- Easier to construct;
- Relatively simple to operate; and
- Do not require extensive maintenance techniques.

Flocculator Clarifier

Flocculation is a water treatment process that coagulates or combines smaller particles into larger particles, which settle out of the water as sediment. Iron salts and alum or synthetic organic polymers are commonly used to increase coagulation. The salts and alum can be used either alone or in combination with metal salts. Sedimentation or settling occurs naturally as flocculated particles settle out of the water.

There are two different types of flocculators,namely:

Mechanical Flocculators

Mechanical flocculators are used widely due to their greater flexibility in varying G values and also due to low head loss. They are of different types; one is a horizontal shaft flocculator, which oscillates with a

back-and-forth motion. The benefit of this type of mechanical flocculator is that it prevents water from rotating continuously in the same direction around the shaft.

The shape of flocculation compartments is affected by the type of mechanical flocculator. Vertical flocculators are associated with square compartments of varying dimensions. Vertical flocculators are higher speed devices than horizontal shaft flocculators. They are more applicable to high energy flocculation situations like direct filtration.

Hydraulic Flocculators

Hydraulic flocculating methods are effective and simple, especially in the case of relatively constant flow. The total volume of each compartment is the assumed flocculation volume. In some cases there may be decreased turbulence in portions of the compartments. The main disadvantage with it is that G values are a function of flow that cannot be easily adjusted.

8.7 Sewage Treatment Plant Alternatives

Two main sewage treatment plan alternatives have been investigated. These alternatives are discussed below under on-site alternatives and off-site alternatives respectively.

8.7.1 On-site alternatives

Areas have been identified where sewage will be collected and treated. Please refer to the surface layout Plan: Appendix F). No alternatives exist for the placement of the sewage treatment units as they are optimally placed at the necessary facilities.

Different types of Sewage Treatment Units exist on the market. The sewage plant proposed for Malonjeni mine is known as a multi reactor system or also known as a sequential batch reactor (SBR) system.

The sewage plant will be supplied and erected as a new package sewage plant. The plant is designed to process 32m³/day of raw sewage for 180 persons, discharging from a coal mine complex.

The plant's design capacity should always be greater than the total expected volume input. Allowance for an increase on Transasia requirement of 150 persons @ 180 litres per person, to 180 persons per day, should also be taken into account.

The design offered is for a SBR type Batch Reactor, Activated Sludge Process Plant, as specified by Sasol, Eskom and various hotel groups in South Africa and worldwide. There are 12 SBR Sasol Secunda coal plants in operation, beside others, serving the coal mine industry, all meeting DWA Standards.

The design offered is based upon the plant being operated within the plant's maximum design criteria, (40m³/d), and the raw inflow sewage being free from all substances which could have a detrimental or toxic effect to the process and operating criteria of the plant. DWA specify that NO rain water may enter the sewage plant.

The plant is designed to handle normal waterborne domestic sewage complying with the Department of Water Affairs (DWA) General Standards as described in GAZETTE No. 216187 of 26 March 2004, SECTION 21 (f) and (h). Please refer to Appendix H of this report providing full details and a method statement on the proposed sewage plant.

8.7.2 Off-site alternatives

The off-site alternative is that the proposed mine connects to the municipal sewage system, however this is not a viable option due to the remote location of the proposed mine and hence cannot be investigated.

8.8 No Project Option

The proposed mine will have a favourable economic impact on the local and regional economies. It will make substantial contributions towards job creation and will contribution towards the overall National GDP. The positive impact will, however, be more prominent in terms of the regional and local economies. The no project option will result in:

- Commitments made in the Social and Labour Plan (SLP) in terms of Human Resource Development (HRD) and Local Economic Development (LED) will not be achieved, and
- Zero contributions in terms of poverty alleviation.

The “no-project” option would also have potential serious impacts on the funding provisions for basic services of power and potable water to the local municipalities. The mine project is currently integral to the regional development of basic services and is planned to be a direct contributor to the costs of these services.

The no project option is considered in this EIA Report as a significant negative impact case in that it is definite, and has a regional, severe and long term impact. The “no project” option also has implications for future direct investment beyond the scope of this project.

9 DESCRIPTION OF THE PRE-OPERATIONAL AREA – BASELINE INFORMATION

This section has been compiled using updated information as supplied by specialists in their respective specialist study reports. All information presented in this Chapter is referenced to the source with special reference made to the actual specialist report if and when necessary. All specialist reports form part of Volume 2 of this document. Additional information relating to the geology and topography of the area was sourced by the EAP and referenced accordingly.

9.1 Climate

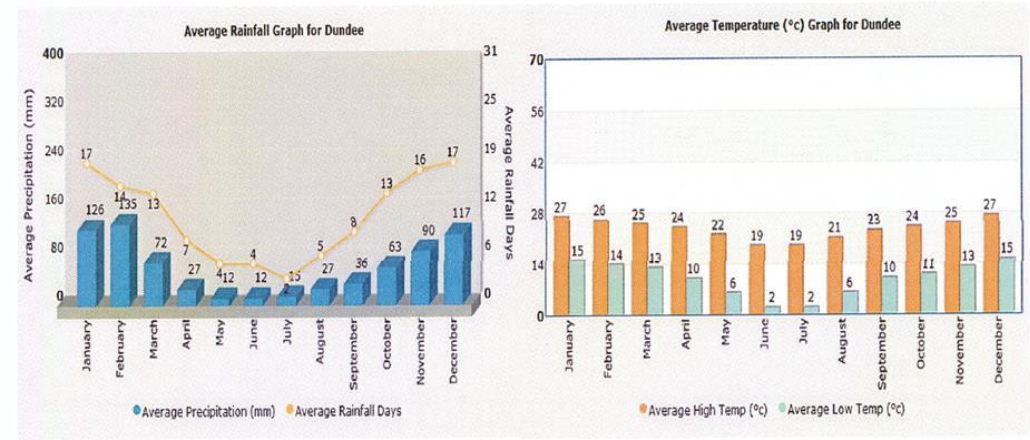
KwaZulu Natal has a varied yet verdant climate due to the diverse, complex topography. Climatic data for the proposed site area was obtained from the Chelmsford DWA weather station at Chelmsford dam (rainfall data and evaporation data). The proposed mining site is located in the summer rainfall region of Southern Africa with precipitation usually occurring in the form of convectional thunderstorms.

The average annual rainfall (measured over a period of 47 years) is approximately 825.04mm, with the high rainfall months between October and March. The area also has a high average temperature with the highest being in December and January (hence the high evaporation rates). The monthly distribution of average daily maximum and minimum temperature shows that the average midday temperature (maximum) for Dundee ranges from 18.6ºC in June to 26.9ºC in January. The region is the coldest during July when temperatures drop to 2.7ºC on average during the night (minimum).

9.1.1 Local

Rainfall

Dundee, which is the closest town to the mining site, normally receives about 732mm of rain per year, with most of the rainfall occurring during midsummer. The chart below indicated the average rainfall values for Dundee per month. It receives the lowest rainfall in June and the highest in January/ February see (Figure 7 below).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Precipitation (mm)	126mm	135mm	72mm	27mm	12mm	12mm	15mm	27mm	36mm	63mm	90mm	117mm
Average Rainfall Days	17	14	13	7	4	4	2	5	8	13	16	17

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average High Temp (°c)	27°c	26°c	25°c	24°c	22°c	19°c	19°c	21°c	23°c	24°c	25°c	27°c
Average Low Temp (°c)	15°c	14°c	13°c	10°c	6°c	2°c	2°c	6°c	10°c	11°c	13°c	15°c

Figure 7: Average Precipitation and Temperature

Wind

The prevailing wind direction is North-westerly. The highest velocities occur during the months of August to October when Westerly winds of up to 5.7 m/s can occur. The average wind speed is 3.7 m/s. During spring and summer, strong South-easterly winds can also develop.

9.2 Topography

The area is characterised by a gentle undulating topography (except for the Corby rock range which rises steeply) and in the area of the proposed mining site the slope is more or less in the order of 1:75.33. The surface topography consists of the Corby Rock mountain range. This mountain range strikes in a NNE-SSW direction and is on average 200 m above the general ground surface elevation of 1200 mamsl (Figure 8).

Locally drainage is towards the Dumangezi which is a non-perennial stream that flows from south to north through the Malonjeni block and an unnamed non perennial river that flows into the Buffelsrivier via an unnamed wetland. The unnamed stream and wetland fall predominantly within the farm Hazeldene 12649. On larger scale, drainage occurs towards the generalised flow of the Buffelsrivier.

Figure 8: General view of Malonjeni topography. The Top Seam outcrops immediately above the sandstone layer running across the centre of the picture.

9.3 Geology

9.3.1 Regional Geology

The investigated area falls within the 2830 Dundee 1:250 000 geology series map and is situated approximately 16 km due east of Dundee, Kwa Zulu Natal. An extract of this map is shown in Figure 9.

The proposed underground mining area falls within the Klip River Coalfield, which extends from Utrecht in the north to Ladysmith in the south. There are two main coal seams present within the Klip River Coal Field, namely Bottom and Top Seams and the distribution of these coal seams are affected by the topography of the pre-Karoo basement and the present day erosional surface. The area is characterised by consolidated sedimentary layers of the Karoo Supergroup. It consists mainly of sandstone, shale and coal beds of the Vryheid Formation of the Ecca Group and is underlain by the Dwyka Formation of the Karoo.

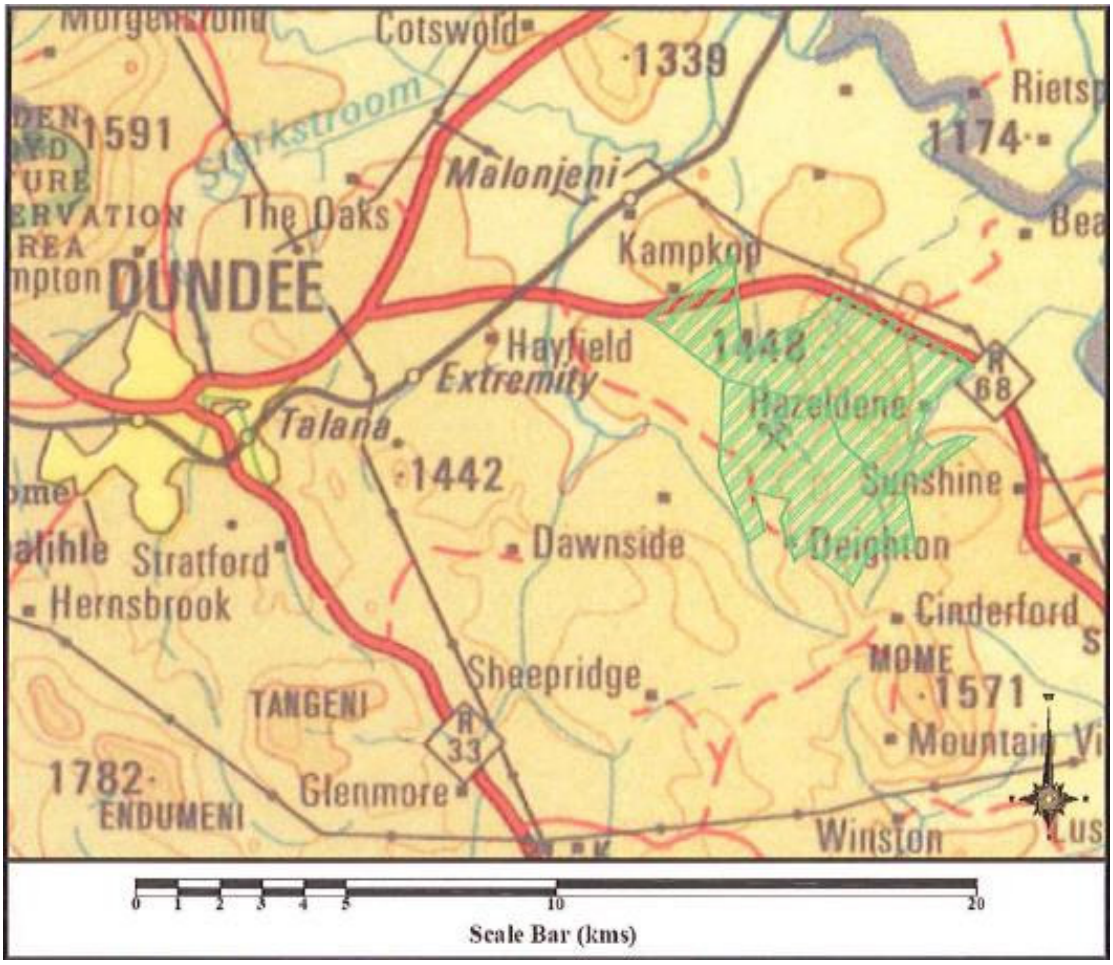


Figure 9: Geology Map

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

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

From the sheet of 2830 Dundee geology series map it is evident that the shale, mudstone and coal beds of the Vryheid Formation of the Ecca Group outcrop in the area. (Geo Pollution, 2013).

9.3.2 Site Specific Geology

The local geology is best concluded from information obtained from exploration borehole logs done for Transasia Minerals and the lithology is best observed in the logs of boreholes drilled at higher elevations, where both coal seams have been encountered. The predominant coal seams located within the mining area are the Bottom and Top seams.

According to information provided by Transasia Minerals SA, the Corby Rock mountain range is capped with dolerite. This dolerite cap extends to an average depth of 50m. Occurring below the dolerite are interbedded shales and sandstones. The Top Seam (targeted for mining) is associated with the sandstone and sub-outcrops on the site at an elevation of approximately 1200 mamsl. It has an average thickness of 1.5m and is generally consistent in thickness and orientation. The Bottom Seam averages a thickness of approximately 0.3m and is localised under the Top Seam.

9.4 Soils

The soil is shallow, derived from shales and mudstones of the Ecca Group of the Karoo Sequence. With a rainfall of 450 mm it is characterized by subsoils which are either duplex, which renders them potentially highly erodible, or dominated by black clays. The highly erodible nature of the soils warants the Mine exercising considerable care in the conservation and preservation of topsoil during the duration of the life of mine. The soil type is particularly suited to grazing and agricultural crop production (as from the report by Hydro Science, 2014).

9.4.1 Soil Chemical Analysis

Although the soil characterisation was conducted based on surface observations and correlations to historical information, soil analyses will be undertaken with a series of soil samples submitted to the laboratory for verification of the preliminary findings. This will need to form part of, or inform the management controls measures to be identified before construction commences and as the Environmental management programme is updated with the relevant results.

9.4.2 Soil Erodibility

The average “Erosion Indices” for the dominant soil forms on the study site are classified as having a moderate to high erodibility index. This is largely ascribed to the moderate clay content of the soils and the low organic carbon content.

The wet and structured soils are more susceptible to compaction, and generally have a moderate to high Erosion Index. These soils will need to be managed extremely well during both the stripping operation, as well as during the stockpiling and rehabilitation stages.

One of the main concerns for this site is the possibility for erosion to take place. The aspect will need to be managed effectively. This is due to the sensitivity of the soils and the use of mechanical implements during/after the removal of surface vegetation. The existing and established vegetation binds and stabilises the soils ensuring the maintained growth conditions, and more essentially, good soil retention. Effective management of rehabilitation as soon after mining is complete will help to minimize the erosion hazard.

9.5 Land Capability and Land Use

The land capability of the study area was classified into five classes namely:

- Agricultural activities (grazing and agricultural fields) (dominant landscape type);
- Two main drainage lines (river systems) surface water bodies including several small farm dams;
- Rocky outcrops;
- Grasslands; and
- Wetland / seepage areas.

In terms of the Land Use within the study area the main contributions to the economy are the agriculture sector, mining sector, construction industries, services and trade sectors. Dundee and Glencoe have well established and serviced areas for light to medium industries. The key economic sectors in terms of the 1996 and 2011 Census date within Endumeni LM included:

- Social Services: 22.16%
- Trade: 13.64 %
- Private House Hold Domestic Services: 13.49%
- Farming: 9.57%
- Manufacturing: 7.39%
- Business Services 4.49%
- Construction 4.5%
- Transport 4.48%
- Mining 1.47%
- Utilities 1.03%

The municipal area has extensive grasslands in the north supporting the primary agricultural sector based on cattle ranching for beef, small scale sheep and mixed farming and maize cultivation. In the southern areas substantial forestry is prevalent.

KwaZulu-Natal has over 11,000Mt remaining reconnaissance coal resources. The majority of the coal resources are located in the Somkele, Klip River and Nongoma Coalfields. Although the Klip River Coalfield has been mined extensively over the years, there still remains a large amount of resources in the coalfield. Please refer to figure 10 below.

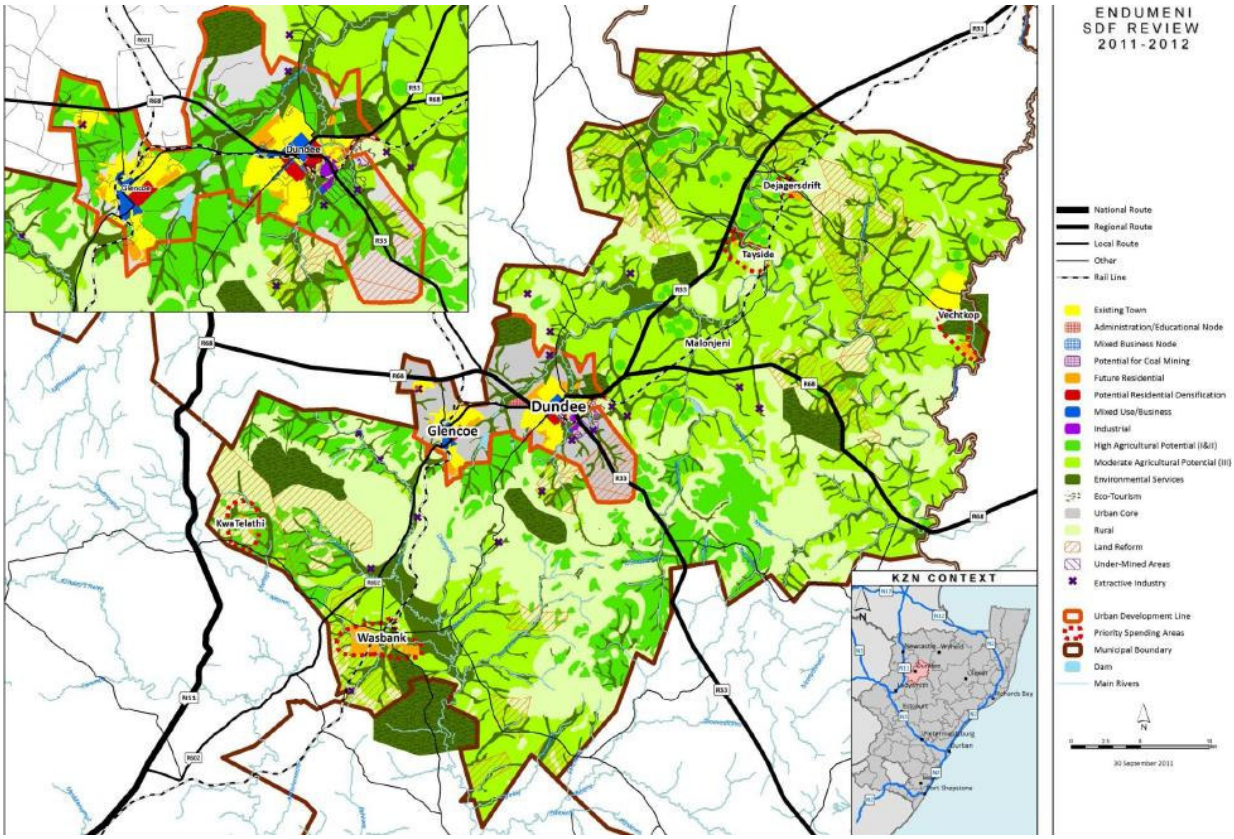


Figure 10: Endumeni Land use Map

9.6 Flora

9.6.1 Regional Vegetation

The Ecological study was conducted by Hydro Science and focussed on the fauna and flora.

According to the South African National Biodiversity Institute (SANBI), forty one (41) threatened vegetation species were previously recorded within the grid square of the project area (2830 - 24 x 27km) and have a probability of occurring on site. Among these species are Aloes, Orchids, species from the Protea family, forest trees, bulbs and flowering plants and can be seen in Table 1 of the report compiled by Hydro Science in 2014. Some of these species are likely to occur as the terrain offers the required habitat, including less accessible forest/woodland on the ridge itself that may contain species of concern including species of cultural or traditional value. However, Hydro Science stated that no ecological survey was conducted and therefore an ecological sweep will be required prior to any clearance and construction activity to determine the locality of species of concern.

9.6.2 Vegetation Communities

The following vegetation communities were identified in the study area:

Grassland community: Dominant grasses identified on site during the field survey include Hyparrhenia hirta (Thatch grass) and Themeda triandra (Redgrass). Other species noted include Tristachya leucothrix (Hairy Trident grass); Eragrostis racemosa (Narrowheart Lovegrass); E. chloromelas (Narrow Curly Leaf), Microchloa caffra (Pincushion Grass); Diheteropogon amplectens (Broadleaf Bluestem); Trachypogon spicatus (Giant Spear grass); Cymbopogon plurinodes (Narrow-leaved Turpentine grass), C. excavatus (Broadleaved Turpentine grass), Digitaria tricholaenoides (Purple Finger grass); Elionurus muticus (Wire grass), Cynodon nlemfuensis (Star grass), C. dactylon (Couch grass), C. Incompletes (Creeping couch grass), amongst many other grass species (Please refer to the report as compiled by Hydro Science Appendix J).

The grassland areas are also characterised by a many different species including geophytic herbs such as Haemanthus humilis, Drimiopsis burkei, D. lachenaloides, Ledebouria ovatifolia, L. floribunda, Gladiolus aurantiacus, G. crassifolius and Hypoxis hermrocallidea. Succulent plants such as Euphorbia clavariodes and Aloe maculata were noted.

Wetland/River vegetation community: There are two main river systems within the project area; tributaries to these systems occur across the project area as well as wetland systems. The vegetation in these communities are aquatic dependant/living plants or indicator species, such as Cyperaceae (Sedges) including Pycreus macranthus, Cyperus rotundus and Fimbristylis complanata; hygrophilous grasses such as Imperata cylindrical (Cottonwool grass); and Reeds (Phragmites australis).

Eroded Areas: In some parts of the project area (western part of Corby Rock 11509 and on the farm Hazeldene 12649) the project area is characterised by gently flat grass areas traversed by mountain ridge rising to about 150-200m above the general ground level. Hillside areas are characterised by thick to sparse vegetation and erosion gullies. It is assumed that this erosion is caused by overgrazing as these areas are seen to be in close proximity the residential house on site and relatively large numbers of livestock were grazing here during the site visit.

Woodlands: Woodland areas were noted in parts of the site. Species observed growing in these areas included Buffalo-thorn (Ziziphus mucronata), Paperbark (Acacia sieberiana var. woodii), Hook Thorn (A. caffra), Sweet Thorn (A. karoo) and Searsia pyroides amongst others.

Agricultural fields: Agricultural fields occur in small areas of the mining area but are not widespread owing to the dolerite boulder outcrops (as seen on Hazeldene portion 3).

Rocky outcrops: Much of the project area was characterised by dolerite boulders with the highest concentration of such outcrops and boulders being on Eastkeal, Corby Rock and Hazeldene portion 3 ERF

9.6.3 Endemic Taxa

Endemic plant species occurring in this vegetation type include Stenostelma umbelluliferum (Near Threatened), Vernonia gerrardii (Least Concerned), Hermannia oblongifoli (Least Concerned) and Habenaria kraenzliniana (Near Threatened) (Http://posa.sanbi.org). Biogeographically important taxa include Aloe modesta and the low shrub Bowkeria citrina (Mucina and Rutherford, 2006).

Ezemvelo has recorded the endemic red data Bowiea volubilis as occurring in this quarter degree square (H. Snyman, per email).

No Red Data List or endemic plant species were observed in the project area during the site visit.

9.6.4 Concluding Remarks

The results of the study determined that the areas of greatest diversity and therefore ecologically the most significant, are located along the south and south-western boundary of the study area, which include the area currently owned by the mine. The areas along the north and north-eastern boundary had been exploited, resulting in the loss of habitat integrity and diversity and should therefore be considered for the majority of infrastructure associated with the proposed mine.

The proposed Malonjeni Mine infrastructure and mining activities would coverrelatively small surface areas of approximately 36ha that will thus be disturbed by mining-related activities. The project area is not pristine and the area has been cultivated in some places and is extensively grazed throughout, but sensitive areas such as wetlands and rocky outcrops encompass large areas within the site. These sensitive systems must be avoided by allocating buffer zones to them and limiting project activities around these areas.

Before construction can commence an ecological sweep needs to be undertaken. The sensitive areas need to be mapped and overlain with the mine layout plan to ensure that sensitive systems are protected. The sensitivity map needs to be incorporated as part of the Environmental Management Programme for the mine and held on site during the construction and operational phase of the mine.

Wetlands are of national concern and therefore the proposed mining infrastructure should be located as far as possible from the any drainage lines and Rivers.

9.7 Fauna

9.7.1 Avifauna

Birds observed during the site visit included several small graminivorous (seed-eating) birds that typically occur in grassland habitat including Larks, Pipits, Chats and Longclaws. Many swallows, swifts and Martins were also noted (refer to appendix B for a list of birds that have been observed in the project area). Many water birds were also seen around the small dams in the project area including several duck species, Ibisises, African Spoonbill, plovers and herons. Raptors were also noted during the visit, perching on telephone poles, including falcons and kestrels.

The Bird distribution data of the first Southern African Bird Atlas Project (SABAP1 –Harrison et al. 1997) were obtained from the Animal Demography Unit website (http://sabap2.adu.org.za/index.php) for the SABAP 1 quarter-degree square covering the proposed development area (2830AB) over the atlas period with 173 species being recorded through the submission of 7 atlassing cards.

Reference was also made to the SABAP 2 pentad data where the project area is seen to be located across two pentads, i.e. Pentad 2755_3005 (47 species recorded for atlassing period) and Pentad 2755_3000 (83 species recorded for the atlassing period) and included as Appendix B form the report compiled by Hydro cience, 2014. This information on birds recorded in the area was refined by a more specific assessment of the actual habitats affected and general knowledge of birds in the region, to draw up an inclusive list of expected avifaunal species.

During the SABAP1 study, a total number of 173 species were recorded for the 2830AB quarter degree square (Harrison, et al, 1997). In the SABAP 2 for the pentad 2755_3005 and 2755_3000, 83 species were recorded (Hydro Science, 2014). Several Red-list species are recorded for these two pentads (Table 8). *None of these species were recorded during the site visit.*

Table 10: Red List avifauna species (Source: SABAP 1 (Harrison, 1997) and SABAP 2 (http://sabap2.adu.org.za/index.php)

Ref No	Common Name	Scientific Name	IUCN Status
82	Southern Bald Ibis	*Geronticus calvus*	Vulnerable
114	Lanner Falcon	*Falco biarmicus*	Least Concern
183	**Lesser Kestrel**	***Falco naumanni***	**Vulnerable**
123	White-backed Vulture	*Gyps africanus*	Endangerd
119	Amur Falcon	*Falco amurensis*	Vulnerable

The KwaZulu-Natal Ezemvelo have recorded the White-backed Vulture (Gyps africanus), a species that is classified as Endangered in terms of the most recent IUCN Red List of threatened species, as occurring in the quarter degree square. This is the most widespread and common vulture in Africa although it is now undergoing rapid declines. Its habitat includes lightly wooded arid savannah and is known to roost at night in tall acacias and on power pylons. During the site visit, an unconfirmed sighting of two large birds similar to a bustard or korhaan was seen. Based on Hockey, et al (2005), it is likely that the birds were either a Black-bellied Bustard (Eupodotis melanogaster) or White Korhaan (Eupodotis senegalensis) that are likely to occur in the area.

9.7.2 **Mammals**

The study area includes a variety of land uses and therefore variations in faunal habitat. The dominant land use to the east of the R565 is game farming and associated activities (such as hunting); in contrast, the dominant land use activities to the west of the R565 are crop agriculture and cattle farming.

Data on the distribution of mammals using Smithers' Mammals of Southern Africa (Apps, 2001) indicate that up to 56 mammal species may occur in the greater project area (Hydro Science, 2014). Discussions with local farmers indicate that both small and large buck species occur in the project area including Bushbuck, Grey Rhebuck, Steenbok, Duiker, and Mountain Reedbuck. Other animals known to occur in the area include Water Mongoose, Porcupine, Rock dassie, Slender Mongoose and feline species such as Genet and Lynx.

9.7.3 **Reptiles**

Alexander and Marais (2007) indicate that more than 50 snake species may occur in the study area with the Southern African Python and the Striped Harlequin Snake being two Red Data species that may occur in the region (Hydro Science, 2014). Other reptilian species that may occur in the study area include Agamas, Chameleons, Monitors, Lacertids (*Skinks*), Cordylids (Crag, Flat and Plated Lizards), Geckos, such as the Marsh Terrapin (*Pelomedusa subrufa*) and Tortoises including the Natal Tortoise, a Near Threatened species. Red data species that may occur in the project are listed in the report from Hydro Science 2014. No reptiles were observed during the site visit although it is likely that many reptilian species may occur in and around the rocky outcrops that characterise the project area.

9.7.4 **Amphibian**

The surface water bodies in the project area provide suitable habitat for many amphibian species including the Natal Sand Frog (Tomopterna natalensis) as most frogs need standing bodies of water for breeding and may breed in the river.

Although Ezemvelo did not list any amphibia in their database, the following species are known to be Red-listed species that may occur in the project area:

- Breviceps bagginsi is a species of frog in the Microhylidae family. It is endemic to South Africa. Its natural habitats are temperate grassland and plantations. It is threatened by habitat loss. Its Red list status is DD (Data Deficient);
- Whistling Rain Frog (*Breviceps sopranus*) is a species of frog in the Microhylidae family. Its natural habitats are temperate forests, dry savannah, moist savannah, and sandy shores. It is threatened by habitat loss. Its Red list status is DD (Data Deficient); and
- Long-toed tree frog (Leptopelis xenodactylis) is Red-listed as Endangered.

9.7.5 **Concluding Remarks**

Sensitive areas need to be earmarked and mapped and overlain with the mine layout plan to ensure that sensitive systems are protected. The sensitivity map needs to be incorporated as part of the Environmental Management Programme for the mine and held on site during the construction and operational phase of the mine. Any additional studies recommended during this process needs to be incorporated together with the approval from Ezemvelo Wildlife.

Wetlands are of national concern and therefore the proposed mining infrastructure should be located as far as possible from the any drainage lines and rivers.

Recommendations that should be implemented in the Environmental Management Programme include:

- Remain within demarcated areas during construction to limit disturbances to surrounding areas;

- Avoid sensitive areas such as rocky outcrops and wetland/river systems by remaining outside of the required buffer zones;
- Remove all exotic/invasive species as CARA, 1983 (Act 43 of 1983) requires;
- Limit construction activities to the day time and working hours for the purpose of not disturbing activities and ecological processes of nocturnal birds, small mammal etc;
- Have a Waste Management Plan in place so as not to pollute the site or surrounding ecology thereby further reducing the ecological integrity; and
- Limit dust and the spreading thereof to surrounding vegetation on site.

This study has shown that there are no fatal flaws from an ecological perspective as to why proposed coal mining project should not be approved on condition that the proposed mitigation measures are strictly applied.

9.8 Surface Water

The study area falls into the Thukela Water Management Area 7, into two Quaternary Catchments V32E and V32F. The eastern portion of the study area drains into the Buffels River, and the western portion of the study area drains into the Madikazi and Sandspruit.

9.8.1 Description of General Catchment Area

The Thukela water management area is predominantly rural in character with forestry, agriculture and eco-tourism as primary activities. Newcastle is the major industrial centre and the only other significant industrial activity at present is a large paper mill near Mandini.

Because of the high mean annual runoff and favourable topography, the Thukela basin offers some of the best opportunities for water resources development in South Africa. Although several large dams have already been constructed in the upper reaches of the Thukela River and on the main tributaries, substantial undeveloped resource potential remains. One of the largest inter-catchment transfer schemes in the country conveys water from the Upper Thukela River to the Upper Vaal water management area. Other water transfers are from the Mooi River to the Mgeni River in the Mvoti to Umzimkulu water management area, from the Buffalo River to the Upper Vaal water management area, and from the lower Thukela River to the Usutu to Mhlutuze water management area. Owing to the relatively well-watered nature of the catchment, only a small proportion of the water requirements is supplied from groundwater.

The general water users in the Thukela Management Area are Irrigation, Urban, Rural, Mining and Bulk Industrial, Power Generation and transfer to other water schemes.

The project area has man-made dams from previous mining activity in the 1980's and others created by farmers. A total of 13 dams were cited in the wetland delineation report and these dams will be ideal for surface water monitoring

In addition Citofield compiled an Integrated Waste Management Plan (IWMP, 2014) (Appendix D) providing management tools on the water catchment within the study area and to minimise the impact of the mine on the water courses. Effective surface water management and monitoring is essential for the long term sustainability and protection of the receiving water environment. There is a legal obligation on the water user to establish a monitoring programme on the site. In addition please refer to Appendix K for the monitoring programme developed for the mine.

9.8.2 Water Quality

Malonjeni Mine has implemented a monitoring program to establish the *baseline conditions* in the catchment and to determine whether their mining activities have a negative impact on the receiving water environment. The monitoring points are described in the monitoring plan (**Appendix K**) and the Geo-Pollution Plan (**Appendix L**).

The parameter to be noted are a difference between the pH values, TDS, Total Hardness, SO4, Calcium, Magnesium and Aluminium between the upstream. Similarly the TDS and SO4 concentrations increased substantially indicating mining related impacts on the Thukela.

9.9 Wetlands

Wetlands are classified in terms of their position in the landscape, and the classification was done according to their hydro-geomorphic setting. Aerial photos, 150 000 topographic maps, satellite photos and GPS points are used to guide on the screen delineation of wetlands. Field verification consisted of several line transect surveys. From a functional perspective, wetlands within the study area serve to improve habitat within and downstream of the study area through the provision of various ecosystem services such as stream flow regulation, flood attenuation, groundwater recharge,

nitrogen removal, phosphate removal, toxicant removal, particle assimilation and provision of natural resources.

Ixhaphozi Enviro Services compiled a Wetland delineation study for the proposed project (Appendix M). Four palustrine wetlands were identified in the study area- a valley bottom wetland with a channel, a valley bottom wetland without a channel, a hillslope seepage feeding a water course and a hillslope seepage not feeding a water course.

A variety of wetland types occur in the study area including valley bottom (channelled and unchannelled) and hillslope seepage (isolated and linked to a stream) wetlands. Extensive erosion (15 - 20% of the study area of ~ 3000 ha) of the foot slopes and valley bottoms occur. These erosion features are part of this landscape since the Late Pleistocene and inchannel wetlands has formed in many of these. Figure 11 Wetland Delineation of the Study Area.

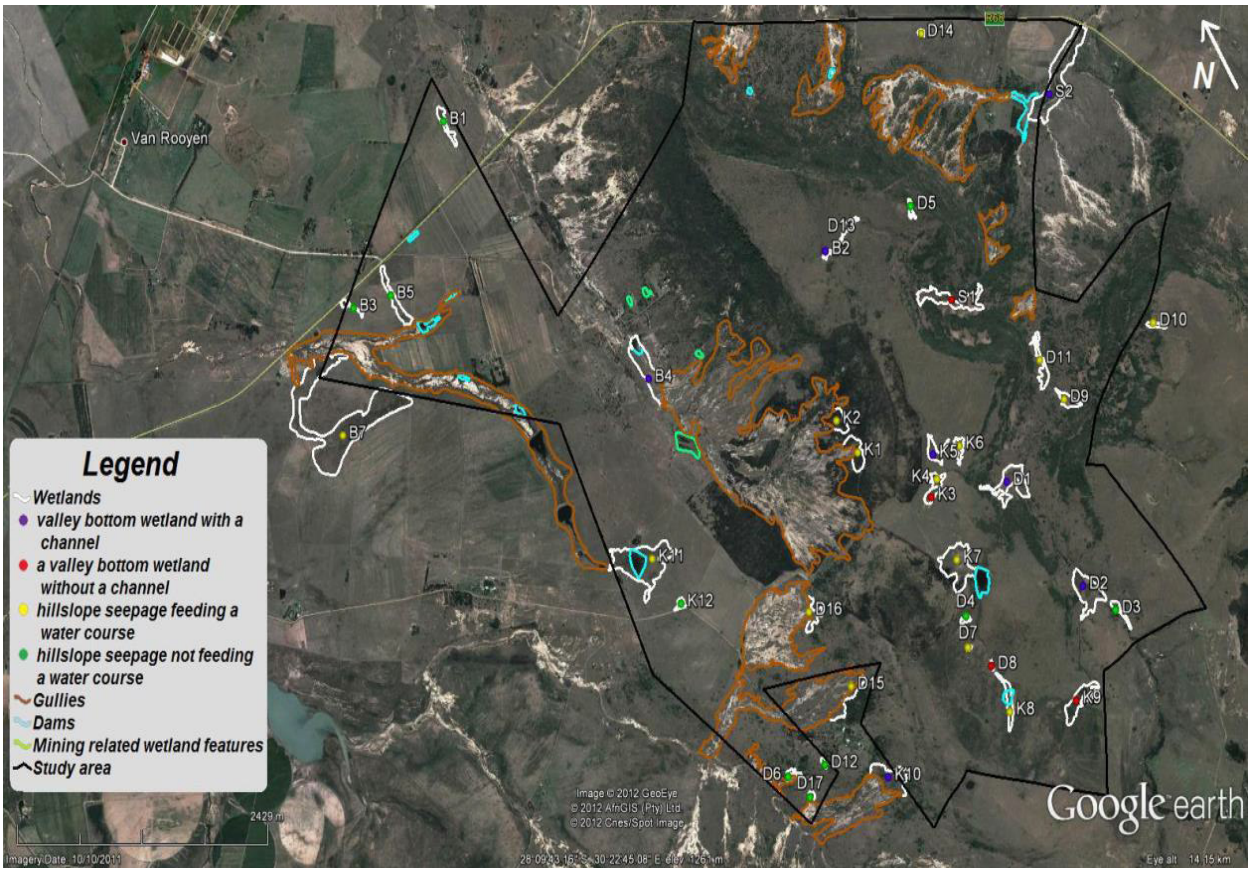


Figure 11: Wetland Delineation for the Study Area

Wetlands are in general more common and wetter in western part of the study area and this is probably as a result of the more extensive occurrence of the Masotcheni Formation on the western slopes of the Malonjeni Ridge which act as a recharge area for groundwater. The majority of the wetlands observed on site are to some extent groundwater dependant. Impacts range from erosion, cultivation, roads, trampling to mining to water abstraction (from previous mining activities), as well as acid mine drainage (AMD) and pollution.

9.9.1 Recommendations

Impacts on wetlands as a result of mining activities should be avoided through investigating and designing appropriate mitigation measures. Herewith the following recommendations:

- The intrusion of the mine into the depression wetland's original footprint raises concern for potential contamination of water through contact with carbonaceous material contained within the buried spoils. It is therefore strongly recommended that water contact and infiltration into the spoils be avoided. Further, effective water separation of the current wetland area from the buried spoils area, without draining the wetland, should form a key point within the rehabilitation design of current mining operations.
- Buffer Zones around the wetland areas need to be implemented.
- A detailed field assessment and delineation should be part of future assessments.
- The groundwater dependency of the majority of wetlands (as well as the springs) should be considered in future assessments and management plans.
- The dependency of households, livestock and cultivation on seepage areas and springs should be noted and assessed in future assessments and management plans.
- Construction of dams in drainage lines and wetlands not eroding should be discouraged.
- A wetland management plan, as part of larger water use plan, encouraging erosion control must be implemented, but the dynamic nature of the erosion should be considered.

9.10 Groundwater

Geo-Pollution Technologies was commissioned to conduct the geohydrological study. The geohydrological investigation for Malonjeni Mine entailed a regional and quantitative site specific investigation pertaining to the geohydrology of the study area, in accordance with the various guidelines and documents obtained from the regulating authorities.

9.10.1 Current Groundwater Conditions

Groundwater levels were measured in nine boreholes during a hydrocensus conducted in January 2013 for the proposed Malonjeni underground mine on the farms Hazeldene 12649, Corby Rock 11509, Lot W 8601, Terrace 3707, Rem of Eastkeal 5138 and ptn 8 of Winkle 5054. The depth of the groundwater was found to vary between 3m and 17m below ground level.

A seasonal aquifer perched on the bedrock probably develops in the upper weathered soil layer, especially after high rainfall events. Flow in this perched aquifer is expected to follow the surface contours closely and emerge as fountains or seepage at lower elevations.

From the chemical analysis of the water samples an overall assumption can be made that the groundwater sampled in the proposed mining area is acceptable for domestic use in terms of the DWA water quality guidelines. It can be deduced from the water quality of the sampled boreholes that the groundwater has not been negatively affected by historic mining related contaminants with the exceptions of TRD18 and TRD20.

9.10.2 Hydrocensus

Groundwater resources are spatially widespread (26 boreholes and 6 surface water points were found in the area), but no borehole yields were reported.

A hydrocensus was conducted for the proposed underground mining site and in the surrounding area, during January 2013. The position of all the boreholes relative to the mining area can be seen in Figure 12. A total of 26 boreholes and 6 surface water bodies and streams were identified during this hydrocensus study. The main characteristics of this data are summarized in the report compiled by Geo Pollution Technologies. There were a number of privately owned boreholes identified. These are utilised for various activities such as watering of life stock and horses, domestic use and small scale irrigation. Hydrocensus field forms containing details of the owner and use are attached under Appendix L as separate PDF-files within the report.

The potential groundwater receptors in the area are the surface water points and it is important that these are included in the monitoring network. Therefore the Dumangezi and the unnamed stream on the farm Hazeldene in the proposed site can be considered as potential receptors.

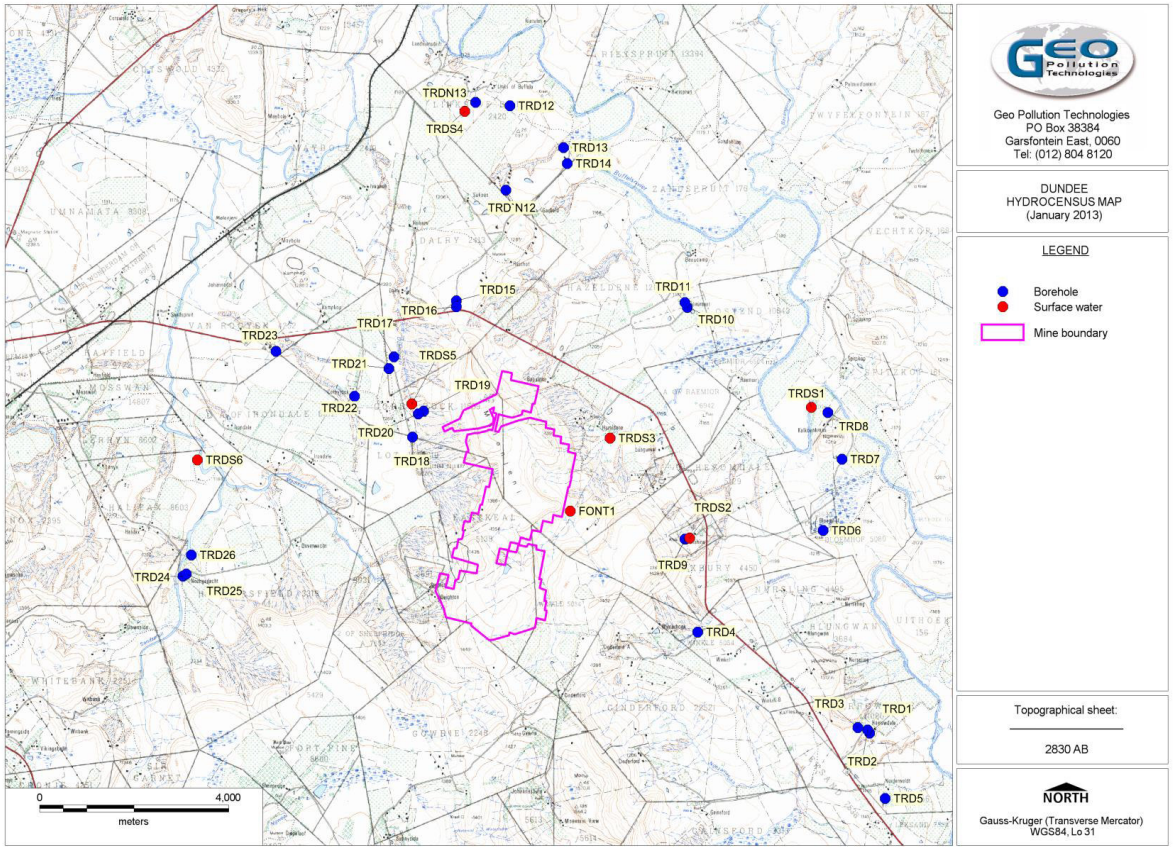


Figure 12: Positions of Hydrocensus Monitored Points

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9.10.3 **Predicted Impact on Mining**

The impacts on the groundwater regime normally associated with mining is dewatering of the aquifer during mining and pollution of the groundwater following mine closure. The dewatering is essential to allow access to the mining areas, while the pollution is due to chemical weathering by oxidation of the sulphur containing minerals (mostly pyrite).

During mining, groundwater seeping into the underground mining areas will have to be pumped out to facilitate access. This will inevitably lead to a lowering of the groundwater table and the development of a local cone of depression. This cone of depression will also contain pollution resulting from mining. Polluted groundwater pumped from the mine will be used for mining purposes.

Post mining, following the closure of the underground and discontinuing of dewatering, the groundwater levels will return to equilibrium. The cone of depression that contained polluted groundwater will cease to exist and movement of a groundwater pollution plume will commence.

Numerical groundwater modelling is considered to be the best method of anticipating and quantifying these likely impacts on the groundwater regime. For this purpose, a numerical model was created using the Department of Defence Groundwater Modelling System (GMS) software as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes

Based on the results of the modelling, the following conclusions are made:

Construction Phase:

The construction phase will consist of preparations for the underground, which is assumed to consist mainly of establishment of infrastructure on site and the mobilisation of earth moving equipment. This phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality.

Operational Phase:

Since the coal seam is situated below the groundwater level, the lowering of the groundwater level during mining will be important. *There are no privately owned boreholes in the potential affected area that might experience a decline in water levels of approximately 5 metres or more*. Base flow of the surrounding streams/rivers is unlikely to be affected due to the cumulative effect of drawdown resulting from the dewatering of the underground. All of the above conclusions were based on the assumption that the surrounding streams/rivers have not been previously affected by underground mining activities.

Post Mining Phase:

Post mining, after closure, the water table will rise to reinstate equilibrium with the groundwater systems. The mined areas will have a large hydraulic conductivity compared to the pre-mining situation. This will result in a relative flattening of the groundwater table over the extent of mining, in contrast to the gradient that existed previously.

- Following closure of the underground, the groundwater level will rise to an equilibrium that will differ from the pre-mining level due to the disturbance of the bedrock and increase in recharge from rainfall.
- Intuitively, it would be expected that this raise in groundwater could result in decanting of the underground as predicted by the groundwater model.

- Groundwater within the mined areas is expected to deteriorate due to chemical interactions between the geological material and the groundwater. The resulting groundwater pollution plume will commence with downstream movement.
- The sulphate contamination plume emanating from the underground mine is predicted to reach the Madikazi river on the farm Huddersfield; the unnamed tributary of the Buffels River on the farm A of Raemior 6942; the Dunlangezi tributary of the Sandspruit on the farm LOT W 8610; and the unnamed tributary of the Buffels River on the farm Hazeldene 12649 in about 100 years after mine closure and rebound of the groundwater levels in the shallow aquifer.
- Five identified privately owned boreholes are likely to be affected by the sulphate pollution plume. These boreholes include TRDS3, TRDS5, TRD18, TRD19 and TRD20. Also, the surface water point, Font1, is likely to be affected.

It must be kept in mind that the modelling was done within the limitations of the scope of work of this study and the limited amount of monitoring data available. Although all efforts have been made to base the model on sound assumptions and has been calibrated to observed data, the results obtained from this exercise should be considered in accordance with the assumptions made.

9.11 Groundwater Management and Mitigation Measures

Since it is inevitable that a mining operation of this scale will impact on the groundwater regime, measures to manage and reduce these impacts to the absolute minimum must be considered. The identified negative impacts of reduction of the groundwater levels during mining and the spread of groundwater pollution after closure of the underground will be addressed in the following paragraphs.

9.11.1 Lowering of Groundwater Levels during Mining

Since the drawdown or the groundwater levels during mining could influence some boreholes, the following measures are recommended:

- The static level of groundwater in all boreholes within a distance of less than one kilometre must be measured regularly to establish a database against which future groundwater levels can be compared.
- Such measurements must be made preferably quarterly, but at least twice annually, following the dry and rainy seasons.
- In the event of unacceptable decrease of the yield of any affected boreholes, alternative water supply should be supplied to the affected parties until such time that the groundwater recovers following closure of the mine.
- It is recommended that the underground keep a distance of at least 150m from the surrounding Madikazi River on the farm Huddersfield; the unnamed tributary of the Buffels River on the farm A of Raemior 6942; the Dunlangezi tributary of the Sandspruit on the farm LOT W 8610; and the unnamed tributary of the Buffels River on the farm Hazeldene 12649.
- Another very important aspect to consider is the layout and order of the underground cuts. The best possible scenario for minimising impacting on the surrounding streams/rivers is to start the adit construction at the farthest point from the surrounding streams/rivers. In such a mining scenario the impact on the surface water bodies will be delayed to the latest possible time before closure of the underground.

9.11.2 **Rise of Groundwater Levels Post-Mining**

As it is predicted that there will be a rise in groundwater levels in the lower sections of the underground that could result in decanting, some measures are needed to mitigate this. It is thus recommended that in order to minimise decanting from the underground, all direct connection (if applicable) between the underground areas and surface should be thoroughly sealed.

9.11.3 **Spread of Groundwater Pollution Post-Mining**

Predictions in the previous sections regarding groundwater pollution have been based on the assumption that the rehabilitated underground will be a constant source of sulphate pollution of 2000 mg/l, representing a worst-case scenario. With appropriate measures, the oxidation rate of pyrite can be limited, resulting in lower starting concentrations. Thus, although it has been predicted that only a limited area of the aquifer might be polluted to such an extent that acceptable standards for domestic water is exceeded, further reduction is achievable.

To minimise the effect of groundwater pollution on the receiving environment, the following measures are suggested:

- All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite.
- Mining should remove all coal from the underground and as little as possible should be left.
- Quarterly groundwater sampling must be done to establish a database of plume movement trends, to aid eventual mine closure.
- Regular sampling and chemical analyses of the groundwater is imperative to establish a sound database:
- Groundwater in all boreholes within a distance of less than two kilometres must be sampled regularly to establish a database against which future groundwater levels can be compared.
- Sampling must be preferably quarterly, but at least twice annually, following the dry – and rainy seasons.
- If it is found during such a sampling event that groundwater from any extraction borehole is polluted beyond acceptable standards, alternative water will have to be supplied to the affected party by the mine.

9.11.4 **Impact Indirectly related to Mining**

During all phases of mining, vehicles and personnel will be operative in the underground. Minor spills such as diesel, petrol and oil could results from machinery operations. Also, domestic water and waste disposal could also affect the groundwater quality. The following is thus recommended:

- It must be ensured that a credible company removes used oil after vehicle servicing.
- A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills.
- Used absorbent fibre must be land-farmed, using approved methodologies.
- Domestic waste water, especially sewage, must either be treated at site according to accepted principles, or removed by credible contractors.

- Solid waste must similarly either be stored at site on an approved waste dump, or removed by credible contractors.

9.11.5 **Future Work**

The following further work is recommended

- There are five impact/plume monitoring boreholes that match the criteria as mentioned in the preceding paragraphs. These boreholes are TRDS3, TRDS5, TRD18, TRD19 and TRD20. Therefore at least 4 to 6 monitoring holes are recommended to be constructed around the underground at positions, inferred from modelling, to be located within plume movement pathways. These boreholes should be sited using geophysical methods and the drilling should be overseen by a qualified hydrogeologist. The newly constructed monitoring boreholes should also be pump tested by a credible company to obtain a further understanding of the hydraulic properties of the aquifer
- A monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources. An audit on the monitoring network should be conducted annually.
- The numerical model should be recalibrated as soon as more hydrogeological data such as water levels in monitoring holes are made available. This would enhance model predictions and certainty.
- The monitoring should commence before mining to establish background values for future reference.

9.12 Air Quality

Atmospheric emissions, more particularly particulate matter, represent the environmental aspects of concern in the current study. In assessing the impact of particulate emissions a distinction needs to be made between Total Suspended Particulates (TSP) and thoracic particulates. Although TSP may be defined as all particulates with an aerodynamic diameter of less than 100 µm, an effective upper limit of 30 µm aerodynamic diameter is frequently assigned. Thoracic particulates are generally defined as particulate matter with an aerodynamic diameter of less than 10 µm (PM10). PM10 has health implications since it represents particles of a size that would be deposited in, and damaging to the lungs.

In the assessment of the potential for air quality impacts on the surrounding environment and human health, a good understanding of the regional climate and local air dispersion potential of a site is essential.

9.12.1 **Sources of current air emissions**

Coal mines

Numerous coal mines are located within the study area. Fugitive emissions from opencast and underground mining operations mainly comprise of land clearing operations (i.e. scraping, dozing, and excavating), materials handling operations (i.e. tipping, offloading and loading, conveyor transfer points), and vehicle entrainment from haul roads, wind erosion from open areas and drilling and blasting. These activities mainly result in fugitive dust releases with small amounts of NOx, CO, SO2, and methane with CO2 being released during blasting operations.

Other Sources of Emissions

Non-industrial sources of combustion products include domestic fuel burning (primarily coal and wood), biomass burning, and vehicle emissions. Domestic fuel burning has been identified as being a significant source in terms of impacts on local air pollutant concentrations and human exposures.

9.12.2 **Material Handling**

Materials handling points at the Malonjeni opencast mine include in-pit excavation operations, backfilling and tipping of material onto trucks and stockpiles. The quantity of dust which will be generated from such loading and off-loading operations will depend on various climatic parameters, such as wind speed and precipitation, in addition to non-climatic parameters such as the nature (moisture content) and volume of the material handled. Fine particulates are most readily disaggregated and released to the atmosphere during the material transfer process, as a result of exposure to strong winds. Increases in the moisture content of the material being transferred would decrease the potential for dust emission, since moisture promotes the aggregation and cementation of fines to the surfaces of larger particles.

9.13 Noise

The noise study was performed by Mr P Maroun and aimed to record the baseline noise conditions within and surrounding the proposed mine area. The results are attached to **Appendix O**.

9.14 Sites of Archaeological Interest

9.14.1 Assessment Methodology

Desktop Study:

The desktop study consisted of the following:

- Review available literature, previous heritage studies, and other relevant information sources;
- Gather data and compile a background history of the area; and
- Identify all known and recorded archaeological and cultural sites; and determine whether the area is renowned for any cultural and heritage resources, such as Stone Age sites, Iron Age sites, informal graveyards or historical homesteads.

Field Study:

The purpose of the field study was to systematically survey the proposed surface infrastructure in order to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest and record GPS points of significant areas identified. The levels of significance of the various types of heritage resources recorded in the project areas were also determined.

9.14.2 Outcome of the Study.

Archaetnos Culture & Cultural Resources was commissioned to conduct the Heritage Impact Assessment. Please refer to Appendix N for a copy of the Heritage Report and findings. Archaetnos identified thirty (36) sites of cultural significance. Please refer to Figure 13 and 14.

Farm workers and farmers talked to in the area indicated that they may even be aware of more grave sites on top of the mountain, but they were unsure of exactly where these are located. It therefore does seem as if there probably are more sites than what were found.

This is an important aspect that needs to be considered during any future activities in the mining area. Any possible identification of additional cultural heritage resources should be dealt with in accordance with the recommendations set out below.

The recommendations are as follows:

- This document should be rewritten at least once every five years or every time a new development is planned (whichever comes first).
- This management plan should be consulted continuously and especially when any new developments are planned.
- Most importantly, should any developments be done in future, the excavations around these should be monitored for the possible existence of archaeological material. If identified, an archaeologist should immediately be contacted to assess the matter.
- It should be remembered that due to the factors indicated in the report, it is possible that all cultural sites may not have been identified. Also the subterranean presence of archaeological and/or historical sites, features or artifacts are always a distinct possibility. Care should

therefore be taken when development work commences that, if any more sites and artifacts are identified and uncovered, a qualified archaeologist be called in to investigate.

- Any sites, features or artefacts identified as mentioned above (recommendation 3 and 4) should be included in this management plan.
- The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan.
- The necessary measures should be put in place to stop any possible degradation of cultural resources on the reserve (see management guidelines at each individual site).
- The social value of the cultural heritage resources at the mine should not be under estimated. The mine could easily use this for social responsibility and community liaison issues.
- Visits to the different sites should be monitored in order to prevent any damage thereto.
- Information educating staff members (and perhaps even visitors) with regards to the National Heritage Resources Act and indicating that it is an offence to damage historical resources should be available and should become part of the induction process at the mine.
- The staff at the mine as well as others involved in the management thereof (including new appointees) should be educated with regards to all aspect mentioned in this management plan. This will assist in the monitoring of sites, but will not on its own solve this problem.
- The fencing of certain resources and keeping the vegetation in control (see management guidelines) is a very important first step that should be implemented urgently.
- Partnerships should be formed with concerned parties order to get these people involved in the preservation and conservation of the cultural heritage at the mine.
- This document should be used to assist in planning, and care should be taken that sites are not demolished without reason. This basically means that all sites should be left as it is, should there not be any reason to intervene.
- It should be noted that even if there is no direct impact there usually is a secondary impact. This includes possible blasting damage, dust etc. Therefore mitigation should also be engaged into in the latter case.
- Sites number 4-10 were identified within the area of impact and will have to dealt with different than others.
- Site no. 4 is of a low cultural significance and may be demolished if needed. No further mitigation is needed. However, since the mining operations will be underground, the site should be left as it is.
- The following sites may also be demolished if needed, but has to be recorded first: 5, 6, 7 and 9. However, since the mining operations will be underground, the sites should be left as it is.
- Site no. 8 may be demolished if necessary, but has to be mapped first as it is regarded as having a higher cultural significance than other similar sites. However, since the mining operations will be underground, the site should be left as it is.
- Site no. 10 is of a high cultural significance. It may not be demolished and will have to be preserved by the mine. Although there will be no direct impact, possible secondary impact is

foreseen (e.g. moving of vehicles and people on site). It means the fencing of the site and that a heritage management plan should be written by a heritage expert.

- All the other sites (1-3, 11-30) were identified outside of the area of impact.
- The following sites are of a low cultural significance and may be demolished should future developments impact thereon: 1, 2, 3 and 22. However, since there is no impact foreseen now, it should be left as it is.
- Site no. 11 is of a high cultural significance. They may not be demolished and will have to be preserved by the mine. That would include having a heritage management plan written by a heritage expert. Currently there is no impact foreseen, but the site can easily be reused by the mine.
- The following sites may also be demolished if future developments impact thereon, but has to be recorded first: 13 and 26. For now, it should be left as it is.
- The grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance. Exhumation is usually the second option, but sometimes it is impossible to prevent. These sites will not be impacted on directly. Due to the possible secondary impact, a heritage expert should write a management plan for each of these sites. It also should be fenced in properly, maintained, managed and preserved. Access to possible descendants should be allowed.
- Site 18 (grave on pillar) also is of a high cultural significance. However due to the specific circumstances of erosion that endangers the site, the grave will have to be exhumed and the human remains reburied. This has to be done in accordance with the legislation discussed above. For this a detailed social consultation process is needed. An undertaker is always involved and an archaeologist is only needed for unknown graves and those older than 60 years. Certain permits need to be obtained, but the mentioned parties will take care of that. Table 1 indicates a risk assessment for the two options in dealing with graves. In this particular case it may perhaps be reburied at one of the other sites (as near as possible) found.
-

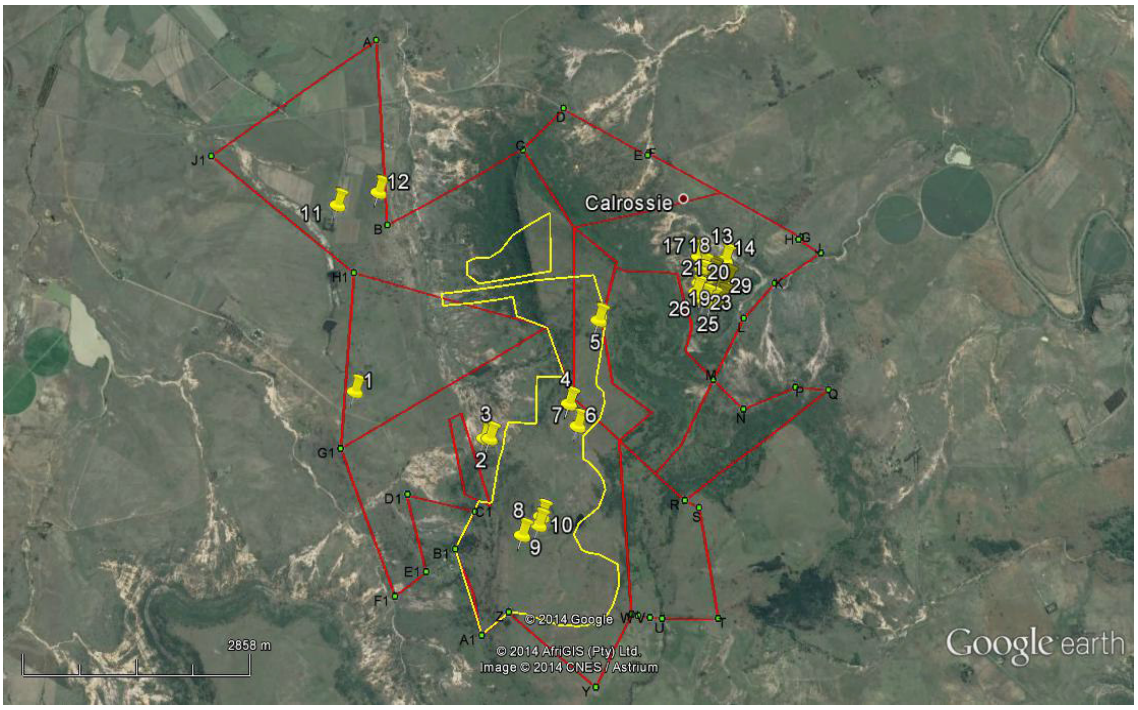

Figure 13 Google image indicating the sites identified during the survey as well as the area of possible impact (yellow).

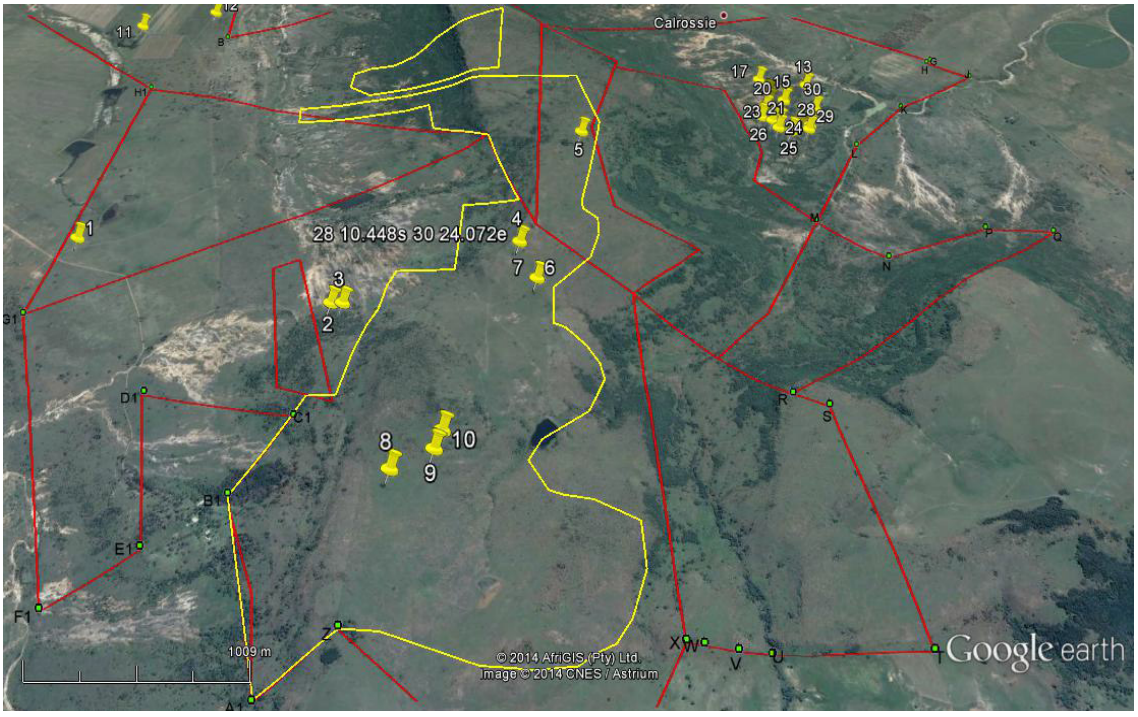

Figure 14 Closer view of the mining area indicating the sites within the area of possible impact. These are numbers 4-10.

9.15 Traffic

The CAPEX estimates in this report provide for un-surfaced access roads to the process plant and associated buildings and to the adit. These roads are typically 8m wide with sufficient layer works to allow for the predicted wheel loading of the coal transport vehicles. The distance from the Provincial road to the Adit is 2.5km. Routes have been selected to minimize the length of new road works from the existing road network to and on the mine. The intersection point with the Provincial Road is based on the survey data provided and its extrapolation using Google. This allowed calculation of sight distances. The access point has been taken as the existing farm access on the assumption that this has been previously accepted by the Provincial Roads Department. The plan and long-section are shown on drawing number H344476-01-400-001 as part of Appendix F.

Mine personnel will commute to and from the proposed site using taxis, buses and private cars. Parking and drop-off facilities will be provided for.

The coal produced by the mine will be transported to the final destination using trucks. Approximately 5-6 trucks per day will enter and exit the mine. These trucks will make use of the existing R68 for the delivery of the coal to existing facilities in the area.

All consumables will be delivered to site via road by registered carriers. This will also apply to all waste removed from site.

9.16 Socio-Economic Environment

Each community is unique as it is shaped by: social networks, cultural influences, norms and values, politics, and the infrastructure in the area. The report therefore provides an overview of the social characteristics of the area in order to determine its current capacity and its ability to manage change.

9.16.1 General Description of the Study Area

Reference is made to the Social and Labour Plan (Appendix I) for the baseline socio-economic information. The Endumeni Local Municipality (ELM) is located 360 kilometres south east of Johannesburg and 290 kilometres north of Durban. The area is in the Biggarsberg Valley in the foothills of the Drakensberg. The Municipality is generally accessed by turning off the N3 highway onto the N11 then proceeding onto the R68 into the municipal area. The ELM area is one of four local authorities forming the uMzinyathi District Municipality. The local municipalities comprising the District are

- Endumeni (KZ 241);
- Nquthu (KZ 242);
- Msinga (KZ 244); and
- Mvoti (KZ 245).

ELM has the smallest population but the largest economy of the local authorities in the District, with its focus on the main urban areas of Dundee and Glencoe. The Endumeni Municipality (KZ 241) comprises the towns of Dundee, Glencoe and Wasbank, together with a number of farms astride MR 33, MR 68 and DR 602. It should be noted that no Ingonyama Trust land is located within the Municipal Area.

9.16.2 Key aspects of the affected municipalities and other stakeholders

The proposed property area falls within the jurisdiction of the Endumeni Local Municipality area (ELM) within the greater Umzinyathi District Municipality (UDM) in Kwa-Zulu Natal.

9.16.2.1 Umzinyathi District Municipality

The uMzinyathi District Municipality is one of the 11 district municipalities ("districts") of KwaZulu-Natal province in South Africa. The seat of uMzinyathi is Dundee. The majority of its 510 838 people speak IsiZulu (2011 Census). There is 113 469 households with an average of 4.4 individuals comprising a household.

The municipality is bordered in the north by Amajuba Municipality, in the west by uThukela Municipality, in the south-west by uMgungundlovu Municipality, in the south-east by iLembe Municipality, and in the east by uThungulu Municipality.

The main economic sectors are: Community, social and personal services (27.4%), agriculture, hunting, forestry and fishing (22.6%), wholesale and retail trade (15.9%), manufacturing (14.8%), financial, insurance, real estate and business services (7.3%), electricity, construction (6.3%), transport, storage and communication (3.5%).

The official unemployment rate in the District is 36.6% and among the youth (individuals between the age of 15 and 34) a 45.6% unemployment rate prevails.

9.16.2.2 Endumeni Local Municipality

Endumeni Local Municipality is an administrative area in the Umzinyathi District of KwaZulu-Natal in South Africa. Endumeni is an isiZulu name meaning "a place of thunderstorm". The municipality shares its name with the Endumeni hill.

The ELM is situated between Durban and Johannesburg, with well-established road, rail and air infrastructure making the Endumeni region the geographic centre of northern KwaZulu-Natal. The town of Dundee acts as the service centre for northern Natal. Dundee and Glencoe have well-established and serviced areas for light-to-medium industry. These towns have a good, consistent supply of water, with six dams and a pipeline from the uMzinyathi/Buffalo River feeding the areaThe main economic sectors include: Social services (22.16%), trade (13.64%), private household/domestic workers (13.49%), farming (9.57%), manufacturing (7.39%), and business services (4.93%). The low uptake of employment of the construction, mining, food and transport industries is of concern and indicates that the economic base of the area is not diversified but concentrated within a few tertiary sectors. According to the ELM IDP (2012 – 2017), the mining sector only employees 260 individuals. This sector, however holds the potential to increase this figure through new labour intensive development of coal mines. Labour intensive methods not only create job opportunities but could trickle down the economy of the ELM.

The ELM is also situated in prime agriculture area which comprises adequate feeding lots and a suitable soil conditions for farming and livestock. The general farming system throughout the area is one of mixed farming with livestock, mainly beef cattle, utilising the grazing land (which is largely the non-arable land) but with a varying emphasis on cropping depending on local soil and climatic conditions. This pattern is logical and is to be encouraged provided that livestock numbers are kept within the carrying capacity of the veld. This is essential because there is evidence of past damage, on a massive scale, to the area as a result of soil erosion.

The development of sustainable living environments is high on the agenda for Endumeni and the other local municipalities within the UDM. This is particularly relevant to roads and stormwater provision in relation to housing delivery.

The area's tourism potential lies in the battle sites as well as Zulu cultural experiences, craft and birding routes, games reserves, fishing, white water rafting, horseback safaris and 4X4 tracks. As a tourist destination, Endumeni serves as the hub from which historical/cultural tourism routes are launched into the broader Battlefields destinations of Nquthu and uMvothi areas.

9.16.2.3 Wards and settlements in the study area

The study area falls within Wards 3 and 6 of the ELM.

9.16.3 **Social Profile: ELM**

9.16.3.1 Population Figures

The population of the ELM area, as determined in the 2011 census, was 44 862 individuals, of which 70.1% were of African origin. The gender split was relatively evenly balanced at 50.95 for females to 49.02 for males.

The age structure of the population in ELM was, according to the Census 2011 statistics as follows: 31.40% of the population was under 15 years of age, 63.8% was between the age of 15 to 64 years and 4.8% made up the population over 65 years. The population growth was estimated at 2.38% per annum.

9.16.3.2 The age profile over the past ten years has not changed significantly and shows a constant, wide bell shaped distribution with a large proportion of the population being young people between 0-35 years old. Youth based programmes are therefore prominent in the Local Economic Development strategy.Gender Profile

There is a gender gap in the area which could be attributed to the situation whereby men leave rural areas to work in urban centres outside of the Municipality e.g. in the towns of Vryheid, Newcastle, eThekweni Metropolitan Areas and even in Gauteng. This gender based out migration results in an increase in women's vulnerability as women increasingly becomes responsible for the household income generation. This situation is exacerbated by the HIV /AIDS pandemic.

9.16.3.3 Education Profile

Of those individuals within the ELM who are 20 years and above, only 31.80% had matric and 10.70% had a higher education. 7% had no schooling.

The province has the lowest number of people aged 20 years and older (5,9%) who have received higher education. The literacy rate is in the region of 57%, plans are in place by the Department of Education to further the number of individuals receiving higher education.

The focus is therefore also to establish strong literacy levels from early childhood education to tertiary. With Dundee already being the administrative hub of the district, focus is now channelled to establish Dundee as the hub for Skills Development.

9.16.3.4 Income and Employment Profile

According to the Census 2011 statistics, the unemployment rate in the ELM was 26.4%, with a higher unemployment rate among the youth (aged 15 to 34 years) of 36.2%.

10 DESCRIPTION AND ASSESSMENT OF POTENTIAL AND CUMULATIVE IMPACTS

10.1 Construction Phase

This activity is related to the clearing of vegetation on infrastructural footprint areas to prepare the site for civil construction, additionally this activity is related to the erection of infrastructure such as the: Process Plant, Water Pollution Control Dams, material storage area, and product export pads (just to mention a few). Expected impacts will relate to the following aspects:

- Noise;
- Dust;
- Soils;
- Visual;
- Topography;
- Fauna;
- Flora;
- Wetland
- Geology;
- Air Quality;
- Surface Water;
- Groundwater;
- Archaeological Sites;
- Traffic;
- Possible influx of job seekers;
- Possible creation of informal settlements;
- Job creation; and
- Health.

The impacts associated with the construction of the Malonjeni Mine have been assessed based on the various construction activities that will take place on site. The construction activities will pertain to the construction of the following mining and infrastructural areas:

Facilities to be catered for on the surface infrastructure on site are:

- The process plant (per details provided by the client's process designer)
- De-stoning will not be required
- Tramp metal magnets to be installed in 2 places
- Loading area for export product
- Loading area for non-export product

- Three stockpile areas for the duff, nuts and nuggets products
- Pollution control dam
- Change house including lamp room, control room, first aid room and laundry designed for
- 520 people, (10% of workers are assumed to be women)
- Wash bay
- Stores building, yard and workshop
- Laboratory
- Scrap yard
- Security gatehouse including 4 offices for the owner's team
- Bus, taxi and private vehicle parking outside of the security area
- Recycling/waste handling area
- Re-fuelling area and fuel storage area
- Substation and standby generators
- Service water storage and return water storage
- Potable water storage
- Explosives magazine and detonator store
- Road access is to be via an 8m wide road with shoulders- approximately 3.2km long

All anticipated impacts associated with each construction activity will be discussed below.

Noise:

Impact

The impact of the construction and development of the mine on the surrounding area will not be significant as the nearest town is Dundee, which is approximately 16 km to west of the proposed site, as well as outlying farms and settlements which are at least 1km from the proposed site.

In addition, current noise levels on the northern side of the site are significantly elevated by the R56 road.

The SABS recommended noise levels for suburban areas are:

- Daytime: 50dBA; and
- Night time: 40 dBA.

Using the limit levels above, for a suburban area, the daytime noise impact will be NONE beyond a distance of 480m from the plant (1500km at night). There are no identified dwellings within approximately 1km of the proposed plant site,

Mr Maroun concluded that the general impact of construction activities on existing noise levels will be very low with without and low with mitigation.

The following table assesses each activity and the impact that could be experienced within the project boundary and beyond.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance: Civil construction activities which include the construction of a building, digging of trenches and the mixing of concrete		-1	2	2	2	1	0.5	-3.50
	Comment: Preparation of the footprint area, earthworks & construction will release noise.							
	Mitigation: All construction equipment to comply with the standards as for construction vehicles as explained in the Environmental Health & Safety Regulations.Construction can also be limited to daylight times which will further reduce the significance of this impact. The extent of this impact is a significant determining factor in the impact significance value.							
	Cumulative Impact: As this impact will be site specific it is not anticipated that cumulative impacts will occur.							
	Residual Impact: No residual impact will remain for the duration of the construction phase. Once construction cease the impact will cease.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads Grading and building of new internal roads and haul roads will release noise.		-1	2	2	2	1	0.5	-3.50
	Comment: All construction equipment to comply with the standards as for construction vehicles as explained in the Environmental Health & Safety Regulations. The construction of the access roads will require vegetation and topsoil clearance. Machinery will be utilised for the construction and compaction of the road which will result in increased noise levels.							
	Mitigation: Limited mitigation is possible. However, by limiting construction activities to construction areas will reduce the magnitude/intensity of this impact.							
	Cumulative Impact: Construction of the access road, assessed with the existing ambient noise levels in the area, could result in a slight increase in ambient noise levels. The construction of access roads will however not impact on neighbouring communities as it is located some distance away.							
	Residual Impact: No residual impact will remain for the duration of the construction phase. Once construction ceases the impact will cease. Utilisation of the access roads will however continue for the duration of the operational phase.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures		-1	2	2	2	1	0.8	-5.60
	Comment: The construction of the sewage treatment plant and water structures will be undertaken together with other construction activities. Civil engineering will be conducted simultaneously as for other structures. The further construction of these facilities will not generate much noise as no heavy machinery will be required. The overall significance of this impact will be low.							

	Mitigation: Mitigation is possible by limiting construction personnel to the development footprint areas. The magnitude or intensity of this impact can be reduced. No construction is to take place after daylight hours.							
	Cumulative Impact: A low cumulative impact will be experienced if considered together with other site activities. The construction of these water management structures will be of a shorter duration if compared to the concentrator plant and hence this impact will be of short duration.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.8	-4.00

From the impact table above it can be concluded that the impact on existing noise levels will be low to very low. Areas where higher noise levels will be experienced will have a higher impact (of medium significance) but generally fall outside of the zone of influence as indicated Mr P Maroun. These impacts will therefore be experienced within or at the project site boundary.

Air Quality and Dust:

Impact

Construction is normally comprised of a series of different operations including: land clearing, topsoil removal, road grading, material loading and hauling, stockpiling, bulldozing, and compaction, etc. Each of these operations has their own duration and potential for dust generation. It is anticipated that the extent of dust emissions would vary substantially from day to day depending on: the level of activity, the specific operations, and the prevailing meteorological conditions.

As none of the predicted incremental or cumulative pollutant concentrations exceeded its representative annual NAAQS all impacts are considered occasional. This would be representative of a few hours or days of exceedance of the NAAQS limit values per year.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	4	2	2	1	0.8	-7.20
	Comment: During earth clearing activities dust will be created, mainly as a result of exposed soils. This impact will be aggravated during the windy season, mostly from August to October. It is assumed that dust fallout will impact in a zone close to 500m from the construction activities. It is therefore assumed that dust impacts will remain site specific but for windy months fugitive dust could reach the R68 or neighbouring dwellings. Site clearing of the laydown area will be once off and of short duration. The impact will have a significance rating of medium.							
	Mitigation: Mitigation is possible by limiting earth clearing activities to non windy months. Dust suppression should be applied directly after earth clearing and continuously with construction activities should it be necessary. Mitigation will limit the impact to the site boundaries. Mitigation will reduce this impact significance to low.							
	Cumulative Impact: A cumulative impact will result for the duration of the construction phase of the project, especially during the windy months. Visibility in the area is poor during the month of August as a result of windy conditions and the effect of inversion, which prohibits the escape of fugitive dust and pollutants into the atmosphere.							
	Residual Impact: No residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	1	0.8	-4.80
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	2	1	2	1	0.8	-4.80
	Comment: The construction of the access road will result in additional dust as a result of exposed surfaces.							
	Mitigation: Dust suppression can effectively be utilised to reduce the significance of this impact. Roads should also not be constructed during the windy months. It is advised that most earth clearing and civil							

	works be conducted in the non windy months however, not during the rainy season. An ideal time to do earth clearing is during the month of May to July and then again from late September to October. The overall significance of this impact will be low.							
	Cumulative Impact: The cumulative impact will be insignificant as construction of roads will be short term and will contribute little toward the existing ambient air quality conditions.							
	Residual Impact: No residual impact will remain as the impact will cease on completion of construction activities.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures		-1	2	1	2	1	0.8	-4.80
	Comment: The construction of the sewage treatment plants will be conducted simultaneously with other construction activities. The respective footprint area will be small. The overall significance of this impact will be low.							
	Mitigation: Mitigation in the form of dust suppression will be effective.							
	Cumulative Impact: No cumulative impact will result.							
	Residual Impact: No impact will remain after construction.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.8	-4.00

Soils:

Impact – Pre Construction

Prior to any construction activities there will be some impacts associated with: exploration, pre-construction, geological investigations, and geotechnical investigations that will require the soils, rock and the environment to be disturbed.

The impact on the soils stripped during the construction of the contractor's field camps, the geotechnical/exploration drilling, exploration, trenching, and sampling will probably be Medium in the short term. The disturbance of any clay rich and more sensitive soils will lead to the formation of hard clods on drying, which should only be worked in the dry state. These soils are highly susceptible to compaction and erosion.

The area that will be affected by the construction of infrastructure is relatively small (isolated exploration pads, access and trenching), when compared to the total site area. Continuous rehabilitation of areas that have been decommissioned will be ongoing. This will limit the size of the affected area.

Proper pre-planning is needed before construction commence, in order to determine the soil profiles of the affected mining area. Due to the various locations of wetlands within the study area soil is classified as sensitive, and will require better than average management inputs if they are to be conserved for future use (rehabilitation and mine closure).

Impact – Construction

The impact on the soils stripped during the "Construction Phase" will be influenced by: the construction of the Pollution Control Dams, the clearing of vegetation, the stripping of soil cover, the construction of the Waste Storage Facility, the clearing of vegetation and stripping of soils for the construction of the Processing Plant and associated Offices and Workshops, the construction of the electrical substation, and the construction of all access roads and conveyance systems. In addition, the disturbed areas will need to be managed for storm water impacts, with the separation of clean and dirty water. Overall, these activities will probably result in a MODERATE to HIGH impact on soils.

The area that will be affected by construction of infrastructure is relatively small compared to the total study area (Mining Right Area). Continuous rehabilitation of areas that have been decommissioned will be ongoing. This will limit the size of the affected area, and reduce the overall impact on the area.

The sensitive nature and variations in the soils that underlie the area proposed for mining and infrastructure development will need to be well managed.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	4	1	4	1	1	-10.00
	Comment: Removal of vegetation and the associated shaping of the area to prepare footprint for construction will allow for dilution of fertile topsoil component. Removal of vegetation and the associated shaping of the area to prepare footprint for construction will allow for soil compaction							
	Mitigation: Keep as much original landcover as possible. Topsoil stripping and stockpiling of the shallow soils should only be attempted where the surface is not too rocky. Keep infrastructure localized to reduce footprint.							
	Cumulative Impact: The cumulative impact will relate to a loss in soils suitable for agricultural production. This could lead to a possible regional loss of soils with a capability to sustain agricultural activities/uses.							
	Residual Impact: Should soils be damaged to the extent where rehabilitation will be too costly a residual impact will remain. The impact will relate to the agricultural potential of the soils to sustain meaningful and sustainable agricultural practises in the area after mine closure.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	1	2	1	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	3	1	4	1	1	-9.00
	Comment: The construction of the infrastructure and access road will consist of earth clearing and civil construction works. Loss of fertile topsoil layer due to construction							
	Mitigation: Preserve as large an area as possible. Stockpile topsoils for rehabilitation purposes. Keep infrastructure localized to reduce footprint. Keep as much original land cover as possible. Vegetate topsoil stockpiles where a topsoil stockpile exceeds 105m. Include erosion control measures. No topsoil stockpiles should exceed 5m in height. Mitigation is possible by limiting road construction to winter months only or dry periods.							
	Cumulative Impact: Should this impact occur, cumulative impacts will result but will be of low significance due to the small footprint area constituted by the access roads and infrastructure in terms of the mining right area.							
	Residual Impact: A small but insignificant residual impact could remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	3	1	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	3	1	4	1	1	-9.00
	Comment: Sewage treatment plants will be constructed, These areas are relatively small in comparison with the other infrastructure that is to be constructed; however this infrastructure will most likely be constructed at the same time. Spillage and seepage of wastewater can occur during construction (Chemical Soil Pollution)							
	Mitigation: Proper chemical waste management should be in place. Waste management procedure should be in place. A detailed waste management strategy will be established and implemented, which							

	will clearly demarcate the containments for different waste types. These containments will be colour coded. Waste management will form a detailed component as part of the induction process provided by the mine. There will be an incident management system including procedures and training for dealing with incidents. Major spillage incidents will be reported to the DMR, DWA, and KZN DAE. Remedial measures will be implemented in consultation with these regulatory authorities. If spills do occur and soils become contaminated, the appropriate remedial measures will be identified in consultation with an appropriate qualified specialist. Mitigation is possible by limiting earth works to dry winter months and by incorporating soil management measures as outlined further on in this report.							
	Cumulative Impact: Should a cumulative impact remain, it will be insignificant.							
	Residual Impact: No residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	3	1	1	-7.00

Visual

Impact

The proposed project is located in a landscape of moderate value (NLA, 2011). The operational activities will be visible from more than half the zone of potential influence. Construction activities will cause a major change in the landscape character over a localised area, resulting in a high change in key views and additionally a high negative effect on the visual quality of the area. Construction activities will add to the cumulative negative effect on the visual quality of the landscape.

The impacts associated with the visual affect or the sense of place was based on the assumption that the proposed mining activity will have a negative effect on people's perceptions and sense of place. It could well be that the proposed development is welcomed by people residing in the area or will not impact on their sense of place at all. However, this impact table was compiled based on the information supplied by NLA and based on the perceptions of the EAP.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	2	1	2	1	0.8	-4.80
	Comment: The construction of the footprint area will most likely not be visible from the majority of the viewing locations. This impact will not extend beyond the site boundary and will have low impact significance.							
	Mitigation: Mitigation will relate to: dust suppression, planting of vegetation, and utilising low level 'bollard' type lights for lighting of areas. Post top lighting should also be avoided. With mitigation this impact can be reduced to a significance rating of low. The determining factors are the intensity as well as the frequency of the impact which can be reduced. The impact might be less visible during the night than during the day.							
	Cumulative Impact: The contribution of the Malonjeni project will contribute towards a change in the sense of place of peoples' perceptions of the area in which they stay in.							
	Residual Impact: No residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.8	-4.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	2	2	2	1	0.5	-3.50
	Comment: The construction of the infrastructure and access roads will be visible from elevated positions and not on ground level. In comparison with other construction activities the construction of the roads will be of a short duration. The expected impact will be low as other construction activities on site will be more visible. The overall significance of this impact is low.							

	Mitigation: Little or no mitigation is possible or necessary.							
	Cumulative Impact: The cumulative impact will be insignificant.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	2	1	2	1	0.8	-4.80
	Comment: The construction of the sewage treatment plant will not be visible from beyond the site boundary. The overall significance of this impact will be low.							
	Mitigation: Mitigation will not be possible							
	Cumulative Impact: No cumulative impact will result							
	Residual Impact: No residual impact will remain after construction							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.8	-4.00

Topography:

Impact

The impacts associated with the topography will relate to changes in the local topography, in terms of: slopes, gradients, and drainage patterns. The impact on the local topography should not be confused with the impacts related to the change to the visual character of the area.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	2	1	2	1	0.5	-3.00
	Comment: Removal of vegetation and the associated shaping of the area to prepare the footprint for construction will allow for increased surface water runoff, which may lead to a change in topographical characteristics of the area. Footprint clearance for boxcut, infrastructure and linear infrastructure							
	Mitigation: Construction areas must be clearly demarcated. All construction must only be conducted within demarcated areas. Removal of vegetation must be in a phased approach to limit surface exposure. Erosion control measures must be installed early in construction phase. Clean and dirty water system must be implemented early in the construction phase, especially down-gradient of construction areas. Linear infrastructure must follow as far as practically possible the natural contours of the area.							
	Cumulative Impact: No significant cumulative impact will result							
	Residual: A small but insignificant residual impact will remain after the construction phase.							
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	2	1	2	1	0.5	-3.00
	Comment: The construction of the access roads will have an impact of low significance on the local topography. Roads will follow the local topography of the area as far possible**. Roads will also not be constructed within the 1:100 year flood lines.**							
	Mitigation: No mitigation will be necessary							
	Cumulative Impact: No cumulative impact will result							

	Residual Impact: No residual impact will remain							
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	3	1	2	1	1	-7.00
	Comment: The construction of the sewage treatment plant and water related structures (excavated structures) will impact on the local topography. The local topography will be altered for the duration of the construction and operational phases. This impact will be of medium significance and will remain local.							
	Mitigation: Mitigation is not possible as these structures have been designed based on run-off water volume calculations. Reducing the respective sizes of these structures will introduce other impacts related to surface water.							
	Cumulative Impact: Due to the relatively small footprint sizes of these structures, the cumulative impact will be insignificant to low.							
	Residual Impact: The residual impact will remain for the duration of the construction phase and beyond but can be mitigated/reduced after LoM.							

Flora:

Impact

Clearance of vegetation on the proposed site during construction of mining infrastructure such as the plant area, change houses, offices and workshops will have an impact on the flora ecosystem currently present on site.

The following objectives and management practices are recommended for the construction of the coal mining infrastructure to minimise the negative impacts on the flora and fauna:

Objectives

- Prevent encroachment and spreading of invasive and exotic species;
- Minimise and limit destruction of vegetation adjacent to mining infrastructure during the construction phase;
- Re-vegetate all areas adjacent to mining infrastructure and lay-down area that were disturbed during the construction phase;
- Use indigenous grassland species and forbs to re-vegetate areas disturbed during the construction phase;
- Prevent destruction of natural, undisturbed vegetation of the surrounding areas that will not be directly impacted on; and
- Prevent destruction of Red Data flora and faunal species.

Management Practices - Mitigation of the impacts identified above will be best achieved in the following ways:

- Cordon off the sensitive vegetation (hydrophilic and primary grassland) to restrict the movement of construction vehicles and construction personnel in the area adjacent to the immediate construction area;
- Construction areas should be inspected for any occurrence of erosion. Appropriate remedial action (rehabilitation) must be undertaken should any eroded areas be identified;

- A comprehensive surface runoff and storm water management plan should be compiled, indicating how all surface runoff generated as a result of the development (during both the construction and operational phases) will be managed to prevent erosion and destruction of faunal and floral habitat;
- No development should take place within any area demarcated as sensitive such as wetlands (introduce buffer zone) and areas characterised by extensive rocky outcrops.

The purpose of buffer zones is to:

- Reduce the impacts of adjacent land uses on the ecology of sensitive areas including the water resource quality;
- Sustain or improve the ability of the water resources to provide goods and services to society;
- Provide protection and habitat for animal species; and
- Sensitive systems can be used as corridors for animals to migrate or move across landscapes.
- Any disturbed area of natural vegetation should be re-vegetated to such an extent that natural grass and herb species will return with time through the process of natural succession. Use must be made of indigenous species to rehabilitate disturbed areas;
- Erosion-prone areas (gentle slopes found throughout the study area) must be stabilised and re-vegetated and monitored until it can be shown that the vegetation regrowth is sustainable;
- The destruction of natural vegetation outside construction and site establishment area should be prevented by declaring and demarcating well-defined no go areas. Chevron tape or snow netting could be used to demarcate such areas; and
- All exotic species and / or invasive trees along or within the area to be disturbed should be removed and the spread of such species through regrowth must be prevented through ongoing monitoring. Similarly, plant species declared as weeds or invasive plants should be managed and controlled to prevent establishment.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	3	2	3	4	1	-12.00
	Comment: The construction of these structures will result in the removal of natural vegetation on a local scale. The extent of this impact will be regional, as a loss in vegetation can result in a reduction of ecological diversity within the regional context. This impact will be of medium significance. Removal of exotic species during mining regarded as beneficial, however retain a portion of the exotic plantations where it serves as a noise and dust barrier. Reinstate grassland composition during decommissioning Disturbances (noise, blasting etc.) cause an impact.							
	Mitigation: The control of alien vegetation should be a priority. Only dedicated footprint areas should be cleared of vegetation. Buffer area and prohibit mining activities - maintain area of exotic plantations as buffer. Monitor presence/absence of grassland bird population during two seasons per annum.							
	Cumulative Impact: On a regional scale the cumulative impact will be low to insignificant							
	Residual Impact: A residual impact will remain and should be addressed in the mine's Biodiversity Plan							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	4	1	-9.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	3	3	3	4	1	-14.00

	Comment: Depending on the road surface and width, construction activities can have a significant impact on the ecosystem continuum, water infiltration and local geohydrology. Furthermore, roads contribute to habitat loss and habitat fragmentation through the removal of vegetation and obstruction of the movement of fauna, which are often critical propagators of plant material. In consideration of the fact that the areas selected are mainly located in very low to moderate ecological sensitive areas, it can be said that the impact of the proposed roads are considered to have a high negative impact on the remaining natural vegetation along their proposed routes in the long term on a local scale.							
	Mitigation: Where possible the proposed roads should follow existing roads. Where the proposed roads cross drainage lines sufficient provision should be made for natural geohydrological process to continue. The new roads should be monitored for the dispersal and establishment of alien vegetation. The emphasis should be on proactive mitigation rather than reactive mitigation. Where the road servitudes are to be re-vegetated only indigenous species from the area should be used. Storm water runoff from road infrastructure should be well managed and should not result in secondary impacts on the vegetation through erosion or siltation. With mitigation this impact can be reduced to medium							
	Cumulative Impact: A definite cumulative impact will result. The area has been fragmented by linear infrastructure and roads for the establishment of: mining, residential, industrial, and tourist areas.							
	Residual Impact: A residual impact will remain after the construction period, however the mine will be able to restore the area after LoM							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	2	4	1	-10.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	3	2	3	4	1	-12.00
	Comment: The construction of the sewage and water related structures will be similar to those impacts anticipated for the establishment of workshops. The generation and improper disposal of waste could impact local ecosystem function. The impact will be of medium significance.							
	Mitigation: A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste types. These containments will be colour coded. Waste management will form a detailed component as part of the induction process provided by the mine. There will be an incident management system including procedures and training for dealing with incidents. The control of alien vegetation should be a priority. Only dedicated footprint areas should be cleared of vegetation.							
	Cumulative Impact: On a regional scale the cumulative impact will be low to insignificant							
	Residual Impact: A residual impact will remain and should be addressed in the mine's Biodiversity Action Plan							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	4	1	-9.00

Fauna:

Impacts:

The project area is characterised by extensive grasslands and rocky outcrops. Due to the rocky outcrop habitat in the project area, it is very likely that many fauna species may occur here as it might utilise the rocky areas as habitat. This specifically includes small mammals, bird and reptile species. Faunal species of concern that have a probability of occurring on site can have been described in the Ecological Report (Hydro Science, 2014).

The proposed project will have a negative impact on animal life but negative impacts can be limited by reducing the footprint area of the development. Only footprint areas selected for the placement of infrastructure will be cleared. Managing the clearance of vegetation will ultimately have a less dramatic and negative effect on the fauna. Mining activities in the local area contributed largely to the general loss

of species diversity and specie population numbers. This impact, assessed on a cumulative scale can be highly significant should one consider the vast areas already cleared for mining and mining related activities. Most animals will mobilise to other areas but it is generally accepted that mining does play a big part in reducing the biodiversity or species richness in an area.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	5	2	4	4	1	-15.00
	Comment: Loss of endangered and / or rare floral and faunal species due to site clearing activities. Of concern is the Rough-haired **Golden Mole** that is known to occur in the quarter degree square. In addition the location and breeding site of **Black Eagle** should be confirmed.							
	Mitigation: The placement of the mining infrastructure and all associated activities that could lead to habitat loss and/or degradation within areas of transformed faunal habitat. The destruction of highly sensitive faunal habitats (outcrops and wetlands) should be avoided at all costs. Clear and definite boundaries should be set in place for all of the actions associated with the project. Fences must be erected where-ever possible. Construction as well as operational personnel should be instructed as to the physical boundaries pertaining to their respective disciplines, measures should be set in place to ensure that they keep to these boundaries (fines etc) and do not affect the natural environment next to these areas. Additionally, erosion control measures must be put in place from the beginning of construction (wind break, water diversions, gabions etc) to ensure that artificial erosion associated with the activities of the project (construction, operation and decommissioning) do not degrade the natural ecological state of habitat bordering the various areas of activity. Before construction commence the breeding site of a **Black Eagle** should be confirmed							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of species diversity and population numbers. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities. Most animals will mobilise to other areas but it is generally accepted that mining does play a big part in reducing the biodiversity or species richness in an area.							
	Residual Impact: Should animals mobilise to other areas, or be killed as a result of construction activities a definite negative residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	4	2	2	3	0.5	-5.50
	Comment: The loss of animal life on current and newly constructed access roads due to collisions with vehicles in addition to diversion of waterways and disruption of wetland system flow.							
	Mitigation: The construction of all roads should allow for the free movement of water (especially in low-lying areas) by means of large pipes under the roads (such pipes will also double as migration routes for smaller species cautious to cross the roads otherwise). It should be ensured that the construction of the roads will allow for the run-off water to join natural wetlands at speeds and volumes matching the natural bordering wetland systems (i.e. seepage wetlands compared to channelled fast-flowing streams).							
	Cumulative Impact: The area is generally well serviced with a provincial and local road network. Local mines in the area also make use of singe lane roads as well as tracks to access various mining related areas. The construction of roads and the general use of roads have resulted in a definite loss of animals especially at night. This impact will occur and will contribute towards the loss of animal numbers but mitigation can significantly reduce the cumulative impact.							
	Residual Impact: Should mitigation not be effective this impact will have a residual effect.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste		-1	4	3	4	3	0.5	-7.00

facilities Spillage and seepage of wastewater								
	Comment: The impacts associated with the potential leaching of chemicals into the groundwater and surface water in the region of the study area. For the duration of the construction phase this impact will be limited to possible hydrocarbon spills or chemical spills. These spills can easily be contained when working in a controlled environment. When assessing this impact one has to assume that it could also occur as an accident or incident in an uncontrolled environment**.**							
	Mitigation: It should be ensured that no leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. It must also be ensured that the transport and storage of all chemicals is done in such a manner that restricts animals from gaining access to these chemicals. The storage and transportation of: diesel, calcine, sulphates, sewage, and all other foreign chemical compounds related to the construction activities must include safeguards against leaching and spills. In case of spillage or leaching, immediate clean-up actions and rehabilitation procedures must be followed. Constant monitoring of areas where spillages and leaching might occur could prevent long-term contamination of ground water and other sensitive areas. A detailed waste management strategy will be established and implemented, which will clearly demarcate the containments for different waste types. These containments will be colour coded. Waste management will form a detailed component as part of the induction process provided by the mine. There will be an incident management system including procedures and training for dealing with incidents.							
	Cumulative Impact: Should this impact occur a cumulative impact could result, depending on the magnitude or severity of the incident.							
	Residual Impact: Without mitigation this impact will result with far reaching effects on the natural environment.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.2	-1.40

Wetland:

Impact

A variety of wetland types occur in the study area including valley bottom (channelled and unchannelled) and hillslope seepage (isolated and linked to a stream) wetlands. Extensive erosion (15 - 20% of the study area of ~ 3000 ha) of the foot slopes and valley bottoms occur. These erosion features are part of this landscape since the Late Pleistocene and inchannel wetlands has formed in many of these.

Impacts on wetlands as a result of mining activities should be avoided through investigating and designing appropriate mitigation measures. Herewith the following recommendations:

- The intrusion of the mine into the depression wetland's original footprint raises concern for potential contamination of water through contact with carbonaceous material contained within the buried spoils. It is therefore strongly recommended that water contact and infiltration into the spoils be avoided. Further, effective water separation of the current wetland area from the buried spoils area, without draining the wetland, should form a key point within the rehabilitation design of current mining operations.
- Buffer Zones around the wetland areas need to be implemented.
- A detailed field assessment and delineation should be part of future assessments
- The groundwater dependency of the majority of wetlands (as well as the springs) should be considered in future assessments and management plans.
- The dependency of households, livestock and cultivation on seepage areas and springs should be noted and assessed in future assessments and management plans.
- Construction of dams in drainage lines and wetlands not eroding should be discouraged.

- A wetland management plan, as part of larger water use plan, encouraging erosion control must be implemented, but the dynamic nature of the erosion should be considered.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	5	2	4	4	1	-15.00
	Comment: Loss of wetland habitat due to the clearance of topsoil. Increased soil sediment loads and coal sediments via surface water runoff into the adjacent wetlands via the clearing of vegetation prior to construction, the construction activities and the removal of topsoil.							
	Mitigation: ***Detailed Wetland assessment and wetland management plan should be implemented before construction***. Vegetation clearing and earthworks should be limited to as small an area as possible, preferably no larger than the direct footprint of the proposed development. Bare soil area falling outside the direct footprint should be landscaped to the original landscape profile and re-vegetated as soon as possible. Where practically possible, the major earthworks should be undertaken during the dry season (roughly from June to September) to limit erosion due to rainfall runoff. A shallow berm should be constructed between the proposed opencast footprint and the downslope wetlands to prevent sediment rich runoff from the construction site entering the wetlands. These berms should thus be constructed prior to the commencement of construction on the opencast pit.							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of species diversity and population numbers. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities.							
	Residual Impact: Should animals mobilise to other areas, or be killed as a result of construction activities a definite negative residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	5	2	4	4	1	-15.00
	Comment: Disturbance to wetland habitat. Increased erosion and sedimentation. Water quality deterioration. Alteration of hydrological regime. Construction of dams, trenches, berm and infrastructure alter the natural runoff of water into the aquatic ecosystems. The change can be both in terms of timing and duration, as well as quantity of water reaching the natural ecosystems. Reduced flows will have an impact on the habitat availability for aquatic fauna and especially impact on those species/taxa with a preference for moderate to fast habitats.							
	Mitigation: Ensure separation of clean and dirty water and allow clean water to enter natural water bodies. Where current pollution sources have been identified these should be rectified. Limit use and abstraction of water from the surface waters. Implement bio-monitoring programme to detect any deterioration of the water courses. Clean and dirty water systems must be implemented prior to the establishment of infrastructure. Existing clean and dirty water systems must be assessed and where pollution sources are identified these must be rectified. All hazardous substances should be stored on impervious surfaces that allow for the containment of spills and leakages (e.g. bunded areas). Should spills occur, these should be reported to the ECO. Larger spills will require the appointment of specialist clean-up teams to rehabilitate the affected area. No hazardous materials may be stockpiled in any wetland area. Movement of machinery and equipment during the construction phase should be limited to the footprint of proposed developments existing roads and defined construction servitudes. Driving outside of these areas should be prohibited. Clear markers should thus be used, or fences, to demarcate the development area. Any disturbance to soils outside the development footprints should be rehabilitated as soon as possible to prevent erosion.							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of ecosystems. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities							
	Residual Impact: Should mitigation not be effective this impact will have a residual effect.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	4	3	4	3	0.5	-7.00
	Comment: Water quality deterioration related to accidental spills during general construction activities (fuels, cement, etc). Storm water flushing construction areas as well as dust can also carry pollutants into water bodies. Water quality deterioration will especially affect aquatic fauna intolerant to water quality alteration but can have an impact on all aquatic fauna (especially fuel spills).							
	Mitigation: Identify potential areas where seepage and spills can occur into the natural environment. Designated waste handling and storage facilities must be put in place at the start of the construction phase. These facilities must be located on bunded areas that do not allow seepage of pollutants into the ground or the runoff of polluted water. All waste must be disposed off in registered waste disposal facilities. Take necessary precautions to reduce potential spills and seepage. Ensure that silt, lime, cement, paint, chemicals etc. do not wash into drains or nearby watercourses. Implement aquatic biomonitoring programme.							
	Cumulative Impact: Should this impact occur a cumulative impact could result, depending on the magnitude or severity of the incident.							
	Residual Impact: Without mitigation this impact will result with far reaching effects on the natural environment.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	1	0.8	-4.80

Geology:

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	2	1	2	1	0.5	-3.00
	Comment: The establishment of surface infrastructure will have a low impact on the local geology. Impacts will be more specific to soils and subsoils (A-Horizon)							
	Mitigation: Mitigation will be possible by limiting construction activities to dedicated footprint areas.							
	Cumulative Impact: This impact will result in no cumulative impact							
	Residual Impact: No impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	1	0.5	-2.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	2	1	2	1	0.5	-3.00
	Comment: The establishment of surface infrastructure will have a low impact on the local geology. Impact will be more specific to soils and subsoils (A-Horizon)							
	Mitigation: Mitigation will be possible by limiting construction activities to dedicated footprint areas.							
	Cumulative Impact: This impact will result in no cumulative impact							
	Residual Impact: No residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	1	0.5	-2.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Waste Rock		-1	2	1	2	1	0.5	-3.00
	Comment: The establishment of surface infrastructure will have a low impact on the local geology. Impact will be more specific to soils and subsoils (A-Horizon)							
	Mitigation: Mitigation will be possible by limiting construction activities to dedicated footprint areas.							
	Cumulative Impact: This impact will result in no cumulative impact							
	Residual Impact: No residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	1	0.5	-2.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	3	1	2	1	1	-7.00
	Comment: Water related structures will be deeper than normal surface infrastructure (on average 2-3 metres) and could result in a slight impact on the shallow norites. This impact will be of medium significance.							
	Mitigation: No mitigation is possible as water management structures have been optimally placed to prevent other impacts from occurring.							
	Cumulative Impact: A cumulative impact might occur but will be of low significance and easily mitigated after LoM.							
	Residual Impact: No significant residual impact will remain.							

Health:

Impact

Health related impacts, as discussed below, are not necessarily impacts that are directly related to the activities as discussed above, but might be indirectly caused by mining or the accumulation of a number of factors, circumstances and prevailing conditions in the area. This impact assessment focuses on the various impacts one can expect (health, safety, social) that may affect the physical wellbeing of the surrounding communities.

Impacts associated with social determinants of health								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Change in population profile (e.g. age, sex)		-1	4	2	3	2	0.5	-5.50
	Comment: The situation may change during construction when male workers, presumably between 20 and 40 years of age, will come to the area. This impact will have a significance of low.							
	Mitigation: Recruit from local area where possible							
	Cumulative Impact: Should this impact occur it may result in a cumulative impact as the area is already largely impacted By a high prevalence in HIV/Aids							
	Residual Impact: A residual impact might remain as impacts on demographics can be permanent.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	2	1	0.5	-4.00
Impacts Associated with Lifestyle								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Influx of people with chronic diseases		-1	3	2	2	1	0.5	-4.00

	Comment: People moving into the area with chronic diseases can place additional pressure or burdens on health service delivery in the area.							
	Mitigation: Recruit from local area where possible and assist local hospitals to deal with increased chronic illnesses. With additional mitigation i.e. assistance from Transasia on health care facilities, this impact could be reversed from negative to positive.							
	Cumulative Impact: A cumulative impact could result as most clinics and health care institutions are already experiencing pressures in terms of the supply of medical services and supplies to chronically ill patients.							
	Residual Impact: A residual impact might remain but with mitigation and the necessary assistance from the mine on local health care, this impact can be reduced significantly with a positive rather than a negative effect on local health care.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	2	2	3	1	0.5	+4.00

Surface Water:

Impact

The impacts associated with surface water during the construction phase of the project are related to the following:

- Contamination of clean water;
  - Waste spillages
  - Sewage spillages
  - Flooding
- Stream flow reduction;
  - Change of physical catchment area;
- Catchment area reduction; and
  - Change of catchment size
- Catchment character change
  - Removal of natural vegetation

Contamination of clean water								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste spillages		-1	2	2	2	1	0.5	-3.50
	Comment: Waste spillage will relate to hydrocarbon spills from trucks either on the construction site (accidental spill) or from the workshop areas.							
	Mitigation: These spills can be easily contained by the placement of drip trays and bunded areas around the workshops							
	Cumulative Impact: Due to the low impact significance it is unlikely that cumulative impacts will result							
	Residual Impact: No residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	1	0.2	-1.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage spillages		-1	3	2	2	1	0.5	-4.00
	Comment: Sewage spills could occur due to the establishment of the sewage system. Spills will result from probable blockages in the system or incorrect instalment. Due to the modular facilities proposed it is unlikely that this impact will occur. This impact has a significance rating of low.							

	Mitigation: Mitigation is possible by the placement of temporary berms to contain dirty water within the construction area.							
	Cumulative Impact: Due to the low significance of this impact as well as the low probability of this impact to occur no cumulative impact will result.							
	Residual Impact: No impact will remain but continuous monitoring of the system will be necessary throughout the LoM							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	1	0.2	-1.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Flooding		-1	2	2	1	1	0.2	-1.20
	Comment: The stormwater management system (SWMS) will be designed to cater for a 1:100 year flood event. This will reduce the likelihood of this impact to occur. The SWMS forms part of the mine design and planning and is a management tool in itself. This impact has received a significance rating of low.							
	Mitigation: Mitigation is possible during the construction phase by constructing temporary berms around the SWM site that can be removed once the system is in place. This system should be established as early as possible but most preferably during the dryer months.							
	Cumulative Impact: Should this impact occur one can expect an increase in TDS and sediments in local rivers and streams, however, this impact will be extremely low due to the location of the mine in respect to major water bodies and streams.							
	Residual Impact: It is not foreseen that an impact will remain after construction							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	1	0.2	-1.00
Stream flow reduction								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Change of physical catchment area		-1	2	2	1	3	0.2	-1.60
	Comment: Footprint clearance will be a once off activity but will have an immediate, almost insignificant effect in terms of reducing the overall flow within the catchment. This impact will occur as a result of the establishment of infrastructure and the removal of topsoil. The significance of this impact might be more severe during the dryer periods (in terms of downstream water users). The overall significance of this impact will be very low							
	Mitigation: Mitigation will be possible by restricting construction activities to the footprint areas. Progressive rehabilitation must also be conducted during the construction phase.							
	Cumulative Impact: Due to the low significance of this impact, one can assume that no cumulative impact will result							
	Residual Impact: No significant impact will remain after construction.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60
Catchment area reduction								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Change of Catchment Size		-1	5	1	3	3	1	-12.00
	Comment: The catchment area will be reduced on the long term as a result of project construction. Activities responsible for this impact will be: footprint clearance, establishment of infrastructure, and topsoil removal. This impact has a significance rating of medium.							
	Mitigation: Mitigation will be possible by restricting construction to dedicated footprint areas in conjunction with progressive rehabilitation during and after construction. Mitigation will, however, not affect the significance of the impact as it will remain medium.							
	Cumulative Impact: One can assume that a cumulative impact will remain after construction and LoM because the tailings facility and mostly likely the waste rock dumps will remain, which together with existing mining activities in the area, could result in a substantial reduction in the catchment area.							

	Residual Impact: A residual impact will remain after the construction period and will most likely be permanent.							
Catchment character change								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Catchment character change		-1	5	1	3	3	1	-12.00
	Comment: The character of the catchment area will change as a result of construction. Catchment change in this context refers to land cover change. This impact will be of medium significance.							
	Mitigation: Little, if any, mitigation will be possible.							
	Cumulative Impact: A cumulative impact will remain because the tailings facility and waste rock dumps will be permanent (as with most other mines in the area). The catchment character has already changed significantly due to mining activities							
	Residual Impact: A residual impact will remain after construction and beyond.							

Groundwater:

Impact

The impact on the groundwater regime during the construction phase of the project will be very limited (Geo Pollution, 2013). This phase is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality. This phase should thus cause very little additional impacts in the groundwater quality. It is expected that the current status quo will be maintained.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
oil and diesel spills		-1	2	1	1	1	0.5	-2.50
	Comment: As only diesel and oil spills have been identified as potential groundwater pollutants during this phase, measures to prevent and contain such spills should be introduced.							
	Mitigation: It must be ensured that a credible company removes used oil after vehicle servicing**.** A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills. Used absorbent fibre must be land-farmed, using approved methodologies							
	Cumulative Impact: No cumulative impact will result due to construction							
	Residual Impact: No residual impact will remain, however mining will continue. This residual impact is discussed under decommissioning and closure.							

Archaeological Sites:

Impact

Archaetnos Culture & Cultural Resources was commissioned to conduct the Heritage Impact Assessment. Please refer to Appendix J for a copy of the Heritage Report and findings. Archaetnos identified Thirty (36) sites of cultural significance.

Farm workers and farmers talked to in the area indicated that they may even be aware of more grave sites on top of the mountain, but they were unsure of exactly where these are located. It therefore does seem as if there probably are more sites than what were found.

This is an important aspect that needs to be considered during any future activities in the mining area. Any possible identification of additional cultural heritage resources should be dealt with in accordance with the recommendations set out below.

The recommendations are as follows:

- This document should be rewritten at least once every five years or every time a new development is planned (whichever comes first).

- This management plan should be consulted continuously and especially when any new developments are planned.
- Most importantly, should any developments be done in future, the excavations around these should be monitored for the possible existence of archaeological material. If identified, an archaeologist should immediately be contacted to assess the matter.
- It should be remembered that due to the factors indicated in the report, it is possible that all cultural sites may not have been identified. Also the subterranean presence of archaeological and/or historical sites, features or artifacts are always a distinct possibility. Care should therefore be taken when development work commences that, if any more sites and artifacts are identified and uncovered, a qualified archaeologist be called in to investigate.
- Any sites, features or artefacts identified as mentioned above (recommendation 3 and 4) should be included in this management plan.
- The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan.
- The necessary measures should be put in place to stop any possible degradation of cultural resources on the reserve (see management guidelines at each individual site).
- The social value of the cultural heritage resources at the mine should not be under estimated. The mine could easily use this for social responsibility and community liaison issues.
- Visits to the different sites should be monitored in order to prevent any damage thereto.
- Information educating staff members (and perhaps even visitors) with regards to the National Heritage Resources Act and indicating that it is an offence to damage historical resources should be available and should become part of the induction process at the mine.
- The staff at the mine as well as others involved in the management thereof (including new appointees) should be educated with regards to all aspect mentioned in this management plan. This will assist in the monitoring of sites, but will not on its own solve this problem.
- The fencing of certain resources and keeping the vegetation in control (see management guidelines) is a very important first step that should be implemented urgently.
- Partnerships should be formed with concerned parties order to get these people involved in the preservation and conservation of the cultural heritage at the mine.
- This document should be used to assist in planning, and care should be taken that sites are not demolished without reason. This basically means that all sites should be left as it is, should there not be any reason to intervene.
- It should be noted that even if there is no direct impact there usually is a secondary impact. This includes possible blasting damage, dust etc. Therefore mitigation should also be engaged into in the latter case.
- Sites number 4-10 were identified within the area of impact and will have to dealt with different than others.
- Site no. 4 is of a low cultural significance and may be demolished if needed. No further mitigation is needed. However, since the mining operations will be underground, the site should be left as it is.

- The following sites may also be demolished if needed, but has to be recorded first: 5, 6, 7 and 9. However, since the mining operations will be underground, the sites should be left as it is.
- Site no. 8 may be demolished if necessary, but has to be mapped first as it is regarded as having a higher cultural significance than other similar sites. However, since the mining operations will be underground, the site should be left as it is.
- Site no. 10 is of a high cultural significance. It may not be demolished and will have to be preserved by the mine. Although there will be no direct impact, possible secondary impact is foreseen (e.g. moving of vehicles and people on site). It means the fencing of the site and that a heritage management plan should be written by a heritage expert.
- All the other sites (1-3, 11-30) were identified outside of the area of impact.
- The following sites are of a low cultural significance and may be demolished should future developments impact thereon: 1, 2, 3 and 22. However, since there is no impact foreseen now, it should be left as it is.
- Site no. 11 is of a high cultural significance. They may not be demolished and will have to be preserved by the mine. That would include having a heritage management plan written by a heritage expert. Currently there is no impact foreseen, but the site can easily be reused by the mine.
- The following sites may also be demolished if future developments impact thereon, but has to be recorded first: 13 and 26. For now, it should be left as it is.
- The grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance. Exhumation is usually the second option, but sometimes it is impossible to prevent. These sites will not be impacted on directly. Due to the possible secondary impact, a heritage expert should write a management plan for each of these sites. It also should be fenced in properly, maintained, managed and preserved. Access to possible descendants should be allowed.
- Site 18 (grave on pillar) also is of a high cultural significance. However due to the specific circumstances of erosion that endangers the site, the grave will have to be exhumed and the human remains reburied. This has to be done in accordance with the legislation discussed above. For this a detailed social consultation process is needed. An undertaker is always involved and an archaeologist is only needed for unknown graves and those older than 60 years. Certain permits need to be obtained, but the mentioned parties will take care of that. Table 1 indicates a risk assessment for the two options in dealing with graves. In this particular case it may perhaps be reburied at one of the other sites (as near as possible) found.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Footprint Clearance		-1	5	2	4	4	1	-15.00
	Comment: Archaetnos identified thirty (36) sites of cultural significance. Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance.							
	Mitigation: The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan.							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of heritage sites. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities.							

	Residual Impact: -.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Establishment of Infrastructure and Access Roads		-1	5	2	4	4	1	-15.00
	Comment: Archaetnos identified thirty (36) sites of cultural significance within the study area. Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance.							
	Mitigation: The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of heritage sites. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities.							
	Residual Impact: Should mitigation not be effective this impact will have a residual effect.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage treatment and water structures And waste facilities Spillage and seepage of wastewater		-1	4	3	4	3	0.5	-7.00
	Comment: Archaetnos identified Thirty (36) sites of cultural significance. Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance.							
	Mitigation: The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan							
	Cumulative Impact: Should this impact occur a cumulative impact could result, depending on the magnitude or severity of the incident.							
	Residual Impact: Without mitigation this impact will result with far reaching effects on the natural environment.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	1	0.8	-4.80

Traffic:

Impact

Activity	Impact – Pre Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Increased vehicles on **R68**		-1	4	2	3	1	0.8	-8.00
	Comment: During the peak construction period traffic volumes on the R565 will increase by approximately 6%. During the rest of the construction period the increase in traffic volumes will be almost unnoticeable. The significance of this impact was calculated to be medium during the peak construction period. This impact will decrease towards the commissioning phase of the project.							
	Mitigation: Although this impact has a significance rating of medium an additional 6% vehicles on the R68 (only during peak construction) will not pose a major impact. The only effective mitigation would be to transport as many workers to site via busses and/or taxis as a means to reduce the number of vehicles on the local road infrastructure. A turning lane should be constructed at the mine entrance as not to cause traffic congestion at the site entrance. With mitigation this impact could be reduced to low.							
	Cumulative Impact: A cumulative impact will result as there are other future mining operations in the area that could place additional volumes on the R68.							
	Residual Impact: No significant impact will remain after construction. During operations this impact will continue.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	1	0.8	-4.80

Social and Socio-Economic Impacts

Impact

Population Impacts								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Employment Opportunities and Skills Inequity		+1	3	2	1	1	1	+7.00
	Comment: Construction work would require unskilled, semi-skilled, and highly skilled individuals. The majority of the construction activities would probably be undertaken by a main contractor appointed Such a contractor would usually use their own teams of personnel to undertake the construction activities; especially those specialised tasks requiring various highly technically skilled individuals and other skilled workers (all with specific mining construction related experience). The benefit to the local communities in this regard thus depends on whether the local skills match the requirements of the lower skilled employment opportunities (e.g. civil works such as plumbing, bricklaying, carpentry and so forth) and whether local individuals would thus be employable. This impact, although limited, will have an overall positive medium impact.							
	Mitigation: Mitigation will enhance this impact and will include: • Training of potential future employees, contract workers and/or community members should focus on mining related skills such as: rock drilling, welding, fitting, rigging, boiler making and etc. Mining related skills training would equip trainees/beneficiaries with the necessary portable skills to possibly find employment at the similar types of employment sectors within the study area. Multi-skilling is thus the preferred training and skills development method. • Training of local construction workers during the construction phase to enable them to be employable during the operational phase would not stop the influx of outsiders, but could attempt to minimise the number of "new" outsiders coming to the area in search of employment. Community members without adequate proof of their skills could undergo a practical examination to determine their relevant skills levels							
	Cumulative Impact: Possible difficulty in sourcing semi-skilled and skilled locals							
	Residual Impact: Skilled and experienced individuals who can more easily obtain employment whether as part of the proposed Malonjeni project's operational phase or other similar projects in the municipal or district area							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	2	2	2	1	+10.00

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Inflow of Temporary Workers		-1	4	2	2	1	1	-9.00
	Comment: Introducing a large sector of outsiders, especially if there happens to be a difference in: age, race, ethnical composition, and local culture, compared to the local communities, could create possible discontentment concerning the project and could possibly result in social conflict between the groupings. If During the construction phase, the possibility of this impact materialising would be more prominent if these outsiders are mostly single males and if no adequate housing facilities are created.							
	Mitigation: Mitigation should reduce this impact, mitigation includes: • Construction workers falling within the semi-skilled to unskilled category should be sourced from the local population where possible. This is done to avoid possible conflict arising between locals and the outside workforce, and additionally to limit the need for a temporary accommodation facility. • Introduce contractual obligations for contractors to use local labour (as far as possible). • Contractors are to ensure that foreign workers reside in suitable facilities and not establish informal houses. • Construction workers should be supervised at all times. • Construction activities should be kept to normal working hours e.g. from 7 am until 5 pm during weekdays. • Property owners surrounding the construction areas should be informed of the construction schedules and activities. • Security on-site should be active prior to the construction period. • The construction site and accommodation facilities should be properly managed to avoid any littering and possible environmental pollution. Water and sanitation facilities should be up to adequate standard. • Information distributed as part of the existing HIV/Aids awareness campaigns undertaken in the area should again be focused on and communicated to the local workforce. • Unrealistic employment expectations should not be created. • The development of informal vending "stations" where food and small goods are sold should be properly managed (to avoid littering, safety risks and possible environmental pollution).							
	Cumulative Impact: The cumulative impact will relate to the possible cumulative inflow of temporary workers to the area							
	Residual Impact: Long term consequences concerning the provision of services and the implementation of infrastructure (should construction workers from outside the study area remain in the area without suitable accommodation facilities or permanent employment).							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	1	1	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Inflow of Job Seekers		-1	4	2	3	3	1	-12.00
	Comment: As with the majority of construction projects, an influx of jobseekers is to some extent anticipated. The size and profile of these jobseekers cannot be determined or controlled. The extent of the inflow is usually determined by some of the following factors: • The proximity of the construction site to existing low-income or informal settlements. • The unemployment levels of those residents in close proximity to the construction site or in the study area. • The type of construction activity and the need for unskilled or semi-skilled workers; • The length of the construction period. • The scale of the construction activities. • The existing presence of jobseekers who already came to the area in search of employment at other sources of possible employment. • Whether recruiting of labourers is taking place at the construction site itself. • The confidence of the jobseekers with regards to actually securing employment. An extensive influx of jobseekers to an area could result in negative social impacts such as: the development of illegal and/or informal settlements (especially on state owned land) with associated environmental pollution, social conflict between the jobseekers and locals to secure employment, conflict between informal vendors (also seen as jobseekers) for "new" business, misbehaviour of jobseekers (e.g. possible increase in alcohol use), possible increase in crime due to these jobseekers being unemployed, increased pressure on already strained infrastructure, and additional pressure on health and community services. This impact will have a significance of medium							

	Mitigation: The following mitigation measures are proposed to reduce the significance of this impact • Maximise the use of local labour and contractors where possible by developing a strategy to involve local labour in the construction process. • The development, publication and widespread dissemination of a recruitment policy could serve to encourage local employment and reduce the potential influx of jobseekers to the area. • The communication strategy should ensure that unrealistic employment expectations are not created. A representative of the Malonjeni Mine could liaise with the traditional leaders and local councillors to either attend key community meetings arranged within the various wards to discuss the employment and recruitment process; or liaise with the traditional leaders and local councillors to ensure that the correct information regarding this issue is portrayed to the communities.							
	Cumulative Impact: • Sub-letting of properties or rooms could increase due to the influx of jobseekers putting more pressure on the land available and on the existing infrastructure.							
	Residual Impact: • The presence of new groups of jobseekers within the local communities remaining unemployed with subsequent negative social impacts. • Long term consequences concerning the provision of services and implementation of infrastructure should construction workers from outside the study area remain in the area without suitable accommodation facilities or permanent employment.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-5.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Accommodation of Workforce		-1	3	2	1	1	1	-7.00
	Comment: For the duration of the construction period, non-local and/or temporary contract workers (forming part of the construction team of the main contractor) would require accommodation. It is anticipated that these contractors would make use of the existing establishments in close proximity to the site in e.g. Dundee. If large numbers of locals could be employed, it would lessen the need for any new and temporary accommodation facilities.							
	Mitigation: With mitigation this impact can be reduced from a **negative** medium to a **positive** medium impact. Mitigation will include: • Local accommodation facilities in close proximity to the site (e.g. radius of 10 km) should receive preference. • Once all local accommodation facilities have been exhausted other facilities further than 10 km from the proposed site should be considered.							
	Cumulative Impact: The cumulative impact relates to the possible shortage of accommodation in close proximity to the site							
	Residual Impact: None anticipated							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	3	3	1	1	1	+8.00
Community and Institutional Activities								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Local Economic Contribution		+1	3	2	2	1	1	+8.00
	Comment: Expenditure during the construction phase will result in business opportunities for the local and regional economy, especially with regards to the local hospitality industry and service industry. It is further anticipated that a large proportion of the wage bill earned by construction workers would be spent within the local municipal area. This could result in local and regional economic benefits with subsequent indirect spin-offs for local businesses.							
	Mitigation: This impact can be enhanced by doing the following: • Transasia should develop a database of local companies, including credible SMMEs that could qualify as potential service providers prior to the initiation of the tender process, to enable these local companies and SMMEs to be involved with the tender process. In this regard Transasia should liaise with local stakeholders, as well as with representatives of the local Municipalities. • Even if local companies and SMMEs would be considered during the construction phase of the project, the tender process should be based on competitive business principles and the quality of services to be rendered to ensure adherence to standards and to maximise overall welfare.							

	• SMMEs should be assisted with regards to: general business principles, financial management, management of stock, competitive costing (pricing), and marketing of their business. • Should SMMEs be appointed for the procurement of goods or the provision of services, the contract executions should be strictly monitored on a monthly basis. • From a community perspective, enterprise development is a key mitigation measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level where they can become involved in the tender process. Such measures recommended by community representatives could include the following: o The establishment of joint ventures between small businesses and established companies with relevant experiences within the tender process. o Some tenders for "less significant construction related activities" lower than a pre-agreed amount could be awarded to locals providing that these locals would have some form of experience and credibility to ensure that the quality of work is not compromised. o Payment systems should be flexible, but strictly controlled, to assist smaller businesses in terms of expenditure. o An audit of existing local enterprises that could provide services, goods and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures. o SMME's should submit their business profiles once the tender process starts to enable them to receive tender related documentation.							
	Cumulative Impact: • Increased number of skilled and experienced SMME's as a result to other mining activities in area. • Possible loss of social and financial investments with regards to capacity building due to capacitated SMME's being completely contracted by other mines in the area.							
	Residual Impact: • Skilled and experienced SMME's. • More robust local economy.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	3	3	2	1	-12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Individual and Family Level Impacts								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Impacts on Farming Activities		-1	2	2	2	1	0.5	-3.50
	Comment: No farming activities would be affected on the proposed site for development as this area has not been actively farmed for some time. No impacts on the site itself are thus foreseen due to the development footprint. The main impacts, however, associated with the construction phase on stock farming areas should be noted as the family living on the property could still have some cattle on the property. These impacts would relate to: the movement of heavy vehicles, the presence and movement of workers in close proximity to the properties and possible intrusion of workers on these properties, the possibility of crop and stock losses due to theft and/or poaching, and the potential damage to farming infrastructure. From a social perspective, the significance of the impacts is anticipated to be low, but mitigation should be implemented to ensure that no financial losses (related to farming practices) occur as a result of the construction activities.							
	Mitigation: Mitigation will include: • Effective management of the mining activities to avoid any environmental pollution focusing on: water, waste and sanitation infrastructure /services, and limiting any increase in noise levels. • Strict security measures should be put in place. Security personnel should be on site on a permanent basis. • The mining area should be fenced to avoid unauthorised entry by animals onto the mining area. • The contractor should communicate the construction schedule and vehicle movements to the neighbouring property owners. • Construction workers should have access to construction sites only.							
	Cumulative Impact: Possible cumulative impact on water quality as a result of existing mining activities in the area.							
	Residual Impact: None anticipated							

	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	1	0.2	-1.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Impact of Blasting		-1	4	2	3	3	0.2	-2.40
	Comment: This section does not aim to provide the technical aspects with regards to the possible impact of blasting, but rather refers to the possible negative social impacts associated with blasting within the core communities. The opencast operations at the mine will consist of drilling and blasting Blasting impacts during the construction phase could have negative impacts on nearby structures or dwellings. Therefore there is the possibility exists that blasting could impact on property values if it was scientifically found to impact on the stability of the structures. Furthermore blasting could result in disturbing negative noise impacts, especially in this rural type area characterised by relatively low ambient noise levels. Those that could be affected by the blasting noise would include: the actual construction workers, farmers, labourers residing in the vicinity of the construction site, and residents of nearby communities As blasting is not a continuous noise, the negative noise impact associated with blasting could be classified as of a low significance.							
	Mitigation: Mitigation will be possible by the following actions: • Property owners and surrounding property owners should be notified of blasting schedules. • Blasting activities should be restricted to non-intrusive times (e.g. blasting on Sundays and during the night should be avoided). • The impact of blasting on nearby properties (dwellings) should be frequently monitored. • Cattle farmers should be notified timeously of blasting schedules to allow them sufficient time to move their animals. • A communication channel should be established through the traditional leaders at their community meetings to ensure that community members are aware of the procedures. Communication processes are to be followed when possible blasting impacts are reported • A community liaison officer could be appointed to assist community members in this regard. •							
	Cumulative Impact: • Possible cumulative impacts due to possible previous blasting in the area.							
	Residual Impact: • Possible damaged structures left unattended with subsequent safety risks to those property owners.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	2	1	0.2	-1.40
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Safety and Security Risks		-1	4	2	3	1	0.5	-5.00
	Comment: During the construction phase the following could potentially impact on the safety of workers, pedestrians and members of the surrounding communities: • The movement of construction vehicles transporting goods and materials on the R68 and possibly through local communities (e.g. heavy machinery, heavy vehicles, and earthmoving equipment). • The movement of vehicles transporting construction personnel (should a large section of the construction team be accommodated at establishments not in close proximity to the site). • The influx of an outside workforce and potential jobseekers which could potentially lead to an increase in the local population and/or which could impact on the crime levels in the area. An increased risk of veldt fires due to the presence of construction workers and construction related activities on site that in turn pose a threat to livestock, crops, residents, and houses in the area. On-site, construction workers would furthermore be exposed to operational safety risks. These risks should be addressed as part of the Occupational Health and Safety Act (1993). The increase in crime levels due to the the increase in the local population numbers as a result of the mining activities.							
	Mitigation: The following mitigation will be effective: • A Fire/Emergency Management Plan should be developed and implemented. It is important that this management plan and associated communication channels are developed at the outset of the construction phase. It would be important to regularly review the functionality and							

	efficiency of such a plan in conjunction with the local emergency teams, mine management, and affected communities as well as neighbouring landowners. • Open fires for cooking and related purposes should not be allowed on site. • Appropriate fire fighting equipment should be on site and construction workers should be appropriately trained for fire fighting. • The project proponent and contractors should discuss the safety and security issues, as well as construction schedules with the local community leaders and local police service. • The construction area should be fenced or access to the area should be controlled to avoid animals or people entering the area without authorisation. • The construction sites should be clearly marked and "danger" and "no entry" signs should be erected. • Speeding of construction vehicles must be strictly monitored. • • Due to the traffic volumes on the R68 it is imperative that the entrance to the mine be designed in consultation with the Department of Public Works, Roads and Transport. Traffic calming measures around this section of the road could also be introduced. • Maximise the employment of locals where possible.							
	Cumulative Impact: Increase in criminal activities due to the influx of unemployed jobseekers to the area.							
	Residual Impact: Possible increase in criminal activities.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	3	1	0.2	-1.80
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Health Impacts		-1	4	2	3	3	1	-12.00
	Comment: The main concern in terms of public health is HIV/Aids as it is known the disease spreads with the influx of outside workers to an area. Young male mineworkers could be classified as those in the "high risk" categories, as they are exposed to extreme conditions where they can easily fall victim to Aids related diseases, thus increasing the HIV/Aids prevalence. If a significant proportion of the construction workforce is affected by HIV/Aids, it can lead to: lower productivity, increased health related expenses, and negative implications to replace workers. A large proportion of the population in the municipality area is classified as "young adults", thus part of the "high risk" age category. The mineworkers can therefore infect the locals that are not infected and vice versa with long term social consequences. Usually concerns are raised with regard to the possible public health impact of the construction activities on the health of the surrounding landowners and communities due to possible air/dust pollution, noise pollution and the impact on the water quality. Care should, however, be taken to limit any possible health related impacts by striving towards international best practice. Existing health and emergency services could already come under added pressure during the construction phase due to the general population growth in the area as a result of the number of construction team members (especially during peak construction periods).							
	Mitigation: The following mitigation will reduce the intensity of this impact: • Maximise the employment of locals where possible. • An on-site mobile clinic should be established as a priority. • First aid supplies should be available at various points at the construction site. • Emergency and health services should be notified of the construction schedule and peak construction periods. • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site. • The general health of construction workers should be monitoring on an on-going basis.							
	Cumulative Impact: A cumulative impact would be increased pressure on local clinics							
	Residual Impact: Increase in HIV/Aids and related diseases.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	2	1	0.2	-1.60
Community Infrastructure Needs								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Impact on Infrastructure and Services		-1	4	2	2	3	1	-11.00
	Comment: A possible influx of outsiders in search of employment who remain in the area as employed or unemployed members of society would place an unnecessary and additional long term burden on the provision of services and infrastructure. There is already a need for improved health services and infrastructure within the local communities. The presence of a construction team would thus put an additional short term burden on municipal clinics. Movement of construction related vehicles on local roads could also impact negatively on the road surfaces over time.							
	Mitigation: The following mitigation will prove to be effective: • Maximise the employment of locals where possible. • Maintenance of the roads frequently used by construction traffic e.g. R68 should be discussed and negotiated with the Department of Public Works, Road and Transport							
	Cumulative Impact: Cumulative impact on the infrastructure in the area due to various activities in the area.							
	Residual Impact: Poor health status and quality of life of the residents of the local communities due to lack of adequate services and infrastructure							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	3	2	2	3	1	+10.00

10.2 Operational Phase

The operation of the facility will introduce a new set of impacts as those discussed above. These impacts will be assessed as above, based on the operational activities on site. The reason for this is that a different set of impacts are introduced depending on the nature and type of each activity.

For the operational phase, the following activities will have an impact on the bio-physical environment:

- Continuation of open Cast mining of coal;
- Coal product stockpiling and transportation;
- Coal product crushing, screening and washing plants;
- Slurry deposition;
- Control of clean and dirty water (pollution control dams, clean/dirty water separation infrastructure, stormwater, sewage); and
- Waste generation & handling and hydrocarbon storage.

Where required, additional sections will be included under each activity, where more detail and clarity is required to discuss and address the particular impact. For example a section will be included under the heading for open cast mining of coal, which will specifically address the groundwater impacts.

Noise:

Impact

As no mine currently exists, archive measurements from a similar underground mining / plant operation have been used to carry out the assessment. The worst case values from these measurements of 50 dB(A) at 480m from the acoustic centre of the plant have been used in this assessment.

The following table assesses each activity and the impact that could be experienced within the project boundary and beyond. After operations have ceased and the mine has been decommissioned, no residual noise impacts will occur.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Open cast and underground coal mining		-1	4	2	2	3	1	-11.00
	Comment: Noise created during drilling. Drilling of holes and the preparation of the coal face for blasting. Noise created by the removal of overburden material such as soil and rocks and the free digging of coal. Noise created by the removal of overburden material such as soil and rocks and the free digging of coal.							
	Mitigation: All drilling to be done by using the topography as an acoustic barrier and the equipment to comply with the standards as for construction vehicles							
	Cumulative Impact: Although the impact of this specific activity is rated to be low, this could result in a cumulative impact, bearing in mind that other operational activities on site will contribute to elevated noise levels.							
	Residual Impact: No impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.8	-6.40
Activity **Crushing and Screening and Washing plants**	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	4	2	2	3	1	-11.00
	Comment: Noise created by the crushing, screening and washing of coal.							
	Mitigation: All equipment to be acoustically screened off. Crushing and vibration tables to be maintained in a good condition.							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously at on the mine layout The cumulative impact significance will however also simultaneously become lower.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.8	-6.40
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Coal product stockpiling and transportation								No Impact
	Comment: No issues expected during operational phase.							
	Mitigation: No mitigation is necessary.							
	Cumulative Impact: No Cumulative impact is anticipated.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
								No Impact
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Control of Clean and Dirty Water systems								No Impact
	Comment: No issues expected during operational phase.							
	Mitigation: No mitigation is necessary							
	Cumulative Impact: No cumulative impact is anticipated.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

								No Impact
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste Generation and Handling of waste and hydrocarbon storage								No Impact
	Comment: No issues expected during operational phase							
	Mitigation: No mitigation is necessary.							
	Cumulative Impact: No cumulative impact will occur.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
								No Impact

Air Quality and Dust:

Impact

The opencast operations at the mine will consist of drilling and blasting of overburden and coal, and removal thereof by means of an excavator. Drilling at the opencast mine will be a continuous process.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Release of dust (PM10)		-1	3	2	3	1	0.8	-7.20
	Comment: Crushing, screening and washing plants.							
	Mitigation: Dust monitoring must be undertaken throughout the life of mine. Should the dust monitoring indicate extensive issues, PM10 monitoring should be incorporated and the required management measures should be investigated and implemented.							
	Cumulative Impact: Cumulatively only PM10 impacts have the potential to be moderately severe.							
	Residual Impact: An insignificant residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50

Soils:

Impact

Utilizable Soil Handling – General Infrastructure

During the operational phase, the significance of the impacts on the soils for the areas constructed will continue throughout the life of the mining project (with significant additional impacts if they are not managed correctly). Protection of the soils from pollutants/contamination and the effects of erosion and compaction will all need to be considered as part of the management planning.

During the operational phase, the topsoil stockpiles will need to be kept clear of all dirty water and contaminated dust, and will need to be protected from erosion and compaction by maintaining an adequate vegetative cover; additionally the directing of dirty water along routes should be managed.

In addition to the extremes of the structure of soils and possibly some areas of wet based material, the workability of the materials will have an effect on when the materials should be worked. The soils will have been differentiated and stockpiled as "utilizable soil's" or "balance of subsoil's, and will need to be kept separate for use at closure (for rehabilitation).

The "utilizable soil" (topsoil and some of the subsoil "B2/1" Horizon) is generally more free draining and contains the majority of the seed and nutrient pool, and is often more susceptible to compaction, and will definitely erode if exposed or left unprotected. However, they are generally more easily worked and stored. The disturbed soils will be more susceptible to wind and water erosion if adequate drainage and vegetation cover is not considered. On this basis, ESS concluded that the significance of disturbing these soils will probably result in a Medium impact in the medium term.

Soil Handling – Mining Areas (Underground)

The significance of the impacts of the soils on the proposed underground mining will probably be Low for the majority of the site as the underground method and depth of mining will negate the majority of the impacts at the surface.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Crushing and Screening and Washing plants		-1	5	2	3	3	1	-13.00
	Comment: Chemical Soil Pollution.							
	Mitigation: Proper Chemical Waste Management							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower.							
	Residual Impact: After operations have ceased these areas will be rehabilitated and vegetated to their previous natural state. Seeding and vegetation programmes will be implemented to ensure the natural state of these areas.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Coal product stockpiling and transportation		-1	2	1	2	3	1	-8.00
	Comment: Soil compaction – RoM Stockpiles							
	Mitigation: Stockpile heights will be restricted as far as practically possible. Stockpiles will only be placed within the designated mine area boundaries. The visual management measures as incorporated during the construction phase will be maintained during the operational phase.							

	Cumulative Impact: No Cumulative impact is anticipated.							
	Residual Impact: After operations have ceased these areas will be rehabilitated and vegetated to their previous natural state. Seeding and vegetation programmes will be implemented to ensure the natural state of these areas.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Control of Clean and Dirty Water systems		-1	5	2	3	3	1	-13.00
	Comment: Chemical Soil Pollution. Spillage and seepage of wastewater. Change in natural landscape Ground clearance and waste disposal							
	Mitigation: Proper chemical waste management. Keep infrastructure to a minimum to reduce footprint							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste Generation and Handling of waste and hydrocarbon storage		-1	5	2	3	3	1	-13.00
	Comment: Chemical Soil Pollution. Spillage and seepage of wastewater. Change in natural landscape Ground clearance and waste disposal.							
	Mitigation: Proper chemical waste management. Keep infrastructure to a minimum to reduce footprint.							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00

Topography:

Impact

Activity	Impact – Pre Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Open cast and underground coal mining		-1	5	2	3	3	1	-13.00
	Comment: The topography will be altered with the extension of the opencast pit. The impact will be mitigated with continuous rehabilitation.							
	Mitigation: Ensure concurrent rehabilitation is conducted							
	Cumulative Impact: No cumulative impact							
	Residual Impact: After operations have ceased these areas will be rehabilitated and vegetated to their previous natural state. Seeding and vegetation programmes will be implemented to ensure the natural state of these areas.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Coal product stockpiling and transportation		-1	2	1	2	3	1	-8.00
	Comment: The stockpiling of material will impact on the micro and macro topography due to the establishment of the RoM Stockpiles. The activity will only impact during the life of the mine.							
	Mitigation: Stockpile heights will be restricted as far as practically possible. Stockpiles will only be placed within the designated mine area boundaries.							
	Cumulative Impact: No Cumulative impact is anticipated.							
	Residual Impact: After operations have ceased these areas will be rehabilitated and vegetated to their previous natural state. Seeding and vegetation programmes will be implemented to ensure the natural state of these areas.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.8	-6.40

Fauna:

Impact - Before construction commence the breeding site of **Black Eagle** should be confirmed.

The impacts associated with operational phase are very similar to those discussed for construction.

The project area is characterised by extensive grasslands and rocky outcrops. Due to the rocky outcrop habitat in the project area, it is very likely that many fauna species may occur here as it might utilise the rocky areas as habitat. This specifically includes small mammals, bird and reptile species. Faunal species of concern that have a probability of occurring on site can have been described in the Ecological Report (Hydro Science, 2014).

The proposed project will have a negative impact on animal life but negative impacts can be limited by reducing the footprint area of the development. Only footprint areas selected for the placement of infrastructure will be cleared. Managing the clearance of vegetation will ultimately have a less dramatic and negative effect on the fauna. Mining activities in the local area contributed largely to the general loss of species diversity and specie population numbers. This impact, assessed on a cumulative scale can be highly significant should one consider the vast areas already cleared for mining and mining related

activities. Most animals will mobilise to other areas but it is generally accepted that mining does play a big part in reducing the biodiversity or species richness in an area.

Activity	Impact – Pre Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Open cast and underground coal mining		-1	4	1	1	3	0.8	-7.20
	Comment: Open excavated trenches/pits can prevent animal migration. Contamination of water bodies. Habitat Removal. Noise and lighting associated with operating activities will create a degree of disturbance in the surrounding area. Direct mortality due to storage overburden.							
	Mitigation: Avoidance of highly sensitive wetland/ridge habitat. Dust suppression of gravel roads, blasting only during wind-still conditions. Undertake a detailed assessment of the clean and dirty water systems and upgrade and improve where required. Ensure berms are in place to prevent contaminated Run-off from entering fresh water streams/dams. Possible implementation of animal tunnels and conduits under areas where heavy road traffic and faunally sensitive habitats interact should be kept clear. Periodic monitoring of fences and internal areas for snares, animal tracks and suspicious human activity. Implementation of strict penalties and fines. Periodic monitoring of fences and internal areas for snares, animal tracks and suspicious human activity. Implementation of strict penalties and fines.							
	Cumulative Impact: This activity could cause a cumulative impact of low to medium significance							
	Residual Impact: No impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.8	-5.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Coal product stockpiling and transportation		-1	4	2	1	3	0.5	-5.50
	Comment: The impact of access roads on the fauna in the area is predicted to be of low significance. Animals crossing the road could occasionally be run over by vehicles travelling on these roads which will contribute to the diminishing of animal species in the area							
	Mitigation: Driving at night should be prohibited (except for emergencies); a speed limit of no more than 40 km/h must be enforced. Booms should be erected to restrict access to the haul (and other roads) at night. Speed bumps should be placed on these roads to ensure that the speed limit is adhered to.							
	Cumulative Impact: Other mining operations in the area will also contribute to the possibility of animals being run over and diminishing animal populations in the area. **Residual Impact:** No residual impact will occur as no consistent travelling will occur in the area after mine closure (except for the occasional visit to the site for rehabilitation and monitoring purposes).							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste Generation and Handling of waste and hydrocarbon storage		-1	3	2	2	3	1	-10.00
	Comment: Waste Handling Pollution of water systems may have a negative impact on fauna							
	Mitigation: Identify potential areas where seepage and spills can occur into the natural environment. Take necessary precautions to reduce potential spills and seepage. Ensure that silt, lime, cement, paint, chemicals etc. do not wash into drains or nearby watercourses. Maintain aquatic bio-monitoring programme. The water structures such as the storm water dams and settling ponds could attract faunal species present in the area, and hence have a negative impact on them. Birds for instance could get stuck and drown in fine, silty soils along these water structures. The impact of these structures on the							

	faunal species in the area is predicted to be of medium significance.							
	Cumulative Impact: This activity could cause a cumulative impact of low to medium significance							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.5	-4.00

Flora:

Impact

Clearance of vegetation on the proposed site during construction of mining infrastructure such as the plant area, change houses, offices and workshops will have an impact on the flora ecosystem currently present on site.

The following objectives and management practices are recommended for the construction of the coal mining infrastructure to minimise the negative impacts on the flora and fauna:

Objectives

- Prevent encroachment and spreading of invasive and exotic species;
- Minimise and limit destruction of vegetation adjacent to mining infrastructure during the construction phase;
- Re-vegetate all areas adjacent to mining infrastructure and lay-down area that were disturbed during the construction phase;
- Use indigenous grassland species and forbs to re-vegetate areas disturbed during the construction phase;
- Prevent destruction of natural, undisturbed vegetation of the surrounding areas that will not be directly impacted on; and
- Prevent destruction of Red Data flora and faunal species.

Management Practices - Mitigation of the impacts identified above will be best achieved in the following ways:

- Cordon off the sensitive vegetation (hydrophilic and primary grassland) to restrict the movement of construction vehicles and construction personnel in the area adjacent to the Immediate construction area;
- Construction areas should be inspected for any occurrence of erosion. Appropriate remedial action (rehabilitation) must be undertaken should any eroded areas be identified;
- A comprehensive surface runoff and storm water management plan should be compiled, indicating how all surface runoff generated as a result of the development (during both the construction and operational phases) will be managed to prevent erosion and destruction of faunal and floral habitat;
- No development should take place within any area demarcated as sensitive such as wetlands (introduce buffer zone) and areas characterised by extensive rocky outcrops.

The purpose of buffer zones is to:

- Reduce the impacts of adjacent land uses on the ecology of sensitive areas including the water resource quality;

- Sustain or improve the ability of the water resources to provide goods and services to society;
- Provide protection and habitat for animal species; and
- Sensitive systems can be used as corridors for animals to migrate or move across landscapes.
- Any disturbed area of natural vegetation should be re-vegetated to such an extent that natural grass and herb species will return with time through the process of natural succession. Use must be made of indigenous species to rehabilitate disturbed areas;
- Erosion-prone areas (gentle slopes found throughout the study area) must be stabilised and re-vegetated and monitored until it can be shown that the vegetation regrowth is sustainable;
- The destruction of natural vegetation outside construction and site establishment area should be prevented by declaring and demarcating well-defined no go areas. Chevron tape or snow netting could be used to demarcate such areas; and
- All exotic species and / or invasive trees along or within the area to be disturbed should be removed and the spread of such species through regrowth must be prevented through ongoing monitoring. Similarly, plant species declared as weeds or invasive plants should be managed and controlled to prevent establishment.

Mitigation measures during the operational phase must include the following:

- Re-establish the vegetation cover as soon as possible after topsoil has been placed back on the disturbed areas;
- Ensure that vegetation cover in recently disturbed areas is sustainable;
- Limit construction activities to the day time and working hours for the purpose of not disturbing activities and ecological processes of nocturnal birds, small mammal etc;
- Implement a Waste Management Plan to prevent pollution of the site and surrounding ecology thereby further reducing the ecological integrity; and
- Limit dust and the spreading thereof to surrounding vegetation on site; and
- Monitor disturbed areas for establishment of alien vegetation for at least a year. If alien species are observed, such species must be removed.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Open cast and underground coal mining		-1	4	2	3	4	1	-13.00
	Comment: Human activities in and around the Opencast operations create a Loss of natural vegetation and Spread of alien invasive species.							
	Mitigation: Rehabilitation should be ongoing, seed and significant individuals should be rescued from affected natural areas prior to mining. The existing rehabilitated grasslands should be monitored and maintained. Alien vegetation should be controlled in accordance to the Conservation of Agricultural Resources Act criteria. Buffer area and prohibit mining activities - maintain area of exotic plantations as buffer against noise and dust.							
	Cumulative Impact: No cumulative impact							
	Residual Impact: Should this impact occur and if mitigation is not effective a residual impact will remain (relating to a general loss of biodiversity in the area).							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Coal product stockpiling and transportation		-1	2	1	2	3	1	-8.00
	Comment: Dust from haul roads and stockpiling areas affects plant life and grazing potential. This activity will have a medium impact on the flora of the area. The possible dust generation of this activity will have a negative impact on the plants, in terms of their access to oxygen and their palatability for the remaining fauna in the area. Furthermore, often ornamental plants are introduced in the vicinity of these areas for aesthetic purpose and thereby there is a risk of alien species introduction.							
	Mitigation: Make sure that dust is controlled on daily basis, especially during winter months. Only regional indigenous plants should be used for ornamental plants. The control of alien vegetation should be a priority. Dust from the stockpiling area should be limited as practical as possible. Storm water runoff from this infrastructure should be well managed and should not result in secondary impacts on the vegetation (through erosion or siltation).							
	Cumulative Impact: On a regional scale the cumulative impact will be low to insignificant							
	Residual Impact: A residual impact will remain and should be addressed in the mine's Biodiversity Plan							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste Generation and Handling of waste and hydrocarbon storage		-1	2	1	2	3	1	-8.00
	Comment: Pollution of water systems may have a negative impact on flora							
	Mitigation: Identify potential areas where seepage and spills can occur into the natural environment. Take necessary precautions to reduce potential spills and seepage. Ensure that silt, lime, cement, paint, chemicals etc. do not wash into drains or nearby watercourses. Maintain aquatic bio-monitoring programme.							
	Cumulative Impact: On a regional scale the cumulative impact will be low to insignificant							
	Residual Impact: A residual impact will remain and should be addressed in the mine's Biodiversity Plan							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	2	1	0.5	-3.50

<u>Wetland</u> - ***Detailed Wetland assessment and wetland management plan should be implemented before construction.***

<u>Impact</u>

A variety of wetland types occur in the study area including valley bottom (channelled and unchannelled) and hillslope seepage (isolated and linked to a stream) wetlands. Extensive erosion (15 - 20% of the study area of ~ 3000 ha) of the foot slopes and valley bottoms occur. These erosion features are part of this landscape since the Late Pleistocene and in-channel wetlands has formed in many of these.

Impacts on wetlands as a result of mining activities should be avoided through investigating and designing appropriate mitigation measures.. Herewith the following recommendations:

- The intrusion of the mine into the depression wetland's original footprint raises concern for potential contamination of water through contact with carbonaceous material contained within the buried spoils. It is therefore strongly recommended that water contact and infiltration into the spoils be avoided. Further, effective water separation of the current wetland area from the buried

spoils area, without draining the wetland, should form a key point within the rehabilitation design of current mining operations.

- Buffer Zones around the wetland areas need to be implemented.
- A detailed field assessment and delineation should be part of future assessments
- The groundwater dependency of the majority of wetlands (as well as the springs) should be considered in future assessments and management plans.
- The dependency of households, livestock and cultivation on seepage areas and springs should be noted and assessed in future assessments and management plans.
- Construction of dams in drainage lines and wetlands not eroding should be discouraged.
- A wetland management plan, as part of larger water use plan, encouraging erosion control must be implemented, but the dynamic nature of the erosion should be considered.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Open cast and underground coal mining		-1	2	1	2	3	1	-8.00
	Comment: Increased sedimentation due to erosion of stockpiles. Increased turbidity and sedimentation in receiving watercourses may result in habitat deterioration and loss of fauna. Stream banks may be further destabilised by blasting							
	Mitigation: Ongoing maintenance of the erosion control measure and conduct weekly inspections thereof. Prevent erosion of stockpiles and ensure dam walls and stream banks are stabilised. Conduct weekly monitoring of the stability of the stream banks and dam wall.							
	Cumulative Impact: On a regional scale the cumulative impact will be low							
	Residual Impact: No impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	2	1	0.5	-3.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Crushing and Screening and Washing plants		+1	3	2	4	1	1	+10.50
	Comment: Deterioration in water quality with possible loss of sensitive biota.							
	Mitigation: The crushing screening and washing plants must be located within the dirty water area of the mine and all runoff from the stockpiles should be captured in the dirty water system. No dirty water may be discharged into any wetland or water resource on site unless treated to the required standards. No process water may be discharged, but must be captured in the dirty water system and reused/treated as far as possible.							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower.							
	Residual Impact: No impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	2	1	0.5	-3.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Coal product stockpiling and transportation		-1	4	2	3	4	1	-13.00
	Comment: Deterioration in water quality. Coal and coal dust from stockpiles, trucks, roads and bridge crossings flushed into the surface waters. This would lead to increased turbidity (decreased water quality) which may have a negative impact on aquatic fauna. The impact would vary in intensity between							

	different species and different life stages and processes (spawning, feeding, etc.). The intolerant biota, as well as those with predatory behaviour, will especially be influenced by increased turbidity. When the suspended solids (soil particles) settle out on the substrates in the aquatic ecosystems, it leads to further deterioration in habitat quality. Interstitial spaces between rocks are lost and pool bottom substrates are transformed that may lead to deterioration in biotic integrity. Water pollution - seepage of pollutants (especially acid mine drainage) into groundwater and then running into surface waters (High sulphates, metals and acidity are associated with acid-main drainage).							
	Mitigation: The coal product stockpiles must be located within the dirty water area of the mine and all runoff from the stockpiles should be captured in the dirty water system. No dirty water may be discharged into any wetland or water resource on site unless treated to the required standards. Overloading of coal trucks must be prohibited and strictly enforced to reduce spillages. Dust control measures must be employed. Runoff from the vehicle washbays must be directed into the dirty water system and oil effectively trapped. Spills should be prevented. Ensure adequate pollution control measures (trenches, linings, pollution control dams, etc.) to be in place. Should monitoring (biomonitoring, groundwater or surface water monitoring or environmental audits detect any signs of pollution, detailed investigations need to be initiated. In the case where acid mine drainage is detected, an Acid-Base: Accounting, Technique and Evaluation (ABATE) should be initiated (Usher et al., 2003).							
	Cumulative Impact: This could possibly add to erosion of certain parts of the site due to other activities taking place during the operational phase which could result in a negative cumulative impact.							
	Residual Impact: There will be a residual impact.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Control of Clean and Dirty Water systems		-1	5	2	3	3	1	-13.00
	Comment: Deterioration in water quality. Storm water runoff may contain coal dust, contaminated mine water, sewage treatment effluent, spills (especially oils and fuels in workshops & stores) may lead to pollution of freshwater ecosystems, with a consequent loss of biota or integrity. Alteration of natural hydrological regimes (including impact on groundwater / aquifer).							
	Mitigation: Clean and dirty water must at all times be separated. Clean water should be diverted around dirty areas and returned to the natural water resources. Dirty water systems should meet the requirements of GN704 as a minimum. Current sources of pollution should be addressed appropriately (e.g. treatment plants, lining of pollution control dams). No dirty water may be discharged unless treated to meet the applicable standards and under authorisation from the DWA. Maintain biomonitoring programme (ensure the inclusion of toxicity testing of all PCD';s and potential effluents (such as sewage treatment facilities) to determine their potential risk to the aquatic fauna should they be released/spilled and to enable the determination of safe dilution factors for releases. Ensure compliance with water use licence. Discharge points of clean water should be protected against erosion and should aim to mimic the hydrology of the receiving water resource. Return clean water to natural aquatic ecosystems (without storage) to limit impact on natural hydrological regime of streams.							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower.							
	Residual Impact: Residual Impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste Generation and Handling of waste and hydrocarbon storage		-1	2	1	2	3	1	-8.00
	Comment: Waste Handling - Deterioration in water quality. Water quality deterioration related to accidental spills during general operational activities (fuels, cement, etc). Storm water flushing construction areas as well as dust can also carry pollutants into water bodies. Water quality deterioration will especially affect aquatic fauna intolerant to water quality alteration but can							

	have an impact on all aquatic fauna (especially fuel and sewage spills).							
	Mitigation: Designated waste handling and storage facilities must be put in place at the start of the construction phase. These facilities must be located on bunded areas that do not allow seepage of pollutants into the ground or the run-off of polluted water. All waste must be disposed off in registered waste disposal facilities. The waste facilities should be located within the dirty water area of the mine. Identify potential areas where seepage and spills can occur into the natural environment. Take necessary precautions to reduce potential spills and seepage. Ensure that silt, lime, cement, paint, chemicals etc. do not wash into drains or nearby watercourses. Maintain aquatic biomonitoring programme.							
	Cumulative Impact: Cumulative impacts will occur due to operations taking place simultaneously. The cumulative impact significance will however also simultaneously become lower							
	Residual Impact: Residual impact will remain							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	2	1	0.5	-3.50

Health:

Impact

Health related impacts, as discussed below, are not necessarily impacts that are directly related to the activities discussed above but might be caused as an indirect result of mining, or the accumulation of a number of factors, circumstances, and prevailing conditions in the area. This impact assessment focus on the various impacts one can expect (health, safety, and social) that can affect the physical wellbeing of the surrounding communities.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Increased Income		-1	2	2	2	1	0.5	-3.50
	Comment: Increased income may lead to lifestyle changes which may lead to poor health choices resulting in increased lifestyle diseases. This impact is also coupled with substance abuse.							
	Mitigation: Limited mitigation is possible. Mine employees could be educated in money spending to improve lifestyle and health							
	Cumulative Impact: If one considers new mining developments in the area a cumulative impact might result which ultimately has a positive impact on the local and regional economies.							
	Residual Impact: This impact could result in a permanent change (positive or negative) in terms of lifestyle.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Water and air pollution related illnesses		+1	3	2	4	1	1	+10.50
	Comment: Reduction in water and air pollution related illnesses as a result of upgraded of water and electricity infrastructure. This will make communities less dependable on groundwater or surface water use with a positive effect on their health. The same could be said in terms of electricity provisions to the area. Electricity provisions would reduce the dependence on fire wood as a source of heat and energy.							
	Mitigation: No mitigation is required.							
	Cumulative Impact: A positive cumulative impact will result as Transasia will play a big role in terms of upgrading service delivery to the area.							
	Residual Impact: A positive residual impact will remain long after mine closure.							
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Road Infrastructure		-1	2	2	2	1	0.5	-3.50

	Comment: Road infrastructure degradation leading to accidents.							
	Mitigation: Malonjeni will contribute to the upgrading of roads and will construct a safe site entrance. Assistance with regular road maintenance will have a positive impact on road safety.							
	Cumulative Impact: Should accidents occur as a result of the condition of road infrastructure a significant cumulative impact will result.							
	Residual Impact: Without appropriate maintenance a residual impact will remain which could have a significant and long term impact on road accidents.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	2	1	1	1	0.5	+2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Housing and Health		-1	2	2	2	1	0.5	-3.50
	Comment: Increases in housing and health related issues (e.g. social tensions, TB, etc) as a result of overcrowding.							
	Mitigation: Transasia will assist in ensuring that mine employees have access to appropriate housing and living conditions.							
	Cumulative Impact: A large and significant cumulative impact can result due to existing pressures on the availability of houses and additionally as a result of general influx of people to the area.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Community health facilities		-1	2	2	2	1	0.5	-3.50
	Comment: Overburdened community health facilities and inadequate health services resulting from more people in the area.							
	Mitigation: Transasia could assist with the provision of basic health care and emergency responses (ambulances).							
	Cumulative Impact: Under the assumption that the mitigation as proposed will be effective, a positive and long term cumulative impact will result.							
	Residual Impact: A positive or negative residual impact can remain, depending on the successful implementation of mitigation measures.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	2	2	1	1	0.5	+3.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Food quality		-1	2	2	2	2	0.5	-4.00
	Comment: The Influx of people may result in: food inflation, increasing food deprivation, and as a result food nutrition related diseases. Additionally poor hygiene and quality of food services may increase food related illnesses.							
	Mitigation: Mitigation is possible by means of social projects							
	Cumulative Impact: A negative cumulative impact will result, however, with mitigation this impact can be enhanced to a positive impact.							
	Residual Impact: A positive or residual impact can remain after mine closure depending on social projects created?							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	2	2	2	3	0.5	+4.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Environmental Pollution		-1	2	2	4	1	0.2	-1.80
	Comment: Environmental pollution can result due to: vehicular pollution, pollution associated with onsite storage of hazardous material, pollution episodes associated with spillages, and/or the releases of							

	hazardous materials in various environmental media. The intensity of impacts will vary depending on the incident which can range from less severe to extremely severe.							
	Mitigation: Mitigation measures as proposed by specialist and outlined in this report will be considered, throughout the operational phase, in order to reduce the probability of impacts/accidents/ to occur.							
	Cumulative Impact: Environmental pollution will be prevented at all costs, however, cumulative impacts on: air quality, water resources, and fauna and flora could occur if pollution is not regularly controlled and mitigated.							
	Residual Impact: A negative residual impact can remain after mine closure.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	4	1	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

Surface Water:

Impact

The impacts associated with surface water during the operational phase of the project are related to the following:

- Contamination of clean water;
    - Waste spillages;
    - Sewage spillages;
    - Leakages from pipelines;
    - Runoff from permanent surface infrastructure; and
    - Flooding.
- Additional sediment load;
    - Dust generation;
    - Sediment from waste dumps and stockpiles;
    - Sediment from conveyance systems; and
    - Sediment from containment facilities.
- Catchment area reduction; and
    - Change of catchment size.
- Catchment character change.
    - Removal of natural vegetation.

Contamination of clean water								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste spillages		-1	3	2	2	3	0.5	-5.00
	Comment: Waste spillage will relate to hydrocarbon spillages from: trucks during operations (accidental spill), conveyance systems, storage facilities or spillages from the workshop, and plant areas.							
	Mitigation: These spills can be easily contained by the placement of drip trays and bunded areas around the workshops. Trucks should also be properly covered and the conveyance systems should work properly and effectively.							
	Cumulative Impact: Due to the low impact significance it is unlikely that cumulative impacts will result.							
	Residual Impact: No residual impact will remain.							

	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	3	0.2	-1.20
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage spillages		-1	3	2	2	3	0.2	-2.00
	Comment: Sewage spills will result from probable blockages in the system or incorrect instalment. Due to the modular facilities proposed it is unlikely that this impact will occur. This impact has a significance rating of low.							
	Mitigation: Mitigation is possible by maintaining the lining systems at these facilities.							
	Cumulative Impact: Due to the low significance of this impact as well as the low probability of this impact to occur no cumulative impact will result.							
	Residual Impact: No impact will remain but continuous monitoring of the system will be necessary throughout the LoM.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	3	0.2	-1.20
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Leakages from pipelines		-1	3	2	3	3	0.2	-2.20
	Comment: This activity could affect the operation of the water management system which in turn could impact on the surface water in the area. This impact has a significance rating of low.							
	Mitigation: Mitigation is possible by the placement of temporary berms to contain dirty water within the construction area.							
	Cumulative Impact: Due to the low significance of this impact, as well as the low probability of this impact to occur, no cumulative impact will result.							
	Residual Impact: No impact will remain but continuous monitoring of the system will be necessary throughout the LoM.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	3	0.2	-1.20
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Runoff from permanent infrastructure		-1	4	2	3	3	1	-12.00
	Comment: During the operational phase increased runoff will occur from permanent infrastructure such as: buildings, offices, workshops, and the plant area. This could result in an increase of erosion gullies etc on site. This impact has a significance rating of medium.							
	Mitigation: Mitigation is possible by ensuring that the stormwater drains work effectively by diverting stormwater runoff into the storm water dams.							
	Cumulative Impact: This could possibly add to erosion of certain parts of the site due to other activities taking place during the operational phase which could result in a negative cumulative impact.							
	Residual Impact: No impact will remain but continuous monitoring of the stormwater system will be necessary throughout the LoM							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.2	-1.40
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Flooding		-1	2	2	1	3	0.2	-1.60
	Comment: The stormwater management system (SWMS) will be designed to cater for a 1:100 year flood event. This will reduce the likelihood of this impact to occur. The SWMS forms part of the mine design and planning and is a management tool in itself. This impact has received a significance rating of low.							
	Mitigation: Mitigation measures should be installed during the construction phase, such as the SWMS being designed to cater for a 1:100 year flood event.							

	Cumulative Impact: Should this impact occur one can expect an increase in TDS and sediments in local rivers and streams, however, this impact will be extremely low due to the location of the mine in respect to major water bodies and streams.							
	Residual Impact: It is not foreseen that an impact will remain after operations have ceased.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	3	0.2	-1.20
Additional Sediment Load								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Dust Generation		-1	4	2	3	3	1	-12.00
	Comment: During the operational phase additional dust will be generated by trucks travelling on site and from the operations of the concentrator plant and crusher. As a result this will increase the sediment load in surface water. The significance of this impact is rated as medium.							
	Mitigation: To mitigate this impact trucks should be properly covered when transporting dust generating material and continuous dust suppression should take place on site. This could reduce the significance of the impact to low.							
	Cumulative Impact: Along with other impacts increasing the sediment load in surface water bodies could cause a cumulative impact.							
	Residual Impact: No significant impact will remain after operations have ceased.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.5	-3.50
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sediment from Waste Dumps and Stockpiles		-1	4	2	3	4	1	-13.00
	Comment: This impact will occur due to the: erosion of the waste rock dumps, topsoil stockpiles, and tailings dam facility. This impact is predicted to be of medium significance.							
	Mitigation: This impact could be mitigated by designing the side slopes of these dumps as to minimise erosion. Progressive rehabilitation should take place at these facilities. It is important to ensure that the retention ponds at the base of the facilities work effectively in receiving all runoff from these dumps and to ensure that berms are constructed around the dumps.							
	Cumulative Impact: Along with other impacts increasing sediment load in surface water bodies could cause a cumulative impact.							
	Residual Impact: This could possibly lead to increased sediment loads in larger surface water bodies, in the area after mine closure as these dumps (tailings and waste rock) will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	2	3	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sediment from Containment Facilities		-1	2	2	1	3	0.2	-1.60
	Comment: This impact refers to the possibility of dam breaks during the operational phase of the project. The stormwater dams and settling ponds will be designed with the appropriate liner systems and will also be designed to cater for a 1:100 year flood event thus the possibility of this impact occurring is very low. The significance of this impact is predicted to be very low.							
	Mitigation: Ensure that these systems are correctly designed and installed. Continuous maintenance should also be done on these systems.							
	Cumulative Impact: Due to the low significance of this impact as well as the low probability of this impact occuring no cumulative impact will result.							
	Residual Impact: No residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.2	-1.40

Catchment area reduction								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Change of Catchment Size		-1	5	2	3	4	1	-14.00
	Comment: The catchment area will be reduced due to the: continuous waste rock piling, tailings dam construction, and topsoil removal during operations. The tailings dam will also greatly impact on the catchment size. This impact has a significance rating of high.							
	Mitigation: Mitigation will be possible by engineer design slopes, not to exceed the planned footprint area of the dumps and tailings dam, and also to do continuous rehabilitation of these facilities during operations. Mitigation could reduce the impact to medium.							
	Cumulative Impact: All of the facilities (dumps and tailings) could add to a cumulative impact.							
	Residual Impact: One can assume that a residual impact will remain after life of mine as the tailings facility and most likely the waste rock dumps will remain, which together with existing mining activities in the area, could result in a substantial reduction in the catchment area.							
	Impact-Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00
Catchment character change								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Catchment character change		-1	5	2	3	4	1	-14.00
	Comment: The character of the catchment area will change during the operational phase due to continuous waste rock piling, tailings dam construction and topsoil removal. Catchment change in this context refers to land cover change. This impact will be of medium significance.							
	Mitigation: Little, if any, mitigation will be possible.							
	Cumulative Impact: A cumulative impact will remain as the tailings facility and waste rock dumps will be permanent, as is the case with most other mines in the area. The catchment character has already been changed significantly due to mining activities in the area.							
	Residual Impact: A residual impact will remain after mine closure.							

Groundwater:

Impact

The operational phase is interpreted as the active mining of the proposed Malonjeni underground mine. It is inevitable that these effects will impact on the groundwater regime. The potential impacts that will be considered are the groundwater quantity and quality.

Provisional mining plans were made available at the time of this study, and conservative assumptions were thus made regarding mining planning, such as that the whole mine would be dewatered. The mining depth was taken as the floor coal seam to be mined, supplied by the mine as exploration borehole logs. It is recognised that the mining layout might not be final, and is essential that this model is updated once final information is available.

Impacts on Groundwater Quantity

During the operational phase, it is expected that the main impact on the groundwater environment will be de-watering of the surrounding aquifer. Water entering the mining areas will have to be pumped out to enable mining activities. This will cause a lowering in the groundwater table, in and adjacent to the mine.

The dewatering of the aquifer has been calculated for the mine using the calibrated numerical model as described above. A worst-case scenario has been modelled, assuming that all underground mining areas

will be dewatered simultaneously. This will obviously not be the case, and the actual drawdown could thus be less.

Based on the current mining plan, the impact of dewatering has been modelled as seen in the figures below. The drawdown has been calculated for both the upper aquifer that is in contact with the streams (Figure 20- as per the Geo Pollution Report), as well as for the lower aquifer from which boreholes typically draw water from (Figure 21 - as per the Geo Pollution Report).

The predicted impacts are:

- The calculated drawdown in the upper aquifer, as contours of drawdown. It follows from this figure that the drawdown is predicted to be mainly limited to the mining area.
- The impacts at the streams are predicted to be minimal and little, if any, impact is expected on the base flow of streams.
- Similarly, the drawdown in the deeper aquifer is also limited to the immediate area of the underground mine, and the largest drawdown is predicted to be in the order of 10 metres.
- There are no privately owned boreholes in the potentially affected area that might experience a decline in water levels of approximately 5 metres or more.
- It thus does not seem that the drawdown will have any significant impact on the groundwater regime.

Despite the modelled predictions, it must again be stressed that structures of preferred groundwater flow have not been modelled. It is known by experience that dolerite will most likely transgress the area, but details are limited and not adequate to model these structures. If such a structure is dewatered through mining, any boreholes drilled into the structure might be seriously affected. These effects cannot be predicted with the current knowledge, and can only be established through continuous groundwater level monitoring.

It is also possible to calculate the inflow into the underground from the numerical model. The computed inflow to the total underground, assuming that all areas are dewatered simultaneously, was calculated as 300 m^3/day.

However, this number is preliminary based on average expected conditions. The actual inflow will depend on the area being mined at any one moment in time as well as the occurrence of groundwater flow structures that will be encountered during mining.

It must be cautioned that these calculations have been done using simplified assumptions of homogeneous aquifer conditions. The reality could deviate substantially from this and the model should thus be updated as more information becomes available.

Impacts on Groundwater Quality

The flow in the aquifer will be directed towards the underground during this stage of mining, and very little groundwater pollution is thus expected.

Impacts on streams/wetlands

Although surface water as such is not part of this study, the impact of the proposed underground on streams in the area can be estimated qualitatively from the model in so far as the groundwater component (base flow) of the stream is concerned. Such an impact assessment will not include possible surface runoff, but merely address the base flow component due to gaining (or losing) of groundwater by the stream.

It can be deduced from in the figure depicting drawdown during mining, that the groundwater drawdown at the streams close to the underground will have very little impact.

Groundwater Management

An insignificant drop in groundwater level is predicted, and it is confined to the immediate area above the proposed underground. As a drawdown of 5 metres and more is needed to possibly affect the yield of boreholes, no negative quantity impact on any current private groundwater users or streams in the area is predicted, as previously discussed. Thus, no mitigation measures are deemed necessary, except to monitor groundwater levels to detect deviations from the predicted drawdown.

It is thus imperative to monitor static groundwater levels on a quarterly basis in all boreholes within a zone of two kilometres surrounding the underground to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately. Preferred flow structures (dykes, sills, faults, etc.) have not been included in the model due to the unknown hydraulic characteristics, and these structures could alter the actual effects considerably.

If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply.

Although little or no groundwater contamination is expected during this stage due to the cone of depression, it is nevertheless also recommended that groundwater quality be monitored on a quarterly basis. This is essential to provide a necessary database for future disputes.

Water samples must be taken from all the monitoring boreholes by using approved sampling techniques and adhering to recognised sampling procedures. Samples should be analysed for both organic as well as inorganic pollutants, as mining activity often leads to hydrocarbon spills in the form of diesel and oil. At least the following water quality parameters should be analysed for:

- Major ions (Ca, K, Mg, Na, SO4, NO3, Cl, F)
- pH
- Electrical Conductivity (EC),
- Total Petroleum Hydrocarbons (TPH)
- Total Alkalinity

These results should be recorded on a data sheet. It is proposed that the data should be entered into an appropriate computer database and reported to the Department of Water Affairs.

.**Activity**	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Groundwater quantity-lowering of groundwater table		-1	3	1	1	3	1	-8.00
	Comment: Impact on water supply of groundwater users surrounding mine							
	Mitigation: Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one to two kilometres surrounding the underground to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately. If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply. The numerical model should be updated during mining by using the measured water ingress, water levels, mining and geophysics information to re-calibrate and refine the impact prediction							
	Cumulative Impact: No cumulative impact anticipated.							
	Residual Impact: The residual impact is predicted to be of medium significance. The significance of this impact relates to the duration of flooding and not due to a large negative ground water related impact.							

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Impact on base flow of streams		-1	5	1	1	3	1	-10.00
	Comment: This impact is of medium significance.							
	Mitigation: Keep a buffer distance of at least 150m from the edge of the Madikazi river on the farm Huddersfield; the unnamed tributary of the Buffelsriver on the farm A of Raemior 6942; the Dunlangezi tributary of the Sandspruit on the farm LOT W 8610; and the unnamed tributary of the Buffelsriver on the farm Hazeldene 12649. Another very important aspect to consider is the layout and order of the underground cuts. The best possible scenario for minimising impacting on the surrounding streams/rivers is to start the adit construction at the farthest point from the surrounding streams/rivers. In such a mining scenario the impact on the surface water bodies will be delayed to the latest possible time before closure of the underground.							
	Cumulative Impact: Other mining operations in the area could add to the negative impact on groundwater quality.							
	Residual Impact: Depletion of groundwater quality could be possible							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	1	1	3	0.5	-4.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Deterioration of groundwater quality down gradient of the mining operations		-1	5	1	1	3	1	-10.00
	Comment: This impact is of high significance							
	Mitigation: Groundwater quality must be monitored on a quarterly basis as mention in section 8. The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network should be audited annually to ensure compliance with regulations. Numerical groundwater model must be updated by calibrating the model with monitoring data. Pollution control dams should be lined to prevent ingress of contamination. Mine sections should be sealed where possible during mining to reduce the contact of water and air with remaining sulphides. Install water collection and pumping systems within the mining areas capable of rapidly pumping water out, so minimising contact of water with geochemically reactive material. Assess the impact of the neighbouring mines (if present) on this colliery and vice versa. This is best done by pooling measured groundwater data to update and expand the current numerical model. Kinetic testing of the pillar material should be conducted to aid in the prediction of post mining geochemical conditions. Process water must be stored in a lined pollution control dam and the processing areas should be designed to prevent standing water. Clean and dirty water systems should be separated.							
	Cumulative Impact: This impact could result in a cumulative impact as other TSF in the area could also possibly cause this impact on the groundwater quality							
	Residual Impact: Depletion of groundwater quality could be possible.							
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Influence on surface water features and the depletion of stream base flow		-1	1	1	1	1	0.2	-0.80
	Comment: The extent of the impact on surface water resources will be restricted to areas where mining intersects a preferential ground water flow zone, in hydraulic continuity with a surface water feature. With the mining method in mind, as well as the depth of mining activities, depletion of surface water or ground water base flow will not take place. The limited drawdown and cone of depression around the declines will not influence the base flow component to the river systems of the area, thus the impact is predicted to be of very low significance.							
	Mitigation: Currently no impact is predicted, however, the surface water monitoring program must report the natural volumes of wet and dry weather flow. In the event that an impact is identified, further							

	investigations into the source of depletion must be undertaken.
	Cumulative Impact: No cumulative impact.
	Residual Impact: No residual impact will remain.

Traffic:

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Increased vehicles on R68		-1	4	3	3	3	0.8	-11.20
	Comment: The commissioning and operational phase will cause the current traffic volumes on the R565 to increase steadily over time until full production is reached which will ultimately result in an increase of approximately 8%. Staff and personal that will be employed at the mine will also use different modes of transport to the site which will also contribute to the higher traffic volumes on the R68. This will make significant contributions towards traffic volume increase on the R68 than compared with the haul trucks (per day).							
	Mitigation: Although this impact has a significance rating of medium with an additional 8% vehicles on the R68 (during peak operation) will not pose a major impact. The only effective mitigation would be to transport as many workers to site via busses and/or taxis in order to reduce the number of vehicles on the local road infrastructure. A turning lane should be constructed at the mine entrance as not to cause traffic congestion at the site entrance. With mitigation this impact could be reduced but will still remain medium.							
	Cumulative Impact: A cumulative impact will result as there are other future mining operations in the area that could place additional volumes on the R565.							
	Residual Impact: No impact will remain after mine closure.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	3	1	3	0.8	-7.20

Blasting

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Blasting		-1	4	2	3	3	0.8	-9.60
	Comment: Ground Vibrations, Fumes Fly Rock Sit Blast.							
	Mitigation: Reduced Charge Mass per delay, Different initiation systems, different drilling and charging. Stemming control, Reduced charging, initiation system. Restricted sleep time, correct product for correct conditions							
	Cumulative Impact: The zone of maximum impact is difficult to determine.							
	Residual Impact: After mine closure the impact will no longer occur, however, damages may have already been experienced during the operational phase.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	1	1	3	0.5	-4.00

Social and Socio-Economic Impacts

Impact

- Population Impacts;
    - Employment Opportunities and Skills Inequities.
    - Accommodation of Permanent Workforce.
- Community and Institutional Activities;

- Local Economic Contribution.
- Capacity Building and Skills Training.
- Social Development and Social Services Support.
- Impact on the Local Tourism Industry.

- Conflicts between Local Residents and Newcomers;
  - Presence of an outside agency.
  - Introduction of new social classes.
- Individual and Family Level Impacts;
  - Impacts on Daily Living and Movement Patterns and Farming Activities.
  - Impact on the Local Municipality.
  - Impact of Blasting.
  - Health and Safety Risks.
- Community Infrastructure Needs; and
  - Impact on housing.
  - Impact on Infrastructure and Services.
- Intrusion Impacts.
  - Visual Impact and Sense of Place.
  - Noise Impact.

Population Impacts								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Employment Opportunities and Skills Inequity		+1	3	2	3	3	1	+11.00
	Comment:. Training to be focused on mining related skills. It is imperative that some attention be given to this issue to lessen the number of foreign labour required.							
	Mitigation: Mitigation will enhance this impact and will include: • Training and skills development policies and programmes to enhance the employability of locals should be initiated during the build-up phase to ensure long term employment benefits. • Job creation and training remains critical as there is still a high unemployment rate within the local communities. The reason being is that the local community members do not have the necessary skills to be easily employable. Training should thus be focused on mining related skills. • The general practice would be that if a mining company is not able to appoint a local person with the necessary skills, they would employ an "outsider". The intent is to identify local individuals who should be trained to take over the specialised skill from that person. • A recruitment policy should be adopted to enhance employment positive impacts, limit in-migration of outside jobseekers and mitigate the potential impact of residual in-migration. • Employees should be properly informed of the skills development programmes and how they can be involved in these programmes. • .							
	Cumulative Impact: A possible difficulty in sourcing semi-skilled and skilled locals. Skilled local individuals could already be employed by other operations.							
	Residual Impact: Skilled and trained individuals who can more easily obtain employment							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance

		+1	4	3	4	3	1	+14.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Accommodation of permanent workforce		-1	3	2	2	3	1	-10.00
	Comment: During the operational phase of the mine, the workforce would require accommodation. These employees should be assisted by the Malonjeni mine to obtain proper rental accommodation or to achieve home ownership within the nearest existing residential area or community systems. No hostels will be constructed. As employees would also be recruited locally (whether appointed as contractors or as permanent personnel) it is anticipated that these employees would already own or rent houses within the core communities. No additional social impacts in this regard are thus foreseen. Temporary, migrant and / or foreign employees, on the other hand, would require accommodation facilities. These workers would also be assisted by Malonjeni mine to obtain accommodation within the existing residential areas or community systems.							
	Mitigation: Mitigation should reduce this impact and includes: • Employees should be educated with regards to their accommodation options. • Housing needs should be monitored and addressed in consultation and cooperation with the local Municipality. • Maximise the employment of locals to limit the need for any additional housing infrastructure (as far as possible).							
	Cumulative Impact: Possible existing housing shortage in the area.							
	Residual Impact: Possible overcrowding, sub-letting and development of informal settlements							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	3	2	1	3	0.2	-1.80
Community and Institutional Activities								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Local Economic contribution		+1	3	2	2	3	1	+10.00
	Comment: Through employment and income generation during the mining processes, some economic benefits (to the region and local communities) will occur. The proposed mine would contribute to the local economy through it's: employee wages, procurement of local contractors and services, purchasing of water and electricity, and through payment of taxes to the Local Municipality.							
	Mitigation: Focused programmes aimed at building SMME links to the mine could supplement the indirect economic benefits to the local communities. The mine should adopt a Procurement Plan whereby they aim to provide Historically Disadvantaged South Africans (HDSAs) and SMME's with the opportunity to become involved in the procurement of capital goods, consumables, and services. This Plan should be implemented in conjunction with the local municipalities and local development programmes in the surrounding communities. These programmes should focus on providing support and technical advice to entrepreneurs and/or SMMEs to enable them to supply goods and materials for operations at the future mine.							
	Cumulative Impact: • Economic growth and development due to the mining activities in the area. • Some diversification of local economy due to the mining activities in the area.							
	Residual Impact: • Economic growth and development. • Some diversification of local economy.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	3	3	3	1	+13.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Capacity Building and Skills Training		+1	3	2	2	3	1	+10.00
	Comment: Transasia should aim to increase the skills levels through their Human Resource Development Programme.							

	Mitigation: • Learner ship programmes are recommended to start once the project has received a positive authorisation. These programmes should focus on individuals from the local areas in order to maximise the long term employment opportunities of these local community members. • Possible candidates to undergo capacity building and skills training should be identified by consulting the skills database audit and by consulting with the traditional leaders and local councillors, as well as secondary schools. • Training and career path plans should be focused on mining related skills. Progress in this regard should be monitored on an annual basis. • Local secondary schools could be informed in how to guide learners to the mining sector and to provide learners with more information on how to further their studies within this sector. • Bursaries should be awarded to promising secondary school learners to further their studies within the mining sector. • In-house training through learner ships to fill the hard-to-fill vacancies would be crucial for long term capacity building and skills development within the core and affected communities. • Encourage non-mining skills acquisition in consultation with employees. • Ensure compliance to Mining Charter and MPRDA. • Ensure that HDSA and women are considered and determine the required staff component in this regard. •							
	Cumulative Impact: Enhancement of skills levels of large sectors of the local communities due to the input from the proposed Malonjeni mining project.							
	Residual Impact: Skilled and capacitated individuals.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	2	3	3	1	+12.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Social Development and Social Services Support		+1	3	2	2	3	1	+10.00
	Comment: The proposed Transasia Mine would result in social development and social services support through their investments and interventions within the communities through: skills training and capacity building, community development projects, infrastructure support, and local economic development.							
	Mitigation: This impact can be enhanced by doing the following: • Involvement in upliftment programmes should be done according to the priority needs and projects identified as part of the local municipality, as well as in consultation with other stakeholders such as: the local community representatives, ward committees, traditional leaderships, and youth organisations. • Continuous involvement of the mine would be necessary and should be undertaken in a transparent and supportive manner.							
	Cumulative Impact: Development of agricultural skills, recreational and sports related skills, improvement of nutrition and so forth would all assist poverty alleviation and will improve the quality of lives of many local community members.							
	Residual Impact: Improved quality of life.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	2	3	3	1	+12.00

10.3 Decommissioning and Closure Phase

Noise:

Impact

The impact during the decommissioning and closure of the mine on the surrounding area will not be significant.

The SABS recommended noise levels for suburban areas are:

- Daytime: 50dBA; and
- Night time: 40 dBA.

The decommissioning and closure phase of the project will not have a significant noise impact. The significance of the impact will most likely be the same as for the construction phase, however; no blasting will take place during the closure phase.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Dismantling of Structures		-1	2	2	3	1	1	-8.00
	Comment: The closure phase will require civil work where structures (steel and concrete) on site will be dismantled. .							
	Mitigation: Mitigation is possible by limiting closure activities to daytime hours. Furthermore it is advised that machinery and personnel required for the dismantling of structures be limited to the site boundary.							
	Cumulative Impact: Cumulative impacts will result if one takes into consideration the existing noise levels in the area.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	1	-5.00

It can be concluded that the impact on existing noise levels will be medium. Mitigation is possible by limiting dismantling activities to daytime hours. Furthermore it is advised that machinery, equipment and personnel be limited to the site boundary.

Air Quality and Dust:

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Dismantling of Structures		-1	2	2	2	1	0.8	-5.60
	Comment: During the dismantling of structures dust will be created, mainly as a result of exposed soils. This impact will be aggravated during the windy season, mostly from August to October. It is assumed that dust fallout will impact in a zone close to 500m from the dismantling activities. It is therefore assumed that dust impacts will remain site specific but for windy months fugitive dust could reach the R68 or neighbouring dwellings. Decommissioning will be once off and of a short duration. The impact will have a significance rating of medium.							
	Mitigation: The intensity of this impact can be reduced by reducing the intensity (magnitude) of the impact together with the extent of the impact. The extent of the impact can be reduced by limiting the closure personnel and equipment to the project site. Mitigation is possible by limiting dismantling activities to non windy months. Dust suppression should be applied directly after structures have been dismantled and should continue with closure activities if necessary. Mitigation will limit the impact to the site boundaries. Mitigation will reduce this impact significance to low.							
	Cumulative Impact: As this impact will be site specific it is not anticipated that cumulative impacts will result. Should other dismantling activities take place on site, within other infrastructural areas, a cumulative impact could result for the duration of the closure phase.							
	Residual Impact: No residual impact will remain.							

	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	0.5	-2.50

Soils, Land Use and Land Capability

Impact

The decommissioning and closure phase will see:

- The removal of all infrastructure;
- The demolishing of all concrete slabs and ripping of any hard surfaces;
- The backfilling of any open voids and deep foundations and the reconstruction of the barrier layer (compaction) wherever feasible and possible;
- Topdressing of the disturbed and backfilled areas with the stored "utilizable" soil ready for re-vegetation;
- Fertilization and stabilization of the backfilled materials and final cover materials (soil and vegetation); and
- The landscaping of the replaced soils to be free draining.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Soils		-1	4	2	3	4	1	-13.00
	Comment: Ongoing rehabilitation during the decommissioning phase of the project will probably bring about a long-term positive impact on the soils. The initial impact will be high. However, rehabilitation and mitigation measures will ensure a medium impact rating for the sites (since the chemical and physical properties of the soils will improve through rehabilitation works).							
	Mitigation: During the rehabilitation exercise preliminary soil quality monitoring should be carried out to accurately determine the fertilizer requirements that will be needed. Additional soil sampling should also be carried out annually until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.							
	Cumulative Impact: If not managed correctly a cumulative impact will result that will only be evident after mine closure, as and when the area will be utilised for alternative land uses such as grazing.							
	Residual Impact: A residual impact can remain after mine closure if the topsoil removed is not able to sustain meaningful agricultural activities.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	3	1	1	-7.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Land Use and Land capability		-1	3	2	2	1	1	-8.00
	Comment: There will be a net improvement (positive) impact on the soil and land capability environments as the area of disturbance is reduced, and the soils are returned to a state that can support low intensity wildlife grazing or sustainable conservation (as close as possible to the original state). On mine closure the long-term negative impact on the soils will probably be of medium significance if the management plan set out in the Environmental Plan is effectively implemented to reinstate current soil conditions. Chemical amelioration of the soils will possibly have a low impact on the nutrient status (only) of the soils in the medium term.							

	Mitigation: The following maintenance is recommended: • The area must be fenced, and all animals must be kept off the area until the vegetation is self-sustaining. • Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.) – • Traffic should be limited were possible while the vegetation is establishing itself. • Plants should be watered and weeded as required (on a regular and managed basis) were possible and practical. • Check for pests and diseases at least once every two weeks and treat if necessary. • Replace unhealthy or dead plant material. • Fertilise, hydro seeded and grassed areas soon after germination. • Repair any damage caused by erosion.							
	Cumulative Impact: If not managed correctly a cumulative impact will result when the area will be utilised for alternative land uses such as grazing.							
	Residual Impact: A residual impact can remain after mine closure should the topsoil removed not be able to sustain meaningful agricultural activities.							
	Impact-Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	1	-5.00

Topography:

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Infrastructure Removal		-1	2	1	3	1	1	-7.00
	Comment: Overall improvement of the sites topography will be experienced as all voids and opencast pits will be backfilled prior to rehabilitation being undertaken.							
	Mitigation: Infilling of the portals or box cuts will take place during the closure phase and this will aim to close up these portals and to restore the previous topography of the area (as far as possible). This impact can be reduced to a low significance.							
	Cumulative Impact: In terms of a regional / cumulative impact one can expect a low to medium cumulative impact. Current mining activities in the area have already contributed towards alterations of the local topography.							
	Residual Impact: No significant impact will remain.							

Fauna:

Impact

Activities relevant to faunal impacts during the decommissioning and closure phase are:

- Faunal habitat loss/degradation as a result of earth clearing and general construction activities;
- Bird electrocutions / collisions during power line de-construction;
- Access road kills;
- Ecological discontinuity as a result of infrastructure development;
- Faunal attraction to mining water;
- Chemical spills; and
- Natural fauna loss to pets.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Habitat loss		-1	4	2	4	4	1	-14.00
	Comment: This impact will relate to the loss and degradation of untransformed faunal habitat (i.e. loss of grassland, outcrop and wetland habitat) as a direct result of clearing of vegetation and							

	habitat destruction to allow for the construction of mining infrastructure. This impact will have a significance of high and will remain long after mine closure.							
	Mitigation: The destruction of highly sensitive faunal habitat (outcrops and wetlands) should be avoided at all costs. Clear and definite boundaries should be set in place for all of the actions associated with the decommissioning and closure activities. Fences must be erected where-ever possible and decommissioning operators as well as personnel should be restricted as to the physical boundaries pertaining to their respective disciplines. Additionally, measures should be set in place to ensure that they keep to these boundaries (fines etc) and do not affect the natural environment next to these areas. Also, erosion control measures must be put in place from the beginning of decommissioning (wind break, water diversions, gabions etc) to ensure that artificial erosion associated with decommissioning does not degrade the natural ecological state of habitat bordering the various areas of activity.							
	Cumulative Impact: Mining activities in the local area have contributed largely to the general loss of species diversity and population numbers. This impact, assessed on a cumulative scale, can be highly significant (should one consider the vast areas that have already been cleared for mining and mining related activities). Most animals will mobilise to other areas, but it is generally accepted that mining does play a big part in reducing the biodiversity or species richness in an area.							
	Residual Impact: Through mitigation measures this impact could be reduced to a medium significance however the impact on habitat loss will still remain long after mine closure.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	2	4	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Bird electrocutions		-1	3	3	3	3	0.5	-6.00
	Comment: The loss of bird life as a result of electrocution and collisions resulting from the presence of power lines related to the project. This impact will be of low significance as these structures will be removed during decommissioning and closure.							
	Mitigation: No mitigation is necessary during this phase of the project as all mitigation measures would have been put in place during the construction phase.							
	Cumulative Impact: Mining activities in the local area have contributed largely to the general loss of species diversity and population numbers							
	Residual Impact: No residual impact will remain as the power lines will be removed during this phase.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Access Roads		-1	4	2	2	3	0.5	-5.50
	Comment: The loss of animal life on access roads due to collisions with vehicles as well as diversion of waterways and disruption of wetland system flow. This impact could possibly occur but if so will only be for a short period of time. The impact is predicted to be of low significance.							
	Mitigation: During this phase, all roads should still allow for the free movement of water (especially in low-lying areas) by means of large pipes under the roads (such pipes will also double as migration routes for smaller species cautious to cross the roads otherwise). It should be ensured that the roads allow run-off water to join natural wetlands at speeds and volumes matching the natural bordering wetland systems (i.e. seepage wetlands compared to channelled fast-flowing streams).							
	Cumulative Impact: The area is generally well serviced with a provincial and local road network. The construction of roads and the general use of roads have resulted in a definite loss of animals (especially at night). This impact will occur and will contribute towards the loss of animals but mitigation can reduce this cumulative impact significantly, this will only be for a short period of time.							
	Residual Impact: Should mitigation not be effective this impact will have a residual effect.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Ecological Discontinuity		-1	4	2	2	4	1	-12.00
	Comment: This impact will relate to the disruption of ecological connectivity and migration routes of larger, flightless animals as well as territorial infringement as a result of decommissioning of the mine and mine related infrastructure. This impact will have a medium significance which can be reduced with mitigation measures as presented below.							
	Mitigation: All decommissioning activities must be limited to the site only – no land use changes or otherwise disturbances of animals outside of the study area should be allowed; vehicles should yield to larger mammals on the access roads. Where-ever linear structures bisect natural areas of untransformed faunal habitat measures should be put in place to ensure the continued movement of all faunal groups needing to cross such lines. After the dismantling of underground pipelines, rehabilitation must be done swiftly and effectively – areas must be returned to similar contours, as before construction and re-vegetated, as soon as possible. The same principles apply to the dismantling and maintenance of roads and power lines.							
	Cumulative Impact: The natural areas have been bisected by fences, roads and pipelines. These structures generally prohibit the movement of animals through an area. The mine will place some constraints on the natural movement patterns of animals and hence one can assume that a cumulative impact will result. The significance of this cumulative impact can be reduced based on effective mitigation measures.							
	Residual Impact: After LoM all linear or obstructive structures will be removed to allow for the free movement of animals through the area.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	4	1	-8.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Poaching		-1	4	2	2	3	0.8	-8.80
	Comment: As a result of decommissioning activities poaching, snaring and trapping of wild animals could increase. This impact will be of medium significance.							
	Mitigation: There should be effective policing of fences and areas bordering the mining area; the severe fining and resolute punishment of offenders (there must be strong focus on warnings at the mining site). Fences should be constructed around all areas related to the decommissioning phase (where personnel have daily access is of the utmost importance). There should be regular inspection of these fences to ensure the fences' integrity. Patrolling of the borders and surrounding areas next to the mining area for the presence of snares etc will limit the impact of poaching and snaring. Communication with farmers whose farms border the operational areas must be done in order to create awareness of the potential poaching problems in the area. With mitigation this impact can be reduced to low.							
	Cumulative Impact: Poaching is a reality and has a negative effect on South Africa's biodiversity.							
	Residual Impact: Should this impact occur, and if mitigation is not effective, a residual impact will remain and will relate to a general loss of biodiversity in the area.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	3	0.2	-1.40
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Faunal attraction to mine water		-1	3	2	2	3	0.8	-8.00
	Comment: This impact has relevance to the attraction of faunal species to the surface water present in the mining area during the decommissioning activities. This impact will have a significance rating of medium.							
	Mitigation: Areas of open water must be limited and covered as far as is possible. Medium – and large-sized mammals should be denied access to these open water areas by means of electrical fencing. Steep slopes of fine, silty soils should be avoided as to prevent birds drinking from this water and as a result getting stuck. After mine closure this impact will not occur.							
	Cumulative Impact: Mitigation is easy and should be effective. No cumulative impact will result.							
	Residual Impact: With effective mitigation residual impacts can be avoided and after mine closure this impact will not occur.							

	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	3	0.2	-1.60
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Chemical spills		-1	4	3	4	3	0.5	-7.00
	Comment: This impact is associated with the potential leaching of chemicals into the groundwater and surface water in the region of the study area during the decommissioning phase. For the duration of the decommissioning phase this impact will be limited to possible hydrocarbon spillages or chemical spillages. These spills can be easily contained when working in a controlled environment. When assessing this impact one has to assume that it could also occur as an accident or incident in an uncontrolled environment**.**							
	Mitigation: It should be ensured that no leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. The storage and transportation of diesel, calcine, sulphates, sewage and all other foreign chemical compounds related to the decommissioning activities must include safeguards against leaching and spillages. In case of spillage or leaching, immediate clean-up actions and rehabilitation procedures must be followed. Constant monitoring of areas where spillages and leaching might occur could prevent long-term contamination of ground water and other sensitive areas.							
	Cumulative Impact: Should this impact occur a cumulative impact could result depending on the magnitude or severity of the incident.							
	Residual Impact: Without mitigation this impact will result with far reaching effects on the natural environment. After mine closure this impact will not occur.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	3	0.2	-1.40
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Natural fauna loss to pets		-1	4	2	2	3	1	-11.00
	Comment: The loss of natural animal individuals and/or populations as a result of the introduction of foreign/exotic animals.							
	Mitigation: No pets whatsoever should be allowed in or near the mining area. The offices of personnel of the project must be investigated for the presence of pets (especially cats and dogs) on a regular basis. Any pets found anywhere related to the project must be confiscated and the guilty party fined accordingly.							
	Cumulative Impact: This impact can easily be mitigated. No significant cumulative impact should occur.							
	Residual Impact: No impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	2	1	3	0.2	-1.40

Flora:

Impact

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Infrastructure Removal		-1	4	2	2	4	1	-12.00
	Comment: Re-vegetation of the impacted area with grasses and forbs will have an overall positive effect on the flora. The spread of alien vegetation should be mitigated. Building of roads created erosion gullies.							
	Mitigation: Storm water should be controlled, bare areas should be stabilised and revegetated. Control alien invasive species in accordance with the Conservation of Agricultural Resource Act criteria.							
	Cumulative Impact:							
	Residual Impact: If these primary mitigation measures are implemented it should be possible to keep the impact at acceptable levels.							

	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	2	1	1	1	-6.00

Surface Water:

Impact

Contamination of clean water								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Waste spillages		-1	3	1	2	1	1	-7.00
	Comment: Waste spillage will relate to: hydrocarbon spillages from trucks during decommissioning (accidental spill), from storage facilities or spillages from the workshop, and plant area during dismantling operations.							
	Mitigation: These spills can be easily contained by the placement of drip trays and bunded areas around workshops. Trucks should also be properly covered and the conveyance systems should work properly and effectively.							
	Cumulative Impact: Due to the low impact significance it is unlikely that cumulative impacts will result.							
	Residual Impact: No residual impact will remain.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	1	-5.00
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Sewage spillages		-1	2	1	2	1	0.8	-4.80
	Comment: This impact could occur during the destruction and removal of all systems on site during the decommissioning phase.							
	Mitigation: Mitigation measures could include supervision during all decommissioning activities of these structures and containing and removal of all sewage from site.							
	Cumulative Impact: Due to the low significance of this impact, as well as the low probability of this impact to occur, no cumulative impact will result.							
	Residual Impact: No impact will remain if all mitigation measures are correctly implemented.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	1	1	1	1	0.2	-0.80
Additional Sediment Load								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Dust Generation		-1	4	2	3	1	1	-10.00
	Comment: During the decommissioning phase, additional dust will be generated by trucks travelling on site and also due to the dismantling activities. As a result this will increase the sediment load in surface water. The significance of this impact is rated as medium.							
	Mitigation: To mitigate this impact trucks should be properly covered when transporting dust generating material, additionally continuous dust suppression should take place on site. This could reduce the significance of the impact to low.							
	Cumulative Impact: Along with other impacts, increasing sediment load in surface water bodies could cause a cumulative impact.							
	Residual Impact: No significant impact will remain after operations have ceased.							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	2	1	1	1	1	-5.00
Catchment area restore								

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Change of Catchment Size		+1	3	2	3	4	1	+12.00
	Comment: The catchment area will be restored during the decommissioning phase through the removal of all product stockpile areas and the rehabilitation of topsoil stockpiles. This will improve the natural environment and result in a positive impact.							
	Mitigation: Mitigation will be possible by engineer design slopes, not to exceed the planned footprint area and to ensure regular maintenance of the disturbed area after mine closure. Mitigation could further improve the natural environment.							
	Cumulative Impact: This will restore the natural environment as close as possible to its previous state.							
	Residual Impact: The positive impact will remain long after mine closure.							
	Impact-Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	2	4	4	1	+14.00
Catchment character restore								
Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Restoring of Natural vegetation		+1	3	2	3	4	1	+12.00
	Comment: The character of the catchment area will be restored during the decommissioning phase. Catchment change in this context refers to land cover change which is calculated to be of a positive significance. This impact will be of medium significance.							
	Mitigation: Supervision during decommissioning, maintenance, and rehabilitation of vegetation could increase the impact further.							
	Cumulative Impact: A cumulative impact will occur as the area will be restored as close as possible to its previous natural state.							
	Residual Impact: A residual impact will remain long after mine closure.							
	Impact-Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		+1	4	2	4	4	1	+14.00

Groundwater:

Impact

As it is predicted that there will be a rise in groundwater levels in the lower sections of the underground that could result in decanting, some measures are needed to mitigate this. It is thus recommended that in order to minimise decanting from the underground, all direct connection (if applicable) between the underground areas and surface should be thoroughly sealed.

Spread of Groundwater Pollution Post-mining

Predictions in the previous sections regarding groundwater pollution have been based on the assumption that the rehabilitated underground will be a constant source of sulphate pollution of 2000 mg/l, representing a worst-case scenario. With appropriate measures, the oxidation rate of pyrite can be limited, resulting in lower starting concentrations. Thus, although it has been predicted that only a limited area of the aquifer might be polluted to such an extent that acceptable standards for domestic water is exceeded, further reduction is achievable.

To minimise the effect of groundwater pollution on the receiving environment, the following measures are suggested:

- All mined areas should be flooded as soon as possible to bar oxygen from reacting with remaining pyrite.
- Mining should remove all coal from the underground and as little as possible should be left.
- Quarterly groundwater sampling must be done to establish a database of plume movement trends, to aid eventual mine closure.
- Regular sampling and chemical analyses of the groundwater is imperative to establish a sound database:
- Groundwater in all boreholes within a distance of less than two kilometres must be sampled regularly to establish a database against which future groundwater levels can be compared.
- Sampling must be preferably quarterly, but at least twice annually, following the dry – and rainy seasons.
- If it is found during such a sampling event that groundwater from any extraction borehole is polluted beyond acceptable standards, alternative water will have to be supplied to the affected party by the mine.

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Long-term quality of mine water seepage		-1	4	1	1	4	1	-10.00
	Comment: As stated in the previous sections, no surface decant or uncontrollable mine water seepage will take place away from the mining complex. The only potential post closure impact is that of the deterioration of mine water in-situ (in the long term). The impact is considered as medium, mainly due to the duration of the impact.							
	Cumulative Impact: Other mining operations in the area could add to the negative impact on groundwater quality.							

Heritage Impacts:

Activity	**Impact – Pre Mitigation**	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
Infrastructure Removal		-1	5	2	4	4	1	-15.00
	Comment: Archaetnos identified Thirty (36) sites of cultural significance. Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance.							
	Mitigation: The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan.							
	Cumulative Impact: Mining activities in the local area contributed largely to the general loss of heritage sites. This impact, assessed on a cumulative scale, can be highly significant if one considers the vast areas already cleared for mining and mining related activities.							
	Residual Impact:							
	Impact- Post Mitigation	Status	Probability	Extent	Intensity	Duration	Frequency	Significance
		-1	5	1	2	4	1	-12.00

Social and Socio-Economic Impacts

Impact

Decommissioning refers to the actual closure of the mine, the dismantling of the infrastructure and/or the replacement of the infrastructure with newer technology. At this stage, the life of mine is anticipated to be

15 years. After this period, Transasia might have secured other resources and could extend the life of the mine depending on future decisions. The mining activities can thus continue or the entire facility will be completely decommissioned. This would depend on the economic feasibility of the various options.

Possible social impacts to be experienced during decommissioning (closure of the mine) could include the following:

- Job losses due to mine closure;
- Decline in the sustainability of the local economy as a result of the loss of employment, household income and capital investments;
- Reduced economic activities within the area with subsequent negative impacts on smaller businesses;
- A decline in the local economy would also have a direct impact on the financial status of the affected local municipalities. This, and the fact that one of the key role players, such as the mine, falls away, would seriously impede the municipality in exercising its functions in terms of strengthening the Local Economic Development (LED) process;
- Negative impact on the revenue base of the local municipalities;
- Population changes and “out flux” of people from the area;
- Negative impact on the social fabric and social networks;
- Decrease in the quality of life of the surrounding communities due to the discontinuation of social development support and local economic development programmes;
- Skilled workers moving out of the area in search of employment elsewhere;
- Negative impact on infrastructure development and maintenance;
- A change in community infrastructure;
- A change in the industrial focus of the area;
- Disruptions and nuisance factors associated with the actual decommissioning such as noise, visual and traffic related impacts;
- Increased safety risks associated with the decommissioning of the infrastructure;
- Possible negative impact on the crime levels due to increased unemployment rate;
- Possibility of additional temporary job creation during the decommissioning phase;
- Remnants of possible environmental impacts; and
- Remaining visual impact as a result of mining.

As decommissioning or the replacement of the infrastructure is likely to only take place within approximately 15 years, it is recommended that a detailed Social Impact Assessment be undertaken; thereafter it is recommended that the actual impacts on the changing social environment be determined at that stage.

Possible social impacts to be experienced during the replacement of infrastructure with newer technology options would be similar to the impacts described as part of the construction process (although more limited).

11 ENVIRONMENTAL OBJECTIVES

The environmental objectives given below are broad in order to give the reader a brief overview of the intentions of the proposed mine with regards to: environmental management, protection and monitoring. The detailed objectives and proposed mitigation measures are outlined in the EMPr (**Appendix A**).

11.1 Construction and Operational Phases

The environmental objectives for the construction and operational phases can be broadly summarised as follows:

- To ensure a safe environment in which people can live in as stipulated in the constitution;
- To protect the biophysical environment from any impacts that cannot be mitigated and that could negatively impact on the environment;
- To preserve the water resources in line with the objectives of the integrated DWA catchment management policy and thereby ensure that the limited available resources are utilised to the maximum benefit by the country and its inhabitants;
- To prevent pollution or degradation from occurring, continuing or recurring;
- To remediate the effects of pollution;
- To ensure optimal exploitation and utilisation of the mineral resources and other natural resources;
- To ensure that adequate financial provision is set aside in order to achieve sustainable closure;
- Where possible, rehabilitation should take place during the operational phase, out of operational costs, to reduce the amount of time and money required for closure; and
- Monitoring programs for surface water, groundwater and air quality have been presented in this document and should be implemented and maintained to ascertain the level of impact, if any, on the environment and to implement additional mitigatory measures (should baseline conditions deteriorate as a result of mining related activities).

11.2 Decommissioning and Closure

The objectives for decommissioning and closure are briefly summarised below:

- The holder of a mining right must, as far as it is reasonably practicable, rehabilitate the environment affected by the mining operations to its natural or predetermined state, or to a land use which conforms to the generally accepted principle of sustainable development, through: restoration, remediation, rehabilitation, and stabilisation;
- Mine closure must be achieved in order to ensure that the mine is not abandoned;
- A closure plan will be drawn up prior to the application for a closure certificate, and will accompany said application. The closure plan will detail what will happen to each facility or infrastructure. At this stage it is planned that the facilities that can be utilised by the community, like the office buildings will remain. The facilities that cannot be utilized by the community will be demolished and sold off where possible;
- Correct allocation of closure funds according to the closure plan and ensure adequate financial provision;

- To ensure that good water quality is maintained on site; and
- Monitoring will continue until such a time that it can be proven that there are no more negative impacts on the environment and mine closure can be achieved.

11.3 Socio-economic Objectives and Goals

The following socio-economic objectives should be attained during the construction, operation and decommissioning phases of the project:

- Adhere to an open and transparent communication procedure with I&APs at all times;
- Ensure that information is communicated to I&APs accurately and timeously and in a manner that is understandable and accessible to I&APs;
- Enhance project benefits and minimise negative impacts through intensive consultation with stakeholders;
- Assemble adequate, accurate, appropriate and relevant socio-economic information relating to the mine and surroundings;
- Ensure that recruitment strategies for the mine prioritise the sourcing of local labour and include women (as far as possible);
- Ensure that there is an atmosphere of equality and non-discrimination among the workforce;
- Contribute to the development of functional literacy and numeracy among employees;
- Empower the workforce to develop skills that will equip them to obtain employment in other sectors of the economy after mine closure;
- Contribute to the development of a self-reliant (not dependent on the mine) community surrounding the area of operation;
- Ensure that retrenchments and decommissioning take place in a legally compliant and humane manner; and
- Adhere to principles of international best practice in all socio-economic activities.

11.4 Historical and Cultural Aspects

The mine should endeavour to:

- Ensure that relocation of any archaeological material, if necessary, is done in such a way as to retain the relevant context of the artefacts and structures (should any be identified during mining). This should be done in accordance with procedures set out by SAHRA; and
- Encourage the preservation of artefacts not affected by mining.

12 PUBLIC PARTICIPATION PROCESS

12.1 Introduction

The principles of NEMA govern many aspects of EIAs including consultation with Interested and Affected Parties (I&APs). These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to make informed comments regarding the proposed project. NEMA together with the MPRDA also allows for the participation of historically disadvantaged individuals, including: women, the disabled, and the youth.

12.2 Objectives

The main objectives of the public participation process (PPP) are to:

- Supply any and all identified I&APs with sufficient information on the proposed project in such a way that the I&APs are empowered to actively participate in the decision-making process, and
- Create an entity point for I&APs to raise their viewpoints (issues, comments and concerns) with regard to potential impacts, benefits and drawbacks related to the proposed project.

The PPP would thus ensure that I&APs' input is considered and integrated into the planning, construction, and operation of the proposed project. .

12.3 Approach and Methodology: Scoping Phase

Citofield as independent environmental consultant, was appointed by the applicant, Transasia Minerals (Pty) Ltd to undertake the required Environmental Impact Assessment (EIA) as part of the authorisation process in terms of the National Environmental Management Act (NEMA) (No 107 of 1998), Sections 24 and 24D of NEMA, as read with the EIA regulations of GNR 543, GNR 545 and GNR 546 as required for the development of the proposed new Malonjeni Coal Mine.

A Public Participation Process (PPP) was undertaken for the mining right application in terms of the MPRDA in 2012 by Hydro Science and SD e'Africa. This PPP was used by Citofield as the basis for the PPP followed during the NEMA application process. Additional PPP specific to this application process was undertaken in order to comply with the minimum requirements of NEMA and its EIA Regulations.

The activities undertaken by Citofield included:

- Identification of key interested and affected parties (affected and adjacent landowners) and other stakeholders (organs of state and other parties)
- Formal notification of the application to interested and affected parties (including all affected and adjacent landowners) and other stakeholders through:
    - A Newspaper advertisement in English in the Northern KwaZulu Natal Courier on 14 February 2014
    - Site notices were erected on site and at four visible locations close to the site to inform surrounding communities, affected and adjacent landowners of the proposed development, site notices
    - Written notifications to I&AP's and other key stakeholders were directly informed of the proposed development by e-mail on 22 March 2014. The Background Information Document (BID) and Registration and Comment sheets were also supplied to all parties. I&APs were given 30 days to comment and / or raise issues of concern regarding the proposed development.

- Consultation and correspondence with I&AP's and stakeholders
- Submission of a draft Scoping Report (February 2014), a Final Scoping Report (June 2014) and another Final Scoping (Amended) Report (October 2014).
- The Draft Scoping Report was made available for public review from 22 March to 31 May 2014.
- The Final Scoping Report (FSR) and Plan of Study (POS) have been released for public review and comment for 21 calendar days from 6 June to 27 June 2014.

Hardcopies of the FSR has been submitted to all Organs of State and relevant authorities. In addition copies were placed at the Dundee Public Library located on Boundary Street, Dundee by Citofield.

In October 2014 Batho Earth was appointed to take the study through the EIA Phase as the new independent environmental consultant. **Please refer to Appendix P for the Public Participation Folder and Issues and Response Report and Project Database**.

12.4 Approach and Methodology: EIA Phase

As indicated above, Batho Earth was appointed in October 2014 to finalise the EIA Report and to conduct the public participation process during the EIA Phase of the project. The activities undertaken as part of the PPP are discussed in the following section.

12.4.1 Site Visit

A site visit was undertaken in November 2014 to investigate the area proposed for the project. The purpose of the site visit was to obtain an overview of the study area and collect any available data, to identify and verify key stakeholders, venues for the public participation meeting and appropriate advertising methods/languages, and to gather geographic information required.

12.4.2 Consultation with State Departments

Consultation took place with representatives of the EDTEA after Batho Earth was appointed. Specific comments and input were further sourced from Ezemvelo KZN Wildlife.

12.4.3 Finalisation of Scoping Report

Based on comments received from EDTEA, Batho Earth undertook the necessary actions to finalise the Scoping Report that was initially submitted by Citofield. This entailed the inclusion of an Issues and Response Report which included the comments received during the Scoping Phase, as well as the comments received from Ezemvelo KZN Wildlife as received in January 2015.

The Scoping Report was accepted on 21 January 2015.

12.4.4 Verification and update of I&APs – database

The existing database of stakeholders and/or I&APs (as received from Citofield) was verified and updated to ensure inclusion of additional relevant parties. I&APs were telephonically contacted to verify and update their contact details.

I&APs were also notified in writing that Batho Earth has been appointed to finalise the EIA process and that any additional comments and concerns should be addressed to these consultants.

The database will be updated and maintained during the entire PPP.

12.4.5 Issues and Response Report

As part of the PPP, the Issues and Response Report compiled based on the comments received during the Scoping Phase would be updated with comments received during the EIA Phase of the project. This report would be incorporated into the final EIA Report. The report will inter alia consist of the following:

- A description of the PPP followed;
- List of registered I&APs;
- Proof of meeting proceedings; and
- Issues and Response Report.

The final Public Participation Report will be completed once the public review period has expired. The issues and concerns that were obtained through the entire PPP will thus form the basis of this report.

12.4.6 **Advertisement**

Once the draft PPP and EIA Report has been compiled a newspaper advertisement (in English and isiZulu) will be placed in a local newspaper. The aim of the newspaper advertisement would be to advertise the availability of the draft EIA Report and the details with regards to the public meeting/public open day.

12.4.7 **Public Review**

The Draft Environmental Impact Assessment Report was made available for public review from Friday 20 February 2015 until Tuesday 31 March 2015 (40 calendar days (excluding public holidays)) at the Dundee Public Library. Registered stakeholders and those Interested and Affected Parties (I&APs) on the database was formally notified of the availability of the draft report via e-mail and SMS. Proof of e-mail notifications is included in the project documentation IS ATTACHED TO APPENDIX P.

Where requested by I&APs, copies of the document were made available on CD.

12.4.8 **Public Meeting/Public Open Day**

During the review period, a public open day was held at Battlefields Lodge on Friday 27 February 2015. The open day was held to provide I&APs with more information on the project, the contents of the draft EIA Report and to allow for a further opportunity for clarification and comments.

The specific aims of the public open day were to:

- Provide I&APs with an opportunity to view project documentation such as maps and the draft EIA Report;
- Discuss issues of concern with the consultants;
- Discuss issues raised for clarity; and
- Raise additional comments and concerns with regards to the proposed project.

A copy of the minutes of the public open day is attached (Refer to **Appendix P**).

Issues and comments received on the draft reports were further captured in this Issues and Response Report and forms part of the final EIAR.

13 ENVIRONMENTAL MANAGEMENT PROGRAMME

13.1 Topography

Topography	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Alteration of the topography due to construction activities and mining operations. Residual impacts in terms of the mine will remain.
Objectives/targets	*Construction Phase* • To minimise the disturbance to the topography as far as is possible. • To prevent the erosion of excavated areas and stockpiled soil by keeping free draining surface. • To minimise impacts on local drainage patterns. *Decommissioning Phase* • To ensure that all rehabilitated surfaces are profiled correctly to allow free drainage of surface water, without causing erosion.
Management measures	*Planning and Design Phase* • Harsh, steep engineered slopes (as normally designed) should be avoided *Construction Phase* • Construction should be limited to: -footprint areas; -areas as depicted on the block plan; -areas away from koppies or naturally elevated areas; -outside of sensitive drainage lines; and -outside 1:100 year floodline areas and riparian zones. • Construction activities should include ongoing rehabilitation, especially soil management. Soil mismanagement can lead to erosion which can have a significant impact on the local topography over the long term. *Operational Phase* • Appropriate stormwater management structures should be installed as not to impact on soil conditions which could impose impacts associated with sediment run-off and erosion. *Decommissioning Phase* • Profiling of the landscape will take place to ensure the area is rehabilitated

Topography	Management
	as close to its natural state as possible. • The portals will be backfilled with a significant portion of waste rock. It will be the intent to utilise as much of the waste rock as possible to backfill declines and the portal structures. Once backfilled the area will be sloped according to its natural gradient and sloped to allow for surface water run-off. • Drainage lines and storm water management structures will be removed in order to allow for the free drainage of water over the area.
Responsibility	• The construction manager, or the mine manager, in conjunction with the environmental officer/appointee, is responsible for these management objectives. • The engineer/company appointed to oversee the operation will be responsible for ensuring its safe construction according to design, and in conjunction with the environmental officer/appointee is responsible for the ongoing rehabilitation through to closure.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.2 Geology

Geology	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Disturbance of the natural geology and the disturbance of a non-renewable mineral resource. Positive impact in terms of the utilisation of this resource to: generate income, stimulate local, regional economies, and contribute towards the national GDP.
Objectives/targets	*Construction Phase* • To ensure the optimal location and construction of mine layout and infrastructure. *Operational Phase* • To create as little as possible disturbance in terms of the geology that could result in surface and subsurface disturbances. *Decommissioning Phase* • To ensure that underground structures are left stable as to prevent surface subsidence.
Management	*Planning and Design Phase*

Geology	Management
measures	• Feasibility designs should be conducted on a confidence level that will allow for the optimal placement of infrastructure. Mine design should focus on all reefs with a mining potential. *Construction Phase* • The reefs should be mined and processed to ensure effective extraction of coal. • The start of construction and development will be done in line with the OHSA and MHSA as well as other best practice methods to ensure that underground conditions are safe. Measures should also be implemented to prevent the possible collapse of underground workings. *Operational Phase* • The plant should be designed for optimal extraction of the target minerals from the RoM coal using current best practices and technology. *Decommissioning Phase* • Underground working should be left safe and all mining areas should be sealed off where applicable and appropriate.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational, and decommissioning phases outlined above.

13.3 Soils, Land Use and Land Capability

Soils, Land Use and Land Capability	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Damage of soil integrity, losses due to erosion, pollution with the indirect impact of the loss or destruction of the soil land use potential after closure.
Objectives/targets	*Construction Phase* • To ensure that soil integrity is maintained with minimal soil losses during soil stripping and storage. Correct placement and long term storage strategy employed. *Operational Phase* • To ensure that soil is tested regularly in terms of fertility and that a fertilising programme is followed if needed. *Decommissioning Phase*

Soils, Land Use and Land Capability	Management
	• Successful placement of topsoil and erosion control.
Management measures	*Planning and Design Phase* • Feasibility designs should be conducted on a confidence level that will allow for the optimal placement of portals and declines to access reef. Mine design should focus on all reefs with a mining potential. *Construction Phase* • Delineation of areas to be stripped: o Stripping will only occur where soils are to be disturbed by activities that are described in this report and where a clearly defined end rehabilitation use for the stripped soil has been identified. • Reference to biodiversity action plan: o It is recommended that all vegetation is stripped and stored as part of the utilisable soil. • Stripping and handling of soils: o Wherever possible, soils will be handled in dry weather conditions so as to cause as little compaction as possible. o Topsoil and the upper portion of subsoil (B2/1) must be removed and stockpiled separately from the lower "B" horizon, with the sub base materials being separated from the soft/decomposed rock, and wet or highly structures soils separated from the dry more friable sandy loam and sandy clay loam soils if they are to be impacted. o The "utilizable" soil will be stripped to a depth of 500mm or until hard rock is encountered. These soils will be stockpiled together with any vegetation cover present. o Total stripping depth should be 750mm wherever possible • Delineation of stockpiling areas: o Stockpiling areas will be identified in close proximity to the source of the soil in order to limit handling and to promote the reuse of soils in the correct areas. o All stockpiles will be founded on well engineered and free draining stockpile pads. o Soils stockpiles will be demarcated and clearly marked to identify both the soil type and the intended area of rehabilitation. *Operational Phase* • Stockpile management: o Vegetation establishment and erosion control: Enhanced growth

Soils, Land Use and Land Capability	Management
	of vegetation on the Soil stockpiles and berms will be promoted (e.g. by means of watering and/or fertilisation), or a system of rock cladding will be employed. The purpose of this exercise will be to protect the soils and to combat erosion by water and wind. o Storm water control: stockpiles will be established / engineered with storm water diversion berms put in place to prevent run off erosion. o Stockpile Height and Slope Stability: Soil stockpile and berm heights will be restricted where possible to 15m and <1.5m respectively so as to avoid compaction and damage to the soil seed pool. Stockpiles exceeding 1.5m should be benched at 2m intervals. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related to erosion. o Waste: Only inert waste rock material will be placed on the soil stockpiles if the vegetative growth is impractical or not viable. This will protect the stockpile from erosion. o Vehicles: Equipment, human and animal movement on the soil stockpiles will be limited in order to avoid compaction and subsequent damage to the soils and seed bank. *Decommissioning Phase* • Rehabilitation of disturbed land and restoration of soil utilisation: o Placement of Soils: Stockpiled soils will be used to rehabilitate disturbed sites. The utilised soils removed during the construction phase, must be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved past development end land use (conservation capability and/or low intensity wildlife grazing) and will attain a free draining surface profile. o Fertilisation: A representative sampling of the stripped and stockpiled soils will be analysed to determine the nutrient status and chemistry of the utilisable materials. As a minimum the following elements should be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay%, and organic Carbon. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary. o Erosion Control: Erosion control measures will be implemented to ensure that the soil is not wasted away and that erosion gulleys do not develop prior to vegetation establishment. • Pollution of Soils: o In-situ Remediation: If soil is polluted the first management priority is to treat the pollution by means of in situ bioremediation. The

Soils, Land Use and Land Capability	Management
	acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented. o Off-site disposal of soils: If in-situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste and additionally should be disposed of at a licence waste disposal facility.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.4 Flora

Flora	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Introduction of alien species and the loss of biodiversity. Loss of endangered/threatened species is also a possible impact.
Objectives/targets	*Construction Phase* • To restrict the development to dedicated footprint areas only and to preserve: medicinal, endangered, and species of conservation significance. • To prevent the introduction and/or spread of alien vegetation. *Operational Phase* • To prevent further impacts on the vegetation with the aim of improving the biodiversity of the area. • Not to impact on sensitive areas or ecosystems. • Not to impact on any area not intended for mining developments. • Not to constrict the flow of surface water to sensitive areas and riparian zones. • To prevent the spread of alien vegetation. *Decommissioning Phase* • To restore the biodiversity of the area. • To prevent the spread of alien vegetation.

Flora	Management
Management measures	*Construction Phase* • Before the establishment of any of the proposed infrastructure, a plant rescue exercise should take place to remove any plants of medicinal value, especially: forbs. Indigenous plants and seeds should be harvested and held in nurseries to assist with the re-vegetation / rehabilitation[2]/ restoration of disturbed areas, gardens and tailing dams. • Any alien species encountered should be removed and treated according to the guidelines of the Conservation of Agricultural Resources Act. • The removed indigenous trees should be made available to the local communities to reduce the illegal harvesting of trees in the areas. Other organic litter (branches, leaves) should be used in the creation of compost. • Runoff from the construction sites should be monitored and controlled in order to prevent erosion of areas adjacent to the construction areas. *Operational Phase* • Environmental management during this phase is mainly concerned with the proactive monitoring and control of alien vegetation. Storm runoff should be monitored to prevent erosion. • Only regional indigenous vegetation should be used in the re-vegetation of the tailings dam to assist with the dust control. • Compost from the organic litter obtained during the construction phase should be used for improving the soil fertility on the tailings dams. The introduction of earthworm compost could also be considered. *Decommissioning Phase* • Areas where infrastructure has been removed need to be re-vegetated using regional indigenous species from the area. • The area should be monitored for alien infestation for at least a 3 year period from decommissioning and closure.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.5 Fauna

Fauna	Management
Phase	• Construction. • Operational.

[2] Revegetation involves the complex process of earthworks, soil preparation and species selection using ecological criteria. This process should be facilitated by a registered professional ecologist

Fauna	Management
	• Decommissioning.
Potential impact(s)	• The loss and degradation of untransformed faunal habitat. • The loss of bird life as a result of electrocution and collisions resulting from the presence of power lines related to the project. • The loss of animal life on newly constructed access roads due to collisions with vehicles, as well as diversion of waterways and disruption of wetland system flow. • The disruption of ecological connectivity and migration routes of larger, flightless animals as well as territorial infringement. • An increase in poaching, snaring, and trapping of wild animals. • The attraction of faunal species to the surface water present in the mining area as a result of the mining operation. • The impacts associated with the potential leaching of chemicals into the groundwater and surface water in the region of the study area.
Objectives/targets	• To prevent the loss of biodiversity. • To ensure as little as possible habitat destruction and no habitat destruction within sensitive areas. • To avoid contamination of surface and groundwater, this could impact on fauna habitat and health. • To ensure the overall protection of fauna.
Management measures	*Construction Phase* • The destruction of highly sensitive faunal habitat (outcrops and wetlands) should be avoided at all costs. • Clear and definite boundaries should be set in place for all of the actions associated with the project. • Fences must be erected where-ever possible. Construction operators as well as operational personnel should be instructed as to the physical boundaries pertaining to their respective disciplines and measures should be set in place to ensure that they keep to these boundaries (fines etc). Natural environments next to these areas must not be effected. • Erosion control measures must be put in place from the beginning of construction (wind break, water diversions, gabions etc) to ensure that artificial erosion associated with the activities of the project (construction, operation and decommissioning) do not degrade the natural ecological state of habitat bordering the various areas of activity. • To avoid collisions (mostly with the earth wire) the Eskom “bird flappers” should be installed on the earth wire of the power line – the same principle applies – the power line must be monitored to assess the severity of

Fauna	Management
	potential collisions once operational. • The construction of all roads should allow for the free movement of water (especially in low-lying areas) by means of large pipes under the roads (such pipes will also double as migration routes for smaller species cautious to cross the roads otherwise). • It should be ensured that the construction of the roads allows run-off water to join natural wetlands at speeds and volumes matching the natural bordering wetland systems (i.e. seepage wetlands compared to channelled fast-flowing streams). • Where-ever linear structures bisect natural areas of untransformed faunal habitat measures should be put in place to ensure continued movement of all faunal groups needing to cross such lines. • After the laying of underground pipelines for water and slurry, rehabilitation must be done swiftly and effectively • Before construction commence the breeding site of Black Eagle should be confirmed. *Operational Phase* • Driving at night should be prohibited, except for emergencies; a speed limit of no more than 40 km/h must be enforced. Booms should be erected to restrict access to the haul and other roads at night. Speed bumps should be placed on these roads to ensure that the speed limit is adhered to. • Regular inspection of these fences to ensure the fences' integrity, the borders and surrounding areas next to the mining area should be patrolled for the presence of snares etc. this will limit the impact of poaching and snaring. • There must be communication with farmers whose farms border the operational areas in order to create awareness of potential poaching problems in the area. • Areas of open water must be limited and covered as far as is possible. • Medium and large-sized mammals should be denied access to these open water areas by means of electrical fencing. • The development of steep slopes with fine, silty soils should be avoided to protect birds from getting stuck and drowning. • It should be ensured that no leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. • To prevent further impacts on the vegetation with the aim to improve the biodiversity of the area. *Decommissioning Phase* • To ensure the area is pollutant free (especially surface and groundwater) prior to the removal of fences

Fauna	Management
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.6 Surface Water

Surface Water	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Introduction of alien species and the loss of biodiversity. Loss of endangered/threatened species is also a possible impact.
Objectives/targets	*Construction and Operational Phase* • To separate dirty and clean water. • To contain dirty water in a system. • To prevent contamination of clean water. • To return clean water to the catchment. *Decommissioning Phase* • To restore the biodiversity of the area. • To prevent the spread of alien vegetation.
Management measures	*Construction Phase* • Contamination of clean water: o Cover trucks. o Create temporary berms and storm water management channels to contain dirty water. o Design and construct slopes to minimise erosion and possible increases of sediment in local water bodies and streams. • Stream flow reduction: o Restrict construction to planned areas. o Develop storm water management plan to allow for the maximum run-off of clean water. o Restrict / reduce the footprint areas of dirty working areas. o Spills should be cleaned up immediately and reported to the environmental officer. Major spills should be reported to the Department of Water Affairs.

Surface Water	Management
	Operational Phase • Control sediment run-off. • Prevent chemical spills as far possible. Clean-up of the spills will be conducted immediately. • Major spills will be reported to Department of Water Affairs. • Maintain SWM system to ensure zero blockages or overflows. • Zero contaminations of clean water in clean water environments. • General protection of surface water as a valuable resource. • Monitoring of surface water quality on the mine and in close proximity to the mine. *Decommissioning Phase* • Ensure that SWM system is demolished appropriately to allow for free and natural draining of rainwater / surface water to water bodies and streams. • Continue with water monitoring for at least 3-5 years after closure. • Control erosion to limit sediment.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational, and decommissioning phases outlined above.

13.7 Wetland

Wetland	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	. Loss of wetland habitat.
Objectives/targets	*Construction Phase* • To restrict the development to dedicated footprint areas only and to preserve: medicinal, endangered, and species of conservation significance. • To prevent the introduction and/or spread of alien vegetation. *Operational Phase* • To prevent further impacts on the vegetation with the aim of improving the biodiversity of the area. • Not to impact on sensitive areas or ecosystems.

Wetland	Management
	• Not to impact on any area not intended for mining developments. • Not to constrict the flow of surface water to sensitive areas and riparian zones. • To prevent the spread of alien vegetation. *Decommissioning Phase* • To restore the biodiversity of the area. • To prevent the spread of alien vegetation.
Management measures	*Construction Phase* • The wetland management plan should aim to maintain the wetlands in their current state (i.e. prevent further degradation) or improve their current state. The present ecological assessment carried out as part of this assessment should serve as the baseline against which the success of the management plan can be monitored. No decrease in the PES ratings of the individual wetland units should occur. The water quality data and results from the aquatic biomonitoring (diatoms, macro-invertebrates, and fish) should also serve as baseline data against which future biomonitoring data can be compared. • Any alien species encountered should be removed and treated according to the guidelines of the Conservation of Agricultural Resources Act. • The removed indigenous trees should be made available to the local communities to reduce the illegal harvesting of trees in the areas. Other organic litter (branches, leaves) should be used in the creation of compost. • Runoff from the construction sites should be monitored and controlled in order to prevent erosion of areas adjacent to the construction areas. • **Detailed Wetland assessment and wetland management plan should be implemented before construction.** *Operational Phase* • Environmental management during this phase is mainly concerned with the proactive monitoring and control of alien vegetation. Storm runoff should be monitored to prevent erosion. • Only regional indigenous vegetation should be used in the re-vegetation of the tailings dam to assist with the dust control. • Compost from the organic litter obtained during the construction phase should be used for improving the soil fertility on the tailings dams. The introduction of earthworm compost could also be considered. *Decommissioning Phase* • Areas where infrastructure has been removed need to be re-vegetated using regional indigenous species from the area. • The area should be monitored for alien infestation for at least a 3 year

Wetland	Management
	period from decommissioning and closure.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.8 Groundwater

Groundwater	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	• Impact on groundwater due to decline development • Impact on groundwater due to construction of dams. • Influx of groundwater into mine workings. • Deterioration in groundwater quality in the mining section and seepage into the receiving environment. • Inner-mine flow during the operational phase. • Groundwater quality impacts due to surface dams.
Objectives/targets	*Construction and Operational Phase* • To prevent groundwater impacts as far possible with appropriate mitigation measures. • To treat chemical spills immediately as to prevent surface and groundwater contamination. • Construct the water dams as to prevent groundwater contamination. *Decommissioning Phase* • To restore the area as such as to prevent long term residual impacts.
Management measures	*Construction Phase* • Pump water to dirty water dams (if required). • Report spills and/or major impacts on groundwater to Department of Water Affairs. • Ongoing testing of local borehole yields to determine impacts on local users. • Sampling and analysis of local boreholes to determine possible contamination as early as possible.

Groundwater	Management
	Operational Phase • Pump excess groundwater in mine workings to settling ponds. • Monitor boreholes for loss and quality changes. • Handle excess groundwater as part of the operational phase water balance. *Decommissioning Phase* • Continuation of water sampling for a period of 3 to 5 years after mining.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.9 Air Quality

Air Quality	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	• Impacts on surface water, human health, fauna, and flora as a result of increased dust. • Increases in PM10 (fugitive dues) in terms of ambient air quality.
Objectives/targets	*Construction and Operational Phase* • To limit dust during all site activities. *Decommissioning Phase* • To ensure that the site is left stable in terms of air quality. • Areas are well vegetated to limit dust.
Management measures	*Construction Phase* • Effective dust suppression especially during the windy months. • Clearing of areas during non-windy months where possible. • Clearing of footprint areas only. • Establishing of appropriate fire breaks around the construction site. • No fuel or biomass burning. *Operational Phase* • Ongoing dust suppression.

Air Quality	Management
	• To minimise dust by means of water sprays as all ore transfer points. *Decommissioning Phase* • Mine area sloped and where possible vegetated.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.10 Noise

Noise	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Noise impacts as a result of blasting and site activities.
Objectives/targets	*Construction and Operational Phase* • Limit noise to operational areas only. • Establishment of an affective grievance mechanism to inform local residents of blasting and/or noise generation activities. *Decommissioning Phase* • To limit noise generation to areas to be demolished.
Management measures	*Construction and Operational Phase* • Fit efficient silencers and enclose engine compartments. • Damp mechanical vibrations of equipment. • Maintain equipment conscientiously. • Erect berm, screen, or barrier at truck holding sites and any haul roads. • Carefully select permanent equipment positions. • Preferential choice of low noise plant. • Reduce noise at source by acoustic treatment, etc. • Isolate source by acoustic enclosure, etc. • Standardised noise measurements should be carried out on individual equipment at the site to construct a reference database. • To do environmental noise monitoring. *Decommissioning Phase*

Noise	Management
	• Decommissioning activities should be done inside the plant area prior to the removal of steel claddings. • Surface rehabilitation with earth moving equipment should focus on the area to be rehabilitated; however, this impact will be similar as for construction where expected noise levels will be up to 5dB above the recommended values for a suburban area and within the recommended daytime noise levels of 50dB.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.11 Sites of Archaeological Interest

Archaeological	Management
Phase	• Construction. • Operational.
Potential impact(s)	Destruction of below surface archaeological findings.
Objectives/targets	• To preserve all archaeological and historical site
Management measures	Archaetnos identified Thirty (36) sites of cultural significance. Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance. The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan. The heritage assessment should be rewritten at least once every five years or every time a new development is planned (whichever comes first). It should be remembered that due to the factors indicated in the report, it is possible that all cultural sites may not have been identified. Also the subterranean presence of archaeological and/or historical sites, features or artifacts are always a distinct possibility. Care should therefore be taken when development work commences that, if any more sites and artifacts are identified and uncovered, a qualified archaeologist be called in to investigate. The fencing of certain resources and keeping the vegetation in control (see management guidelines) is a very important first step that should be implemented urgently. Partnerships should be formed with concerned parties in order to get these people involved in the preservation and conservation of the cultural heritage at

Archaeological	Management
	the mine. This document should be used to assist in planning, and care should be taken that sites are not demolished without reason. This basically means that all sites should be left as it is, should there not be any reason to intervene. It should be noted that even if there is no direct impact there usually is a secondary impact. This includes possible blasting damage, dust etc. Therefore mitigation should also be engaged into in the latter case. Sites number 4-10 were identified within the area of impact and will have to dealt with different than others. Site no. 8 may be demolished if necessary, but has to be mapped first as it is regarded as having a higher cultural significance than other similar sites. However, since the mining operations will be underground, the site should be left as it is. Site no. 10 is of a high cultural significance. It may not be demolished and will have to be preserved by the mine. Although there will be no direct impact, possible secondary impact is foreseen (e.g. moving of vehicles and people on site). It means the fencing of the site and that a heritage management plan should be written by a heritage expert. Site no. 11 is of a high cultural significance. They may not be demolished and will have to be preserved by the mine. That would include having a heritage management plan written by a heritage expert. Currently there is no impact foreseen, but the site can easily be reused by the mine The grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance. Exhumation is usually the second option, but sometimes it is impossible to prevent. These sites will not be impacted on directly. Due to the possible secondary impact, a heritage expert should write a management plan for each of these sites. It also should be fenced in properly, maintained, managed and preserved. Access to possible descendants should be allowed. Site 18 (grave on pillar) also is of a high cultural significance. However due to the specific circumstances of erosion that endangers the site, the grave will have to be exhumed and the human remains reburied. This has to be done in accordance with the legislation discussed above. For this a detailed social consultation process is needed. An undertaker is always involved and an archaeologist is only needed for unknown graves and those older than 60 years. Certain permits need to be obtained, but the mentioned parties will take care of that. Table 1 indicates a risk assessment for the two options in dealing with graves. In this particular case it may perhaps be reburied at one of the other sites (as near as possible) found
Responsibility	The construction and/or mine manager.
Timeframes	As soon as these sites are discovered.

13.12 Visual

Visual	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Changing the visual character of the area
Objectives/targets	*Construction and Operational Phase* • Measures should be feasible, effective and acceptable. • All mitigations should be designed to suit the existing landscape character and needs of the locality. • Mitigation measures should respect and build upon landscape distinctiveness.
Management measures	*Construction and Operational Phase* • Project area development: o As little vegetation as possible be removed from the construction site. o Dust suppression techniques should be in place at all times during construction. o Only the footprint and a small construction buffer zone should be exposed. As much possible natural vegetation should be retained. o Paint buildings and structures with colours that reflect and complement the natural colour of the surrounding landscape. Avoid pure whites and pure blacks. o To reduce the potential of glare, external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal. o Roofs to tall structures to be painted a 'dirty' grey. *Decommissioning Phase* • Where the natural vegetation intrudes onto the sites it should be retained. • An ecological approach to landscaping is recommended. Plants introduced into the project, should be guided by ecological rather than horticultural principles. For example ecological communities of indigenous plants provide more bio-diversity and habitat opportunities and would blend with the natural vegetation. This approach is also less costly to maintain and is sustainable in the long term once the plants have established. • Plant a combination of tall indigenous trees and shrubs within the development to partially absorb the views of the plant, vent shafts, incline shaft entrance, and the electricity generation area.

Visual	Management
	• Plant only indigenous trees to the area should be used for rehabilitation / landscaping purposes during the closure phase.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational, and decommissioning phases outlined above.

13.13 Traffic

Traffic	Management
Phase	• Construction. • Operational. • Decommissioning.
Potential impact(s)	Increase in traffic on R68 due to: construction, operation, and decommissioning.
Objectives/targets	*Construction and Operational Phase* • To limit traffic impacts relating to traffic volumes, health, and safety.
Management measures	*Construction, Operational and Decommissioning Phases* • Design and construct a site entrance of the R68 that is safe and poses no threat to existing road users. • Allow for appropriate traffic calming measures during road construction. • If possible, limit the delivery of construction materials to after hours or during the day (avoid peak hour traffic times). • . • Allow for contributions toward road upgrades and maintenance (specifically R68).
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational, and decommissioning phases outlined above.

13.14 Socio-Economic Environment

Socio-Economic	Management
Phase	• Construction. • Operational. • Decommissioning.

Socio-Economic	Management
Potential impact(s)	Impacts associated with the influx of job seekers, economic development, skills inequities, living conditions, health and safety, land acquisition etc. (as discussed in impact section).
Objectives/targets	• Maximise employment opportunities and limit skills inequities. • Minimise any potential negative impacts associated with the inflow of workers and jobseekers. • Provision of adequate accommodation for members of the construction team. • Maximise local economic contribution to ensure positive economic spin-offs for the communities. • Limit any possible negative impact on the local tourism industry and enhance possible positive impacts. • Limit any possible dust pollution and unauthorised movement of construction workers on private properties; additionally limit vehicle movement and increases in crime levels. • Limit environmental pollution and social intrusions to avoid impacts on the daily living and movement patterns of neighbouring property owners and local community members. • Proper communication to the local communities regarding blasting activities, possible impact on structures, and possible compensation. • Limit any safety and security risks during the construction phase. • Avoid any additional pressure on infrastructure and services as a result of the proposed mine and mining activities. • Assist in combating the spread of sexually transmitted diseases and limit any negative impacts on the general health of the communities. • Limit negative impact on the sense of place.
Management measures	*Construction, Operations and Decommissioning Phases* Maximise Employment Opportunities • Training of potential future employees, contract workers and/or community members should focus on mining related skills. • Training of local construction workers during the construction phase to enable them to be employable during the operational phase would not stop the influx of outsiders, but could attempt to minimise the number of “new” outsiders coming to the area in search of employment. • Training courses should be accredited and certificates obtained should be acceptable by other related industries. • The development of a mining institute funded by all the mines operating in the area is seen, from a community perspective, as a key mitigation

Socio-Economic	Management
	measure in addressing the skills inequities in the local area. Such an option is achievable, although not necessarily economically feasible from a mining management perspective. <u>Inflow of Temporary Workers and Jobseekers.</u> • Construction workers falling within the semi-skilled to unskilled category should be sourced from the local population, where possible, to avoid possible conflict arising between locals and the outside workforce, but also to limit the need for a temporary accommodation facility. • Introduce contractual obligations for contractors to use local labour as far as possible. • Contractors are to ensure that foreign workers reside in suitable facilities and not establish informal houses. • Construction workers should be supervised at all times. • Construction activities should be kept to normal working hours e.g. from 7 am until 5 pm during weekdays (daylight hours). • Property owners surrounding the construction areas should be informed of the construction schedules and activities. • Security on-site should be active prior to the construction period. • The construction site and accommodation facility should be properly managed to avoid any littering and possible environmental pollution. Water and sanitation facilities should be up to standard. • Information distributed as part of the existing HIV/Aids awareness campaigns undertaken in the area should again be focused on and communicated to the local workforce. • Unrealistic employment expectations should not be created. • The development of informal vending “stations” where food and small goods are sold should be properly managed, to avoid: littering, safety risks, and possible environmental pollution. • Maximise the use of local labour and contractors where possible by developing a strategy that will involve local labour in the construction process. • The development, publication and widespread dissemination of a recruitment policy could serve to encourage local employment and could reduce the potential influx of jobseekers to the area. <u>Accommodation of Workforce</u> • For construction, should a temporary accommodation facility be required on site, this facility must be managed in an environmentally and socially acceptable manner to avoid any social conflict and environmental pollution. • The employment of locals should be maximised to limit the need for any additional housing infrastructure (as far as possible).

Socio-Economic	Management
	Local Economic Contribution • Even if local companies and SMMEs would be considered during the construction phase of the project, the tender process should be based on competitive business principles and the quality of services to be rendered in order to ensure the adherence to standards and to maximise overall welfare. • SMMEs should be assisted with regards to: general business principles, financial management, management of stock, competitive costing (pricing), and the marketing of their business. • Should SMMEs be appointed for the procurement of goods or the provision of services, the contract executions should be strictly monitored on a monthly basis. • From a community perspective, enterprise development is a key mitigation measure in this regard. The proponent should assist small businesses and/or SMME's to develop to a certain level where they can become involved in the tender process. Such measures, recommended by community representatives, could include the following: o The establishment of joint ventures between small businesses and established companies with relevant experiences within the tender process. o Some tenders for "less significant construction related activities" lower than a pre-agreed amount should be awarded to locals provided that these locals would have some form of experience and credibility to ensure that the quality of work is not compromised. o Payment systems should be flexible, but strictly controlled, to assist smaller businesses in terms of expenditure. o An audit of existing local enterprises that could provide services, goods, and material should be undertaken with the assistance of local leaders and community representatives, as well as local business structures. o SMME's should submit their business profiles once the tender process starts to enable them to receive tender related documentation. • The mine should adopt a Procurement Plan whereby they aim to provide Historically Disadvantaged South Africans (HDSAs) and SMME's with the opportunity to become involved in the procurement of capital goods, consumables, and services. This Plan should be implemented in conjunction with the ELM and local development programmes in the surrounding communities. These programmes could focus on providing support and technical advice to entrepreneurs and/or SMMEs to enable them to supply goods and materials for operations at the future mine. Farming Activities

Socio-Economic	Management
	• Effective management of the mining activities to avoid any environmental pollution focusing on: water, waste and sanitation infrastructure and services; and limiting any increase in noise levels. • Strict security measures should be put in place. Security personnel should be on site on a permanent basis. • The mining area should be fenced to avoid entry of animals into the mining area. • The contractor should communicate the construction schedule and vehicle movements to the neighbouring property owners. <u>Daily Living and Movement Patterns</u> • Dust suppression methods should be strictly implemented if and where required. • Should local road users be affected by the movement of the construction vehicles or by the construction activities taking place across roads, sufficient warning signs should be erected. • All construction vehicles should be in a good condition and should adhere to road worthy standards. • Dust creation should be kept to a minimum by adhering to the speed limits on the gravel roads. • The construction of additional access roads should be limited. • Speeding of construction vehicles must be strictly monitored. • Mine related traffic (especially heavy vehicles) should aim to avoid the peak traffic peaks <u>Safety and Security</u> • A Fire/Emergency Management Plan should be developed and implemented. It is important that this management plan and associated communication channels are developed at the outset of the construction phase. It would be important to regularly review the functionality and efficiency of such a plan in conjunction with the local emergency teams, mine management and affected communities as well as neighbouring landowners. • Open fires for cooking and related purposes should not be allowed on site. • Appropriate firefighting equipment should be on site and construction workers should be appropriately trained for firefighting. • The project proponent and contractors should discuss the safety and security issues, as well as construction schedules with the local community leaders and the local police service. • The construction area should be fenced or access to the area should be controlled to avoid animals from entering, or people entering the area

Socio-Economic	Management
	without authorisation. • The construction sites should be clearly marked; “danger” and “no entry” signs should be erected. • Speed limits on the local roads surrounding the construction sites should be enforced. • Speeding of construction vehicles must be strictly monitored. • Mine related traffic (especially heavy vehicles) should aim to avoid the morning and afternoon traffic peaks and times when children are walking to and from school. • Due to the existing traffic volumes on the R68 it is imperative that the entrance to the mine should be designed in consultation with the Department of Public Works, Roads and Transport. Traffic calming measures around this section of the road could also be introduced • Maximise the employment of locals where possible. <u>Health Impacts</u> • Maximise the employment of locals where possible. • A mobile on-site clinic should be established as a priority. • First aid supplies should be available at various points at the construction site. • Emergency and health services should be notified of the construction schedule and peak construction periods. • Continue and extend the current HIV/AIDS awareness and support programmes, with specific focus on those in and nearby the construction site. • The general health of construction workers should be monitored on an on-going basis. <u>Infrastructure and Services</u> • Maximise the employment of locals where possible. • Maintenance of the roads frequently used by construction traffic e.g. R68 should be discussed and negotiated with the Department of Public Works, Road and Transport. <u>Land Acquisition and Zoning</u> • Skills development, social developmental support and local economic contribution should be implemented to enhance the positive impacts to the communities in this regard. <u>Visual and Sense of Place</u> • The construction site should be kept litter free. • Site rehabilitation on certain sections of the site should occur as soon as

Socio-Economic	Management
	the construction process allows. Noise • Construction vehicles should be in a good working order. • Construction activities should be kept to normal working hours e.g. 7 am until 5 pm during weekdays. • *Decommissioning Phase* • Downscaling and retrenchment should be properly communicated to all temporary and permanent staff. • Training programmes should be adjusted to allow for training of non-mining related skills. • A Closure Plan should be compiled where the social risks associated with mine closure are outlined together with appropriate actions plans to relieve communities and individuals from the impacts associated with mine closure.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational, and decommissioning phases outlined above.

13.15 Health

Health	Management
Phase	• Construction and Operational.
Potential impact(s)	• Potential changes in social cohesion related to influx of people. • Safety and security. • Health impacts related to inadequate housing.
Objectives/targets	*Construction and Operational Phase* • Improve social cohesion in community. • Improve financial skills in employees and extended families and communities. • Improve road safety. • Increase awareness on safety. • Reduce injuries on and off site. • Reduce impact of blasting in terms of vibrations. • Reduce the prevalence of TB.

Health	Management
	• Assist in improving the capacity of health services. • Prevent additional health impacts resulting from improper health services. • Increase awareness about lifestyle and communicable diseases. • Reduce adverse impacts of non-communicable diseases in workforce and potentially affected community. • Reduce environmental impacts such as spills, air pollution, water pollution etc. • Reduce burden on existing services.
Management measures	• The mine could assist the relevant authorities and health services s when the authorities or stakeholder are undertaking the following:Conduct education programmes on violence-prevention, socio-economic education, financial skills, substance abuse and general environmental principles such as illegal dumping. • Maintain road infrastructure and enhance the visibility of trucks and intersections. • Create awareness, or conduct awareness training associated with overcrowding such as: fires, burns, and road safety. • Undertake awareness campaigns at schools with thefocus being on: traffic-safety, paraffin, pesticide, and domestic fuel use. • Provide adequate measures to curb dust suspension. • Training of employees on safety issues. • Collaborate with relevant departments on housing requirements. • Collaborate with the Department of Health on awareness creation around vaccinations to communicable diseases for vulnerable populations such as children. • Collaborate with clinics to identify opportunities for assisting with health services. • Establishment of on-site health facility operational at the onset of construction. • Provide educational handouts for use in local clinics. • Implement programmes to support the: psychosocial, emotional, and mental health of workforce.
Responsibility	The construction and/or mine manager.
Timeframes	As per the construction, operational and decommissioning phases outlined above.

13.16 Compliance and Performance Assessment

Transasia needs to ensure that its operations are in compliance with this Environmental Management Plan (EMPr), should this project be approved. This is to ensure compliance with NEMA, Act No. 107 of 1998, section 28 that relates to the Duty of Care Principles. This section prescribes that an organisation must implement the necessary measures to mitigate or manage its activities which may cause significant pollution or degradation to the environment.

As part of good practice the following is recommended:

- Due diligence investigations to determine environmental liabilities (in financial terms);
- Environmental management system implementation assessments; and
- Assessment of status in terms of environmental legislation and requirements.

For this purpose a detailed environmental audit should be undertaken to assess compliance with the approved EMPr and environmental legislation. It is recommended that this environmental performance assessment and legal compliance audit be undertaking once a year.

Internal audits must also be performed focusing on the following:

- Environmental Management Plans;
- Emergency Action Plans;
- Legal Compliance; and
- Monitoring Plans.

14 ENVIRONMENTAL MONITORING AND REPORTING

The monitoring programme is based on information provided in the Mining Right application that was approved and submitted to the DMR. Part of the application a detailed Management Plan was developed, please refer to **Appendix A**. From the Environmental Management Plan Transasia developed a separate monitoring management plan compiled by Citofield. Please refer to **Appendix K**.

14.1 Soils, Land Capability and Land Use

Nutrient requirements reported herein are based on the monitoring and sampling of the soils at the time of the baseline survey. These values will definitely alter during the storage stage and will need to be re-evaluated before being used during rehabilitation. Ongoing evaluation of the nutrient status of the growth medium will be needed throughout the life of the project and into the rehabilitation phase.

During the rehabilitation exercising preliminary soil quality monitoring should be carried out to accurately determine the fertilizer requirements that will be needed. Additional soil sampling should also be carried out annually until the levels of nutrients, specifically: magnesium, phosphorus and potassium, are at the required levels for sustainable growth. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.

Monitoring Aspect/Activity	Timeframe	Reporting	Estimated Cost
Soil Fertility	Biannually	Annually	R20000

Soils samples should be analysed for the following parameters:

- pH (H2O);
- Phosphorus (Bray I);
- Electrical conductivity;
- Calcium mg/kg;
- Cation exchange capacity;
- Sodium mg/kg;
- Magnesium mg/kg; Potassium mg/kg;
- Zinc mg/kg;
- Clay; and
- Organic matter content (C %).

The following maintenance is recommended:

- The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;
- Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.) ;

- Traffic should be limited were possible while the vegetation is establishing itself;
- Plants should be watered and weeded as required on a regular and managed basis were possible and practical;
- Check for pests and diseases at least once every two weeks and treat if necessary;
- Replace unhealthy or dead plant material;
- Fertilise, hydro seeded and grassed areas soon after germination, and
- Repair any damage caused by erosion.

14.2 Flora

Due to the absence of quantitative data and related vegetation population dynamics (density, structure, age), this information will have to be collected prior to the construction of the mine and should actively commence, during the optimal flowering period (December – March). This will provide the baseline information against which rehabilitation and re-vegetation procedure can be measured. Crucial information to be documented and monitored with regards to vegetation is:

1. Vegetation cover – effective and sufficient vegetation cover reduces runoff and decreases erosion risk. Erosion leads to environmental degradation on a regional scale, due to loss of topsoil and increased sediment loads within drainage lines.
    a. Basal cover: the distance from a set of randomly selected points to the nearest herbaceous plant (forb or grass).
    b. Tree cover: all woody species along a 100 m long by 2 m wide transect are recorded within the major vegetation units present in the area. The height of each individual is recorded. This method allows for the determination of the structure and age of woody species present in the area. It will indicate whether certain species are increasing or decreasing due to over utilisation (grazing pressure) or exploitation (wood harvesting).
2. Vegetation composition – the nature of the species present within a plant community changes due to various factors ranging from management to climate change. On a local scale the main driver for vegetation composition change is management or the lack thereof which results in either overgrazing or exploitation or the transformation of areas with an increase in edge effects and an increase in pioneer and invasive species. Therefore, the decrease or increase in species within the area will have to be monitored using the Braun-Blanquet approach and steppoint methods. The current study's Braun-Blanquet approach results can be used, but will have to be supplemented to facilitate monitoring at a larger/ finer scale. In addition steppoints counts will have to be done prior to construction to provide a baseline with regards to the ecological status (veldt condition and carrying capacity) of the vegetation. These results will also reveal whether livestock, domestic or game, has changed their grazing patterns due to the mining activity, for example concentrating/ overgrazing natural vegetation further away from the mining activities than what is currently the case.
3. The results of the study determined that the areas of greatest diversity and therefore ecologically the most significant. The areas along the north and north-eastern boundary had been exploited, resulting in the loss of habitat integrity and diversity and should therefore be considered for the majority of infrastructure associated with the proposed mine.

The proposed Malonjeni Mine infrastructure and mining activities are relatively small surface area's of approximately 36ha that will be disturbed by mining-related activities. The project area is not pristine and the area has been cultivated in some places and is extensively grazed throughout but sensitive areas such as wetlands and rocky outcrops encompass large areas within the site. These sensitive systems must be avoided by allocating buffer zones to them and limiting project activities around these areas.

Before construction can commence an ecological sweep needs to be undertaken. The sensitive areas need to be mapped and overlain with the mine layout plan to ensure that sensitive systems are protected. The sensitivity map needs to be incorporated as part of the environmental monument programme for the mine and held on site during the construction and operational phase of the mine.

Wetlands are of national concern and therefore the proposed mining infrastructure should be located as far as possible from the any drainage lines and Rivers.

Monitoring Aspect	Frequency of Monitoring	Reporting	Cost of monitoring
Biodiversity	biannual	annual	R40 000/annum

14.3 Fauna

To be able to compare the faunal communities over time, the methods used for monitoring changes over time should be standardized as to limit the observer's error as well as to eliminate other potential sources of variation such as sampling effort (timing, location of sample points etc.). It is therefore essential to have fixed sample points, sample periods and sample effort that are repeatable throughout the monitoring period. The following methods are proposed for monitoring changes in the faunal communities of the study area (both mining infrastructure and tailings rehabilitation area):

1. Mammals: small mammal communities will be monitored using small mammal live traps at fixed locations for fixed sample periods biannually. Motion-sensor camera traps baited with specific bait combinations will be used to sample for large mammals – especially carnivores and omnivores.
2. Birds: fixed point sampling as well as general sampling will be used to assess potential changes in bird communities in the study area. Location of
3. Reptiles and amphibians: fixed point pitfall trapping and acoustic sampling (male frogs calling) as well as general sampling will be used to assess the study area's reptiles and amphibian communities.
4. Invertebrates: fixed point sweep samples of the vegetation of the study area will be used to assess potential changes of the invertebrate communities found in these microhabitats (these inverts will be used as indicator assemblages of the general invertebrate community of the study area). Additionally, fixed point butterfly monitoring will be used as a further indication of invertebrate community stability.

The project area is characterised by extensive grasslands and rocky outcrops. Due to the rocky outcrop habitat in the project area, it is very likely that many fauna species may occur here as it might utilise the rocky areas as habitat. This specifically includes small mammals, bird and reptile species. Faunal species of concern that have a probability of occurring on site can have been described in the Ecological Report (Hydro Science, 2014).

The proposed project will have a negative impact on animal life but negative impacts can be limited by reducing the footprint area of the development. Only footprint areas selected for the placement of infrastructure will be cleared. Managing the clearance of vegetation will ultimately have a less dramatic and negative effect on the fauna. Mining activities in the local area contributed largely to the general loss of species diversity and species population numbers. This impact, assessed on a cumulative scale can be highly significant should one consider the vast areas already cleared for mining and mining related activities. Most animals will mobilise to other areas but it is generally accepted that mining does play a big part in reducing the biodiversity or species richness in an area

Sensitive areas need to be earmarked and mapped and overlain with the mine layout plan to ensure that sensitive systems are protected. The sensitivity map needs to be incorporated as part of the environmental management programme for the mine and held on site during the construction and

operational phase of the mine. Any additional studies recommended during this process needs to be incorporated together with the approval from Ezemvelo Wildlife.

Wetlands are of national concern and therefore the proposed mining infrastructure should be located as far as possible from the any drainage lines and Rivers.

Monitoring Aspect	Frequency of Monitoring	Reporting	Cost of monitoring
Biodiversity	biannual	annual	R40 000/annum

14.4 Surface Water

There are man-made dams on the site from previous mining activities and the ones constructed by farmers. In total there are 13 dams and these will make excellent surface water monitoring sites.

Monitoring of the proposed monitoring points as indicated in below should be initiated during the construction and operational phase of the mine. Once the mine moves towards decommissioning and closure, the monitoring programme will have to be updated and upgraded to cover the monitoring needs related to the specific closure objectives. Figure 16.

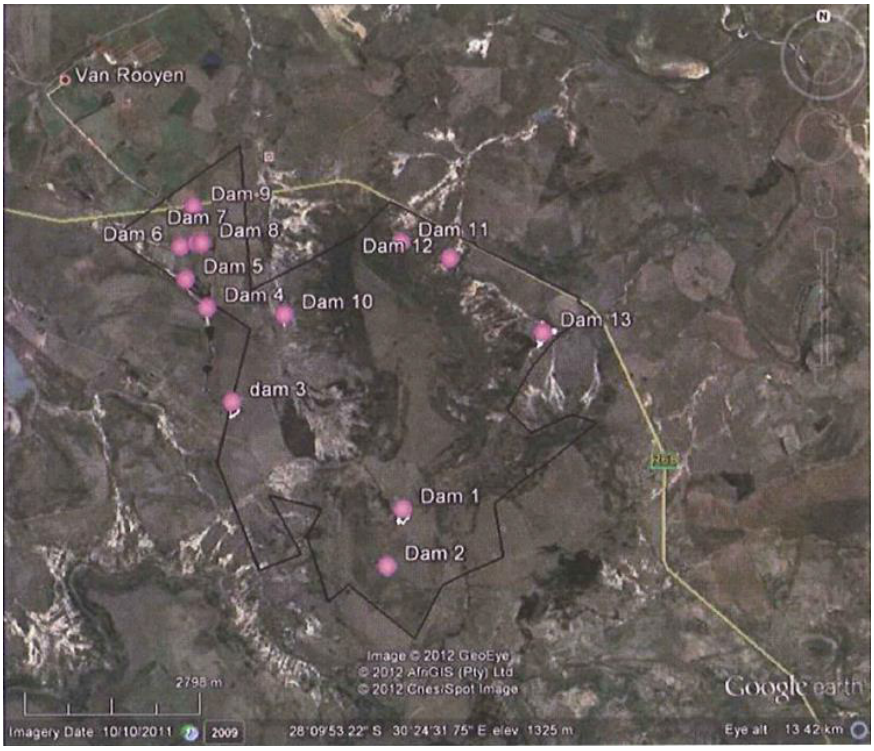

Figure16 Proposed surface water compliance monitoring points and frequency

Table 11: Elements to be monitored

No.	Element
1	pH Value @ 25°C
2	Conductivity in mS/m
3	Total Dissolved Solids
4	Total Acidity as $CaCO_3$ to pH 8.3
5	Calcium,Ca
6	Magnesium, Mg
7	Sodium,Na
8	Potassium,K
9	Sulphate, SO_4
10	Chloride,Cl
11	Fluoride, F
12	Iron, Fe
13	Manganese, Mn
14	Aluminium, Al
15	Nitrate & Nitrite as N
16	Total Alkalinity as $CaCO_3$

The main purpose of surface water quality monitoring is to keep track of clean and dirty water systems and to ensure that these systems are separated at all time. Verifying the quality of a water body (component) will assist in the maintaining and updating of a water system status (clean or dirty).

These monitoring procedures will assist in the regulation of normal operating conditions and stormwater conditions on site.

Quality monitoring should be conducted on a quarterly basis and a report should be compiled for each sample run. Surface water quality monitoring should continue annually for the entire life of mine.

Regular maintenance on all SW infrastructure is also required in order to obtain optimal water management on site.

14.5 Groundwater

Groundwater Monitoring Network

A groundwater monitoring system has to adhere to the criteria mentioned below. As a result the system should be developed accordingly.

Source, plume, impact and background monitoring

A groundwater monitoring network should contain monitoring positions which can assess the groundwater status at certain areas. The boreholes can be grouped according to the following purposes:

- Source monitoring – monitoring boreholes are placed close to or in the source of contamination to evaluate the impact thereof on the groundwater chemistry.

- Plume monitoring – monitoring boreholes are placed in the primary groundwater plume's migration path to evaluate the migration rates and chemical changes along the pathway.
- Impact monitoring – monitoring of possible impacts of contaminated groundwater on sensitive ecosystems or other receptors. These monitoring points are also installed as early warning systems for contamination break-through at areas of concern.
- Background monitoring – background groundwater quality is essential to evaluate the impact of a specific action/pollution source on the groundwater chemistry.

System Response Monitoring Network

Groundwater levels – the response of water levels to abstraction are monitored. Static water levels are also used to determine the flow direction and hydraulic gradient within an aquifer. Where possible all of the above mentioned boreholes' water levels need to be recorded during each monitoring event.

Monitoring frequency

In the operational phase and closure phase, quarterly monitoring of groundwater quality and groundwater levels is recommended. Quality monitoring should take place before after and during the wet season, i.e. during September and March. It is important to note that a groundwater-monitoring network should also be dynamic. This means that the network should be extended over time to accommodate the migration of potential contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

Monitoring Parameters

The identification of the monitoring parameters is crucial and depends on the chemistry of possible pollution sources. They comprise a set of physical and/or chemical parameters (e.g. groundwater levels and predetermined organic and inorganic chemical constituents). Once a pollution indicator has been identified it can be used as a substitute to full analysis and therefore save costs. The use of pollution indicators should be validated on a regular basis in the different sample positions. The parameters should be revised after each sampling event; some metals may be added to the analyses during the operational phase, especially if the pH drops.

14.6 Air Quality

Ambient air quality monitoring can serve to meet various objectives such as:

- Compliance monitoring;
- Validation of dispersion model results;
- Use as input for health risk assessment;
- Assist in source apportionment;
- Temporal trend analysis;
- Spatial trend analysis;
- Source quantification; and,
- Tracking progress made by control measures.

PM_{10} Monitoring:

It is recommended that ambient PM_{10} monitoring be conducted. PM_{10} monitoring can be economically carried out by the use of a "mini hi-vol" apparatus. This consists of a battery-driven flow-controlled sampling pump drawing ambient air through a filter for 24 h. The pre-and post exposure weighting of the filters provides daily average concentration values. The changing of batteries and filters can be carried

out by site personnel with minimum training, whilst the deployment at regular intervals (every 3 days or so, including weekends) provides a time series free of systematic sampling error, as well as a long-term average value. The filters can be sent to a suitable industrial hygiene laboratory by courier for weighing and metal analysis. PM_{10} samples collected can be sent for chemical and metal analysis.

More sophisticated PM_{10} monitoring equipment that is less labour intensive but more costly could also be considered.

14.7 Noise

Noise monitoring should be carried out regularly at specific positions in order to detect deviations from predicted noise levels and additionally to enable corrective measures to be taken where warranted. Noise monitoring should be conducted at the five (5) monitoring points established for baseline monitoring. This should be conducted at the start of construction and at quarterly intervals. For the operational phase monitoring should be conducted at least twice a year.

14.8 Blasting

Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Additionally assistance may be sought when blasting is done close to the highways. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance (with regards to blast results and the effects related to blasting operations).

Vibrations should be monitored (with respect to the infrastructures listed below) against the recommended ground vibrations limit for each structure.

A Blast Report will be compiled after each blast with the aim to detect the extent of ground vibrations.

Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)
National Roads/Tar Roads:	150	N/A
Steel pipelines:	50	N/A
Electrical Lines:	75	N/A
Railway:	150	N/A
Transformers	25	N/A
Water Wells	50	N/A
General Houses of proper construction	USBM Criteria with limitations for 6mm/s for mud houses	Shall not exceed 134dB at point of concern but 120 dB preferred

14.9 Socio-Economic Environment

The implementation of this management plan will be the responsibility of Transasia and all appointed contractors. Many of the management plans presented above can be included in the day to day operational policies to be developed by Transasia.

In order to ensure general compliance to the proposed mitigation measures and management plans as outlined above it will be essential for Transasia to appoint an independent auditor / contractor to measure compliance. It is hereby recommended that compliance monitoring be conducted as illustrated by the table below.

Project Phase	Activity	Timeframes	Reporting
Construction	Interviews and consultation with contractors, service providers,	Annually	Annually
Operations	Interviews and consultation with contractors, service providers,	Every five years	Every five years
Decommissioning and Closure	Development of SIA for closure. Interviews and consultation with mine employee representatives, and stakeholders such as community leaders (tribal authorities and political leaders), youth organisations,	Five years prior to decommissioning and closure	Five years prior to decommissioning and closure

15 ENVIRONMENTAL IMPACT STATEMENT

This EAIR was informed by key issues identified by means of the Scoping Report, specialist studies and the EIA as presented in this report. Project alternatives and potential impacts were investigated and mitigation measures recommended. Key issues investigated include:

- Ecological (fauna and flora);
- Groundwater;
- Surface water;
- Wetland
- Soils;
- Land use;
- Noise;
- Visual;
- Historical/Heritage;
- Traffic;
- Health;
- Socio-Economic;
- Construction and operational impact;
- Impacts associated with closure;
- Residual impacts; and
- Cumulative impact.

Positive and negative impacts have been identified for all project phases which can be grouped into impacts on the natural and socio-economic environments. In general terms the impacts associated with the receiving natural environment are negative and range from impacts of low significance to impacts with high significance which is irreversible with limited but some mitigation possible (such as the waste facilities). Impacts relating to the socio-economic environment are generally more beneficial with significance impact ratings of low positive to high positive. Some negative impacts associated with the socio-economic environment include the influx of job seekers and the social ills that could result.

Other significant impacts relate to the probable loss of fauna/flora and wetland, additional impacts associated with visibility and the resultant impact on the sense of place and various graves located on the study area.

Generally, the project will have positive socio-economic impacts and negative environmental impacts. Most environmental impacts can be monitored and mitigated throughout the LoM. Some impacts, such as the visual impact after the LoM, will remain. This impact, per example, will remain but can be mitigated by the design and final rehabilitation of the mine.

Positive socio-economic impacts can also come to an end after the LoM and will require constant mitigation from Transasia.

16 PROCEDURES RELATED TO EMERGENCIES AND REMEDIATION

This section pertains to the required Emergency Response Plan (ERP) that will be developed and executed in the case of any operational emergency as a result of the operation of the mine or any other activity carried out on site.

The purpose of the ERP is to provide a framework, where key persons can develop their competencies to effectively and efficiently respond to an emergency. It also provides mechanisms for ensuring the continuous accuracy and relevance of the emergency procedures and the on-going competency of key persons to effectively implement the emergency preparedness and response procedures.

The emergency response plan applies to all employees, visitors and contractors and therefore it is essential that an emergency induction be completed by all people visiting the site on a regular basis. The emergency response procedure for each section of the operation should be specific and will address the emergency preparedness and response procedure for all significant risks and aspects.

16.1 Responsibilities

The effective implementation of the emergency response plan will require the assigning of responsibilities to key persons in designated areas. The following responsibilities will be delegated to key personnel:

I. Operations Manager:

   a. Keeping a list of all the contact numbers of personnel on standby;
   b. Notifying the appropriate emergency services and relaying information during an emergency;
   c. Activating the evacuation alarm on instructions from the Section Manager of the affected section;
   d. Maintain a chronological record of the organisational responses and key events during the emergency; and
   e. Assisting in any other communication issues as may be directed by the rescue teams or Senior Operations Manager.

II. General Manager:

   a. Obtaining an accurate picture of the extent of the emergency;
   b. Implementing emergency procedures;
   c. Mobilise the Emergency Team;
   d. Liaising with emergency services (internal and external), police, Fire Brigade and City Council and the security section;
   e. Requesting the services of any persons to assist with stipulated tasks;
   f. Ensuring that evidential material to any post –incident investigation is not interfered with;
   g. Completing critical incident reports and identifying corrective and preventive actions; and
   h. Liaise with the SHE Officer / Department to investigate the cause of the incident and develop / implement corrective and preventive measures.

III. Fire Officer:

a. Proceed to the emergency and take the necessary control and action to contain the situation;

b. Request for any assistance through the Senior Manager on standby and/or Operations Manager for the affected section; and

c. In case of fire after normal shift, the standby SHE Officer in conjunction with the area Foreman shall take control (pending the arrival of the Fire Officer).

IV. First Aid Officer/SHE Officer:

a. That preparedness drills are undertaken to ensure that trained first aid staff are in a position to manage the medical aspects of any emergency that may occur on the premises;

b. That the emergency stations are suitably equipped to manage any potential incidents that may occur;

c. That on being notified of an emergency, and if required, establish a first aid site station immediately; and

d. By contacting and employing emergency response personnel from the nearest hospital.

V. Security:

a. Secure the main gate or entrance and any other areas where persons can gain access in order to prevent personnel and any other unauthorised persons from gaining access to the premises;

b. Delegate employees to assist with securing the premises; and

c. Secure any other areas as requested by the Senior Manager on standby.

16.2 Communication Procedures

The following records are required to be kept and maintained at all times:

- A list of all contacts and personnel on standby for all plant sections. This list should be collated by the Section Manager and submitted to the Operations Manager on a weekly basis. Any changes must be communicated accordingly;
- A list of all contact numbers for external agencies that can be contacted to assist in case of an emergency; and
- A list of all trained first aiders should be drawn by the Section Manager and submitted to the Operations Manager to make sure there are a sufficient number of first aiders per shift.

During all hours of operation, the Operations Manager on duty must be contacted via internal phones, cell phones or radios in case of any emergency. The emergency number must be communicated to all employees.

The emergency numbers for the following people should be provided:

- SHE Officer;
- First Aid Manager/Representative; and
- Operations Managers.

16.3 Emergency Response

Various accidents or incidents can occur as a result of operational activities or other related or non-related activities on site. The following general procedures should be followed in the case of an emergency.

The first person to witness, be notified or made aware of an emergency within their areas of responsibility, will ensure that the Operations Manager and Section Manager is notified (by phone, radio or messenger) and that persons are moved away from any immediate danger.

When notifying the Section/Operations Manager, the following information must be provided:

- Name of the informant;
- Type of emergency and exact location;
- Actions taken by persons at the scene; and
- Report of any persons injured (as well as nature of injury, if known).

Upon receiving the information, the Section Manager will:

- Activate the emergency alarm;
- Upon hearing the alarm make people evacuate the affected area and move to their respective emergency assembly points;
- Notify the first aid personnel;
- Notify SHE Officer on standby;
- Notify the Operations Manager, who shall proceed to the scene and ensure that an appropriate response to the emergency is initiated. This will include advising /notifying the first aid personnel of the need to establish a first aid field station; and
- Ensure that first aid personnel shall immediately respond to the need and establish a field first aid station (where necessary).

Assembly points will be indicated by emergency sign boards. During the construction phase of the project a temporary emergency assembly point will be utilised. For the operational phase a new assembly point will be proposed. Smaller assembly points will be necessary in the plant area and another point some distance from the furnace buildings.

All staff should be familiar with the emergency execution programme and will therefore have to complete site specific emergency induction training.

17 SOCIAL AND ENVIRONMENTAL AWARENESS PLAN

Businesses, industries, and mines are increasingly challenged to support sustainable business development and prove that they are providing a benefit to sustainable development. The importance of promoting training and environmental awareness is also emphasised in the ISO 14001: 2002 international standard for Environmental Management Systems (EMS). In accordance with Agenda 21, there is still a considerable lack of awareness of the interrelated nature of all human activities and the environment. An EMS can only successfully be implemented if the people involved in the system have been trained properly. Therefore it is important that all personnel, (contractors and/or permanent staff to be employed at the proposed facility), will understand and be encouraged to accept the importance of achieving the environmental objectives and targets for which they are responsible and / or accountable for. To facilitate this, education and training is needed to ensure that employees have appropriate and current knowledge of regulatory requirements, internal standards and Transasia's policies / objectives.

Contractors will also be required to demonstrate that they have the required knowledge and skills to perform the work in an "environmentally responsible manner".

The aim of this Social and Environmental Awareness Plan (SEAP) is to ensure that all personnel and contractors doing work for or on behalf of Transasia (that have or can have a significant environmental and/or social impact) are competent on the basis of appropriate education, training and experience. In addition, the SEAP provides for the identification of training needs to ensure that employees and contractors: (with direct responsibility for activities relevant to the project's social and environmental performance) have the knowledge and skills necessary to perform their work, are made aware of the significant impact associated with their activities, are aware of the importance of conforming to the national legislation, are aware of the benefits of improved environmental performance, and are aware of the consequences of non-compliance from applicable environmental management requirements.

Training will also address the specific measures and actions required in respect of this EIAR, and in particular, the Management Plans and Measures as set out.

ISO 14001 requires that appropriate training (relevant to the achievement of environmental policies, objectives and target) be provided to all personnel within an organisation. Employees should have an appropriate knowledge base, which includes training in the methods and skills required to perform their tasks in an efficient and competent fashion, additionally employees should have knowledge of the impact their activities can have on the environment if performed incorrectly.

17.1 Social and Environmental Awareness Training

All personnel and contractors are required to attend awareness training sessions that are presented by the Safety, Health and Environmental (SHE) Officer or relevant Training Department. In broad term this training will include:

- Understanding of the aims of the Social and Environmental Assessment and Management System;
- Understand the aims and objectives of the SHE management system and SHE policy;
- All relevant and probable environmental aspects and impacts;
- All relevant and probable social aspects and impacts;
- Health issues, including HIV/AIDS, smoking, drugs and alcohol;
- General and personal hygiene issues;

- Environmental management standards and procedures relevant to waste separation, storage and disposal, spill clean-up techniques, hazardous materials handling, emergency response, etc; and
- Training on all Transasia policies and standards to develop a clear understanding of the contents, aims and objectives of these policies.

This training will be done to make employees and contractors aware of:

- The importance of conforming with the environmental policy and procedures and with the requirements of the environmental management system;
- The significant social and environmental impact of their work activities and the environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirements of the environmental management system; and
- The potential consequences of departure from specified operating procedures.

The guidelines for training are summarised in the table below, which are line with the ISO 14001:2004 guidelines with regards to training and awareness creation.

Table 3: Guidelines with regards to training and awareness

Types of training	**Audience**	**Purpose**
Raising awareness of the strategic importance of environmental management	Senior management	To gain commitment and alignment to the organisation's environmental policy.
Raising general environmental awareness	All employees	To gain commitment to the environmental policy, objectives and to instil a sense of individual responsibility.
Skills enhancement	Employees with environmental responsibilities	To improve performance in specific tasks.
Compliance	Employees whose actions can affect compliance	To ensure that regulatory and internal requirements for training are met.

The training programme will consist of the following elements:

- Identification of employee training needs;
- Development of a training plan to address defined needs;
- Verification of conformance of training programme to regulatory or organisational requirements and standards;
- Training of target employee groups;
- Documentation of training received; and
- Evaluation of training received.

This training is done on an annual basis for all personnel, together with the annual required induction programmes. The training material provided will be subject to annual review based on such issues as: incidents, accidents, new legislative requirements, modified processes, and environmental and social

aspects identified from time to time. This training is to be carried out and coordinated by the Training Department. Attendance registers of such training provided will be retained by the Training Department and/or SHE Officer.

Transasia will therefore develop the capabilities and support mechanisms necessary to achieve its environmental policy, objectives and targets.

17.2 Identification of Training Needs

The identification of training and personnel development needs is dependent on the type of role and within different categories that personnel and contractors play, both in the development and implementation of an effective SHE Management System. The following categories are considered:

- Senior Management;
- Middle Management;
- SHE Officer;
- Supervisors;
- Operators and Tradespersons;
- Internal Auditors; and
- Contractors.

Additionally as outlined in the above table, each of the different categories has different responsibilities and roles within the SHE Management System and accordingly different knowledge requirements are applicable.

17.3 Job Specific Training

As prescribed by the Mine Health and Safety Act (MHSA) of 1996 Section 10, Transasia is obligated to provide training in terms of job-related health and safety, through the provision of information and instructions given to employees in an induction programme implemented by the mine.

Prior to the commencement of work, each employee has to be proven competent to perform the required activities in their job specification. In order to ensure compliance in this regard, continuous competency assessments will be conducted through Planned Task Observations (PTO's). Transasia employees will undergo continuous training in terms of: new safety standards, equipment, and Standard Operating Procedures (SOP's).

Job specific training requirements are outlined in the table below.

17.4 EMP Specific Training

Transasia will be required to make all employees (especially those responsible for the implementation of the SHE system) aware of the EMP and Environmental Monitoring requirements as stipulated in this report. The table below outlines the proposed training programme per occupational category.

Table 4: Social and Environmental Training Requirements

Occupation Category	EMS Responsibility/Role	Required knowledge and input	Training required	Interval
Senior and Middle management	Managing and reporting on SHE Management and EMP	Understanding the aims of the EMP and SHE Management system Knowledge of commitments made in the EMP relevant to	General management training on EMP and SHE Management commitments as well as all internal policies and	Once off

		construction and operation of the smelter Setting and review of environmental objectives	relevant legislation	
		Assessment of all applicable legislation		
Supervisors	Implementation and daily management of the SHE management system and EMP	Understanding the aims of the SHE management system	General management training	Once-off
		Knowledge of the relevant social and environmental impacts during construction and operational phases		
		Actively implementing action to achieve SHE management plans		
		Knowledge of relevant operational procedures and emergency response plans	Meeting and talk topics	Continuous
Operators	General environmental awareness and job specific impacts	General awareness of the aims of the SHE management system and EMP	Environmental awareness training	Annual and/or as often as required
		Understanding the SHE management system and EMP with relevance to their operations		
		Understanding requirements for not polluting the environment and consequences of departure from standards		
		Knowledge of relevant operational procedures and incident reporting	Meeting and talk topics	
SHE Officer	Managing the SHE Management system and ensures compliance with EMP. Identification of non-compliance and assessment of additional training as and when required	Understanding the aims and objectives of SHE management, the EMP and all Transasia's SHE policies	Specific Social and Environmental Training in respect of EMP commitments and the SHE management	Annual
		Current knowledge on all applicable regulatory requirements		
		Implementation of ISO 14001 standards with the aim of ISO 14001 certification	ISO 14000 training	Once-off
Contractors	General environmental awareness and job specific training	General awareness of the aims of the SHE management system and EMP commitments	Environmental awareness training	Annual
		Understanding the requirements for not polluting the environment and consequences of departure from standards		
		Knowledge of relevant operational procedures and incident reporting		

17.5 Training Material

As proposed by Transasia training strategy, skills based competency training and Recognition of Prior Learning (RPL) assessments will be outsourced to an accredited Mining Qualifications Authority (MQA) training vendor, which will need to meet the requirements as set by the MQA in terms of standards of the: venue, training material, staff qualifications, and various quality systems.

Skills verification, as well as all other training such as: management training, supervisory training, emergency preparedness, and Safety, Health and Environment (SHE) inductions will be conducted by the Transasia training academy, which will commence in earnest 2012.

Review of training material includes the verification of training programs to ensure consistency with organisational requirements. All training material generated will be subject to an annual review to ensure the content remains valid with consideration to:

- New of modified processes;
- Analysis of monitoring reports i.e. social and environmental specific reporting;
- Analysis of internal audit results;
- Emergency situations that occurred in that period;
- Incidents reported; and
- Changes in relevant policies.

18 CONCLUSION

This project conforms to the procedural legislative requirements as stipulated in NEMA. A Mining Right Application (MRA) was submitted to the DMR and approved in November 2014 (Appendix B). In line with both regulations a Scoping Report was compiled describing the project, motivating the project and to set the Terms of Reference for specialist studies to be conducted. These processes as well as the content of the Scoping Report were presented to stakeholders and I&APs. The Scoping phase of the project furthermore opted to evaluate preliminary impacts, including cumulative impacts, to guide additional specialist study undertakings and to minimise gaps and assumptions within the EIA phase of the project. The Scoping Report was submitted to KZN DAE and accepted after which the EIA phase of the project commenced.

Within the EIA phase of the project various specialists were contracted to gather baseline information on the receiving environment. The receiving environments were broken down into the natural environmental as well as the socio-economic environment. Both of these environments were regarded with equal importance. Specialist studies conducted focused on: groundwater, fauna and flora (ecological), wetland, noise, geotechnical, heritage, and waste and water management. Specialists then utilised baseline information to predict project related impacts as accurately as possible. The EAP then utilised these finding to compile the EIAR, specifically the Environmental Impact Assessment and Environmental Management Program. A methodology was utilised by the EAP to equally evaluate all impacts on the same quantitative scale. This was necessary to reduce subjectivity and to evaluate all impacts on the same scale in order to adequately rank the impact significance for each expected and known impact.

The Malonjeni Anthracite Mine is located in central KwaZulu Natal and is accessed via the Provincial road R68 which connects Dundee and Nqutu. The road intersection into the mining property will be approximately 20km from Dundee. The Project area lies in the centre of the Klip River Coalfield, and the surrounding areas currently support a number of coal mining operations and undeveloped coal resource blocks.

It should be stated that Transasia will contribute largely towards the upgrading of services i.e. water and electricity, to the area. Transasia will contribute towards the capital expenditure for electricity upgrades to the area.

The area currently experiences medium levels of dust due to un-surfaced roads, dust originating from existing mine dumps. The general noise climate of the area is very quiet with the main source of noise being the R68 running to the north of the proposed project site. Traffic conditions are typical of those for a rural area with peak noise hours in the morning and late afternoons. Sites of cultural and heritage significance have been identified.

Archaetnos identified thirty (36) sites of cultural significance. . Grave sites found (site no. 12, 14-17, 19-21, 23-25 and 27-30) are of a high cultural significance. The management guidelines given in this management plan (at the above discussion of each of the individual sites) must be implemented in conjunction with these recommendations. This will have to consist of a short, medium and long term strategy for the preservation, conservation and utilization of the cultural heritage resources. This strategy is already imbedded in this management plan

The construction phase of the underground is not expected to influence the groundwater levels. With the exception of lesser oil and diesel spills, there are also no activities expected that could impact on regional groundwater quality. Based on the numerical groundwater model and available data, there are no privately owned boreholes in the potential affected area that might experience a decline in water levels of approximately 5 metres or more. Base flow of the surrounding streams/rivers is also unlikely to be affected due to the cumulative effect of drawdown resulting from the dewatering of the underground.

A variety of wetland types occur in the study area including valley bottom (channelled and unchannelled) and hillslope seepage (isolated and linked to a stream) wetlands. Extensive erosion (15 - 20% of the study area of ~ 3000 ha) of the foot slopes and valley bottoms occur. These erosion features are part of this landscape since the Late Pleistocene and inchannel wetlands has formed in many of these.

Impacts on wetlands as a result of mining activities should be avoided through investigating and designing appropriate mitigation measures. A detailed field assessment and delineation should be part of future assessments. In addition proper groundwater management needs to be implemented.

The previous land use was that of cattle farming as early as 3 to 4 years ago. The general land use/soil potential has a low to medium ability to sustain agricultural activities and due to the ability of soils to retain water these soils are generally not ideal for agricultural activities such as crop production.

The study revealed that unemployment rates are very high. Low education levels could result in the absence of skilled individuals with an associated high unemployment rate.

A Public Participation Process (PPP) was followed for the duration of the project. Engagement is ongoing and will be extended for the duration of the project i.e. implementation phase. I&APs were identified and notified of the proposed project through various means At the onset of the project , advertisements were also placed in the local newspapers in English. Notifications would further be distributed notifying the public of the availability of documents for public review and upcoming public meeting.

From the information gathered during the EIA process, and by conducting the Impact Assessments for both natural and socio-economic environments, it was concluded by means of the Environmental Impact Statement that the project will, in general, have a medium negative impact on the natural environment, and a medium negative to high positive impact on a socio-economic level, mainly on local and regional scales. By implementation of the proposed management measures, as outlined in the EMP, negative impacts can be reduced substantially and positive impacts can be enhanced effectively to make this project a sustainable project. The current LoM is estimated to be 15 years.

It is the opinion of the EAP that this project can continue provided that all mitigation measures are followed accurately. Internal and external audits must be conducted annually, at the very least, to confirm compliance to this EIAR.

19 SOURCES CONSULTED

19.1 DOCUMENTS

Enumeni Local Municipality (2012) Final Integrated Development Plan (IDP): 2012-2017

19.2 WEBSITES

www.endumeni.gov.za

www.localgovernment.co.za

www.umzinyathi.gov.za