Geohydrology

Information in this section was derived from the HYDROGEOLOGICAL INVESTIGATION of the Proposed Coal Mining on the Farm Grootfontein 165 IR, District Nigel, Ekurhuleni Metropolitan Municipality, Gauteng, Report by Van der Merwe and Damhuis (2017)

The purpose of the hydrogeological investigation is to determine the baseline hydrogeological conditions, including the current mine (Vlakfontein), and the overall impacts (if any) of the proposed mining activities on the receiving hydrogeological environment.

The regional aquifer type is described as a shallow intergranular and fractured aquifer, consisting predominantly out of carbonaceous rocks (sandstone), and a deeper karst type aquifer, consisting of carbonate rocks (dolomite). The borehole yield classification for the shallow aquifer is between 0.1 and 0-5l/s (low yielding boreholes) and for the deeper aquifer >5l/s (high yielding) (Hydrogeological Map Series of the RSA; Johannesburg 1999).

The average static water level is 12m and the average rainfall 686 mm/annum. Groundwater recharge is estimated at 35 mm/annum (South African Groundwater Decision Tool, DWAF). The groundwater associated with the Vryheid formation is generally of very good quality in terms of human consumption. The quaternary drainage region is C21E; for this region a general authorisation for the taking of water of 75m^3/hectare/annum is applicable (Aquananzi, 2010).

The site area includes the following four types of groundwater systems:

- Shallow, unconfined aquifer consisting of recent and quaternary sediments such as alluvial clay, shale and weathered sandstone (3-20m bgl);
- Intermediate weathered and/or fractured Karoo sediments which are located above the coal (Snygans, 2010);
- A confined aquifer formed by more permeable sandstone and coal seam layers (GPT, 2014), and
- Deeper Dwyka tillite aquifer (2-15 m) (Pre-Karoo rocks) (van Tonder et al., 2007).

The aquifer is recharged by rainfall and according to Dennis et al., (2015) and recharge calculated using the chloride mass balance method (CMB), the recharge of the site aquifer varies between 1.35% and 5.1 % of MAP. The recharge infiltrates into the weathered rock until a denser or solid (impermeable) layer is reached. Groundwater moves laterally and according to surface slope on top of this solid rock accordingly.

The water levels measured North-East of the site averaged to approximately 2 m in a wetland area, which indicates shallow groundwater conditions in this area.

Groundwater Quality

Previous Water Quality Results (Snygans, 2010):

According to the study done by Snygans (2010), eight (8) samples were analysed for quality, of which 6 was surface water samples. The surface water results indicated pH variations of between 3.9 and 7.92, whilst TDS varied from 234 mg/l up to 4280 mg/l. The water quality results revealed that poor water quality was evident at dams or streams located near slimes dams or waste rock dumps. The groundwater quality indicated acceptable values in terms of Fe, SO_4, TDS and pH.

According to the latest client supplied monitoring data (Snygans, 2017), the groundwater quality fluctuates over time. The two monitoring boreholes, located on the remaining extent of the farm Vlakfontein 281-IR, indicate exceedances of the limits stated in SANS 241:2011, in terms of iron at both boreholes (BH 11 and BH 10 of the 2017 hydrocensus) and only nickel at the MBH-01 (BH 10 of 2017 hydrocensus) (refer to Figure 12Figure 12).

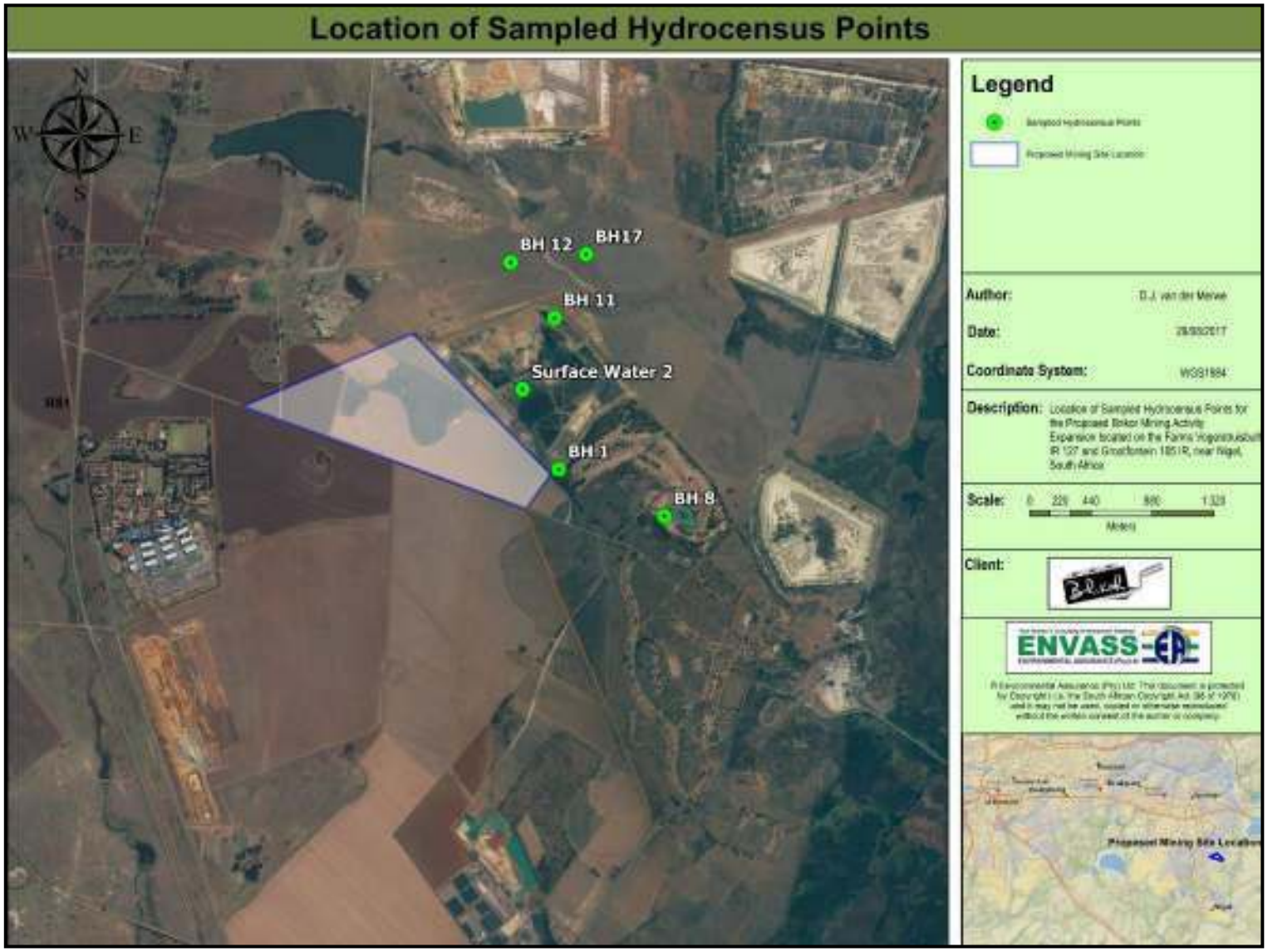

Figure 12: Location of 2017 Hydrocensus Sampled Points

Water Quality Results for Samples taken in 2017

During the 2017 hydrocensus six (6) samples were taken and analysed for water quality. The chemical parameters were compared according to the guideline target qualities of South African Water Quality Guidelines: Domestic Water Use (DWAFa, 1996) target water quality; SANS 241:2015 and South African Water Quality Guidelines: Livestock Watering (DWAFb, 1996).

According to the chemical results data, various exceedances were observed. These include exceedances of the Electrical Conductivity (EC) (Surface Water 2, BH 1, 17 and 11), Total Dissolved Solids (TDS) (Surface Water 2, BH 1, 17 and 11), Total Hardness (Surface Water 2, BH 1, 17 and 11), Chloride (BH 12 and BH 11), Sulphate (Surface Water 2 and BH 11), Aluminium (All six samples tested), Calcium (Surface Water 2, BH 1, 17 and 11), Magnesium (BH 1, 8 and 11), Manganese (Surface Water 2, 17 and 11), Sodium (BH 11) and Nickel (Surface Water 2).

The Surface Water 2 sample exceeded EC, Total hardness, Manganese and Nickel in terms of South African Water Quality Guidelines: Domestic Water (henceforth referred to as Domestic Use), whilst exceeding TDS, Sulphate, Calcium and Magnesium in terms of SANS 241:2015. This sample only exceeded the South African Water Quality Guidelines: Livestock Watering target water quality in terms of Aluminium.

The BH1 sample exceeded EC, TDS, total hardness and calcium in terms of Domestic Use, whilst only exceeding aluminium and iron in terms of SANS 241:2015. BH 2 exceeded chloride and manganese in terms of Domestic Use and Aluminium in terms of SANS 241:2015.

The sample of BH 8 exceeded only exceeded aluminium and iron in terms of SANS 241:2015. BH 17 exceeded the Domestic Use target water quality in terms of EC, TDS, Total Hardness, Calcium and Magnesium whilst only exceeding aluminium in terms of SANS 241:2015.

Lastly, BH 11 exceeded EC, TDS, Total Hardness, Chloride, Sulphate, Iron, Magnesium, Manganese and Sodium in terms of Domestic use, whilst only exceeding the aluminium and calcium target water quality in terms of SANS 241:2015.

BH 17, 1 and 12 indicates typical Ca, Mg -bicarbonate rich water qualities whilst BH 11 indicates Ca, Na and Sulphate rich water quality, The Surface Water 2 (Main Pit of Vlakfontein Mine) indicated high sulphate, EC and TDS values which is normally associated with coal mining (Council of Geoscience, 2011). A trend can be seen in all of the samples that elevated aluminium levels are present. This could be a result of rock-water interaction of the clay that is being mined at the site. Finally, when comparing the results of Snygans (2010) to the 2017 Hydrocensus results in terms of sulphate and iron, no substantial change could be seen.

Groundwater Levels

Aquanzi GeoConsultants CC conducted a hydrocensus for the adjacent Vlakfontein Quarry in 2010. The hydrocensus produced 13 points, of which 5 were boreholes and 12 were surface water locations, within a 1.5 km radius of the Vlakfontein site (Snygans, 2010). The results indicated that no major groundwater users were identified.

During the hydrocensus conducted for this study (2017), a total of 26 boreholes were located and 10 surface water locations were identified. The surface water locations included 2 mining pits, 1 evaporation dam, 4 streams and 3 dams. An effort was made to revisit the previous hydrogeological study (Snygans, 2010) boreholes to compare the results. Water levels could not be measured at 14 of the boreholes as a result of either obstructions in the boreholes, boreholes being dry, the boreholes being collapsed, or the boreholes being closed by pumping equipment.

Water levels varied between 1.35 mbgl and 54.3 mbgl. The average water level was calculated at 10.99 m bgl. Groundwater levels indicated a 61.16% correlation to surface topography. This suggests that groundwater flow generally follows topography and occurs under semi-confined conditions.

Geochemical testing

During the investigation four (4) rock samples were taken for geochemical analysis, i.e.:

- DSB 702, taken from the coal layer at the site (Coal 1);
- DSB 703, taken from the coal layer at the site (Coal 2);

- DSB 704, taken from the carbonaceous shale layer present at the site (Carb Shale); and
- DSB 705, taken from the sandstone layer at the site (Sandstone).

The samples were submitted to an accredited laboratory for analysis in order to determine the following:

- The geochemical nature of the materials (e.g. mineralogy, elemental composition, sulphur mineral species and the acidification and neutralisation potential for each lithology); and
- An assessment of the possible water qualities that may emanate from the various waste mterial at the site.

Acid-base accounting is currently being performed for the site, along with humidity cell geochemical tests on the waste material present at the site. In terms of the overall risk posed by ARD for the site it should be considered that the pre-mitigation impact rating would be high (i.e. worst-case scenario) for both the operational and closure phases of the mining operations. The migration of ARD contaminated water (if any) is represented by the simulated contaminant plumes in the proceeding sections of this report, which will be updated once the geochemical data becomes available.

Preliminary test results were made available for this report and should be considered as preliminary and indicative. The final test results will be made available in a separate addendum to be attached to this report later once testing has been finalised. Preliminary acid base accounting (ABA) results showed the coal and sandstone units at the site both had no net acidification potential, while the carbonaceous shale unit had a net acid generation potential.

As shown in the preliminary test results, there is potential ARD generation from the shale unit at the site, but limited potential within the other units. The shale will be used in the brick making process at the site, which will eliminate the potential for ARD from this unit. These results are preliminary and should be interpreted as such. The final results will be included as an addendum to this report and the numerical modelling exercise updated accordingly.

Groundwater Systems

The site area includes the following four types of groundwater systems:

- Shallow, unconfined aquifer consisting of recent and quaternary sediments such as alluvial clay, shale and weathered sandstone (3-20m bgl);
- Intermediate weathered and/or fractured Karoo sediments which are located above the coal (Snygans, 2010);
- A confined aquifer formed by more permeable sandstone and coal seam layers (GPT, 2014), and
- Deeper Dwyka tillite aquifer (2-15 m) (Pre-Karoo rocks) (van Tonder et al., 2007).

According to literature values, the alluvium clays are an unconfined aquifer and is expected to indicate a transmissivity of 50 m2/day and a storativity of 0.15, whilst the Karoo sediments are an unconfined/confined aquifer system with an expected transmissivity of 5 m2/d and a storativity of 0.0025 (Snygans, 2010).

Groundwater Reserve Determination

As part of the study, a groundwater reserve determination was completed for the site which indicated an allocable reserve of 89% (823 853 m^3/a). Thus, should additional groundwater be abstracted during mining operations the overall groundwater reserve will not be impacted on severely provided effective management of abstraction at the site (if any) is implemented. This was calculated by including the following factors in the groundwater reserve determination:

- Basic Human Needs: For the study area of 56.17 km^2, the population was calculated at 27 243.57 population for the Unit of Analysis (UA). According to the data, the total amount of water allocated to the basic human need in the study are is therefore 681.09 m^3/day (248 594.20 m^3/a);
- Groundwater Contribution to baseflow: According to the GRDM, the UA indicated a base flow of 0.131 Mm^3/a (131 000 m^3/a). This can be attributed to the wetland systems of the Blesbokspruit.
- Rainfall Recharge: The effective rainfall-recharge is dependent on the catchment geology, soils, surface run-off and stream morphology but most importantly for the

study area, the effective storage. The UA indicated a recharge of 5.1 % according to the GRDM. However, due to the fact that South Africa is a water scarce country this value was halved to 2.5% in order to take into account periods of prolonged drought, which gave a total recharge value of 969 915.46 m^3/a to the unit of analysis;

- Existing Abstraction: The abstraction from the hydrocensus data was calculated at 1752.28 m^3/day (639 582.2 m^3/a), assuming that only the represented pumping takes place in the UA;
- Proposed Abstraction: The draft mine works program (MWP) indicates that normal municipal water will be utilised for the site operations and thus 0 m^3/a will be used from the immediate aquifers.

Biodiversity

Information in this section was derived from the ECOLOGICAL SCAN FOR THE FOR THE PROPOSED MINING OF CLAY, SAND AND COAL ON A PORTION OF PORTION 85 OF THE FARM GROOTFONTEIN 165 IR AND A PORTION OF THE REMAINDER OF THE FARM VOGELSTRUISBULT 127, NIGEL, GAUTENG PROVINCE by Taylor (2017)

The study site is identified as an Ecological Support Area (ESA), and parts as Important Area (IA) in terms of the Gauteng Conservation Plan 3.3, 2014.

Ecoregion

According to the delineation provided by Dallas (2005), the Level 1 Ecoregion of the area, is Highveld (11) (refer to Figure 14). Kleynhans et al. (2005) describes the Highveld ecoregion as a high lying area with various grassland vegetation types. Plains characterise this ecoregion with a moderate to low relief. The Highveld ecoregion covers parts of the central and central east of South Africa (Kleynhans et al. 2005). The Highveld Ecoregion is the largest Ecoregion which measures approximately 163 615.1 km2. Several large rivers originate from the region, including the Vet, Modder, Riet, Vaal, Olifants, Steelpoort, Marico, Crocodile (west), Crocodile (east) and the Great Usutu.

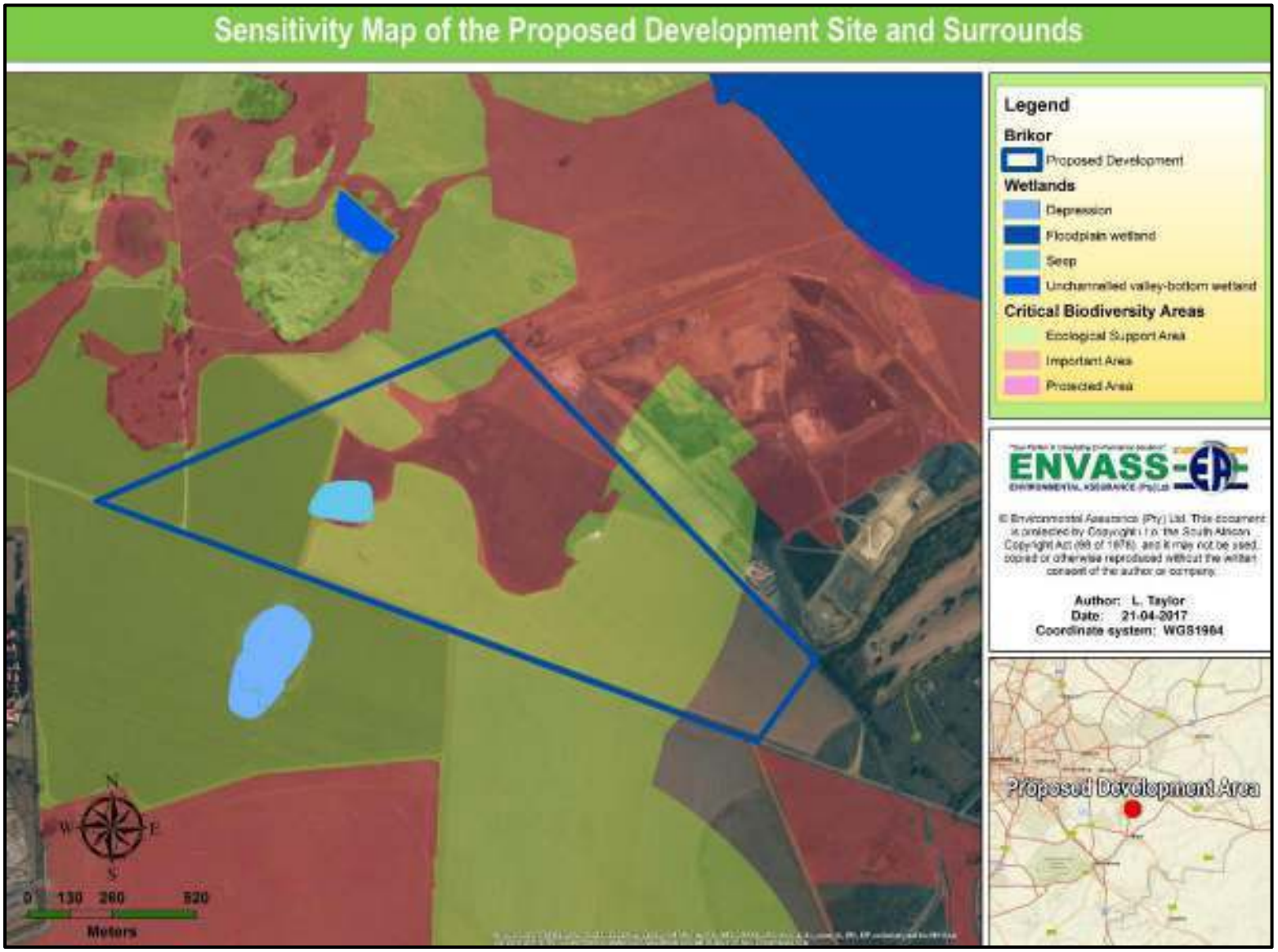

Figure 13: Preliminary Sensitivity Map (Gauteng Conservation Plan Version 3.3)

Figure 14: Highveld Ecoregion

The Biotic Environment

The natural characteristics and ecological importance of the various biotic ecosystems are described in the sections below.

Vegetation and Ecosystems

The proposed mining site falls within the Grassland Biome (Rutherford & Westfall, 1994), which is characterised by high summer rainfall and dry winters. The Grassland Biome mainly comprises of grasses and plants with perennial underground storage organs and sparse tree cover. The majority of Rare and Threatened plant species in the summer rainfall regions of South Africa are restricted to high-rainfall grasslands, making this the vegetation type in most urgent need of conservation. Frost, fire and grazing maintain the herbaceous grass and forb layer and prevent the establishment of thickets (Tainton, 1999).

Grass plants tolerate grazing, fire, and even mowing, while most produce new stems readily, using a wide variety of strategies. Overgrazing tends to increase the proportion of pioneer, creeping and annual grasses, and it is in the transition zones between sweet and sour grass dominance that careful management is required to maintain the abundance of sweet grasses. The Grassland Biome is the mainstay of dairy, beef and wool production in South Africa. Pastures may be augmented in wetter areas by the addition of legumes and sweet grasses.

The Grassland Biome is the cornerstone of the maize crop, and many grassland types have been converted to this crop. Sorghum, wheat and sunflowers are also farmed on a smaller scale.

Urbanisation is a major additional influence on the loss of natural areas - the Witwatersrand is centred in this biome. The Grassland Biome is considered to have an extremely high biodiversity, second only to the Fynbos Biome. Rare plants are often found in the grasslands, especially in the escarpment area. These rare species are often endangered, comprising mainly endemic geophytes or dicotyledonous herbaceous plants. Very few grasses are rare or endangered. The scenic splendour of the escarpment region attracts many tourists (SANBI, 2017).

Biomes are further divided into bioregions, which are spatial terrestrial units possessing similar biotic and physical features, and processes at a regional scale. The proposed site is situated within the Mesic Highveld Grassland Bioregion (Mucina & Rutherford, 2006), which

is found mainly in the eastern regions of the Highveld, extending to the Northern Escarpment. The study area is classified as belonging to the Tsakane Clay Grassland (Gm 9). This vegetation type occurs in patches throughout the Gauteng and Mpumalanga Provinces, primarily comprising of short, dense grassland. The vegetation is dominated by a mixture of common highveld grasses, including Themeda triandra, Heteropogon contortus, Elionurus muticus, as well as various Eragrostis species.

The Tsakane Clay Grassland vegetation is classified as endangered, with only 1.5% conserved in statutory reserves and private nature reserves. More than 60% has been transformed by cultivation, urbanisation, mining, dam building and roads. The expansion of the southern suburbs of Johannesburg and the towns of the East Rand will surely increase the pressure on the remaining vegetation.

Vegetation

The entire proposed mining site falls within the Tsakane Clay Grassland vegetation type (refer to Figure 15) which is classified as Endangered. The vegetation has been severely disturbed and transformed by grazing, crops fields, mining, roads and footpaths and, therefore, the conservation priority and sensitivity is of this vegetation type is High. The need for rehabilitation, however, is classified as medium. No red data species occurs within this vegetation type area. Situated close to the study site, is the Eastern Temperate Freshwater Wetland riparian vegetation type. This area is Vulnerable, providing habitat to various faunal species of conservation concern.

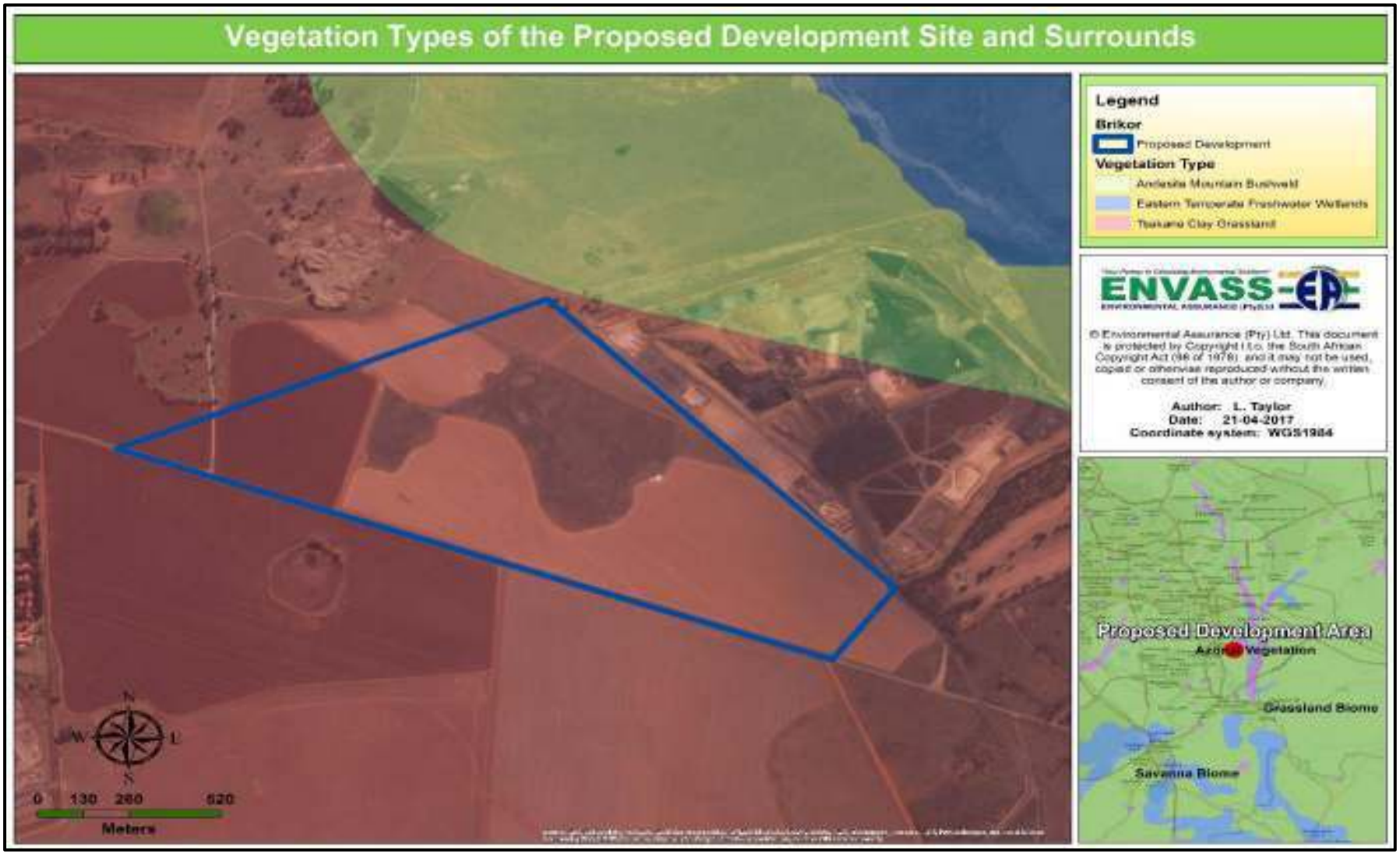

Figure 15: Vegetation Classification

Floral Assessment

Twenty-four (24) species were recorded in the study area. Sixteen of these were indigenous species, and 15 are known wetland indicator species. A full list of plant species identified during the assessment is presented in the Ecological Scan attached to this report in Appendix 8.

Category 1 a & b NEMBA invasive species and plants have been identified on the site. The removal of these plants are compulsory in terms of the regulations formulated under the National Environmental Management: Biodiversity Act 2004 (act no. 10 of 2004) Alien and Invasive Species Regulations, 2014, as amended. The invasive species are listed in the GNR-864 Alien and Invasive Species Lists, 2016. The following Alien Invasive Species were observed on the site during the field assessment.

- Cirsium vulgare (Spear Thistle, Scotch Thistle) - Category 1b
- Datura ferox L. (Large Thorn Apple) - Category 1b
- Eucalyptus sp. – Category 1b, but not listed within cultivated land that is at least 50 metres away from untransformed land, but excluding within any area in (a) above.
- Flaveria bidentis (Smelter's-bush) - Category 1b
- Plantago lanceolata - Not Listed
- Seriphium plumosa - Not Listed
- Tagetes minuta - Not Listed
- Verbena bonariensis L. (Wild verbena, Tall verbena, Purple top) - Category 1b

Fauna

Due to the small surface area and severe habitat degradation of the study site, very little faunal species diversity was observed on the day of the assessment. The area of concern simply doesn't have the correct attributes to successfully house a variety of animal species. The area is too fragmented by agricultural practices, roads and mining to allow free species migration similar to that of the surrounding environment. Due to the severely degraded state of the study area, only avifauna was found on site.

Mammals

The Ecological Scan lists all the mammal species of conservation concern which could possibly occur on the study site in the Gauteng Province – none of these species occur on site or has the potential to occur on site, as a result of the severely degraded state of the habitat within the study area. All other species which could possibly occur are of Least Concern (LC).

Herpetofauna

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupiculous (rock dwelling) and wetland associated vegetation cover. Three of these habitat types for Herpetofauna were present i.e. terrestrial, rupiculuous and wetland habitat. The presence or absence of reptile and amphibian species was deduced based on their known distribution ranges. No individuals of Herpetofauna were recorded on the day of the field assessment. The Ecological Scan lists all species of Herpetofauna which could potentially occur on the study site. All species potentially occurring, are of Least Concern (LC).

Avifauna

The avifaunal species listed in the Ecological scan, are the species of conservation concern that are likely to occur on the study site. Refer to Annexure A of the Ecological Scan for a full list containing all avifaunal species likely to occur on the study site. 300 potential bird species occur within the area, however, none of the species of conservation concern were recorded on site, most likely due to the habitat fragmentation, the size of the site and noise and light pollution from the adjacent agricultural and mining activities.

The habitat systems on site will not favour any of the mentioned Red Data avifaunal species due to a lack of suitable breeding, roosting and/or foraging habitat on and surrounding the study site. The bird species observed on the study site are the more common bird species associated with the various habitat systems and species that are able to adapt to areas transformed by man.

The results of Ecological Scan, indicated that the study area is not deemed sensitive, due to the current state of the site.

Cultural and Heritage

Information in this section was derived from the Cultural Heritage Impact Assessment of the Proposed Coal Mining on the Farm Grootfontein 165 IR, District Nigel, Ekurhuleni Metropolitan Municipality, Gauteng, Report by Coetzee, 2017

Archaeological remains can be defined as human-made objects, which reflect past ways of life, deposited on or in the ground. Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and they are valuable, finite, non-renewable and irreplaceable.

All archaeological remains, features, structures and artefacts older than 100 years and historic structures older than 60 years are protected by the relevant legislation, in this case Section 34 and 35 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). The Act makes an archaeological impact assessment as part of an EIA and EMPR mandatory (refer to Section 38). No archaeological artefact, assemblage or settlement (site) may be moved or destroyed without the necessary approval from the South African Heritage Resources Agency (SAHRA).

Human remains older than 60 years are protected by Section 36 of the NHRA. Human remains that are less than 60 years old are protected by the Regulations Relating to the Management of Human Remains (Government Notice Regulation 363 of 22 May 2013), made in terms of the National Health Act No. 61 of 2003 as well as local Ordinances and regulations.

No archaeological (Stone Age and Iron Age) and historical settlements, structures, features, assemblages or artefacts within the demarcated study area were observed by the specialist during the site visit in December 2016. However, Archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, such activities should be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (cf. NHRA (Act No. 25 of 1999), Section 36 (6)).

Palaeontology

Information in this section was derived from the Palaeontological Impact Assessment: Phase 1 Field Study of the proposed development area by Fourie (2017) attached in Appendix 8

Description of the Geological Setting in terms of Palaeontology

The Karoo Supergroup is renowned for its fossil wealth (Kent 1980, Visser 1989). Large areas of the southern African continent are covered by the Karoo Supergroup. An estimated age is 150 – 180 Ma and a maximum thickness of 7 000 m is reached in the south. Three formations overlie the Beaufort Group, they are the Molteno, Elliot and Clarens Formations. At the top is the Drakensberg Basalt Formation with its pillow lavas, pyroclasts, and basalts (Kent 1980, Snyman 1996). The Beaufort Group is underlain by the Ecca Group which is underlain by the Dwyka Group.

The southern part of the Karoo basin has a thickness of 3 000 m, but the northern part of the basin is considerably thinner. The animals present during Beaufort times flourished on the floodplanes, lakes and marshes. Sandstone is deposited in times of flooding in the river channels and the mudstones were deposited on the floodplains in the shallow lakes (Snyman 1996).

The Ecca Group is early to mid-Permian (545-250 Ma) in age. Sediments of the Ecca group include lacustrine and marine to fluvio-deltaic (Snyman 1996). The Ecca group is known for its coal (mainly the Vryheid Formation) (five coal seams) and uranium. Coalfields formed due to the accumulation of plant material in shallow and large swampy deltas. The Ecca Group conformably overlies the Dwyka Group and is conformably overlain by the Beaufort Group, Karoo Supergroup. It consists essentially of mudrock (shale), but sandstone-rich units occur towards the margins of the present main Karoo basin in the south, west and north-east, with coal seams also being present in the north-east (Kent 1980, Johnson 2009).

The Vryheid Formation is named after the type area of Vryheid-Volksrust. In the north-eastern part of the basin the Vryheid Formation thins and eventually wedges out towards the south, southwest and west with increasing distance from its source area to the east and northeast (Johnson 2009). The Vryheid Formation consists essentially

of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500 m. It forms part of the Middle Ecca (Kent 1980). This formation has the largest coal reserves in South Africa. The pro-delta sediments are characterised by trace and plants fossils (Snyman 1996).

Coal has always been the main energy source in industrial South Africa. It is in Mpumalanga, south of the N4, that most of the coal-fired power stations are found. Eskom is by far the biggest electricity generator in Africa. Thick layers of coal just below the surface are suited to open-cast mining and where the overlying sediments are too thick, shallow underground mining. In 2003, coal was South Africa's third most valuable mineral commodity and is also used by Sasol for fuel- and chemicals-from-coal (Norman and Whitfield 2006). Grodner and Cairncross (2003) proposed a 3-D model of the Witbank Coalfield to allow easy evaluation of the sedimentary rocks, both through space and time. Through this, one can interpret the environmental conditions present at the time of deposition of the sediments. This can improve mine planning and mining techniques. The Vryheid Formation is underlain by the Dwyka Group and is gradually overlain by mudstones (and shale) and sandstones of the Volksrust Formation. The typical colours for the Vryheid Formation are grey and yellow for the sediments and black for the coal seam. The thickness of the grey shale can vary and this is interlayered with the also variable yellow sandstone and coal seams.

Ecca rocks are stable and lend themselves well to developments. It is only unstable in or directly above mining activities (Snyman 1996). The site itself is partly situated on the flat-lying Vryheid Formation, Ecca Group, Karoo Supergroup. Dolerite dykes do occur throughout the Karoo Supergroup. Structural geological features such as dykes and faults can have a measurable influence on ground water flow and mass transport.

Field Observations

The walk through did not locate fossils. During mining activities shale gets discarded, these often contain fossils. For this project, the shale will be utilised in brick making, therefore, destroying the fossils.

There is some concern with the project due to the presence of the Vryheid Formation. The topsoil, subsoil and overburden must be surveyed for fossils and Mitigation is needed during construction for the shale layer if fossils are present.

Background to Palaeontology of the area

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

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

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

Aesthetic Quality

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

The main sources of visual impacts in the wider area is mining and industrial activities. The existing mining activities adjacent to the study area is the main source of visual impact in close proximity to the study area.

Visual Absorption Capacity (VAC) can be described as the ability of an area to absorb physical modifications. Factors affecting VAC include inter alia, vegetation, the built

environment, existing infrastructure and topography. In terms of these factors the receiving environment is perceived to have a low to medium VAC.

The following have been identified as sensitive receptors in terms of visual impacts and impacts on the 'Sense of Place' of the study area and surrounding area:

- Visitors to the Marievale Bird Sanctuary Provincial Nature Reserve 2.5 km south-east of the study area;
- Travelers on the R51 provincial road adjacent to and 1 km west of the study area;
- Surrounding land users within 2 km from the study area;
- Residents of the Marievale and Vorsterskroon residential areas between 2 and 3 km south and south-west of the study area;
- Residents to the north in Vogelstruisbult, north-west in Sharonpark and Dunnotar to the west of the study area; and
- Residents of the town of Nigel within 5 km south-west of the study area.

Traffic

Information in this section was derived from the Traffic Impact Statement: Proposed mining of clay, sand and coal on Portion of Portion 85 of the Farm Grootfontein 165 IR and a Portion of the Remainder of the Farm Vogelstruisbult 127 IR, Nigel by Du Toit (2017) attached in Appendix 8

The existing road network consists of the following roads:

- Road R51 (Nigel Spring Road), a single lane surfaced road, running in a north-south direction, between Springs and Nigel. Road R51 (Nigel Spring Road), falls under the jurisdiction of The Gauteng Department of Roads and Transport (Gautrans).
- Marievale Road is a single lane road running in an east-west direction. Marievale Road falls under the jurisdiction of the City of Nigel.

The proposed development will generate negligible additional trips and based on the guideline documents, the traffic engineer is not required to evaluate any intersections.

The application was evaluated in terms of the Gauteng Transport Infrastructure Act of 2001 by the Traffic Engineer. Based on the comments received from Gautrans and as per the Gauteng Strategic Road Network, the applicant site is affected by the following provincial roads:

- PWV16: The future route is planned approximately 5.0km south of the applicant site and the approval of the proposed development will have no impact on the route.
- Road K152: The future route is planned to the south of the PWV16 and the approval of the proposed development will have no impact on the route.
- Road K136: The future route is planned approximately 800m north of the applicant site and the approval of the proposed development will have no impact on the route.
- Road K181: Part of the future route traverses the applicant site. The proposed basic planning as shown in Gautrans Drawing PRS No.: 88/167/12Bp, is appended in Annexure C of the Traffic Impact Assessment.

Access to the study area is from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.

WASTE

Information in this section was derived from the Waste Classification Report, Fourie (2017) attached in Appendix 8

The purpose of the assessment was to assess the residue deposits and stockpiles that will be generated by the proposed mining including waste rock to be utilised for rehabilitation in accordance with and as required by the following legislation and guidelines:

National Environmental Management: Waste Act (Act 59 of 2008) [as amended] (NEMWA) Regulations:

- GNR 634 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008): Waste Classification and Management Regulations, 2013;

- GNR 635 National Norms and Standards for the Assessment of Waste for Landfill Disposal;
- GNR 636 National Norms and Standards for the Disposal of Waste to Landfill; and
- The Guidelines for the Handling and Disposal of Sewage Sludge (Volume 1 and 2) 2006.

The classification is necessary to determine disposal mechanisms and methods for the waste rock.

LEGAL REQUIREMENTS

SANS 10234: Classification

The SANS 10234 – Global Harmonisation System (GHS) standard, sets the criteria for the classification of hazardous substances and mixtures, including waste, according to health, environmental and physical hazards, and includes communication elements for labelling and information required for Safety Data Sheets (SDS's). Unlike the Minimum Requirements, the SANS standard do not prescribe any specific obligations based on whether a waste is hazardous or not, nor the type of landfill where these wastes must be disposed of. Rather, the purpose is to ensure adequate and safe storage and handling of hazardous waste, and to inform the consideration of suitable waste management options.

The responsibility for waste classification rests with the waste generator, who must ensure that wastes are classified within 180 days of generation, except for certain wastes listed in the GNR 634 that do not require classification and are considered to be 'pre-classified'. These wastes are listed in Table 10 below.

In terms of transitional arrangements related to classification, the following are applicable:

Waste classified in terms of the Minimum Requirements for Disposal of Waste to Landfill, Department of Water and Forestry, 1998 (or alternative, i.e. de-listed) prior to the Regulations must be re-classified within 3 years; and

Waste produced prior to GNR 634, but not classified, must be classified within 18 months after commencement of the Regulations.

Regarding waste disposal to landfill, the Regulations require that generators must ensure their waste is assessed and disposed of in terms of the two the following two Norms and Standards:

GNR 635 National Norms and Standards for the Assessment of Waste for Landfill Disposal; and

GNR 636 National Norms and Standards for the Disposal of Waste to Landfill.

Table 10: Waste that do not require classification

General Waste	Hazardous Waste
Domestic waste; Business waste not containing hazardous waste/chemicals; Non-infectious animal carcasses; Garden waste; Waste packaging; Waste tyres; Building and demolition waste not containing hazardous waste/chemicals; and Excavated earth material not containing hazardous waste/chemicals.	Asbestos Waste; PCB Waste or PCB containing waste (>50 mg/kg or 50 ppm); Expired, spoilt or unusable hazardous products; General waste (excl. domestic), containing hazardous waste/chemicals; Mixed, hazardous chemical wastes from analytical laboratories, and laboratories from academic institutions in containers <100 litres; and Health Care Risk Waste.

REGULATIONS AND STANDARDS

Government Notice 634 – 635 of 2013

- The Waste classification and Management Regulations were published in 2013 and prescribed the classification and liner requirements for solid waste to be disposed of. These regulations consist of the following GNR Notices:
- GNR 634 National Environmental Management Waste Act (59/2008): Waste Classification and Management Regulations;

- GNR 635 National Norms and Standards for the assessment of waste for landfill disposal; and
- GNR 636 National Norms and Standards for the Disposal of Waste to Landfill.

The results must be assessed against the four levels of thresholds for leachable and total concentrations, which in combination, determines the Risk Profile of the waste.

Table 11: Waste Classification Abbreviations

Abbreviation	Definition
LC	Leachable Concentration of a particular contaminant in a waste, expressed as mg/l.
TC	Total Concentration of a particular contaminant in a waste, expressed as mg/kg.
LCT	Leachable Concentration Thresholds for particular contaminants in a waste (LCT0, LCT1, LCT2 and LCT3).
TCT	Total Concentration Thresholds for particular contaminants in a waste (TCT0, TCT1 and TCT2).

The process to be followed in determining the Waste Type as per GNR 635 is shown in Figure 16. The total and the leachable concentrations need to be analysed and compared with threshold values in order to determine the Waste Type (Type 0 to Type 4).

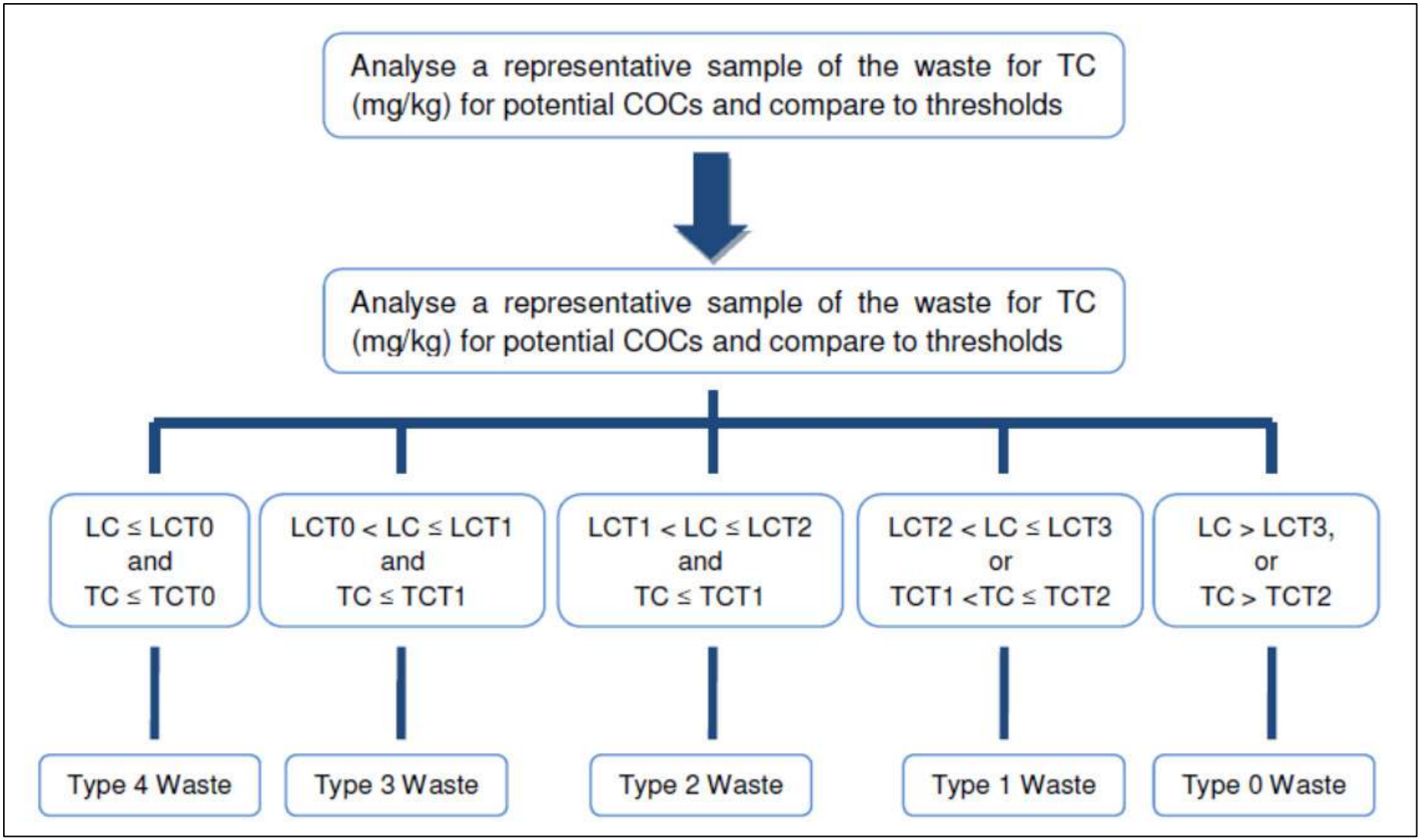

Figure 16: Waste Classification as per GNR 635

Liner Requirements - GNR 636 National Norms and Standards

The standard containment barrier design and landfill disposal requirements for the different waste types as per the GNR. 635 of 2013 are presented in Table 12.

Table 12: Waste Type

Waste Type	Description
Type 0	The disposal of Type 0 waste to landfill is not allowed. The waste must be treated and reassessed in terms of the Standard for Assessment of Waste for Landfill Disposal to determine the level of risk associated with disposing the waste to landfill.
Type 1	Type 1 waste may only be disposed of at a Class A landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a H:h / H:H landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998). Liner requirements are shown in Figure 17.
Type 2	Type 2 waste may only be disposed of at a Class B landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a GLB+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998) Liner requirements are shown in Figure 19.
Type 3	Type 3 waste may only be disposed of at a Class C landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards, or, subject to Section 3(4), of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a GLB+ landfill as specified in the

Waste Type	Description
	Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998) Liner requirements are shown in Figure 20.
Type 4	Disposal allowed at a landfill with a Class D landfill designed in accordance with Section 3(1) and 3(2) of these Norms and Standards or, subject to Section 3(4) of the Norms and Standards, may be disposed of at a landfill site designed and operated in accordance with the requirements for a GSB- landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998). Liner requirements are shown in Figure 21.

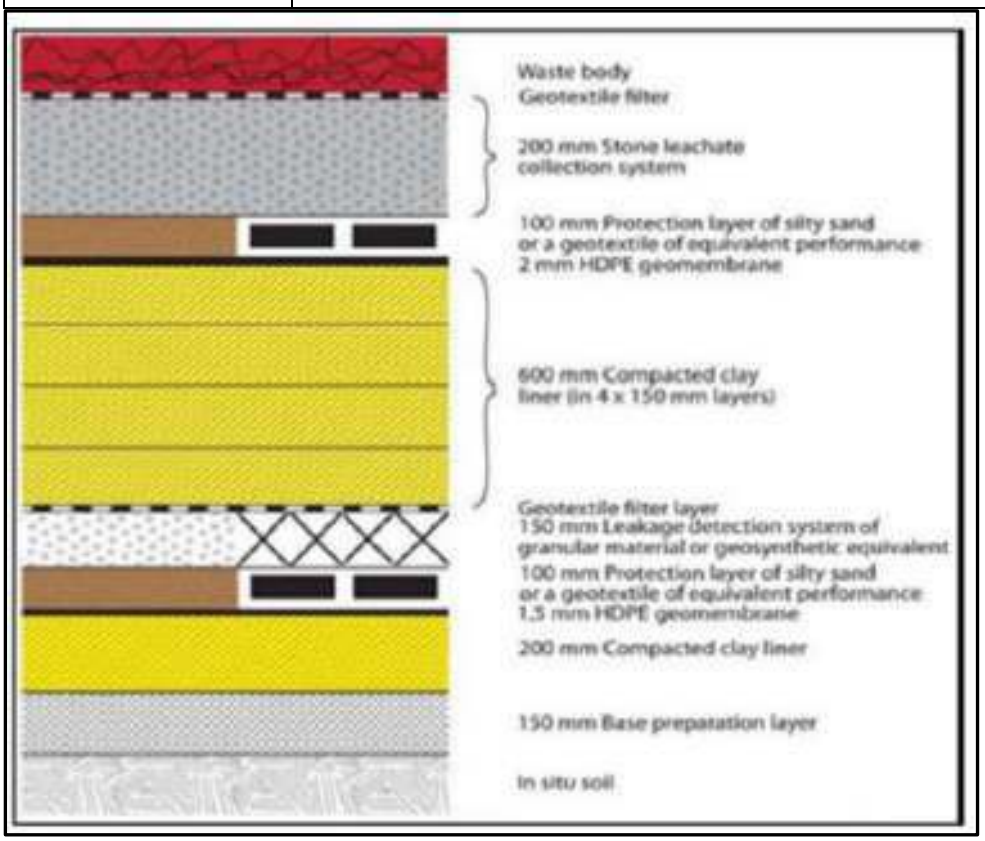

Figure 17: Proposed Class A landfill liner system

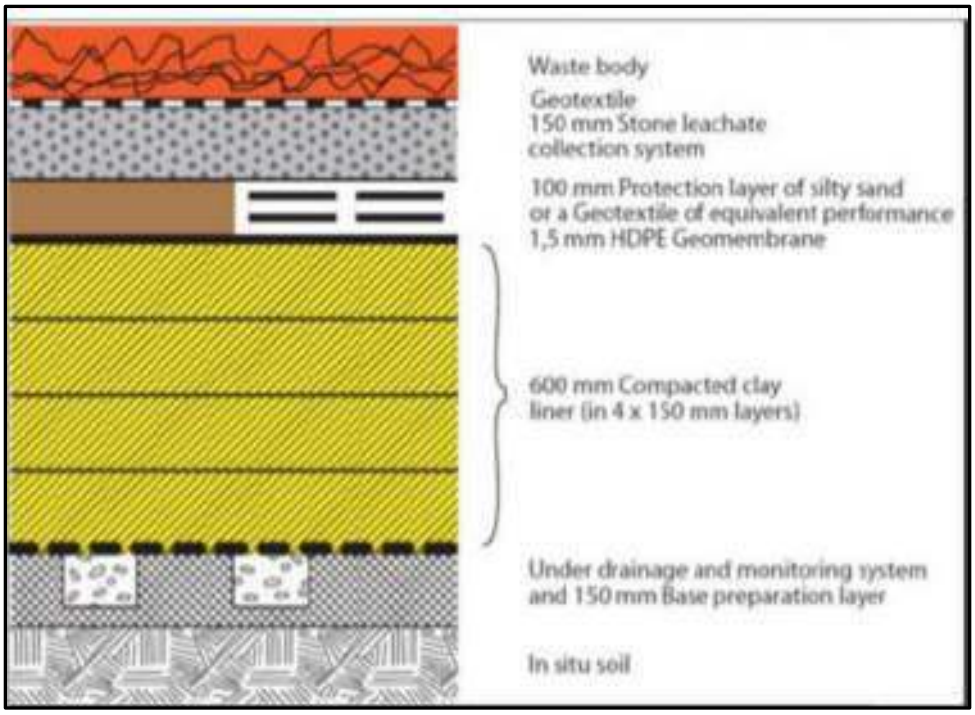

Figure 18: Proposed Class B landfill liner system

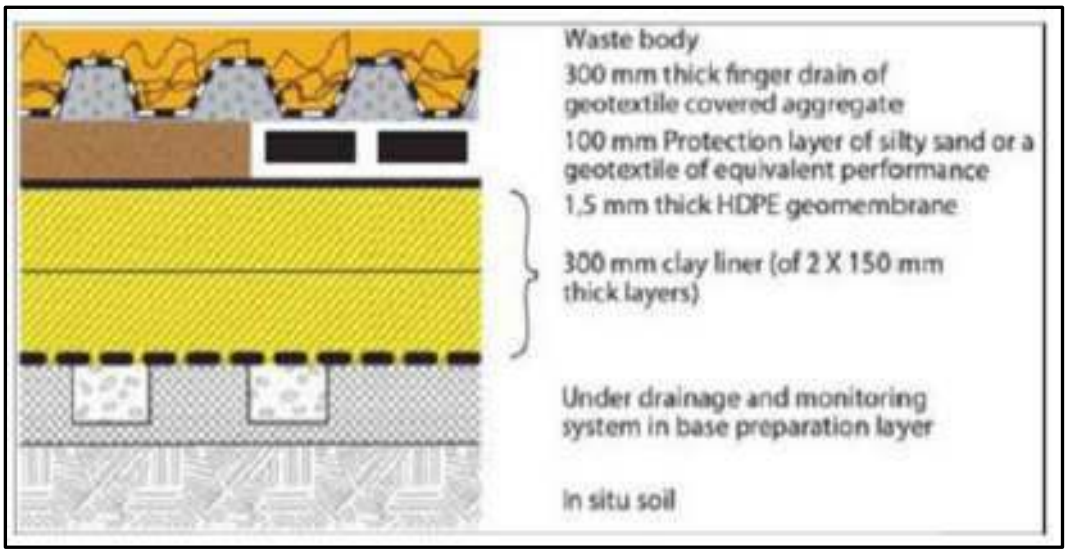

Figure 19: Proposed Class C landfill liner system

Figure 20: Proposed Class D landfill liner system

The results of the waste classiciation is based on the laboratory test results carried out on representative samples of waste rock and Run of Mine (ROM) stockpile from the existing adjacent Vlakfontein Mine. The two samples classified according to the Norms and Standards for the Assessment of Waste for Landfill Disposal, GNR 635. The samples were analysed for total metal and inorganic anions and the leachable fraction was determined according to AS 4439, with the intent of co-disposal with other non-putrescible wastes, as well as mono disposal. The detailed analyses of the samples, per clause of GNR 635, are shown in Appendix A and the raw laboratory results are in Appendix B of the Waste Classification Report in Appendix 8.

The laboratory analyses for the total and leachable fractions resulted in the following classification (Table 13):

Table 13: Waste classification results

Waste stream	Waste Type	Landfill Class
Waste Rock Berm – co-disposal	Type 0	No disposal allowed
Waste Rock Berm – mono disposal	Type 1	Class A
ROM Stock Pile – co-disposal	Type 0	No disposal allowed
ROM Stock Pile – mono disposal	Type 1	Class A

- Waste Rock Berm – co-disposal: The sample appeared to be generally inert except for elevated total levels of Antimony, Selenium and Fluoride. This would normally classify the waste as a Type 1 waste, but the very high TDS (> 100 000) classifies the waste as a Type 0 waste. The waste may therefore not be disposed of without pre-treatment. Examination of the leachable fractions of the metals and inorganic anions show that the high TDS can be allocated to the alkalinity (carbonates) and sodium.

- Waste Rock Berm – mono disposal: The leachable fractions are very low indicating a relatively inert product. Clause 7(6) of GNR 635 states that:

  Notwithstanding section 7(2) of these Norms and Standards, wastes with all element or chemical substance leachable concentration levels for metal ions and inorganic anions below or equal to the LCT0 limits are considered to be Type 3 waste, irrespective of the total concentration of elements or chemical substances in the waste, provided that-

(a) all chemical substance concentration levels are below the following total concentration limits for organics and pesticides:

Table 14: Chemical Substance Total Concentration

Chemical Substance in Waste	Total Concentration (mg/kg)
Organics	
TOC	30 000
BTEX	6
PCBs	1
Mineral Oil (C10 to C40)	500
Pesticides	
Aldrin + Dieldrin	0.5
DDT + DDD + DDE	0.5
2,4-D	0.5
Chlordane	0.5
Heptachlor	0.5

(b) the inherent physical and chemical character of the waste is stable and will not change over time; and

(c) the waste is disposed of to landfill without any other waste.

This clause is satisfied for all leachable fractions analysed for except Antimony, which is negligibly over the limit (0.03 ppm). A strict interpretation of the Norms and Standards therefore classifies the waste as a Type 1 waste. A Type 1 waste can be disposed of in a Class A landfill.

- ROM Stockpile – co-disposal: The waste stream exhibits elevated total levels of Selenium and Fluoride, and similarly to the Waste Rock Berm, also a very high TDS. The laboratory also reported a very high level of burn off (75%) which indicates the presence of organic material, which was not analysed for. Given the analyses tested for, the waste classifies as a Type 0 waste. No disposal is allowed without pre-treatment.

- ROM Stockpile – mono disposal: The waste stream complies with clause 7(6) insofar as all the elements and compounds tested for were below the LCT0 level, and can therefore potentially classify as a Type 3 waste. However, due to the perceived high level of organics in the material, which was not tested for, the conservative approach would be to still classify the waste as a Type 1 waste, until the organic fraction has been quantified.

It was recommended that both streams be re-analysed and that the organic fraction be included. This could potentially reclassify the ROM Stockpile as a Type 3 waste and also elucidate potential risks that may lie in the organic fraction of the wastes. It should also be noted that the Department of Water and Sanitation, with proper motivation from a registered engineer, will consider an exemption from the liner requirements, should it be proven that the Type 3 waste will not cause pollution with a more simple liner or even no installed. The applicant must apply for a water use license for the disposal of waste rock, which may cause an impact on water resources.

Socio-Economic Environment

Demographics

Ekurhuleni houses 6% of the country's population and 26% of Gauteng's. It has a resident population of approximately 3 178 470 million people and 1 015 645 million households (Stats SA, 2011 Census). The municipality has an annual population growth rate of 2.47%. Between 2001 and 2011, the number of households in Ekurhuleni increased by 36.1%, a figure which was above the average national growth of 35.7%. This growth in population holds serious service delivery implications since it translates into increased demand for municipal services Figure 22 below shows the composition and size of the different population groups in Ekurhuleni. The municipality is home to 79% Africans, 16% Whites, 3 % Coloureds and 2% Indians.

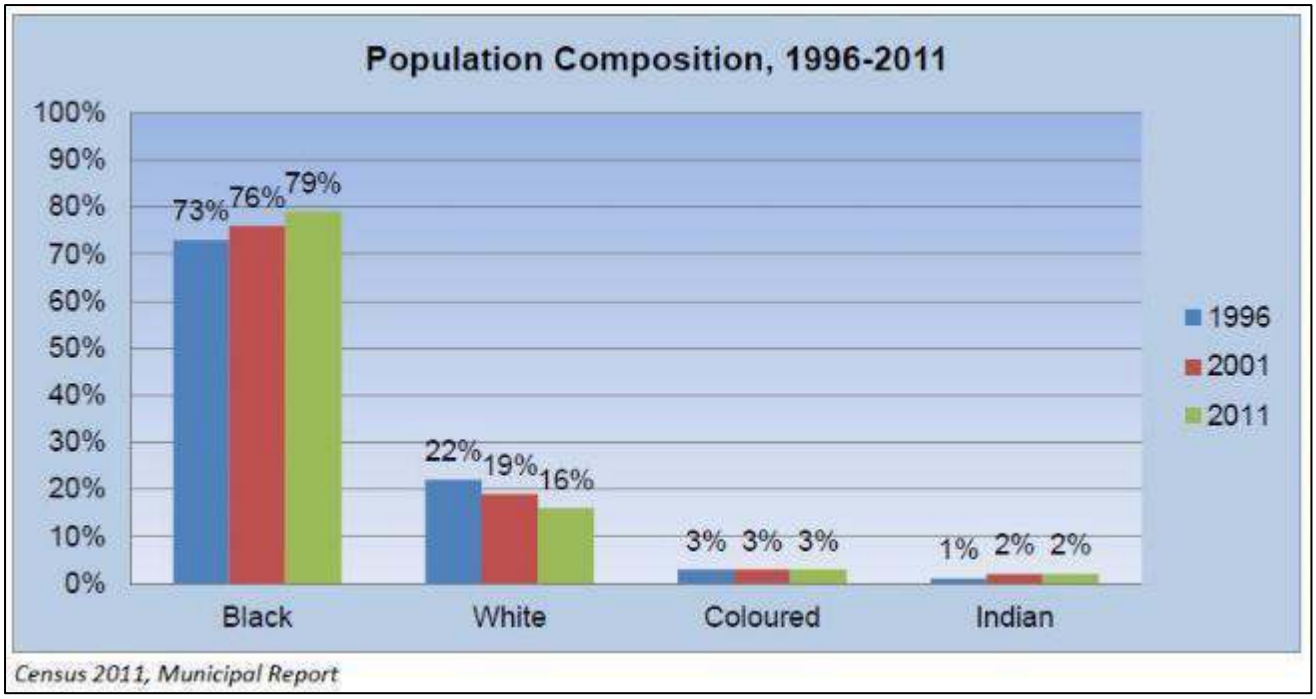

Figure 21: Population Composition

Ekurhuleni was expected to have a population of 3 485 697 at the end of 2016. Other projections based on the 2011 Census data indicate that by 2019 Ekurhuleni's population will reach 3 875 681. Germiston and Boksburg are the fastest growing towns in the municipality. The general population increase in the municipality is attributed to migration by those in search of job opportunities.

From **Figure 22** below it can be observed that a sizeable portion of the population group falls within the 0 to 4 years age group, which calls for more early childhood development facilities.

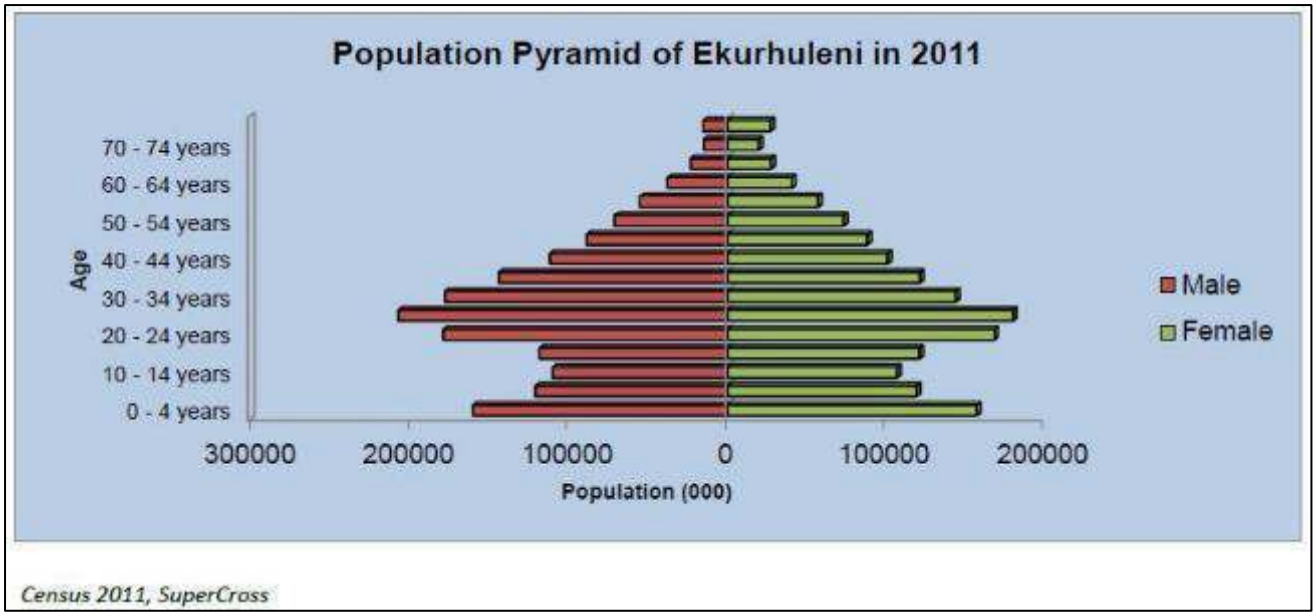

Figure 22: Age and Gender Distribution of the Ekurhuleni Metropolitan Municipality, 2011

Education levels in the municipality increased consistently over the last few decades and with the 2011 Census 35.9% of the population had a Grade 12 Certificate (Figure 23 below).

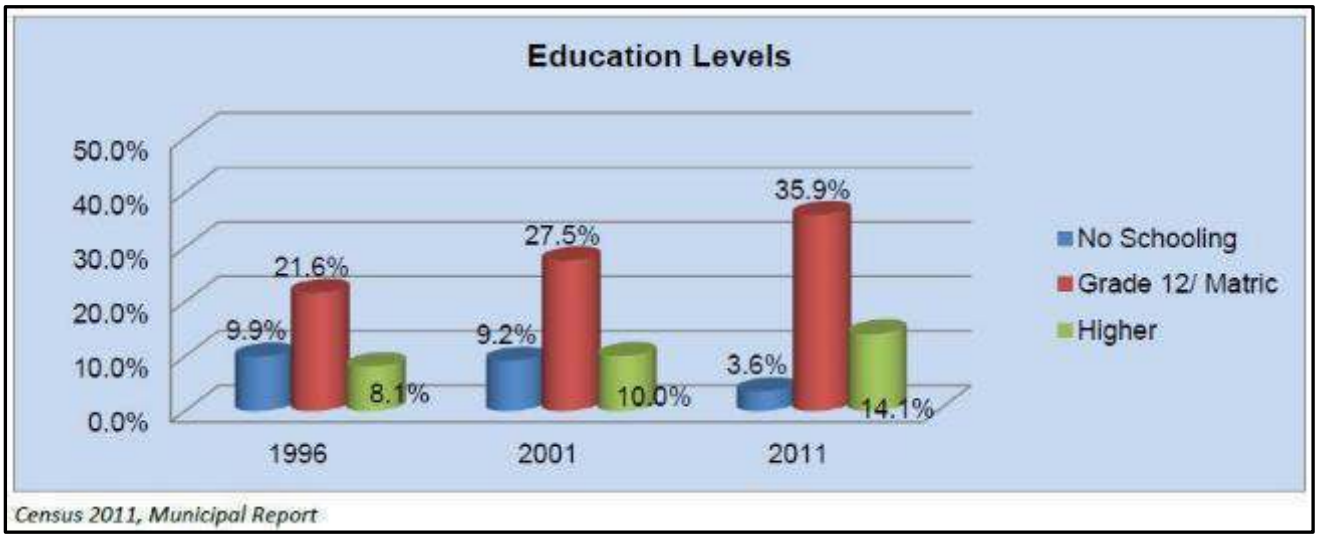

Figure 23: Education levels in the Ekurhuleni Metropolitan Municipality

The municipality's economy has evolved since its heydays as an economy founded on mining. Today, the municipality faces a problem of illegal mining in old mining areas. Ekurhuleni has the largest concentration of industrial activity in Southern-and Sub-saharan Africa. It is not a commercial and manufacturing hub of South Africa. The municipality's

economic contribution to South Africa's GDP is 6%, and to Gauteng's economic output, 18%. Its contribution to national unemployment is 9%. The estimated average economic growth between 1997 and 2012 was 3.1%. The GDP in Ekurhuleni is forecasted to reach 2.7% by 2016. Over the period between 2005 and 2013, the economy of Ekurhuleni registered a steady growth following a slump from 2009 (Figure 24). It is evident for the figure that the growth trend over this period was volatile, reaching both lows of -2.3% and highs of 6.1% over the 8 year period.

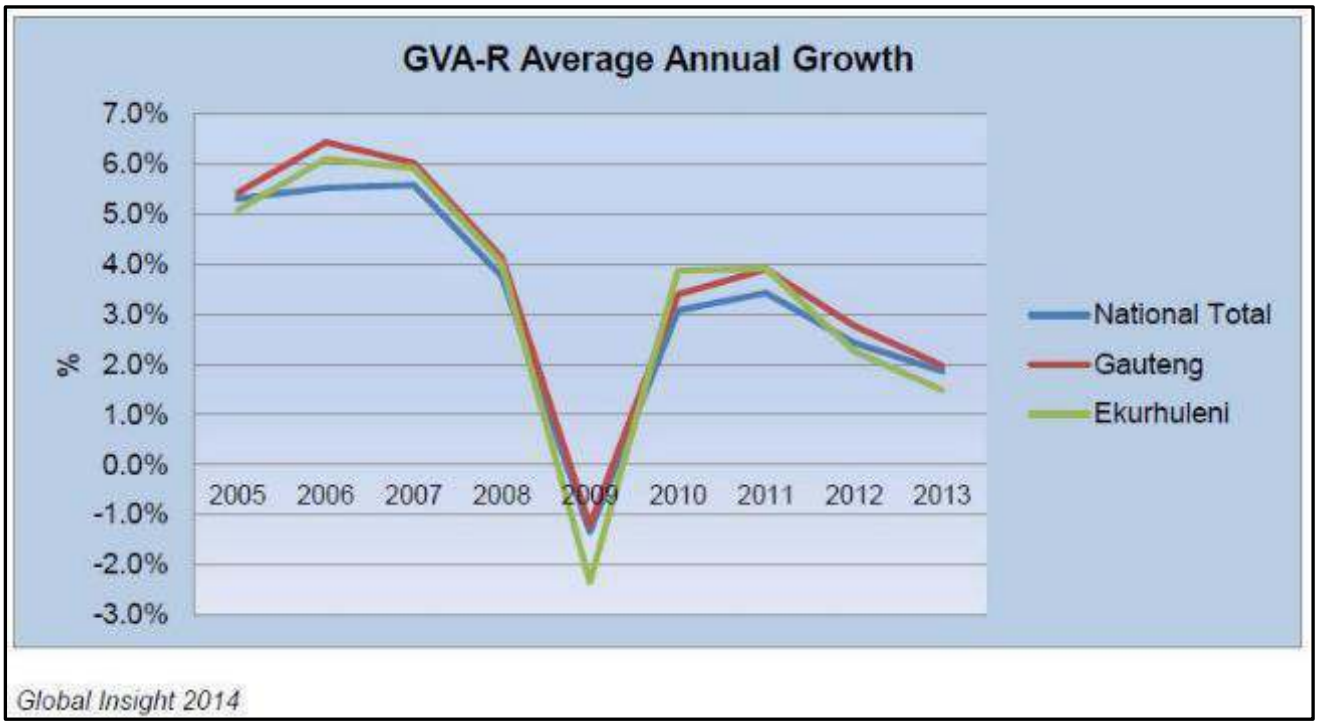

Figure 24: GVA-R Average Annual Growth of the Ekurhuleni Metropolitan Municipality

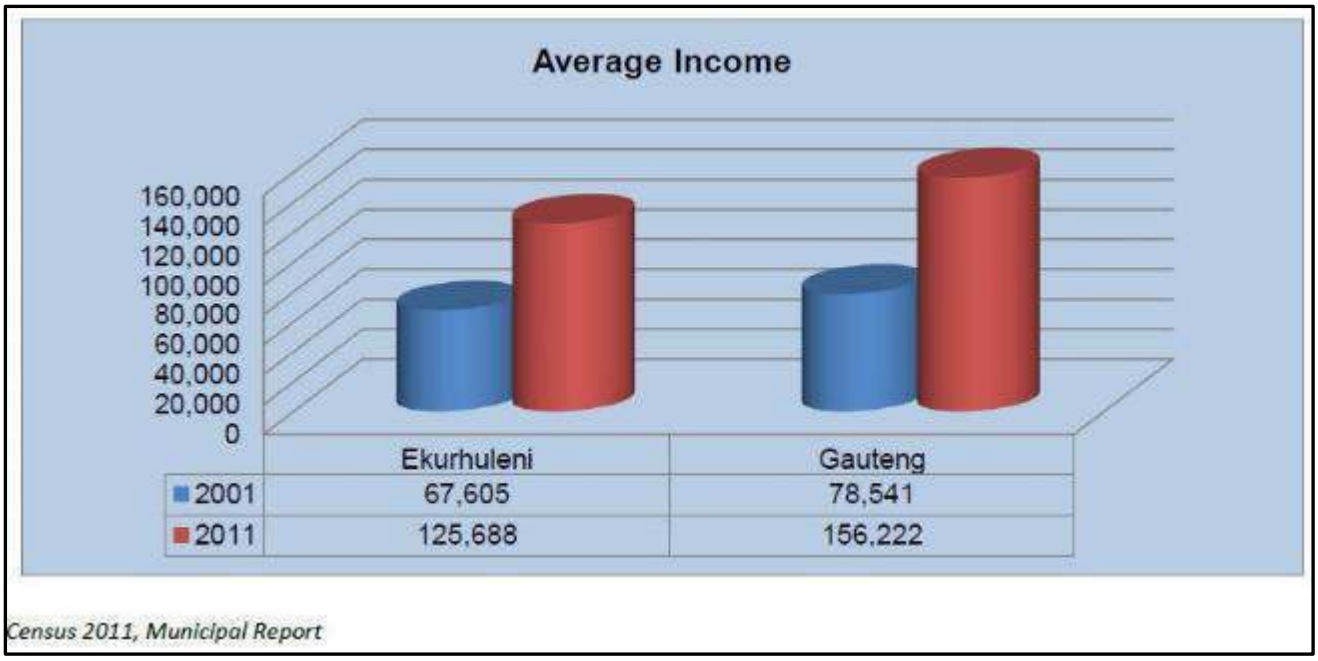

Figure 25: Average Income of households within the Ekurhuleni Metropolitan Municipality

In South Africa, high unemployment (25.4% in quarter three of 2014) coincides with low economic growth (1.4% in quarter three of 2014). The same conditions are evident in Ekurhuleni. The municipality has the highest unemployment rate in the Gauteng Province, compared to other metros. According to StatSA, unemployment in Ekurhuleni, currently stands at 28.8%. This is higher than the national rate and can be attributed, among other factors, to internal migration with individuals being attracted to Ekurhuleni in search of employment. 36.9% of the unemployed is youth. 72% of the population is economically active. Another factor contributing to unemployment in the municipality is the declining contribution of the manufacturing sector to the economy of the municipality. Ekurhuleni's manufacturing sector declined by 9.3% between 2004 and 2014. A closer look into manufacturing shows that the sub-sectors of fuel, petroleum, chemical, rubber, metal, machinery and household appliances suffered major declines during this period. However, manufacturing remains an important sector to Ekurhuleni's economy, specifically metal products, machinery and household appliances sub-sectors, which has been the main driver behind output (**Figure 26**).

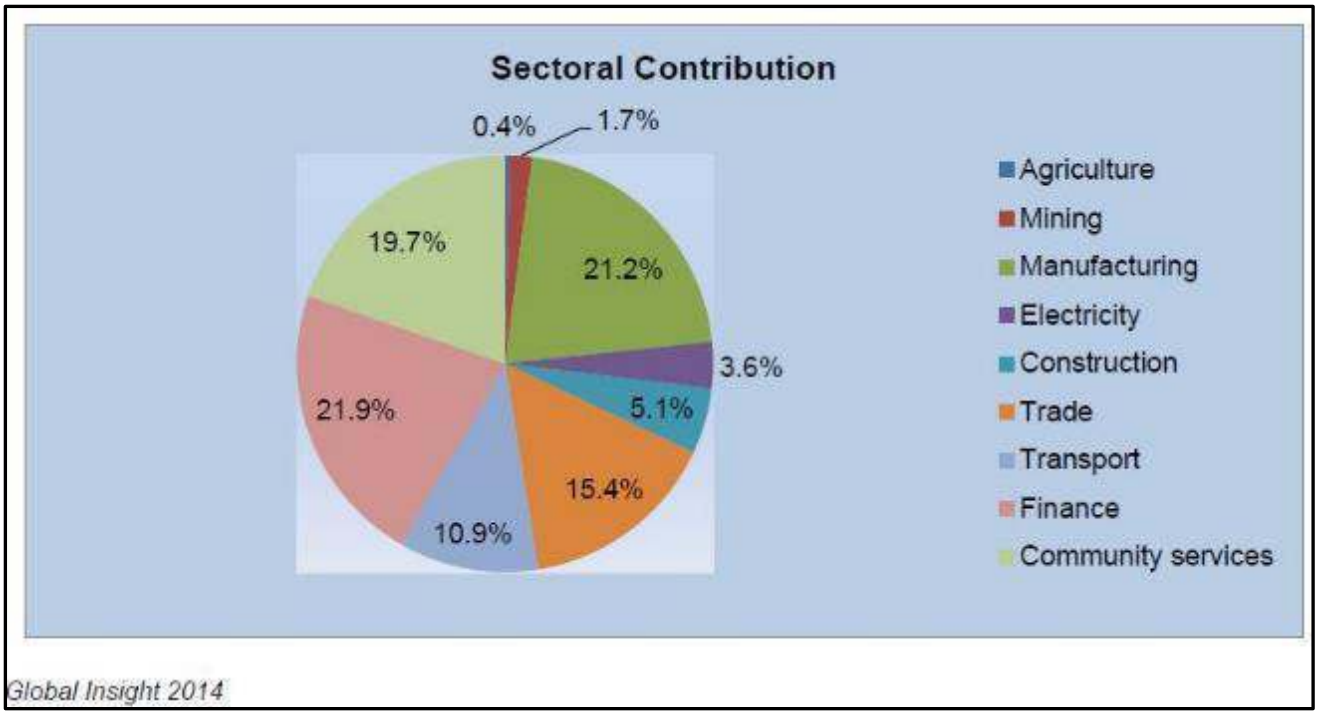

Figure 26: Economic Sectoral Contribution within the Ekurhuleni Metropolitan Municipality

Household income and per capita income exceed the national average by 10% and 33% respectively. The percentage of people living in poverty nationally is 44.4%, compared to 24.2% in Ekurhuleni (Source: Global Insight Regional eXplorer (ReX) v.351). Income levels in Ekurhuleni are above national average (which is to be expected for most urban areas in South Africa), but below that of the Gauteng proivnce's average. In the northern service delivery region, 16% of households have no income, compared to 25% in the sourthern and eastern region. In the north, 44% of households have an annual income of less than R19 200, compared to 60% in the southern and eastern regions. While the northern region has both high and low income, the latter in informal settlements, the eastern and southern regions are charagterised by middle to high income areas, as well as low income in the informal settlements.

The majority of people living below the poverty line live on the urban periphery, far away from job opportunities and social amenitites. Nearly a third of the approximately 1.5 million people living in Ekurhuleni live in poverty. Currently unemployment is estimated at 40%, which is unacceptably high. Many people are forced to resort to desperate measures in order to merely survive. The majority of people below the poverty line live on the urban periphery, far from mainstream job opportunities and urban amenities, and in informal settlements without

basic services. In total, approximately 98% of all the people in Ekurhuleni that live below the poverty line are Africans. Although the Ekurhuleni community ahs a fairly high literacy rate (±84%), technical skills levels are low and not a good fit for the skills demands of the local economy in the area. The prevalent lack of skills and the low local economic growth rate has entrenched the cycle of poverty, deprivation and violence. Malnutrition, especially amongs children, remains a severe challenge, while a high rate of HIV/Adis and other poverty related diseases such as TB is experienced, especially in the peripheral townships and informal settlements. Health services within Ekurhuleni are rendered by the Gauteng Province, the Metro and the private sector. The Metro is primarily responsible for basic healthcare and runs a total number of 109 clinics (4 community health centres, 74 fixed clinics, 20 satellite clinics and 11 mobile clinics), throughout its area of jurisdiction. A high degree of functional integration with provincial health services has been achieved. Crime and domestic violence, including violence against women and children, are at unacceptably high levels, especially in some of the marginalized and poverty stricken areas.

(b) Description of the current land uses

The predominant land uses identified on the day of the assessment for the study area and surrounds included mining and agricultural areas, residential dwellings of the town of Nigel and associated neighbourhoods, road networks (the R51) as well as the Vogelstruisbult Dam to the North and disturbed wetlands in the northern and eastern directions. The Marievale wetland and bird sanctuary is situated approximately one-kilometre (1 km) East of the proposed development site. The land has been significantly disturbed by agriculture and mining activities.

The study area is characterised by open and flat areas consisting of natural grassland (Figure 27) and agricultural fields (refer to Figure 28). The Vogelstruisbult Dam lies approximately 1 km the north. The existing Brikor Vlakfontein Quarry lies immediately east (refer to Figure 29 - 32) of the Military Golf Club, immediately south-east of the study area. The Marievale Bird Sanctuary is situated approximately 2,5 km to the south-east of the study area. The Dunnotar Military Base is located approximately 500 m to the west and the R51 Provincial road 1 km to the west running north to south. The areas immediately to the west and south-west of the study area are characterised by agricultural fields and land uses. The Brikor factory and offices are located 2 km to the south of the study area. There are also some old gold mining fields further to the north-east, east and south-east of the study area. The town of Springs is located 10 km north-west and the town of Heidelberg 20 km to the south-west.

Infrastructure in the general area on and around the site consists of several dirt roads that provide access to the area, as well as power lines, fences, and extensive agricultural fields (both used and dormant).

Figure 27: Natural grassland on the study area, view to the north-west from the eastern border of the study area

Figure 28: Agricultural fields on the study area, view to the south-west from the eastern border to the study area

Figure 29: View of the berm on the border of the existing Vlakfontein quarry and the study area to the north-west

Figure 30: View of the berm on the border of the existing Vlakfontein quarry and the study area to the south-east

Figure 31: General view of the mining activities at the existing Vlakfontein quarry from the eastern border of the study area

Figure 32: View inside the Vlakfontein Quarry adjacent to the study area

(c) Description of specific environmental features and infrastructure on the site

Environmental Features

From the specialist studies, the following environmental features were observed on site:

- There is some concern with the project regarding palaeontology, due to the presence of the Vryheid Formation. The palaeontologist recommended that the topsoil, subsoil and overburden must be surveyed for fossils during construction and operation and mitigation is needed during construction for the shale layer, if fossils are present;
- The agricultural potential of the site varies due to the soils conditions. Some areas are covered by shallow water lodge soil that are of low potential (i.e. Katspruit). Soils with agricultural potential have to a large extent already been tilled and are currently being used for dryland agriculture. The potential of the areas under crop production varies from low to medium due to a range of soil conditions. The main land use is dryland agriculture;

- Two wetlands were identified by the wetland specialists on the study area. Several other wetlands within the 500m of the study area were also recorded (refer to Figure 11). The wetlands are classified as a seepage wetland and an exoreic depressional pan. The Seepage wetland has been impacted on the most and scored an E, on the wetland health assessment scale. An “E” score indicates that a wetland is “Largely Modified”. The Depressional wetland is more isolated and less prone to imapcts, and scored a C on the wetland health assessment scale. A “C” score indicates that a wetland is “Moderately Modified”;
- The entire proposed mining site falls within the Tsakane Clay Grassland vegetation type (refer to Figure 15Figure 15) which is classified as Endangered. The vegetation has been severely disturbed and transformed by grazing, crops fields, mining, roads and footpaths and, therefore, the conservation priority and sensitivity is of this vegetation type is High. The need for rehabilitation, however, is classified as medium. No red data species occurs within this vegetation type area. Situated close to the study site, is the Eastern Temperate Freshwater Wetland riparian vegetation type. This area is Vulnerable, providing habitat to various faunal species of conservation concern;
- Infrastructure in the general area on and around the site consists of several dirt roads that provide access to the area, as well as power lines, fences, and extensive agricultural fields (both used and dormant);
- The applicant site is affected by the following provincial roads:

    - PWV16: The future route is planned approximately 5.0km south of the applicant site and the approval of the proposed development will have no impact on the route;
    - Road K152: The future route is planned to the south of the PWV16 and the approval of the proposed development will have no impact on the route;
    - Road K136: The future route is planned approximately 800m north of the applicant site and the approval of the proposed development will have no impact on the route;
    - Road K181: Part of the future route traverses the applicant site.

- Access to the study area is from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.

(d) Environmental and current land use map

(Show all environmental, and current land use features)

Please refer to Figure 33, Figure 34 and Appendix 4 and Appendix 7 of this report.

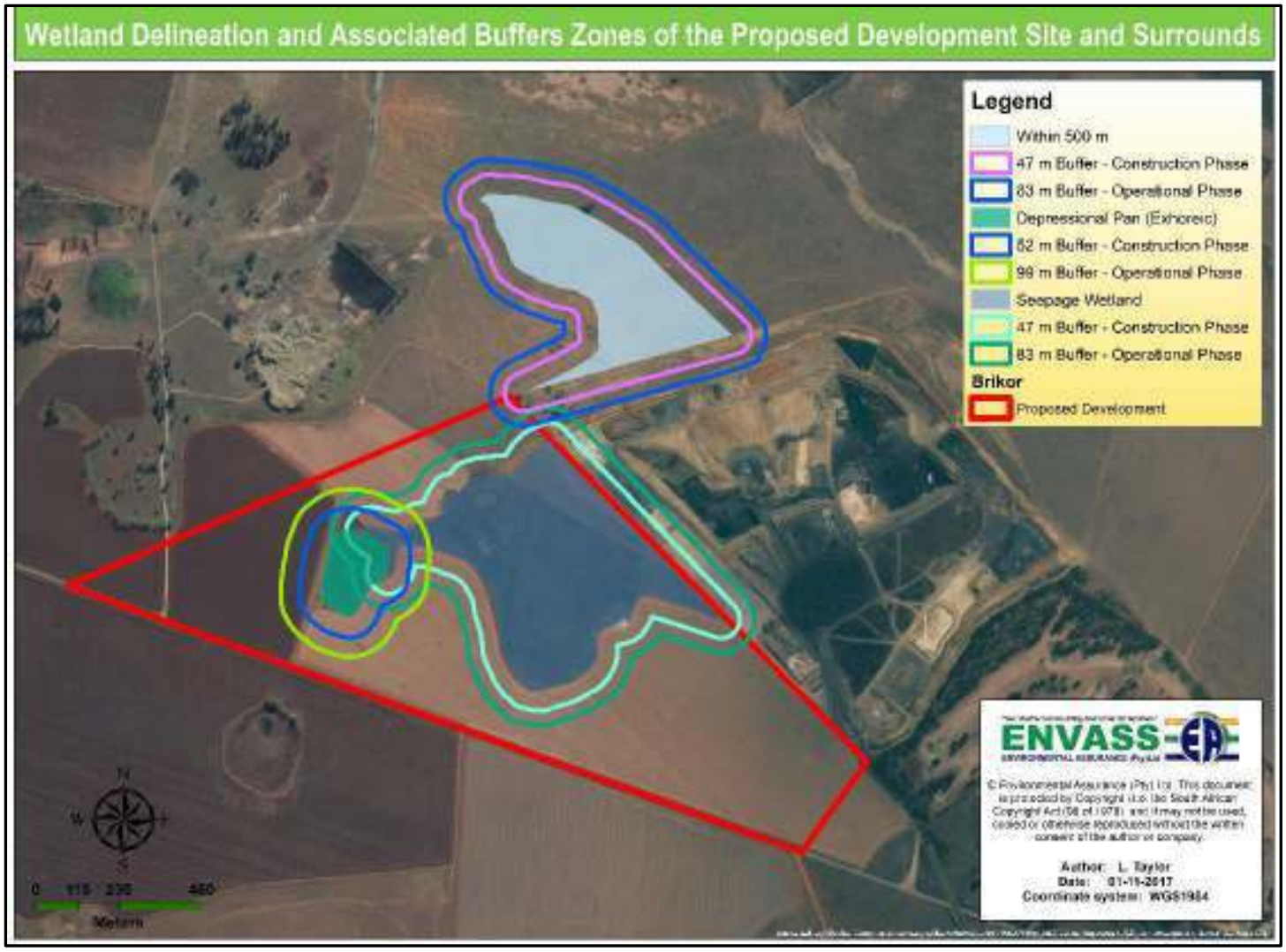

Figure 33: Environmental Features Map

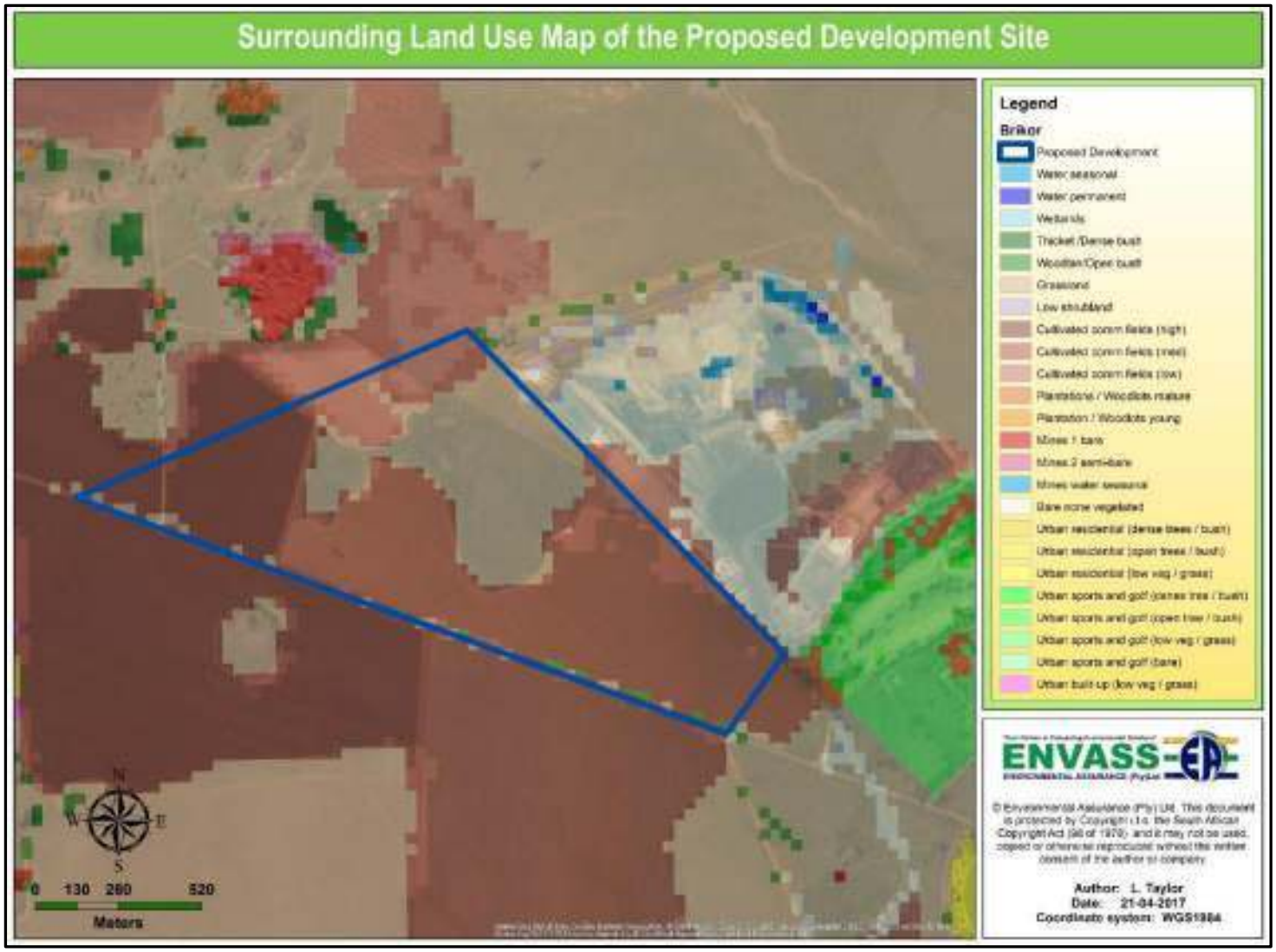

Figure 34: Land Use Map of the Study Area and Surrounds

v) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

Potential impacts that may be caused by the proposed development will be identified using input from the following:

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

The following potential major direct, indirect and cumulative impacts were identified:

- Land degradation;
- Contamination of soil by coal and hydrocarbons;
- Compaction of soils by vehicles and equipment;
- Erosion;
- Acid mine drainage;
- Blasting of coal;
- Altered landforms - topography;
- Loss of agricultural potential and land capability;
- Reduced crop growth;
- Contamination of ground- and surface water quality and decline in quantity;
- Impacts on biodiversity;
- Loss and displacement of fauna;

- Impacts on existing land use of the study and surrounding area;
- Deterioration of local roads used by heavy duty vehicles;
- Mudslides form stockpiles and overburden;
- Destruction or loss of heritage features including graves and other historical sites of importance that may be uncovered during excavations;
- Decreased aesthetic value and impact on “Sense of Place”;
- Poor air quality and decreased visibility due to dust pollution;
- Increased noise levels and impact on surrounding communities and the Marievale Bird Sanctuary;
- Waste generation;
- Increased demand on service infrastructure and resources;
- Slight increase in traffic and need for maintenance of road infrastructure;
- Health and safety impacts;
- Potential injury and loss of health and life of humans; and
- Altered Socio-Economic Environment (Positive or negative).

Please refer to Table 15, Table 16 and Table 17 below, for the complete list and description of identified impacts and the assessment of each impact. Please refer to the following section for the methodology used in the impact assessment.

Table 15: Impact Significance Calculation – Construction Phase

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
GEOLOGY AND SOILS	**Loss of topsoil as a resource** When vegetation is cleared and the topsoil is stripped, the soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Construction vehicles driving on these soils causes compaction of soils and reduces the soils ability to be penetrated by root growth. Compaction also increases erosion potential. When soils are not stripped and stockpiled according to the soil stripping guidelines these soils would have lost their natural physical and chemical properties, reducing the topsoil's ability to be a plant growth medium. The above factors all contribute to a loss of the topsoil's ability to be a resource through alterations and removal.	–	5	2	4	2	13	5	65	Low	Refer to Table 24	43	Certain	High
	Loss of land capability Removal of soil layers will impact on the land capability, because vegetation can no longer be supported.	–	5	2	4	2	13	5	65	Low		43	Certain	High
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	–	3	2	2	4	11	2	22	Medium		11	Sure	Low
HYDROLOGY GROUNDWATER SURFACE WATER	If groundwater is used for supply, then localised dewatering could occur.	–	3	2	2	4	11	3	33	Low		22	Unsure	Medium
	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally.	–	5	2	3	4	14	4	56	Low		37	Sure	Low
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact is caused by compaction of soil, removal of vegetation, surface water redirection during construction activities. Permanent changes to water flows including encroaching onto wetland habitat.	–	4	4	4	4	16	5	80	Low		64	Certain	Medium

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Construction activities will result in earthworks, soil disturbance and natural vegetation removal. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water.	–	5	3	4	5	17	4	68	Low		52	Certain	Medium
	Introduction and spread of alien invasive species The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	–	4	4	4	4	16	4	64	High		30	Certain	High
	Loss and disturbance of water course habitat and fringe vegetation impact. Direct development within water course areas will cause loss and disturbance of water course habitat and fringe vegetation, due to direct development in the water course, as well as changes in management, fire regime and habitat fragmentation.	–	4	4	4	4	16	5	80	Low		64	Certain	High
	Changes in water quality due to pollution Construction activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.	–	3	4	4	4	15	5	75	Med		56	Certain	Med
ARCHAEOLOGICAL/ HERITAGE RESOURCES	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	–	2	1	5	5	13	2	26	Low		17	Sure	Low
VISUAL AND SENSE OF PLACE	Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	–	3	3	1	1	8	5	40	Low		27	Sure	Medium

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	The mining activities and infrastructure, will alter the agricultural sense of place of the study area to a mining sense of place.	–	3	3	1	1	8	5	40	Low		27	Sure	Medium
	Added impact of security lighting on surrounding landowners and nocturnal animals.	–	3	3	1	2	9	4	36	Medium		18	Sure	Low
NOISE AND VIBRATION	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of construction vehicles and equipment.	–	3	3	1	3	10	4	40	Medium		20	Sure	Low
AIR QUALITY	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	–	4	3	1	1	9	5	45	High		15	Sure	Medium
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	–	4	3	1	1	9	5	45	High		15	Sure	Medium
WASTE	Generation of additional general waste, litter and building rubble and hazardous material during the construction phase.	–	3	2	1	1	7	5	35	High		12	Certain	Low
SERVICES	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional strain on natural resources and service infrastructure.	–	2	3	1	1	7	5	35	Medium		18	Certain	Medium
TRAFFIC	The change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	–	3	3	1	1	8	3	24	Medium		12	Sure	Medium
	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles.	–	4	3	1	1	9	2	18	Medium		9	Sure	Low
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	–	3	3	1	1	8	3	24	Medium		12	Sure	Medium
HEALTH AND SAFETY	Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers.	–	5	4	5	5	19	2	38	Medium		19	Sure	Medium
	Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches.	–	4	3	5	5	17	2	34	Medium	Refer to Table 24	17	Sure	Low
SOCIO-ECONOMIC	Positive: Potential creation of short term employment opportunities for the local communities, during the construction phase.	+	3	3	1	1	8	5	40	N/A		40	Certain	Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	Multiplier effects on local economy	+	3	3	1	1	8	5	40	N/A		40	Certain	Low
	Community development social upliftment	+	3	3	1	1	8	5	40	N/A		40	Certain	Low
	Nuisance impacts on the surrounding land users (i.e. dust, noise, vibration).	–	3	3	1	3	10	4	40	Medium		20	Sure	Low

Table 16: Impact Significance Calculation – Operational Phase

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
GEOLOGY AND SOILS	**Loss of topsoil as a resource** Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles, where steep slopes are present. Topsoil can also be lost, due to compaction form mining equipment. Topsoil as a resource could lose its effectiveness if topsoil is not replaced back in the order it was stripped in, hence reducing its ability to grow vegetation.	–	4	2	2	2	10	5	50	Med	Refer to Table	25	Sure	High
	Loss of land capability and land use Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent, because vegetation will be supported and, therefore, returned to the planned post mining land capability such as arable and or grazing.	–	5	2	3	3	13	5	65	Low		43	Sure	High
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	–	3	2	2	4	11	2	22	Med		11	Sure	Low
HYDROLOGY GROUNDWATER SURFACE WATER	**Dewatering** Groundwater depletion will take place in the areas surrounding the opencast pit.	–	2	3	4	3	12	4	48	Med		24	Sure	High
	Base case Scenario **Poor quality seepage** The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage (AMD) to the groundwater resource.	–	2	3	4	3	12	3	36	Med		18	Sure	High
	Scenario 1 **Poor quality seepage** The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource.	–	2	3	4	3	12	3	36	Med		18	Sure	High
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact is caused by compaction of soil, removal of vegetation, surface water redirection during construction	–	4	4	4	4	16	4	64	Low		64	Certain	Medium

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	activities. Permanent changes to water flows including encroaching onto wetland habitat.													
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Construction activities will result in earthworks, soil disturbance and natural vegetation removal. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water.	–	4	4	3	3	14	4	56	Low		42	Certain	Medium
	Introduction and spread of alien invasive species The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	–	3	4	4	3	14	3	42	High		22	Certain	High
	Loss and disturbance of water course habitat and fringe vegetation impact. Direct development within water course areas will cause loss and disturbance of water course habitat and fringe vegetation, due to direct development in the water course, as well as changes in management, fire regime and habitat fragmentation.	–	4	4	4	4	16	4	64	Low		64	Certain	High
	Changes in water quality due to pollution Operational activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.	–	3	4	4	4	15	5	75	Med		56	Certain	Med
ARCHAEOLOGICAL/ HERITAGE RESOURCES	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	–	2	1	5	5	13	2	26	Low	Refer to Table 24	17	Sure	Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the stripped open cast area.	–	3	3	4	1	11	5	55	Low		37	Sure	Medium
	Visibility of solid domestic and operational waste.	–	3	3	4	1	11	5	55	Medium		28	Sure	Medium
	Removal of overburden, through blasting and equipment causes dust pollution, which in turn impacts on visibility on nearby roads and the aesthetic quality of the area.	–	3	3	4	1	11	5	55	Low		37	Sure	Medium
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, will cause a direct visual impact and also indirectly through the creation of dust.	–	2	3	4	1	10	4	40	High		13	Sure	Medium
	Potential increase in traffic and existing traffic to and from the site may cause a negative impact directly, and indirectly through creation of dust.	–	2	3	4	1	10	4	40	High		13	Sure	Medium
	Added impact of security lighting on surrounding landowners and nocturnal animals and the sense of place of the area.	–	3	3	3	2	11	5	55	Medium		27.5	Sure	Low
	Should there not be enough backfill material to backfill open cast pits, a permanent void may be left after mining, which will scar the landscape permanently.	–	3	3	3	2	11	5	55	Medium		27.5	Sure	Low
NOISE AND VIBRATION	Disturbance due to vibrations caused by vehicles.	–	3	3	4	2	10	4	40	Medium		20	Sure	Low
	Blasting will cause noise pollution	–	3	3	4	2	12	4	48	Medium		24	Sure	Low
	Blasting may cause ground vibration at the nearby houses and other buildings.	–	4	3	4	2	13	4	52	Medium		26	Sure	Low
AIR QUALITY	Creation of dust through removal of overburden and ore may cause a decline in ambient air quality.	–	4	3	4	1	12	5	60	High		20	Sure	Medium
	Creation of dust through blasting, may cause a decline in ambient air quality.	–	2	3	4	1	10	4	40	High		13	Sure	Medium
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, may cause a decline in ambient air quality.	–	2	3	4	1	10	4	40	High		13	Sure	Medium
	Potential increase in traffic and existing traffic to and from the site will create dust, which may cause a decline in ambient air quality.	–	2	3	4	1	10	4	40	High		13	Sure	Medium
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of	–	3	3	4	1	11	4	44	Low		29	Sure	Medium

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	concern include carbon dioxide (CO^2) and methane (CH^4).													
WASTE	Generation and disposal of additional general waste, litter and hazardous material during the operational phase and operational waste i.e. waste rock.	–	**3**	**2**	**4**	**1**	**10**	**5**	**50**	**High**		**17**	**Certain**	**Low**
SERVICES	Need for services e.g. water, electricity and sewerage systems, causing additional strain on natural resources and service infrastructure.	–	**2**	**3**	**4**	**1**	**10**	**5**	**50**	**Medium**		**25**	**Certain**	**Medium**
TRAFFIC	The change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	–	**3**	**3**	**4**	**1**	**11**	**3**	**33**	**Medium**		**17**	**Sure**	**Medium**
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	–	**4**	**3**	**4**	**1**	**12**	**2**	**24**	**Medium**		**12**	**Sure**	**Low**
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	–	**3**	**4**	**3**	**1**	**11**	**5**	**55**	**High**		**18**	**Sure**	**Medium**
HEALTH AND SAFETY	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	–	**5**	**4**	**5**	**5**	**19**	**2**	**38**	**Medium**	**Refer to Table 24**	**19**	**Sure**	**Medium**
	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	–	**4**	**3**	**5**	**5**	**17**	**2**	**34**	**Medium**		**17**	**Sure**	**Low**
SOCIO-ECONOMIC	Possibility of mining activities and workers causing veld fires destroying veld and animals on the study area and on adjacent land, impacting on the livelihood of surrounding land owners and users.	–	**5**	**4**	**5**	**5**	**19**	**2**	**38**	**Medium**		**19**	**Sure**	**Medium**
	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	–	**4**	**4**	**4**	**3**	**15**	**3**	**45**	**Medium**		**23**	**Sure**	**Medium**
	Economic impact should there be an incident of public health and safety.	–	**4**	**3**	**5**	**3**	**15**	**3**	**45**	**High**		**15**	**Sure**	**Low**
	Positive: Extended employment provision allowing mining activities to continue for additional years.	**+**	**4**	**4**	**4**	**1**	**13**	**5**	**65**	**N/A**		**65**	**Certain**	**Low**
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	**+**	**3**	**4**	**1**	**1**	**9**	**5**	**45**	**N/A**		**45**	**Certain**	**Low**

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	Social upliftment through: Infrastructure development, poverty eradication and community upliftment in the communities surrounding the operation. Upliftment projects include provision of nutritional information to guide healthy eating habits and also provision of healthy food and liquids to employees. Employees are also provided with living wages in order to afford reasonable housing and receive discounts on bricks from the Brikor group in assisting to build there homes.	+	4	4	4	1	13	5	65	N/A		65	Certain	Low

Table 17: Impacts during the decommissioning and closure phases

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
GEOLOGY AND SOILS	**Loss of topsoil as a resource** Topsoil losses can occur during the decommissioning phase as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present. When infrastructure and roads are being demolished there could be additional compaction. Topsoil as a resource could lose its effectiveness if topsoil is not replaced back in to the order it was stripped hence reducing its ability to grow vegetation.	–	5	2	3	3	13	5	65	Med	Refer to Table 24	32.5	Sure	High
	Loss of land capability and land use Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent because vegetation will be supported and therefore returned to the planned post mining land capability such as arable and or grazing. Erosion and compaction caused by incorrect rehabilitation or no rehabilitation. Soil erosion and compaction by heavy duty vehicles on site. Compaction of soil will lead to less efficient or no establishment of vegetation, due to decreased platn root depth. Incorrect backfilling of soil material layers will impact negatively on post-mining land capability and landuse.	–	5	2	3	4	14	5	70	Low		47	Sure	High
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area, because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	–	3	2	2	4	11	2	22	Med		11	Certain	Low
	Restoration or improvement of land capability prior to mining.	+	5	2	5	4	16	4	64	N/A		64	Sure	High
HYDROLOGY GROUNDWATER SURFACE WATER	**Groundwater Rebound** Following cessation of mining operations, the groundwater levels at the site will rebound to their original level. Decant is unlikely.	–	2	2	5	1	10	3	30	Med		15	Sure	Low
	Poor quality seepage The waste material at the berm areas may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource.	–	3	3	4	3	13	2	26	Med		13	Sure	High

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	However, the footprint of these berms is small, and no contaminants of concern have been identified. The pit area could also potentially undergo oxidation and result in poor quality seepage.													
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact may be caused by incorrect rehabilitation.	–	4	4	4	4	16	5	80	Low		–	4	4
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Decommissioning and rehabilitation activities will result in earthworks and soil disturbance. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water, if done incorrectly.	–	5	3	4	5	17	4	68	Low		–	5	3
	Introduction and spread of alien invasive species The moving of soil and vegetation during the decommissioning and closure phases, if rehabilitation is done incorrectly, may result in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	–	4	4	4	4	16	4	64	High		–	4	4
	Changes in water quality due to pollution Decommissioning and rehabilitation activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.	–	3	4	4	4	15	5	75	Med		–	3	4

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
VISUAL SENSE OF PLACE LIGHTING	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	–	3	3	1	1	8	5	40	Low		27	Sure	Medium
	Visibility of solid domestic and decommissioning waste.	–	3	3	4	1	11	5	55	Medium		28	Sure	Medium
NOISE AND VIBRATION	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy duty vehicles and equipment.	–	3	3	1	3	10	4	40	Medium		20	Sure	Low
	Disturbance due to vibrations caused by heavy duty vehicles.	–	3	3	1	2	9	4	36	Medium		18	Sure	Low
	Impact of security lighting on surrounding landowners and animals.	–	3	3	1	2	9	4	36	Medium		18	Sure	Low
AIR QUALITY	Increased dust pollution due to vegetation clearance and heavy duty vehicles and decommissioning and rehabilitation activities.	–	4	3	1	1	9	5	45	High		15	Sure	Medium
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	–	4	3	1	1	9	5	45	High		15	Sure	Medium
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	–	3	3	4	1	11	4	44	Low		29	Sure	Medium
SERVICES	Need for additional services i.e. water, electricity and sewerage systems during the closure phase causing additional strain on natural resources and infrastructure.	–	2	3	1	1	7	5	35	Medium		18	Certain	Medium
TRAFFIC	The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	–	3	3	1	1	8	3	24	Medium		12	Sure	Medium
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	–	4	3	1	1	9	2	18	Medium		9	Sure	Low
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	–	3	4	3	1	11	5	55	High		18	Sure	Medium
HEALTH AND SAFETY	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	–	5	4	5	5	19	2	38	Medium		19	Sure	Medium
	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and	–	4	3	5	5	17	2	34	Medium		17	Sure	Low

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
	possible loss of life to mine workers and visitors to the site.													
	Increased risk to public and worker health and safety.	–	4	3	5	5	17	2	34	Medium		17	Sure	Low
SOCIO-ECONOMIC	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	–	4	4	4	3	15	3	45	Medium		23	Sure	Medium
	Economic impact should there be an incident of public health and safety.	–	4	3	5	3	15	3	45	High		15	Sure	Low
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	+	3	3	1	1	8	5	40	N/A		40	Certain	Low
	Negative: Loss of jobs, household income, decline in local economy. The concentration of economic activity centred around the mine often increases the community's dependenc on the mining operation, making it vulnerable to downscaling or closure.	–	3	3	4	3	13	5	65	Medium		32.5	Sure	Medium

Table 18: Impacts as a result of not implementing the proposed development

ENVIRONMENTAL ASPECT	NATURE OF THE IMPACT	IMPACT STATUS	MAGNITUDE	EXTENT	DURATION	REVERSIBILITY	IRREPLACEABILITY	PROBABILITY	SIGNIFICANCE PRE-MITIGATION	MITIGATION POTENTIAL	MITIGATION MEASURES	SIGNIFICANCE POST-MITIGATION	CONFIDENCE RATING	CUMULATIVE IMPACTS
SOCIO-ECONOMIC	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	–	3	3	4	3	13	5	65	High	N/A	22	Sure	Medium
	Reduced period of development and upliftment of the surrounding communities and infrastructure.	–	3	3	4	3	13	5	65	High		22	Certain	Medium
	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	–	3	3	4	3	13	5	65	High		22	Certain	Medium
GENERAL	Positive: No additional negative impacts on the environment.	+	4	4	5	4	17	5	85	N/A		85	Sure	Medium

vi) **Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;**

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

A “significant impact” is defined as it is defined in the EIA Regulations (2014): “an impact that may have an notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence”. The objective of this EIA methodology is to serve as framework for accurately evaluating impacts associated with current or proposed activities in the biophysical, social and socio-economical spheres. It aims to ensure that all legal requirements and environmental considerations are met in order to have a complete and integrated environmental framework for impact evaluations.

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

Environmental Impact Assessment (EIA) Regulations, 2014 requirements

The Environmental Impact Assessment (EIA) 2014 Regulations promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), requires that all identified potential impacts associated with the proposed project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2014) include the following:

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

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

ENVASS Impact Assessment Methodology

By considering the root cause of the issue in this way, the probability that the activity undertaken does or may result in an impact, can be determined. The associated impact can then be assessed in order to determine its significance and to define mitigation measures or management measures to address the impact.

The following definitions therefore apply:

- An activity is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation;
- An environmental aspect is an 'element of an organisation's activities, products and services which can interact with the environment. The interaction of an aspect with the environment may result in an impact;
- Environmental impacts are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality;
- Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and palaeontology. Impacts on the environment can lead to changes in existing conditions; the impacts can be direct, indirect or cumulative;
- Direct impacts refer to changes in environmental components that result from direct cause-effect consequences of interactions between the environment and project activities. Indirect impacts result from cause-effect consequences of interactions between the environment and direct impacts; and
- Cumulative impacts refer to the accumulation of changes to the environment caused by human activities.

Assessment of Impact Significance

The accumulated knowledge and the findings of the environmental investigations form the basis for the prediction of impacts. Once a potential impact has been determined, it is necessary to identify which project activity will cause the impact, the probability of occurrence of the impact, and its magnitude and extent (spatial and temporal). This information is important for evaluating the significance of the impact, and for defining mitigation and monitoring strategies. The aspects and impacts identified are therefore described according to the following:

(a) Nature of the impact

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

(b) The status of the impact:

STATUS	Status	Description
	Positive (+)	A benefit to the holistic environment.
	Negative (-)	A cost to the holistic environment.
	Neutral (N)	No cost or benefit to the holistic environment.

(c) Magnitude of the impact

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

Determining the magnitude of an impact			
MAGNITUDE Magnitude / intensity of impact (at the specified scale)	Magnitude	Score	Description
	Zero	1	Natural and/or social functions and/or processes remain unaltered.
	Very low	2	Natural and/or social functions and/or processes are negligibly altered.
	Low	3	Natural and/or social functions and/or processes are slightly altered.
	Medium	4	Natural and/or social functions and/or processes are notably altered.
	High	5	Natural and/or social functions and/or processes severely altered.

(d) Extent of the impact

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

Determining the extent of an impact			
EXTENT **Extent or spatial influence of impact**	**Extent**	**Score**	**Description**
	Footprint	**1**	**Only as far as the activity, such as footprint occurring within the total site area**
	Site	**2**	**Only the site and/or 500m radius from the site will be affected**
	Local	**3**	**Local area / district (neighbouring properties, transport routes and adjacent towns) is affected**
	Region	**4**	**Entire region / province is affected.**
	National	**5**	**Country is affected**

(e) Duration of the impact

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

Determining the duration of an impact			
DURATION **Duration of the impact**	**Extent**	**Score**	**Description**
	Short term	**1**	**Less than 2 years**
	Short to medium term	**2**	**2 – 5 years**
	Medium term	**3**	**6 – 25 years**
	Long term	**4**	**26 – 45 years**
	Permanent	**5**	**46 years or more**

(f) Degree to which impact can be reversed

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

Determining the reversibility of an impact			
REVERSIBILITY	**Reversibility**	**Score**	**Description**
	Completely reversible	**1**	**Impacts can be reversed through the implementation of minimal mitigation measures and rehabilitation with negligible residual effects.**
	Nearly completely reversible	**2**	**Impacts can nearly be completely reversed through the implementation of mitigation measures and rehabilitation, with marginal residual effects.**
	Partly reversible	**3**	**Impacts can be partly reversed through the implementation of mitigation measures and rehabilitation with moderate residual effects.**
	Nearly irreversible	**4**	**Impacts can be mitigated, but only marginally reversed through the implementation of mitigation measures and rehabilitation with severe residual effects.**
	Irreversible	**5**	**Impacts are permanent and can't be reversed by the implementation of mitigation measures or rehabilitation is not viable.**

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

The irreplaceability of an impact can be defined as "the amount of resources that can/can't be replaced".

Irreplaceability = Magnitude + Extent + Duration + Reversibility

Degree to which impact may cause irreplaceable loss of resources			
IRREPLACEABILITY	**Irreplaceability**	**Score**	**Description**
	No loss	**0**	**No loss of any resources**
	Very Low	**1 - 5**	
Irreplaceable loss of resources	**Low**	**6 - 10**	**Marginal loss or resources**
	Medium	**11 - 15**	**Significant loss of resources**
	High	**16 - 20**	**Complete loss of resources**

(h) Probability of the impact occurring

The PROBABILITY of an impact can be defined as: “the estimated chance of the impact happening”.

Determining the probability of an impact			
PROBABILITY	**Probability**	**Score**	**Description**
	Unlikely	**1**	**Unlikely to occur (0 – 15% probability of impact occurring)**
	Possible	**2**	**May occur (15 – 40% chance of occurring)**
	Probable	**3**	**Likely to occur (40– 60% chance of occurring)**
	Highly Probable	**4**	**Between 60% and 85% sure that the impact will occur**
	Definite	**5**	**Will certainly occur (85 - 100% chance of occurring)**

(i) Significance of Impacts - Pre-Mitigation

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

The significance of an impact is determined as follows:

Significance = Irreplaceability x Probability

The maximum value is 100 significance points (SP). Environmental impacts were rated as either of Very High (VH) High (H), Medium (M), Low (L) or Very Low (VL) significance on the following basis:

Table 19: Significance Rating (SR) Basis

Score	Significance
0	Neutral
1 to 20	Very low
21 to 40	Low
41 to 60	Medium
61 to 80	High
81 to 100	Very high

(j) Degree to which the impact can be mitigated

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

MITIGATION POTENTIAL	Determining the mitigation potential of an impact		
	Degree	Calculation	Description
	High	Pre-mitigation SR / 3 = Post Mitigation SR	Impact 100% mitigated
	Medium	Pre-mitigation SR / 2 = Post Mitigation SR	Impact >50% mitigated
	Low	Pre-mitigation SR / 3 = x Then: Pre-mitigation SR – x = Post Mitigation SR	Impact <50% mitigated

(k) Significance of Impacts Post-Mitigation

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

The significance of an impact is determined as follows:

Significance = Irreplaceability x Probability

Table 20: Significance Rating

Score	Significance
0	Neutral
1 to 20	Very low
21 to 40	Low
41 to 60	Medium
61 to 80	High
81 to 100	Very high

(l) Confidence rating

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

Determining the confidence rating of an impact			
CONFIDENCE RATING	CONFIDENCE	Certain	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is unlimited and sound
		Sure	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is reasonable and relatively sound
		Unsure	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is limited

(m) Cumulative impacts

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

Determining the confidence rating of an impact			
CUMULATIVE RATING	**CUMULATIVE EFFECTS**	**Low**	**Minor cumulative effects**
		Medium	**Moderate cumulative effects**
		High	**Significant cumulative effects**

vii) The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

At this stage, there are no layout alternatives.

viii) The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Mitigation measures for each identified impact, including issues raised by the Interested and Affected Parties as listed in (Table 21) are provided for in

ix) Motivation where no alternative sites were considered

N/A.

x) Statement motivating the alternative development location within the overall site. (Provide a statement motivating the final site layout that is proposed)

Study Area:

The property on which the mining is proposed is located immediately to the west of the existing Brikor Vlakfontein Quarry. The location of the proposed mining quarry was chosen due to the prospecting indicating the available reserves on the property and feasibility studies indicating that it will be economically viable to mine there. Due to the location close to the existing quarry and factory, transport costs and impacts will be kept at a minimum. The vegetation on the study area have been relatively disturbed by agricultural activities and little natural vegetation remains on the property (as confirmed by the results of the Ecological Scan. However, a wetland occurs on this property where mining is proposed and mining will result in the loss of the wetland habitat on the property.

Area to the east of the existing Vlakfontein Quarry:

The property adjoining the existing quarry to the east, is regarded as sensitive due to the possible presence of a large floodplain wetland.

i) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity

(Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

- **Approach to the EIA**

An Environmental Impact Assessment (EIA) is a good planning tool. It identifies the environmental impacts of a proposed development and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

The EIA for this project complies with the National Environmental Management Act (1998) (as amended) and the NEMA EIA Regulations (2014) and guidelines of the Department of Environmental Affairs (DEA). The guiding principles of an EIA are listed

below.

- **Guiding principles for an EIA**

The EIA must take an open participatory approach throughout. This means that there should be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent. Technical information must be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project.

There should be ongoing consultation with interested and affected parties representing all walks of life. Sufficient time for comment must be allowed. The opportunity for comment should be announced on an on-going basis. There should be opportunities for input by specialists and members of the public. Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made.

- **Information gathering**

Early in the EIA process, the Environmental Assessment Practitioner (EAP) identified the information that would be required for the impact assessment and the relevant data were obtained. In addition, available information about the receiving environment was gathered from reliable sources, interested and affected parties, previous documented studies in the area and previous EIA Reports. The project team visited the site to gain first-hand information and an understanding of the existing operations and the proposed project.

- **Specialist Assessments**

The following specialist studies have been conducted:

- Conceptual and Final Design Report and Designs;
- Geo-hydrological Study;
- Wetland delineation and impact assessment;
- Ecological Scan;
- Phase 1 Archaeological impact assessment;
- Palaeontological assessment;

- Soil and land capability study;
- Waste Classification;
- Traffic Impact Assessment;
- Air Quality Impact Assessment – currently being conducted.

The main objective of the specialist studies is to provide independent scientifically sound information on issues of concern relating to the project proposal.

The impacts identified by the various specialist studies undertaken, are incorporated within this EIA.

- **Legislative Framework**

The legal requirements were described and assessed in detail.

- **Alternatives**

Site alternatives and layouts have been assessed to determine the feasible socio-economical and biophysical option.

- **Description and assessment of impacts identified**

A comprehensive list of all impacts as identified by the EAP and the specialists, are provided and are assessed.

- **Environmental management programme**

An Environmental Management Programme (EMPr) containing mitigation, management and monitoring measures and specifying roles and responsibilities was compiled with specialist input and are included in this report.

- **Stakeholder engagement**

Registered interested and affected parties including relevant organs of state, are consulted with during the process. All their comments will be formally responded to and incorporated into the final EIA Report and Environmental Management Programme that will be submitted to the competent authority.

j) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Table 21: Assessment of Impacts of Specific Activities

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
When vegetation is cleared and the topsoil is stripped. Construction vehicles driving on these soils throughout the site. Soils are not stripped and stockpiled according to the soil stripping guidelines. Installation of stormwater infrastructure and PCD.	Loss of topsoil as a resource through compaction, erosion, removal and contamination.	Soil	Construction	**High (-)**	**Prevent and reduce and remedy through management measures.** • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 4 m (the practical tipping height of dump trucks); • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • The topsoil 0.5 m of the soil profile should be stripped first and stockpiled separately; • The subsoil approximately 0.5 – 0.9 m thick will then be stripped and stockpiled separately; • Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate;	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
General construction activities. Generation and storage of construction waste.					• Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; • The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; • Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.5 m) then subsoil separately;	
	Loss of land capability Removal of soil layers will impact on the land capability, because vegetation can no longer be supported**.**	Soil	Construction	**High (-)**	Refer to the above mitigation measures	**Medium (-)**
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils,	Soil	Construction	**Low (-)**	**Prevent and reduce and remedy through management measures** • Prevent any spills from occurring; • If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles and machinery will be regularly serviced to ensure they are in proper	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.				working condition and to reduce risk of leaks; • All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and • Leaking vehicles will have drip trays placed under them where the leak is occurring; • All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; and • The approved Integrated Water and Waste Management Plan to be implemented.	
	If groundwater is used for supply, then localised dewatering could occur.	Ground water	Construction	**Low (-)**	• Borehole abstraction should be sufficiently managed and water levels monitored at the abstraction wells and nearby boreholes.	**Very Low (-)**
	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally.	Groundwater	Construction	**Medium (-)**	**Prevent and reduce through management measures** • Staff at workshop areas, yellow metal laydown zones and fuel storage areas should be sufficiently trained in hydrocarbon spill response; • Each area where hydrocarbons are stored or likely to spill should be equipped with sufficient spill response kits and personnel, contaminated soil should be disposed of correctly at a suitable location. • Also see mitigation measures for potential contamination of soils.	**Low (-)**
	Changes in water flow regimes	Surface water including wetlands	Construction	**High (-)**	**Control through management measures.**	**High (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Limit the footprint of the development activities potentially encroaching onto the wetland areas; • A temporary fence or demarcation should be erected around No-go areas, outside the proposed works area, before commencement of construction, as part of the contractor planning phase, when compiling work method statements. This should be done to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the construction phase. This should be monitored as part of the EMPr. The stormwater management plan must also be submitted to DWS as part of the Water Use License Application and approved for implementation before commencement of contstruction; • High energy stormwater input into the watercourses should be prevented at all costs. Changes to natural flow of water (surface water as well as soil flowing within the soil profile) should be taken into account during the design phase and mitigated effectively.	
	Changes in sediment exiting and entering the system	Surface water including wetlands	Construction	**High (-)**	• Consider various methods and equipment available and select the method of mitigation that will have the least impact on the water courses;	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water, reducing the risk of erosion. Effective sediment traps should be installed. • Construction in and around water courses must be restricted to the dryer winter months where possible. • Retain vegetation and soil in position as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005); • Remove only vegetation where essential for construction and any disturbance to the adjoining vegetation should not be allowed; • Rehabilitation plans must be submitted and approved for rehabilitation of damaged during construction and the plan must be implemented immediately upon completion of construction. • Cordon off areas that are under rehabilitation and indicate as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access; • Measures must be put in place to control flow of excess water to prevent impacting on vegetation;	

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Protect all areas susceptible to erosion and ensure there is no undue soil erosion resulting from activities within and adjacent to the construction camp and work areas. • Runoff from the construction area must be managed to avoid erosion and pollution; • Implementation of best management practises; • Source directed controls; • Buffer zones to trap sediments; • Monitoring of sedimentation to address timeously.	
	Introduction and spread of alien invasive species	Biodiversity and surface water and wetlands	Construction	**High (-)**	**Reduce through management measures.** • Weed control should be implemented; • Retain vegetation and soil in position for s long as possible, only removing it immediately ahead of construction / earthworks in a particular area and replacing it where possible afterwards; • Monitor the establishment of alien vegetation within areas affected by construction and maintenance and take immediate corrective action where invasive species are observed to establish; • Rehabilitate or revegetated disturbed areas; • Only vegetation falling directly in demarcated access routes or project sites should be removed; • No further vegetation clearance except for the removal of alien invasive species will be allowed; and	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• All remaining indigenous vegetation should be conserved wherever possible.	
	Loss and disturbance of water course habitat and fringe vegetation impact	Watercousres and Biodiversity	Construction	**High (-)**	**Prevent and control through management measures.** • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented to minimise watercourse loss; • Other than approved and authorised structures, no other development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones; • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas; • Weed control in the buffer zone; • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed; • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish.	**High(-)**
	Changes in water quality due to pollution	Water courses and Biodiversity	Construction	**High (-)**	**Prevent and control through management measures.** • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone;	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse; • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone; • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc.; • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use; • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer; • Control of waste discharges; • Maintenance of buffer zones to trap sediments with associated toxins; • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse; • Regular independent water quality monitoring should form part of operational procedures in order to identify pollution; • Treatment of pollution identified should be prioritized accordingly.	

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	Cultural and Heritage	Construction	**Low (-)**	**Reduce and control through management measures.** • SAHRA provided recommendations to be included in the EMPR for the safeguarding of heritage resources.	**Very Low (-)**
	Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	Aesthetic Environment	Construction	**Low (-)**	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and • Rehabilitation of disturbed areas and re-establishment of vegetation as soon and as far as possible to be implemented.	**Low (-)**
	The mining activities and infrastructure, will alter the agricultural sense of place of the study area to a mining sense of place.	Sense of Place	Construction	**Low (-)**	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Rehabilitation of disturbed areas and re-establishment of vegetation as soon	
	Added impact of security lighting on surrounding landowners and nocturnal animals.	Fauna Land owners / land use	Construction	**Low (-)**	**Reduce through controlling measures.** • Unnecessary lights should be switched off during the day and / or night to avoid light pollution; • If lighting is required, the lighting will be located in such a place and such a manner so as to minimise any impact on the surrounding community; • Install lights that will not create a night sky glow; and • Security lighting should be designed in such a way as to minimise emissions onto undisturbed areas on site and neighbouring properties. Light fittings should face downwards.	**Very Low (-)**
	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of construction vehicles and equipment.	Aesthetic environment	Construction	**Low (-)**	**Reduce through controlling measures.** • Vehicles will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible; • Heavy vehicle traffic should be routed away from noise sensitive areas where possible; • Noise levels should be kept within acceptable limits. All noise and sounds generated should adhere to South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. No pure tone sirens or hooters may be utilised except where	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					required in terms of SABS standards or in emergencies; • With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Site Manager (SM) should liaise with local residents and how best to minimise impacts, and the local population should be kept informed of the nature and duration of intended activities; • The SM should take measures to discourage labourers from loitering in the area, causing noise disturbance; • Noise impacts should be minimised by restricting the hours (between 06h00 and 18h00 from Monday to Saturday, during which the offending activities are carried out and, where possible, by insulating machinery and/or enclosing areas of activity; • Regular monitoring of noise levels at various, pre-determined locations. This will serve as the core of noise mitigation as it will enable the determination of problem areas; • Personal Protective Equipment to all persons working in areas where high levels of noise can be expected; Signs where it is compulsory; • Proper design of the plant areas and machinery where measures are taken to prevent noise generation such as silencers, mufflers and sound suppressing enclosures	

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					for parts/processes which can generate noise; • Regular inspections and maintenance of equipment, vehicles and machinery to prevent unnecessary noise; • Noise breaking barriers can be erected such as netting, walls or high growing trees; and • Placement of noise generating activities can be planned as far away as possible from affected areas or persons.	
	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	Air quality Visual aspects	Construction	**Medium (-)**	• Dust suppression shall be implemented during dry periods and windy conditions; • All exposed surfaces should be minimised in terms of duration of exposure to wind and stormwater; • Excavation, handling and transportation of erodible materials shall be avoided under high wind conditions (excess of 35km/hr) / when visible dust plume is present; • Ensure that shortest routes are used for material transport; • Ensure that stockpile height is kept to a minimum and that any stockpiling occurs downwind of the stockpiles; • Minimise travel speed on paved roads; • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site; and • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed; • Spray areas to be cleared with water.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Ensure minimum travel distance between working areas and stockpiles. • Ensure that topsoil for stockpiles is sprayed with water before tipping to prevent dust generation. • Ensure graded areas are sprayed with water. • Minimise the amount of graded areas. • Ensure that shortest routes is used for material transport. • Load and offload material, as far as possible, downwind of stockpiles. • Actively monitor dust fallout generated in the 8 major wind directions on the borders of the site. • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed.	
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	Social and health Air quality	Construction	**Medium (-)**	• All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks and unnecessary emissions.	**Very Low (-)**
	Generation of additional general waste, litter and building rubble and hazardous material during the construction phase.	Waste	Construction	**Low (-)**	**Control through management measures.** • The conditions of the Integrated Water Use License (IWUL) and the IWWMP must be implemented. • A central waste storage and transition area shall be established within the site camp;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• The central waste storage and transition area shall be surfaced and demarcated appropriately; • Portable wheelie bins shall be placed throughout the site camp as well as at the remainder of the site and at all working areas in the field; • Wheelie bins shall be colour coded and labelled to identify the waste stream for which it is intended; All portable wheelie bins and other containers shall be emptied at the central waste storage and transition area a minimum of once a week as to avoid waste build up; • The waste shall be removed (within 30 days) by a licensed waste service provider as shall be disposed of at a licensed waste landfill site and records of safe disposal (as required for hazardous wastes) shall be supplied to the Contractor. These records shall be kept on site by the ESM. • Wherever possible and practical, waste materials generated on site must be recycled; and • Waste specific (hazardous, timber, steel etc.) mitigation measures to be developed and included in the EMPR.	
	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional	Natural resources including water and electricity.	Construction	**Low (-)**	**Reduce through controlling measures.** • Energy savings measures to be implemented at the mine, e.g.:	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	strain on natural resources and service infrastructure.				➢ No lights to be switched on unnecessarily. Only security lights to be switched on at night; • Energy saving bulbs to be installed; and • Water should be recycled as far as possible to avoid any additional water usage.	
	The change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	Health and Safety and Socio-economic.	Construction	**Low (-)**	**Reduce and control through management measures.** • Where feasible, heavy vehicles should not operate on public roads during peak hours; and • Heavy vehicles should adhere to the speed limit of the road.	**Very Low (-)**
	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles.	Health and Safety	Construction	**Very Low (-)**	**Prevent through management measures.** • Drivers will be enforced to keep to set speed limits. • Trucks will be in a road-worthy condition. • Roads and intersections will be signposted clearly. Only main roads should be used; • Where feasible vehicles should not operate on public roads during peak hours; • Vehicles should adhere to the speed limit of the road; • Heavy vehicles should always travel with their head lights switched on; • Heavy vehicles should not stop on the road to pick up hitchhikers – No stopping on the road approaching the mine will be allowed;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Single directional traffic shall be controlled through a stop-go system or any other appropriate traffic control method; • Brikor shall be responsible for ensuring that suitable access is maintained for public traffic to all relevant businesses and properties; and • All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual.	
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	Socio-economic	Construction	**Low (-)**	i. The applicant site to acknowledge the road reserve requirements for the future Road K181. Part of the future route traverses the applicant site. The proposed basic planning as shown in **Gautrans Drawing PRS No.: 88/167/12Bp**, is appended in **Annexure C**. Based on the information extracted from the **"Basic Planning Report of Road K181, between Roads 1683 & K12"**, Report Book No. 1416, the following technical aspects relates to the impact the future provincial road has on the applicant site: • No direct access permitted from the future route. • A line of no access is imposed along the future alignment of the route. • A building line restriction of 95m is imposed along the future centre line of the route and	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					not the normal 16m measured from the road reserve. • No mining activities or any form of construction may take place within the future road reserve of the road. • A future intersection is proposed where the existing alignment of Marievale Road crosses the alignment of the future K-route. This proposed intersection will in future affect the access to the site. When the K-route is constructed, Marievale Road will function as a Class 3 or 4 road and the access to the site will have to be relocated to the west of the current position - at least 250m from the proposed intersection. ii. Any mining activities to be executed within the future road reserve to be approved by Gautrans. iii. Access to be provided from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.	
	Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding	Health and Safety	Construction	**Low (-)**	**Prevent and control through management measures.** • All workers will be sensitised to the risk of fire; • Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; • The Applicant shall ensure that the basic fire-fighting equipment is available on the site; and	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	landowners, visitors and workers.				• Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation • An Emergency Plan (including Fire Protection, Response and Evacuation Plan) (E.g. in Appendix 11) is to be prepared by the Applicant and conveyed to all staff on the site; and • Identify major risks to minimise the environmental impacts e.g. air pollution and contaminated effluent runoff.	
	Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches.	Health and Safety	Construction	**Low (-)**	**Prevent through controlling management measures.** • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • A health and safety control officer should monitor the implementation of the health and safety plan for the operational phase; • Regular health and safety audits should be conducted and documented; and a record of health and safety incidents should be kept on site and made available for inspection; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily fenced-off; and • Excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible.	
	Positive: Potential creation of short term employment opportunities for the local communities, during the construction phase.	Health and Safety	Construction	**Low (+)**	• Skills training to be in accordance with the approved Social and Labour Plan; • Labourers should initially be sought locally and only regionally if skills are not available; and • The approved Social and Labour Plan should be implemented.	**Low (+)**
	Multiplier effects on local economy	Socio-economic environment	Construction	**Low (+)**	• Where possible, supplies to be bought locally.	**Low (+)**
OPERATIONAL **MINING AND REHABILITATION**	**Loss of topsoil as a resource** Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles,	Soil	Operational	**Medium (-)**	• Stockpiles are to be maintained in a fertile, vegetated, and erosion free state • Stockpiles are to be clearly demarcated; • Ensure proper storm water management designs are in place; • Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; • If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place;	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	where steep slopes are present. Topsoil can also be lost, due to compaction form mining equipment. Topsoil as a resource could lose its effectiveness if topsoil is not replaced back in the order it was stripped in, hence reducing its ability to grow vegetation.				• Unauthorised borrowing of stockpiled soil materials should be prevented • The spoil returned to the opencast should be shaped taking the pre-mining landscape into consideration; • The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; • The yellow and red soils should be replaced in upland landscape positions; • Wetland soils should be put back in the reverse order of stripping; • Wetland soils should be placed in lower landscape positions; • The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; • The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; • Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan.	
	Loss of land capability and land use Impact on the rehabilitation of soil,	Land Capability Land Use	Operational	**High (-)**	Refer to the above mitigation measures	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent, because vegetation will be supported and, therefore, returned to the planned post mining land capability such as arable and or grazing.					
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	Soil	Operational	**Low (-)**	**Prevent and mitigate through control measures** • If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and • Leaking vehicles will have drip trays place under them where the leak is occurring.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Dewatering Groundwater depletion will take place in the areas surrounding the opencast pit.	Ground water	Operational	**Medium (-)**	• No mitigation possible. • Although unlikely to occur, should any local groundwater user's resource be impacted on by operations at the mine the affected party should be provided with an alternative water source at the mine operator's cost. • Groundwater levels should be monitored regularly and should any negative trends in groundwater levels be observed suitable mitigation should be implemented. • Discharge water from the open pit should be disposed of in a safe manner, should the water become contaminated over time it should either be stored in dedicated PCD's for reuse at the plant or treated prior to discharging into the environment.	**Low (-)**
	Base case Scenario **Poor quality seepage** The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage (AMD) to the groundwater resource.	Ground water	Operational	**Low (-)**	• Material at the berms should be capped to avoid oxidation of sulphide bearing minerals and possible seepage into the groundwater environment if they are not to be lined. • The waste rock berms should be maintained, and sufficient storm water management options should be installed to prevent excessive infiltration of runoff to the material.	**Very Low (-)**
	Scenario 1 **Poor quality seepage**	Ground water	Operational	**Low (-)**	• Berms should be lined to avoid possible contaminant seepage into the groundwater environment.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource.				• The waste rock berms should be maintained, and sufficient storm water management options should be installed to prevent excessive infiltration of runoff to the material.	
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact is caused by compaction of soil, removal of vegetation, surface water redirection during construction activities. Permanent changes to water flows including encroaching onto wetland habitat.	Surface water and wetlands	Operational	**High (-)**	**Control through management measures.** • Limit the footprint of the development activities potentially encroaching onto the wetland areas; • A temporary fence or demarcation should be erected around No-go areas, outside the proposed works area, before commencement and during the operational phase. This should be done to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the operational phase. This should be monitored as part of the EMPr. The stormwater management plan must also be submitted to DWS as part of the Water Use License Application and approved for implementation before commencement of contstruction; • High energy stormwater input into the watercourses should be prevented at all costs. Changes to natural flow of water (surface water as well as soil flowing within the soil profile) should be taken into account during the design phase and	**High (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					mitigated effectively during the operational phase	
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Construction activities will result in earthworks, soil disturbance and natural vegetation removal. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water.	Surface water and wetlands	Operational	**Medium (-)**	• Consider various methods and equipment available and select the method of mitigation that will have the least impact on the water courses; • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water, reducing the risk of erosion. Effective sediment traps should be installed. • Retain vegetation and soil in position as long as possible, removing it immediately ahead of mining a certain portion, (DWAF, 2005); • Remove only vegetation where essential for operational activities and any disturbance to the adjoining vegetation should not be allowed; • Cordon off areas that are under rehabilitation and indicate as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access; • Measures must be put in place to control flow of excess water to prevent impacting on vegetation; • Protect all areas susceptible to erosion and ensure there is no undue soil erosion	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					resulting from activities within and adjacent to the offices and work areas. • Runoff from the operational area must be managed to avoid erosion and pollution; • Implementation of best management practises; • Source directed controls; • Buffer zones to trap sediments; • Monitoring of sedimentation to address timeously.	
	Introduction and spread of alien invasive species The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity.	Surface water and wetlands and biodiversity	Operational	**Medium (-)**	**Reduce through management measures.** • Weed control should be implemented; • Retain vegetation and soil in position for s long as possible, only removing it immediately ahead of mining in a particular area and replacing it where possible afterwards; • Monitor the establishment of alien vegetation within areas affected by construction and maintenance and take immediate corrective action where invasive species are observed to establish; • Rehabilitate or revegetated disturbed areas; • Only vegetation falling directly in demarcated access routes or project sites should be removed; • No further vegetation clearance except for the removal of alien invasive species will be allowed; and • All remaining indigenous vegetation should be conserved wherever possible.	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.					
	Loss and disturbance of water course habitat and fringe vegetation impact. Direct development within water course areas will cause loss and disturbance of water course habitat and fringe vegetation, due to direct development in the water course, as well as changes in management, fire regime and habitat fragmentation.	Watercourses and wetlands and biodiversity	Operational	**High (-)**	**Prevent and reduce through management measures** • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented to minimise watercourse loss; • Other than approved and authorised structures, no other development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones; • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas; • Weed control in the buffer zone; • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and	**High (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					take immediate corrective action where needed; • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish; • Operational activities should not take place within watercourses or buffer zones, nor should ege effects impacts on these areas; • Operational activities should not impact on rehabilitated or naturally vegetated areas.	
	Changes in water quality due to pollution Operational activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course	Surface water and wetland habitat biodiversity	Operational	**High (-)**	**Prevent and control through management measures.** • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone; • Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse; • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone; • The development footprint must be fenced off from the watercourses and no related	**Medium (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	function, as well as human and animal waste.				impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc.; • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use; • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer; • Control of waste discharges; • Maintenance of buffer zones to trap sediments with associated toxins; • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects; • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse; • Regular independent water quality monitoring should form part of operational procedures in order to identify pollution; • Treatment of pollution identified should be prioritized accordingly.	
	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	Cultural and Heritage	Operational	**Low (-)**	• SAHRA provided recommendations to be included in the EMPR for the safeguarding of heritage resources	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the stripped open cast area.	Aesthetic environment	Operational	**Medium (-)**	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and • Rehabilitation of disturbed areas and re-establishment of vegetation as soon and as far as possible to be implemented.	**Low (+)**
	Visibility of solid domestic and operational waste.	Aesthetic environment	Operational	**Medium (-)**	• The conditions of the Integrated Water Use License (IWUL) and the IWWMP must be implemented. • A central waste storage and transition area shall be established within the site camp; • The central waste storage and transition area shall be surfaced and demarcated appropriately; • Portable wheelie bins shall be placed throughout the site camp as well as at the remainder of the site and at all working areas in the field; • Wheelie bins shall be colour coded and labelled to identify the waste stream for which it is intended; • All portable wheelie bins and other containers shall be emptied at the central	**Low (+)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					waste storage and transition area a minimum of once a week as to avoid waste build up; • The waste shall be removed (within 30 days) by a licensed waste service provider as shall be disposed of at a licensed waste landfill site and records of safe disposal (as required for hazardous wastes) shall be supplied to the Contractor. These records shall be kept on site by the ESM. • Wherever possible and practical, waste materials generated on site must be recycled; and • Waste specific (hazardous, timber, steel etc.) mitigation measures to be developed and included in the EMPR.	
	Removal of overburden, through blasting and equipment causes dust pollution, which in turn impacts on visibility on nearby roads and the aesthetic quality of the area.	Visual aspects and air quality	Operational	**Medium (-)**	**Reduce and control through management measures.** • Dust suppression shall be implemented during dry periods and windy conditions; • Minimise travel speed on paved roads; • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site; and • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed; • Ensure the access roads are all well maintained in terms of surface and especially dust suppression. • Ensure that shortest routes are used for material transport.	**Low (+)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Ensure crushers are properly enclosed and/or fitted with water sprays to reduce dust generation. • Ensure that stockpile height is kept to a minimum and that any stockpiling occurs downwind of the stockpiles. • Ensure that areas where bulk earthmoving will occur is properly wetted in advance. • Spray unpaved roads with water/dust binding materials and limit travel speed to a minimum. • Minimise travel speed on paved roads. • Ensure that products and material handling occur as far as possible downwind of stockpiles. • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site. • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed.	
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, will cause a direct visual impact and also indirectly through the creation of dust.	Aesthetic environment and air quality	Operational	**Low (-)**	• Refer to measures above	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Potential increase in traffic and existing traffic to and from the site may cause a negative impact directly, and indirectly through creation of dust.	Visual aspects	Operational	**Low (-)**	**Reduce and control through management measures.** Refer to mitigation measures above.	**Very Low (-)**
	Added impact of security lighting on surrounding landowners and nocturnal animals and the sense of place of the area.	Health and Safety and fauna and flora / ecosystems.	Operational	**Medium (-)**	**Reduce through controlling measures.** • Unnecessary lights should be switched off during the day and / or night to avoid light pollution; • If lighting is required, the lighting will be located in such a place and such a manner so as to minimise any impact on the surrounding community; • Install lights that will not create a night sky glow; and • Security lighting should be designed in such a way as to minimise emissions onto undisturbed areas on site and neighbouring properties. Light fittings should face downwards.	**Low (-)**
	Should there not be enough backfill material to backfill open cast pits, a permanent void may be left after mining, which will scar the	Visual aspects	Operational	**Medium (-)**	• As much as possible of the overburden and waste rock must be kept for rehabilitaton;	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	landscape permanently.					
	Disturbance due to vibrations caused by vehicles.	Health and Safety	Operational	**Low (-)**	**Reduce and control through management measures.** • Where feasible, heavy vehicles should not operate on public roads during peak hours; and • Heavy vehicles should adhere to the speed limit of the road.	**Very Low (-)**
	Blasting will cause noise pollution	Health and Safety	Operational	**Medium (-)**	• Surrounding communities should be warned in advance through site notices and in the local media of any blasting that will occur. • Blasting may not occur within 100 m of any residential area.	**Low (-)**
	Blasting may cause ground vibration at the nearby houses and other buildings.	Health and Safety	Operational	**Medium (-)**	• Blasting may not occur within 100 m of any residential area; • All houses / buildings that may be affected, should be surveyed prior to blasting to establish baseline information regarding the structures.	**Low (-)**
	Creation of dust through removal of overburden and ore may cause a decline in ambient air quality.	Air quality	Operational	**High (-)**	**Reduce through management measures.** • Refer to dust management measures.	**Very Low (-)**
	Creation of dust through blasting, may cause a decline in ambient air quality.	Air quality	Operational	**Low (-)**	**Reduce through management measures.** Refer to dust management measures.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, may cause a decline in ambient air quality.	Air quality	Operational	**Low (-)**	**Reduce through management measures** Refer to the mitigation measures above.	**Very Low (-)**
	Potential increase in traffic and existing traffic to and from the site will create dust, which may cause a decline in ambient air quality.	Air quality	Operational	**Low (-)**	Refer to dust management measures	**Very Low (-)**
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	Climate Change	Operational	**Medium (-)**	The air quality impact assessment and the Air Pollution Prevention Plan to be completed and approved by the relevant competent authorities and implemented.	**Low (-)**
	Generation and disposal of additional general waste, litter and hazardous material during the operational phase and operational	Waste	Operational	**Medium (-)**	Refer to waste management measures above.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	waste i.e. waste rock.					
	Need for services e.g. water, electricity and sewerage systems, causing additional strain on natural resources and service infrastructure.	Natural resources	Operational	**Medium (-)**	**Reduce and control through management measures.** • Energy savings measures to be implemented at the mine, e.g.: ➢ No lights to be switched on unnecessarily. Only security lights to be switched on at night; • Energy saving bulbs to be installed; and • Water should be recycled as far as possible to avoid any additional water usage.	**Low (-)**
	The change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	Traffic	Operational	**Low (-)**	**Prevent through management measures.** • Drivers will be enforced to keep to set speed limits. • Trucks will be in a road-worthy condition. • Roads and intersections will be signposted clearly. Only main roads should be used; • Where feasible vehicles should not operate on public roads during peak hours; • Vehicles should adhere to the speed limit of the road; • Heavy vehicles should always travel with their head lights switched on; • Heavy vehicles should not stop on the road to pick up hitchhikers – No stopping on the road approaching the mine will be allowed; • Single directional traffic shall be controlled through a stop-go system or any other appropriate traffic control method;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Brikor shall be responsible for ensuring that suitable access is maintained for public traffic to all relevant businesses and properties; and All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual.	
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	Health and Safety	Operational	**Low (-)**	**Prevent through management measures.** Refer to mitigation measures above.	**Very Low (-)**
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	Traffic and Roads	Operational	**Medium (-)**	iv. The applicant site to acknowledge the road reserve requirements for the future Road K181. Part of the future route traverses the applicant site. The proposed basic planning as shown in **Gautrans Drawing PRS No.: 88/167/12Bp**, is appended in **Annexure C**. Based on the information extracted from the **"Basic Planning Report of Road K181, between Roads 1683 & K12"**, Report Book No. 1416, the following technical aspects relates to the impact the future provincial road has on the applicant site: • No direct access permitted from the future route.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• A line of no access is imposed along the future alignment of the route. • A building line restriction of 95m is imposed along the future centre line of the route and not the normal 16m measured from the road reserve. • No mining activities or any form of construction may take place within the future road reserve of the road. • A future intersection is proposed where the existing alignment of Marievale Road crosses the alignment of the future K-route. This proposed intersection will in future affect the access to the site. When the K-route is constructed, Marievale Road will function as a Class 3 or 4 road and the access to the site will have to be relocated to the west of the current position - at least 250m from the proposed intersection. v. Any mining activities to be executed within the future road reserve to be approved by Gautrans. • Access to be provided from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.	
	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers	Health and safety	Operational phase	**Low (-)**	**Prevent and control through management measures.** • All workers will be sensitised to the risk of fire; • Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	and surrounding landowners, visitors and workers.				• The Applicant shall ensure that the basic fire-fighting equipment is available on the site; and • Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation • An Emergency Plan (including Fire Protection, Response and Evacuation Plan) (Example in Appendix 11) is to be prepared by the Applicant and conveyed to all staff on the site; and Identify major risks to minimise the environmental impacts e.g. air pollution and contaminated effluent runoff.	
	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	Health and Safety	Operational	**Low (-)**	**Prevent through controlling management measures.** • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • A health and safety control officer should monitor the implementation of the health and safety plan for the operational phase; • Regular health and safety audits should be conducted and documented; and a record of health and safety incidents should be kept on site and made available for inspection;	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
					• Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily fenced-off; and • Excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible.	
	Economic impact should there be an incident of public health and safety.	Socio-economic	Operational	**Low (-)**	Refer to mitigation measures above	**Very Low (-)**
	Positive: Extended employment provision allowing mining activities to continue for additional years.	Socio-economic	Operational	**Medium (-)**	Social and Labour Plan to be approved by DMR and implemented.	**Low (-)**
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for	Socio-economic	Operational	**Medium (-)**	Social and Labour Plan to be approved by DMR and implemented.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	an extended period of time.					
	Social upliftment through: Infrastructure development, poverty eradication and community upliftment in the communities surrounding the operation. Upliftment projects include provision of nutritional information to guide healthy eating habits and also provision of healthy food and liquids to employees. Employees are also provided with living wages in order to afford reasonable housing and receive discounts on bricks from the Brikor group in assisting to build there homes.			**High (+)**	Social and Labour Plan to be approved by DMR and implemented.	**High (+)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Due to the closure phase overlapping with the operational phase, all of the impacts described above will be applicable to the closure phase.	All aspects as described above	Closure and Post-Closure Phases		Refer to the above mitigation measures for impacts during the operational phase.	Although it is expected that impacts can be mitigated to acceptable levels, there is still a very low to low overall risk for negative impacts on the bio-physical and socio-economic environment.
	Loss of topsoil as a resource	Soil	Closure and Post-Closure Phases	**High (-)**	Refer to mitigation measures during the operational phase	**Low (-)**
	Loss of land capability and land use	Soil and Land Capability and Land Use	Closure and Post-Closure Phases	**High (-)**	Refer to mitigation measures during the operational phase	**Medium (-)**
	Hydrocarbon Pollution	Soil	Closure and Post-Closure Phases	**Low (-)**	Refer to mitigation measures during the operational phase	**Very Low (-)**
	Restoration or improvement of land capability prior to mining.	Land Capability and Land Use	Closure and Post-Closure Phases	**High (-)**	Positive impact	**High (-)**
	Groundwater Rebound Following cessation of mining operations, the groundwater levels at the site will	Groundwater	Closure and Post-Closure Phases	**Low (-)**	In order to avoid decant the pit should be concurrently backfilled and rehabilitated in a manner where the pit materials mimic the natural groundwater environment as far as possible.	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	rebound to their original level. Decant is unlikely.					
	Poor quality seepage The waste material at the berm areas may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource. However, the footprint of these berms is small, and no contaminants of concern have been identified. The pit area could also potentially undergo oxidation and result in poor quality seepage.	Water resources	**Closure and Post-Closure Phases**	**Low (-)**	• The berm areas should be cleared and suitably vegetated to prevent any oxidation and poor-quality seepage from occurring. The pit should be concurrently backfilled and rehabilitated.	**Very Low (-)**
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow	Surface water and wetlands	**Closure and Post-Closure Phases**	**High (-)**	See mitigation measures in operational phase section	–

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	or increasing flood flows. This impact may be caused by incorrect rehabilitation.					
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Decommissioning and rehabilitation activities will result in earthworks and soil disturbance. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water, if done incorrectly.	Surface water and wetlands	Closure and Post-Closure Phases	**High (-)**	See mitigation measures in operational phase section	–
	Introduction and spread of alien invasive species The moving of soil and vegetation	Surface water and wetlands and biodiversity	Closure and Post-Closure Phases	**High (-)**	See mitigation measures in operational phase section	–

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	during the decommissioning and closure phases, if rehabilitation is done incorrectly, may result in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.					

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Changes in water quality due to pollution Decommissioning and rehabilitation activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.	Surface water and wetlands	Closure and Post-Closure Phases	**High (-)**	See mitigation measures in operational phase section	–
	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	Visual aspects	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Low (-)**
	Visibility of solid domestic and decommissioning waste.	Visual aspects	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy duty vehicles and equipment.	Noise	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Disturbance due to vibrations caused by heavy duty vehicles.	Vibrations	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Impact of security lighting on surrounding landowners and animals.	Visual aspects	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Increased dust pollution due to vegetation clearance and heavy duty vehicles and decommissioning and rehabilitation activities.	Air quality	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	Air quality	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	Air quality	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Low (-)**
	Need for additional services i.e. water, electricity and sewerage systems during the closure phase causing additional strain on natural resources and infrastructure.	Natural resources	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	Traffic	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including	Health and Safety	Closure and Post-Closure Phases	**Very Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	cars and heavy vehicles.					
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	Traffic	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	Health and Safety and Land Use	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	Health and safety	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Increased risk to public and worker health and safety.	Health and safety	Closure and Post-Closure Phases	**Low (-)**	See mitigation measures in operational phase section	**Very Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Nuisance impacts i.e. noise, visual, water etc.	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Low (-)**
	Economic impact should there be an incident of public health and safety.	Socio-economic	Closure and Post-Closure Phases	**Medium (-)**	See mitigation measures in operational phase section	**Very Low (-)**
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Socio-economic	Closure and Post-Closure Phases	**Low (+)**	See mitigation measures in operational phase section	**Low (+)**
	Negative: Loss of jobs, household income, decline in local economy. The concentration of economic activity centred around the mine often increases the community's dependenc on the mining operation,	Socio-economic	Closure and Post-Closure Phases	**High (-)**	See mitigation measures in operational phase section	**Low (-)**

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
	making it vulnerable to downscaling or closure.					

The supporting impact assessment conducted by the EAP must be attached as an appendix, marked **Appendix. Please note that the full impact assessment is provided in Tables 24 – 26 of this report and is not separately appended.**

k) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Soil and Land Capability Assessment	**Construction phase:** - The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; - Topsoil stockpiles are to be kept to a maximum height of 4m (the practical tipping height of dump trucks); - Topsoil is to be stripped when the soil is dry, as to reduce compaction; - The topsoil 0.5 m of the soil profile should be stripped first and stockpiled separately; - The subsoil approximately 0.5 – 0.9 m thick will then be stripped and stockpiled separately; - Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; - The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; - Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; - The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; - Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.5 m) then subsoil separately; - Prevent any spills from occurring; - If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities;	X	Part B: EMPR

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	- All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and - Leaking vehicles will have drip trays place under them where the leak is occurring. **Operational Phase and Closure Phase** - Stockpiles are to be maintained in a fertile, vegetated, and erosion free state - Stockpiles are to be clearly demarcated; - Ensure proper storm water management designs are in place; - Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; - If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; - Unauthorised borrowing of stockpiled soil materials should be prevented - The spoil should be shaped taking the pre-mining landscape into consideration; - The designed post mining landforms should be undertaking; - The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; - The yellow and red soils should be replaced in upland landscape positions; - Wetland soils should be put back in the reverse order of stripping; - Wetland soils should be placed in lower landscape positions; - The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis;		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	- The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; - Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan; - If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; - All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and - Leaking vehicles will have drip trays place under them where the leak is occurring.		
Geohydrological Study	- Borehole abstraction (if any) should be managed effectively and borehole water levels and abstraction volumes from the borehole should be recorded at regular intervals, ideally monthly. - All staff and supervisors at workshops, yellow metal laydown areas and fuel storage areas should be trained in hydrocarbon spill response and each of these areas should be equipped with the appropriate spill response kits and any contaminated soil must be disposed of correctly at a suitable location. - Should any groundwater users be impacted on, the mine would need to supply, at their own cost, an equivalent quantity of water to these impacted parties. No mitigation is possible for the impact on groundwater quantity as a result of mining due to dewatering, however, groundwater levels at the pit area should be monitored and discharge from the pit should be disposed of in a safe manner. The groundwater at the pit is expected to be of poor quality and would not be suitable for discharge into the environment. Should any groundwater users be impacted upon by the mining operations, the mine should supply alternative water at their cost.	X	Part B: EMPR

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	- Brikor plans to use the waste rock to erect berms around the site for safety and security purposes. The base case scenario in terms of solute transport simulated the potential impacts of unlined burns where 100% of a contaminant could possibly leach into the groundwater under the current conditions. The potential of a pollution plume is limited to the site area and migrates to a maximum of 500 m from the site boundaries. - The waste rock berms should be capped to avoid oxidation of sulphide bearing minerals and possible seepage into the groundwater environment if not lined. - Scenario 1 simulated the impacts of lined burns where 0.1% of a contaminant could possibly leach into the groundwater under the current conditions. The potential of a pollution plume is isolated to the site area and migrates to a maximum of 500 m from the site boundaries. The waste rock berm areas indicate low impact during mining, as both are kept relatively small and will not result in large amounts of seepage. - During the closure phase the groundwater levels are expected to recover to their original state within 10 years. The probability of decant occurring at the site is low due to the low-yielding nature of the aquifer and the concurrent rehabilitation of mining operations, however should decant occur it would be at the lowest point in the pit area which is at the northern most pit extent (28.484° E; 26.335° S). There are no mitigation measures for groundwater level rebound and the impact would be low. The berm footprint areas should be cleared and vegetated during the closure phase. The overall impact rating for these features are low. The pit should be concurrently backfilled and rehabilitated in a manner where the pit materials mimic the natural groundwater environment as far as possible to minimise potential oxidation and poor-quality seepage.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	- The berm footprint areas should be cleared and vegetated during the closure phase. The overall impact rating for these features is low. The pit should be concurrently backfilled and rehabilitated in a manner where the pit materials mimic the natural groundwater environment as far as possible to minimise potential oxidation and poor-quality seepage. - Possible mitigation measures for the control/prevention of ARD generation at the site include cladding and vegetation of the waste rock facilities at the site in order to prevent seepage into the materials and limit oxidation potential. The waste rock should be covered as soon as possible when used in pit rehabilitation using topsoil to prevent oxidation, and regular water quality samples should be taken at the waste facilities. Once the management and mitigation measures have been implemented the impact rating would be medium risk due to the long-term duration of the impact. - The Groundwater Management Plan, containing inter alia monitoring measures, within the geohydrological report, must be implemented.		
Conceptual and Final Design Report and Designs of stormwater management and structures and surface water study	All existing stormwater infrastructure on the mine property will only function with resounding efficiency and persistency if the infrastructures are maintained on a regular basis. Routine inspections which include dam wall embankments and spillway inspections, dam seepage control inspections, vegetation overgrowth, sediment settlement and regular water quality monitoring programs are some of recommended tasks to be carried out to ensure a sustainable stormwater management plan is maintained. Several mitigation measures are also provided, and these are included in the EMPr.	**X**	Part B: EMPR
Wetland Delineation and Impact Assessment	- An alien vegetation management plan and long term monitoring for degration of the remaining indigenous vegetation should be developed and implemented;	**X**	Part B: EMPR

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	- A follow up wetland assessment should be conducted during the wet season;		
Ecological Scan	- Care must be taken to reduce impacts on the adjacent properties through the implementation of all the mitigation measures proposed by the specialists. - An Alien and Invasive Species Management Plan must be implemented. - Should any sensitive animal or bird species be encountered during the construction, operation and decommissioning activities, these should be relocated to natural areas in the vicinity. Any sensitive fauna that are inadvertently killed during earthmoving operations should be preserved as museum voucher specimens. - Any stormwater cut-off channels should be kept as a natural as possible with gentle slopes (angle 45°or less) on the side away from the mining activities. These channels should enable, small animals, reptiles and amphibians which have fallen into the channel accidently to escape easily. If not, they could drown if the channels contain water or they may die of exposure when the channels are dry. - For the safety of the animals it is not so much the width and depth of a drainage/storm water channel that are important, but the shape. If it has curved, smooth walls the animals that have fallen in will find it impossible to obtain purchase and will slip back time and time again and fall to the bottom of the channel. The channel must be designed in such a way as to prevent the smaller creatures from blundering in and dying. Safety features that could be incorporated into the drainage/storm water channel are the use of rough surfaces and rocks to allow trapped animals purchase, less curvature on the walls, a “step” in the slope of the wall and a “lip” along the edges of the channel	X	Part B: EMPR

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	which would either act as a deterrent to small animals or as an absolute physical barrier.		
Heritage Impact Assessment	No archaeological (Stone Age and Iron Age) and historical settlements, features, assemblages or artefacts were recorded during the survey. The specialist therefore recommends that from a cultural heritage perspective, the proposed mining activities can proceed. Please note the following: Archaeological usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, the activities should be stopped, and a university or museum notified, in order for an investigation and evaluation of the find(s) to take place.	**X**	Part B: EMPR
Palaeontological Assessment	a. There is no objection (see Recommendation B) to the development, but it was necessary to request a Phase 1 Palaeontological Impact Assessment: Field Study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is **VERY HIGH**. A Phase 2 Palaeontological Mitigation is only required if the Phase 1 Palaeontological Assessment identified a fossiliferous formation or surface fossils or if fossils are found during construction or mining. Fossils were not found during the walk through. The Protocol for Finds and Management Plan is attached (Appendix 2) for the ECO, the development may go ahead. b. This project will benefit the environment, economy, and social development of the community, but it may also have negative environmental impacts. c. Preferred choice: The impact on the palaeontological heritage is **VERY HIGH** (see Executive Summary). d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.	**X**	Part B: EMPR

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	Sampling and collecting (1m,1k): Wherefore a permit is needed from the South African Heritage Resources Agency (SAHRA / PHRA). a. Objections: Cautious. See heritage value and recommendation. b. Conditions of development: See Recommendation. c. Areas that may need a permit: **Yes** for the shale layer if fossils are unearthed. d. Permits for mitigation: **Needed from SAHRA/PHRA**.		
Traffic Impact Assessment	Based on the traffic impact statement, it is recommended that the proposed mining on Portion of Portion 85 of the Farm Grootfontein 165 IR and a Portion of the Remainder of the Farm Vogelstruisbult 127 IR, Nigel, be approved for: Zoning : Opencast clay, sand and coal mining The approval is subject to the following: i. The applicant site to acknowledge the road reserve requirements for the future Road K181. Part of the future route traverses the applicant site. The proposed basic planning as shown in Gautrans Drawing PRS No.: 88/167/12Bp, is appended in Annexure C. Based on the information extracted from the "Basic Planning Report of Road K181, between Roads 1683 & K12", Report Book No. 1416, the following technical aspects relates to the impact the future provincial road has on the applicant site: • No direct access permitted from the future route. • A line of no access is imposed along the future alignment of the route. • A building line restriction of 95m is imposed along the future centre line of the route and not the normal 16m measured from the road reserve. • No mining activities or any form of construction may take place within the future road reserve of the road.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• A future intersection is proposed where the existing alignment of Marievale Road crosses the alignment of the future K-route. This proposed intersection will in future affect the access to the site. When the K-route is constructed, Marievale Road will function as a Class 3 or 4 road and the access to the site will have to be relocated to the west of the current position - at least 250m from the proposed intersection. ii. Any mining activities to be executed within the future road reserve to be approved by Gautrans. iii. Access to be provided from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.		
Waste Classification Report	Currently, the Waste Rock berm (co-disposal) is classified as a Type 0 waste for which disposal is not allowed and the mono-disposal of the wate rock berm is classified as a Type 1 waste, which needs to be disposed of at a Class A Landfill Site. The ROM stockpile (co-disposal) was also classified as a Type 0 waste and the mono-disposal of the ROM stockpile as a Type 1 waste. The specialist recommended that both streams (waste rock berm and ROM stockpile samples), be re-analysed and that the organic fraction be included. This could potentially reclassify the ROM Stockpile as a Type 3 waste and also elucidate potential risks that may lie in the organic fraction of the wastes.		

Attach copies of Specialist Reports as appendices – **Please refer to Appendix 8**

I) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment

Table 22: Summary of Environmental Impacts

NATURE OF IMPACT	DESCRIPTION OF IMPACT	SIGNIFICANCE POST-MITIGATION
PREFERRED ALTERNATIVE – CONSTRUCTION PHASE		
GEOLOGY AND SOILS	Loss of topsoil as a resource	**Medium (-)**
	Loss of land capability	**Medium (-)**
	Hydrocarbon Pollution	**Very Low (-)**
HYDROLOGY GROUNDWATER SURFACE WATER	If groundwater is used for supply, then localised dewatering could occur.	**Very Low (-)**
	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally.	**Low (-)**
	Changes in water flow regimes	**High (-)**
	Changes in sediment exiting and entering the system	**Medium (-)**
	Introduction and spread of alien invasive species	**Low (-)**
	Loss and disturbance of water course habitat and fringe vegetation impact	**High(-)**
	Changes in water quality due to pollution	**Medium (-)**
ARCHAEOLOGICAL/ HERITAGE RESOURCES	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	**Very Low (-)**
VISUAL	Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	**Low (-)**
	The mining activities and infrastructure, will alter the agricultural sense of place of the study area to a mining sense of place.	**Low (-)**
	Added impact of security lighting on surrounding landowners and nocturnal animals.	**Very Low (-)**
NOISE AND LIGHTING	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of construction vehicles and equipment.	**Very Low (-)**
AIR QUALITY	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	**Very Low (-)**
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	**Very Low (-)**
WASTE	Generation of additional general waste, litter and building rubble and hazardous material during the construction phase.	**Very Low (-)**
SERVICES	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional strain on natural resources and service infrastructure.	**Very Low (-)**
TRAFFIC SERVICES TRAFFIC	The change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	**Very Low (-)**

NATURE OF IMPACT	DESCRIPTION OF IMPACT	SIGNIFICANCE POST-MITIGATION
HEALTH AND SAFETY	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles.	Very Low (-)
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	Very Low (-)
HEALTH AND SAFETY	Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers.	Very Low (-)
	Increased risk to public and worker safety: If not fenced off, the public and workers may fall into excavated areas and trenches.	Very Low (-)
SOCIO-ECONOMIC	Positive: Potential creation of short term employment opportunities for the local communities, during the construction phase.	Low (+)
	Multiplier effects on local economy	Low (+)
	Community development social upliftment	Low (+)
	Nuisance impacts on the surrounding land users (i.e. dust, noise, vibration).	Very Low (-)
PREFERRED ALTERNATIVE – OPERATIONAL PHASE		
GEOLOGY AND SOILS	Loss of topsoil as a resource	Low (-)
	Loss of land capability and land use	Medium (-)
	Hydrocarbon Pollution	Very Low (-)
HYDROLOGICAL SURFACE WATER AND GROUNDWATER	Dewatering	Low (-)
	Base case Scenario Poor quality seepage	Very Low (-)
	Scenario 1 Poor quality seepage	Very Low (-)
	Changes in water flow regimes	High (-)
	Changes in sediment exiting and entering the system	Medium (-)
	Introduction and spread of alien invasive species	Low (-)
	Loss and disturbance of water course habitat and fringe vegetation impact.	High (-)
	Changes in water quality due to pollution	Medium (-)
ARCHAEOLOGICAL /HERITAGE RESOURCES	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	Very Low (-)
VISUAL	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the stripped open cast area.	Low (+)
	Visibility of solid domestic and operational waste.	Low (+)
	Removal of overburden, through blasting and equipment causes dust pollution, which in turn impacts on visibility on nearby roads and the aesthetic quality of the area.	Low (+)

NATURE OF IMPACT	DESCRIPTION OF IMPACT	SIGNIFICANCE POST-MITIGATION
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, will cause a direct visual impact and also indirectly through the creation of dust.	**Very Low (-)**
	Potential increase in traffic and existing traffic to and from the site may cause a negative impact directly, and indirectly through creation of dust.	**Very Low (-)**
	Added impact of security lighting on surrounding landowners and nocturnal animals and the sense of place of the area.	**Low (-)**
	Should there not be enough backfill material to backfill open cast pits, a permanent void may be left after mining, which will scar the landscape permanently.	**Low (-)**
NOISE AND VIBRATION	Disturbance due to vibrations caused by vehicles.	**Very Low (-)**
	Blasting will cause noise pollution	**Low (-)**
	Blasting may cause ground vibration at the nearby houses and other buildings.	**Low (-)**
AIR QUALITY	Creation of dust through removal of overburden and ore may cause a decline in ambient air quality.	**Very Low (-)**
	Creation of dust through blasting, may cause a decline in ambient air quality.	**Very Low (-)**
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, may cause a decline in ambient air quality.	**Very Low (-)**
	Potential increase in traffic and existing traffic to and from the site will create dust, which may cause a decline in ambient air quality.	**Very Low (-)**
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	**Low (-)**
WASTE	Generation and disposal of additional general waste, litter and hazardous material during the operational phase and operational waste i.e. waste rock.	**Very Low (-)**
SERVICES	Need for services e.g. water, electricity and sewerage systems, causing additional strain on natural resources and service infrastructure.	**Low (-)**
TRAFFIC	The change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	**Very Low (-)**
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	**Very Low (-)**
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	**Very Low (-)**
HEALTH AND SAFETY	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	**Very Low (-)**
	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	**Very Low (-)**
	Possibility of mining activities and workers causing veld fires destroying veld and animals on the study area and on adjacent land, impacting on the livelihood of surrounding land owners and users.	**Very Low (-)**
SOCIO-ECONOMIC	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	**Low (-)**
	Economic impact should there be an incident of public health and safety.	**Very Low (-)**
	Positive: Extended employment provision allowing mining activities to continue for additional years.	**High (+)**

NATURE OF IMPACT	DESCRIPTION OF IMPACT	SIGNIFICANCE POST-MITIGATION
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	**Medium (+)**
	Social upliftment.	**High (+)**
PREFERRED ALTERNATIVE – DECOMMISSIONING PHASE		
GEOLOGY AND SOILS	Loss of topsoil as a resource	**Low (-)**
	Loss of land capability and land use impact negatively on post-mining	**Medium (-)**
	Hydrocarbon Pollution	**Very Low (-)**
	Restoration or improvement of land capability prior to mining	**High (-)**
HYDROLOGY GROUNDWATER SURFACE WATER	Groundwater Rebound	**Very Low (-)**
	Poor quality seepage	**Very Low (-)**
	Changes in water flow regimes	–
	Changes in sediment exiting and entering the system	–
	Introduction and spread of alien invasive species	–
	Changes in water quality due to pollution	–
VISUAL	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	**Low (-)**
	Visibility of solid domestic and decommissioning waste.	**Low (-)**
NOISE AND VIBRATION	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy duty vehicles and equipment.	**Very Low (-)**
	Disturbance due to vibrations caused by heavy duty vehicles.	**Very Low (-)**
	Impact of security lighting on surrounding landowners and animals.	**Very Low (-)**
AIR QUALITY	Increased dust pollution due to vegetation clearance and heavy duty vehicles and decommissioning and rehabilitation activities.	**Very Low (-)**
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	**Very Low (-)**
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	**Low (-)**
SERVICES	Need for additional services i.e. water, electricity and sewerage systems during the closure phase causing additional strain on natural resources and infrastructure.	**Very Low (-)**
TRAFFIC	The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	**Very Low (-)**
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	**Very Low (-)**
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	**Very Low (-)**
HEALTH AND SAFETY	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	**Very Low (-)**
	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	**Very Low (-)**
	Increased risk to public and worker health and safety.	**Very Low (-)**

NATURE OF IMPACT	DESCRIPTION OF IMPACT	SIGNIFICANCE POST-MITIGATION
SOCIO-ECONOMIC	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Low (-)
	Economic impact should there be an incident of public health and safety.	Very Low (-)
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Low (+)
	Negative: Loss of jobs, household income, decline in local economy. The concentration of economic activity centred around the mine often increases the community's dependenc on the mining operation, making it vulnerable to downscaling or closure.	Low (-)
NO-GO ALTERNATIVE		
SOCIO-ECONOMIC	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	Low (-)
	Reduced period of development and upliftment of the surrounding communities and infrastructure.	Low (-)
	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	Low (-)
GENERAL	Positive: No additional negative impacts on the environment.	Very High (+)

(ii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as **Appendix 4**.

(iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

All alternatives have been assessed and with the advantages and disadvantages of the various alternative options and preferred site layout option described. These positive and negative implications have been described in of this report.

m) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

(Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation).

The EMPr is compiled to provide recommendations and guidelines according to which compliance monitoring can be undertaken during all phases of the development, including the construction, operational and closure phases of the proposed activities at proposed Grootfontein Mine, as well as to ensure that all relevant factors are considered to ensure an environmentally responsible development.

This EMPr informs all relevant parties (the Authority, the Applicant, the Site Manager, the Environmental Site Manager (ESM), the Environmental Control Officer (ECO) and all other staff employed on site), as to their duties in the fulfilment of the legal requirements for the operation of the storage activity, with particular relevance to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation granted by the relevant environmental permitting authority.

The objectives of the EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and / or international;
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr related activities (mitigation measures) are consistent with the significance of the project's impacts;
- Verify environmental performance through information on impacts as they occur;
- Respond to unforeseen events;
- Provide feedback for continual improvement in environmental performance;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or an insignificant level;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Identify measures that could optimise beneficial impacts;
- Create management structures that addresses the concerns and complaints of the Interested and Affected Parties (I&APs) with regards to the development;

- Establish a method of monitoring and auditing environmental management practises during all phases of the activity;
- Ensure that safety recommendations are complied with; and
- Specific time periods within which the measures contemplated in the final EMP should be implemented, where appropriate.

The point of departure for the EMPr is to ensure a proactive rather than a reactive approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed. Therefore the purpose of an EMPr is to provide management measures that should be implemented by the Applicant, the Site Manager, the Environmental Site Manager (ESM), the Environmental Control Officer (ECO) and all other staff employed on site, to ensure that the potential impacts of a proposed development are minimised. It should also be ensured that the EMPr is maintained and upheld as a dynamic document in order for the project team to add or improve on issues that might be considered left out or not relevant to the project. In such instances the approving authority may authorise the ECO to make such changes.

n) Final proposed alternatives

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment).

Proposed alternatives were discussed in PART A Section 3 (g) (i) of this document, and the positive and negative impacts of the alternatives and preferred option are described and assessed in Table 15, Table 16 and Table 17 of this report. The preferred infrastructure option is shown on the mining section layouts included in Appendix 4. The process followed by the EAP to assess, minimise and avoid impacts is provided in Part A Section 3 (h) of this report.

o) Aspects for inclusion as conditions of Authorisation

(Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation).

Please refer to Part A, Section 3, p) ii) of this report.

p) Description of any assumptions, uncertainties and gaps in knowledge

(Which relate to the assessment and mitigation measures proposed).

- All information provided to the environmental team by the applicant and I&APs was correct and valid at the time that it was provided;
- It is not always possible to involve all I&APs individually, however, every effort has been made to involve as many affected stakeholders as possible;
- The information provided by the applicant and specialists was accurate and unbiased; and
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and closure phases of the proposed activity.

Soil and Land Capability Study

Information provided in this specialist report has been based on information obtained from site visits conducted by ENVASS, information provided by Brikor Limited and published scientific literature and maps. The information provided in this report is deemed adequate for the EIA process.

Groundwater

The following assumptions and limitations were made during the project and should be taken into consideration in the review of this report:

- This hydrogeological information used in this report was collected during the hydrocensus investigation, as well as from previous reports completed within the site area. This information was assumed to be correct and representative for the site area;
- Limited information was made available regarding the mining works schedules and high-level mine plans were used in the simulation of the open pit during the operational phase;
- At the time of writing this report the site geochemical testing was still underway and incomplete. Preliminary test results were used to provide indicative acid

generation and acid neutralization potential for the site material. A separate addendum report will be attached when final test results are made available in early 2018;

- No specific contaminant(s) of concern were identified for the site, thus transport numerical modelling was done assuming a source concentration of 100% which allows for the determination of potential contaminant migration paths and extents at the site. Once geochemical testing has been completed the transport model will be updated to include specific contaminants (if any);
- Aquifer parameters, such as transmissivity and storage, were taken from literature and assumed to be applicable to the site;
- Recharge parameter values were taken from literature and calculated using the available site chemistry data and were assumed to be representative of site conditions;
- Based on the available information for the site it was assumed that concurrent rehabilitation will take place at the site, thus waste rock infrastructure would be limited to berms surrounding the open pit area;
- The complexities of fractured rock aquifers imply that the model can only be used as a guide to determine the order of magnitude of dewatering and contaminant transport; and
- The interpretation of modelled results should be based on the assumptions the model was built on and actual results will vary as unknown aquifer conditions and parameters vary in the natural system.

Wetland Delineation and Impact Assessment

- The information provided by the client formed the basis of the planning and layouts discussed in the report;
- All wetlands within 500 m of the study area, should be identified as per the Water Use Licence application regulations. In order to meet timeframes and budget constraints for the project, wetlands within the study area were delineated on a fine scale, based on detailed soil and vegetation sampling. Wetlands that fall outside of the site, but that fall withint 500 m of the proposed activities, were delineated based on desktop analysis of vegetation gradients visible from aerial imagery.

- The detailed study was conducted from one site visit, and, therefore does not depict any seasonal variation in the wetland plant species and richness.
- The site visit took place in autumn in a year of extreme drought and some wetness indicators could not have been present.
- Sections of the wetland and study area were burnt at the time of the site visit and certain vegetation species could not be identified.
- Description of the depth of the regional water table and geohydrological and hydropedological processes fell outside of the scope of the assessment;
- Floodline calculations fell outside the scope of the assessment;
- A red data scan, fauna and flora and aquatic assessments were not included in the current study;
- The recreation grade GPS used for wetland and riparian delineations is accurate within 5 metres
- Wetland delineation plotted digitally maybe offset by at least five metres to either side, furthermore, it is important to note, that, during the course of converting spatial data to final drawings, several steps in the process may affect accuracy. Therefore, it is recommended that No-go areas identified be pegged in the field in collaboration with the surveyor for precise boundaries. The scale at which maps and drawings are presented within the report may become distorted should they be reproduced through printing for example.

Air quality

An air quality impact assessment and Air Pollution Prevention Plan is currently being developed by a specialist and the findings and plan should be approved by the relevant authority and implemented. The recommendations in the specialist report should also be included in the final EIA report. Due to time constraints, this plan and assessment could not be included in the draft EIA. The report, will, however, be made available to all registered I&APs, once it becomes available.

q) Reasoned opinion as to whether the proposed activity should or should not be authorised

(i) Reasons why the activity should be authorised or not

Based on the findings of the environmental impact assessment and the specialist studies, the EAP recommends that the proposed development be considered favourably, due to the positive social and economic impacts for the local and regional communities that may occur as a result of the Grootfontein Mine. The majority of the potential negative impacts can be mitigated to very low and low levels, and some to medium levels, provided that the mitigation measures are strictly implemented and monitored. However, there are sensitive wetlands occurring on the study area that will be affected by the proposed mining. The study area has been impacted on since prior to 1966 and the area is thus, greatly impacted. However, loss of the wetlands on the study area, could have a significant negative downstream effect. It is thus imperative that activities resulting in wetland loss should be mitigated and offset as outlined in the wetland mitigation offset manual (Bootsma & Bezuidenhout, 2017). The activities within the 500m buffer zones of the wetlands occurring on and adjacent to the study area, must be approved by the Department of Water and Sanitation upon submission of a Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998).

(ii) Conditions that must be included in the authorisation

(1) Specific conditions to be included into the compilation and approval of EMPr

- All Category C listed activities in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] (NEMWA) must comply with the requirements and standards of the Norms and Standards for storage of waste, 2013;
- The EMPR, once approved, is a contractual document and must be implemented at the Brikor Grootfontein Mine at all times;
- An independent environmental control officer (ECO) must be appointed to monitor the implementation of the EMPR and audit reports kept by the applicant;

- All contractors and employees of Brikor, must be made aware of the EMPR and its requirements as well as the impact of not implementing the measures of the EMPR;
- The Water Use License (WUL) that will be applied for, need to be issued before any activities may commence on site;
- The activities resulting in wetland loss should be mitigated and offset as outlined in the wetland mitigation offset manual (Bootsma & Bezuidenhout, 2017);
- The activities within the 500m buffer zones of the wetlands occurring on and adjacent to the study area, must be approved by the Department of Water and Sanitation upon submission of a Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998);
- An air quality impact assessment should be conducted and an Air Pollution Prevention Plan should be submitted to and approved by the relevant authorities, before commencement of any activity on the proposed mining site; and
- Copies of the EMPR, Environmental Authorisation, Mining Right and Waste Management License, as well as the Water Use License and any emergency procedures and method statements, must be kept on site and be available on request of the Competent Authority.

(2) Rehabilitation requirements

Mineral right holders (Holders) are currently required to comply with the financial provision requirements under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). In November 2015 new Financial Provision for Prospecting, Exploration, Mining or Production Operations Regulations, November 2015 (GNR 1147) were promulgated in terms of NEMA, regulations.

However, due to the significant issues arising from the 2015 Regulations and legislative amendments required to resolve this, the DMR has communicated that the deadline to comply with the new regulations of 20 February 2017. This deadline will be amended to extend the period to comply with the regulations to 20 November 2017.

The mine plans to commence with the review and assessment to comply with the financial regulations in terms of NEMA, in the beginning of 2017, and will be submitted to the DMR.

The requirements for a final rehabilitation, decommissioning and mine closure plan, are outlined in Appendix 4 of the Regulations (GNR 1147), are to identify a post mining land use that is feasible through the following:

(a) Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
(b) Outlining the design principles for closure;
(c) Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
(d) Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
(e) Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
(f) Identifying knowledge gaps and how these will be addressed and filled;
(g) Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
(h) Outlining, monitoring, auditing and reporting requirements.

r) Period for which the Environmental Authorisation is required.

The authorisation for the waste management facilities is required for a period of 15 years.

s) Undertaking

(Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme report).

The undertaking required in terms of this report is provided in the EMPR in Part B Section 2 of this document and is applicable to both the Environmental Impact Assessment Report (Part A) and the Environmental Management Programme report (Part B).

t) Financial Provision

(State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation)

Quantum of the financial provision for Grootfontein Mine

Brikor Limited has appointed Environmental Assurance (Pty) Ltd (ENVASS) to undertake the closure cost assessment for the Mine. This closure cost assessment has been completed in accordance with the requirements of the MPRDA, with particular reference to regulations 53 and 54 during the transitional period leading to the compliance date of the NEMA, Government Gazette 39425 (Notice Number GNR 1147) in February 2019. The transitional period has been extended to 39 months of the commencement of the Regulations (Government Gazette 40371 (Notice Number GNR 1314)). This assessment partially also responds to the requirements of NEMA GNR 1147.

The mine classification is summarised below in Table 21. The Mine Classification has been done in accordance with the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine.

Table 21: Mine Classification

Mine	Risk Class	Sensitivity	Terrain	Proximity to Urban Areas
Brikor	A	Medium	Flat	Urban

The Units Rates utilised for the assessment is presented in Table 22. The unit rates for each closure component is been in increased with CPI from 2005 to 2017. The 2017 CPI has been calculated at 5.5 based on the average change in CPI over the period from January 2017 to September 2017.

Table 22: DMR unit Rates – 2017

NO	Description	Unit	DME rates December 2017 CPI 5.5%
1,0	Dismantling of processing plant and related structures (including overland conveyors and power lines)	m3	R 14,50
2(a)	Demolition of steel buildings and structures	m2	R 201,93
2(b)	Demolition of reinforced concrete buildings and structures	m2	R 297,58
3,0	Rehabilitation of access roads	m2	R 36,14
4(a)	Demolition and rehabilitation of electrified railway lines	m	R 350,72
4(b)	Demolition and rehabilitation of non-electrified railway lines	m	R 191,30
5,0	Demolition of housing and facilities	m2	R 403,86
6,0	Opencast rehabilitation including final voids and ramps	ha	R 205 544,80
7,0	Sealing of shafts, adits and inclines	m^3	R 108,41
8a	Rehabilitation of overburden and spoils	ha	R 141 139,34
8b	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	R 175 786,50
8c	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	R 510 567,32
9,0	Rehabilitation of subsided areas	ha	R 118 182,94
10,0	General surface rehabilitation	ha	R 111 806,17
11,0	River diversions	ha	R 111 806,17
12,0	Fencing	m	R 127,54
13,0	Water management	ha	R 42 511,85
14,0	2 to 3 years of maintenance and aftercare	ha	R 14 879,15

The quantum costs was calculated by Environmental Assurance (Pty) Ltd as presented in Table 23. The updated units rates was utilised for the assessment. The closure items are based on the mine works plan. Phase 1 will be a total area of 12.74ha

and will consist out of 4 box cuts. Concurrent rehabilitation will be employed and the topsoil, subsoil and Waste rock dump will be approximately 2ha.

Table 23: Closure Cost Assessment

CALCULATION OF THE QUANTAM							
	Brickor - Closure Costs Assessment		Brickor - GROOTFONTEIN				
	Environmental Assurance	**Date:**	13-Nov-17				
			A	**B**	**C**	**D**	**E=A*B*C*D**
	Description:	**Unit:**	**Quantity**	**Master rate**	**Factor 1**	**Factor 2**	**Amount (Rands)**
	Class A (Low Risk)						
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
6	Opencast rehabilitation including final voids & ramps	ha	12,74	R 205 544,80	**1,00**	1,00	R 2 618 641
8(A)	Rehabilitation of overburden & spoils	ha	2,00	R 141 139,34	1,00	1,00	R 282 279
14	2 to 3 years of maintenance & aftercare	ha	12,74	R 14 879,15	1,00	1,00	R 189 560
						Sub Total 1	
						(Sum of items 1 to 15 Above)	**R 3 090 480**
	Weighing factor 2 (step 4.4)			**1**		**Sub Total 1**	**R 3 090 480**
	Preliminary and General			12% of Sub Total 1			R 370 857,57
	Contingency			10% of Sub Total 1			R 309 047,97
						Sub Total 2	**R 3 770 385**
	VAT (14%)						**R 527 853,94**
GRAND TOTAL							**R 4 298 239,23**

(i) Explain how the aforesaid amount was derived

The financial provision amount was calculated utilising the methodology as prescribed by the Guideline Documents for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine issued by the DMR.

The Units Rates utilised for the assessment is presented in Table 22. The unit rates for each closure component is been in increased with CPI from 2005 to 2017. The 2017 CPI has been calculated at 5.5 based on the average change in CPI over the period from January 2017 to September 2017.

It is anticipated that the mine will be mining at a rate of 4.24ha per year. It is anticipated that the mining area within 3 years will be an area of 12.74ha. Concurrent rehabilitation will be employed at not first two box-cuts will be rehabilitated with the overburden from

the third box-cut. An area of approximately 2ha will be utilised for the topsoil, subsoil and waste rock overburden stockpiles

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

It is confirmed that the amount for financial provision is anticipated to be an operating cost and is provided for as such in the Mine Works Programme for the Grootfontein Mine.

u) Deviations from the approved scoping report and plan of study.

(i) Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

Additional specialist studies including Traffic Impact Assessment, Air Quality Impact Assessment, Acid Mine Drainage Impact Assessment, Palaeontological Assessment were conducted, as requested by the Gauteng Department of Agriculture and Rural Development and upon issues raised by Interested and Affected Parties and stakeholders.

(ii) Motivation for the deviation

The deviation was made due to comments received from Interested and Affected Parties and Organs of State that assisted in identifying impacts that may be a result of the activity. Details are provided in the comments and responses reports.

v) Other Information required by the competent Authority

i) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

(1) Impact on the socio-economic conditions of any directly affected person.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as **Appendix 2.19.1** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

The proposed activities will be undertaken on land owned by the Ekurhuleni Metropolitan Municipality and occupied by two farmers, who rents the land from the Municipality. Two farmers are renting the properties from the Municipality and they will not be able to continue farming on the land. The applicant is in negotiations with the landowner regarding the proposed mining activities.

(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act

Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

No archaeological (Stone Age and Iron Age) and historical settlements, structures, features, assemblages or artefacts within the demarcated study area were observed by the specialist during the site visit in December 2016. However, Archaeological deposits usually occur below ground level. Should archaeological artefacts or skeletal material be revealed in the area during development activities, such activities should

be halted, and a university or museum notified in order for an investigation and evaluation of the find(s) to take place (cf. NHRA (Act No. 25 of 1999), Section 36 (6)).

w) Other matters required in terms of sections 24 (4) (a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as Appendix 4).

The EAP included all aspects as required by the EIA regulations, 2014 for the EIA and EMPr as described in the Executive Summary of this report. Please refer to Part A Section 3 (g) and Table 5, for a description and analysis of alternatives considered as part of this application.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft environmental management programme.

a) Details of the EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

Please refer to Part A Section 3 a) i) and ii).

b) Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1) (h) herein as required).

Please refer to Part A Section 3 b) and d).

c) Composite Map

(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

The composite map is included as Appendix 4.

d) Description of Impact management objectives including management statements

i) Determination of closure objectives.

(Ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

Management objectives

- Creating a free draining post mining landscape that has been returned to a productive and safe post-mining land use;
- Creating a landscape that will prevent erosion in the long term;
- Creating a landscape that will reconnect fragmented habitats and increase biodiversity on the properties by rehabilitating and improve disturbed wetland and riparian areas;
- The closure objective regarding surface and groundwater is zero discharge of contaminated water to the environment and long term monitoring of water quality that may be impacted on by waste activities; and
- Creating post-mining employment opportunities for mine workers.

ii) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

The impacts of each activity are explained and described in Tables 36 – 37. Each identified potential impacts associated with each project phase and applicable management measures are provided, in order to ensure that risks and impacts are prevented or minimised. These management measures address the potential for environmental damage, pollution and treatment of water. The measures also include the process for managing extraneous water, which are also discussed in detail in the Integrated Water and Waste Management Plan submitted and to be approved by the Department of Water and Sanitation.

iii) Potential risk of Acid Mine Drainage.

(Indicate whether or not the mining can result in acid mine drainage).

Acid Rock Drainage (ARD) refers to the acidic water that is created when sulphide-bearing minerals are exposed to air and water and, through a natural chemical reaction, produce sulphuric acid. Sulphide oxidation is a spontaneous chemical reaction where oxygen is present. ARD has the potential to introduce acidity and dissolved metals into water, therefore these waters contain high concentrations of dissolved heavy metals (iron, aluminium and manganese, and possibly other heavy

metals) and metalloids (of which arsenic is generally of greatest concern)), and sulphate may have pH values as low as 2.5 (Maree et al., 2004).

The process of ARD initiates when, for example, underground mine shafts, or crushed conglomerate in mine residue areas on the surface become exposed to oxygen and water, creating run-off that is very high in sulphates. ARD includes the release of various chemical contaminants into water resources consequently leading to highly acidic water containing high concentrations of metals, sulphides, and salts and is consequently hazardous to not only human health but the environment as well. Depending on the pH and the nature of the rock involved, ARD may mobilize a wide variety of other metal ions into solution. Generally, iron, aluminium, copper and zinc are found in the highest proportions.

The rate of ARD production depends on many factors such as:

- Surface area of sulphide minerals exposed: Increasing the surface area of sulphide minerals exposed to air and water increases sulphide oxidation and ARD formation.
- Type of minerals present: Not all sulphide minerals are oxidized at the same rate, and neutralization by other minerals present may occur, which would slow the production of ARD.
- Amount of oxygen present: Sulphide minerals oxidize more quickly where there is more oxygen available. As a result, ARD formation rates are higher where the sulphides are exposed to air than where they are buried under soil or water.
- Amount of water available: Cycles of wetting and drying accelerate ARD formation by dissolving and removing oxidation products, leaving a fresh mineral surface for oxidation. In addition, greater volumes of ARD are often produced in wetter areas where there is more water available for reaction.
- Temperature: Pyrite oxidation occurs most quickly at a temperature around 30°C.
- Microorganisms present: Some microorganisms can accelerate ARD production such as these specialised chemolithotrophic bacteria known to accelerate the geomicrobial phenomenon of ARD; Acidithiobacillus ferrooxidans, and Leptospirillum ferrooxidans.

iv) Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

Acid-base accounting is currently being performed for the site, along with humidity cell geochemical tests on the waste material present at the site. In terms of the overall risk posed by ARD for the site it should be considered that the pre-mitigation impact rating would be high (i.e. worst case scenario) for both the operational and closure phases of the mining operations. The migration of ARD contaminated water (if any) is represented by the simulated contaminant plumes in the proceeding sections of this report, which will be updated once the geochemical data becomes available.

v) Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.

Possible mitigation measures for the control/prevention of ARD generation at the site include cladding and vegetation of the waste rock facilities at the site to prevent seepage into the materials and limit oxidation potential. The waste rock should be covered as soon as possible when used in pit rehabilitation using topsoil to prevent oxidation, and regular water quality samples should be taken at the waste disposal areas, including berms, in-pit rehabilitation and other areas where waste rock may be stored during operations. Once the management and mitigation measures have been implemented the impact rating would be medium risk due to the long-term duration of the impact.

vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

Please refer to the above mitigation measures.

vii) Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Table 23: Water use volumes at the proposed Grootfontein Mine

Components/Linkages	Area (m^2)	Annual Average (m^3)	Monthly Average (m^3)	Daily Average (m^3)
Municipal Supply		365.00	30.42	1.01
Groundwater Ingress		31 025	2 585.42	86.18
Dewatering to PCD (or Holding Dam)		24 089	2 007.42	66.91
Dewatering to Dust suppression (Roads, Stockpile & Pit)		72 876	6 073.00	202.43
PCD (Phase 1) to dust suppression		27 305.29	2 275.44	75.85
Consumption at the Temporary Mine Office		365.00	30.42	1.01
Losses from Stockpile	104 460	50 527.30	4 210.61	140.35
Evaporation from Phase 1 Opencast Pit	129 941	10 692	891.00	29.70
Evaporation from PCD (Phase 1)	6 500	10 530	877.50	29.25
Rainfall/Runoff to Phase 1 Opencast Pit	130 180	31 426.23	2 618.85	87.30
Rainfall into PCD (Phase 1)	6 500	4 491.5	374.29	12.48
Rainfall on Stockpile	104 460	72 181.86	6 015.16	200.51

A total annual water supply of 129 269.59 m^3 was calculated for the proposed Grootfontein Mine. This volume accounts for the potable municipal water supply, incident rainfall, runoff and pumped open cast pit dewatering volume. The water balance compiled by GCS water and environmental consultants (2017), indicates that 24 089m^3 of pit dewatering is channelled to the Pollution Control Dam (PCD) or Holding Dam. The annual volume of water that should be used for dust suppression was calculated at 33 065.29 m^3. Prior to using open cast water from the pit or from the PCD /Holding dam for dust suppression, the water must comply with the DWS water quality guidelines which are ideal target values. Only 365 m^3 per annum of potable water will be required from the Municipality, since the process of coal beneficiation, will be carried out at the nearby Vlakfontein Mine.

viii) Has a water use license has been applied for?

A water use license have not yet been submitted, but a pre-application meeting was held with the Department of Water and Sanitation and a site visit was conducted by DWS. The water use licence will be submitted early in 2018.

ix) Impacts to be mitigated in their respective phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES (as listed in 2.11.1)	**PHASE** of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure.	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m^2)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-.. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.

Please refer to Table 24 for the above requested information.

Table 24: Measures to rehabilitate the environment affected by the undertaking of any listed activity, impact management outcomes, and impact management actions for Grootfontein Mine

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
When vegetation is cleared and the topsoil is stripped. Construction vehicles driving on these soils throughout the site. Soils are not stripped and stockpiled according to the soil stripping guidelines. Installation of stormwater infrastructure and PCD. General construction activities. Generation and storage of construction waste.	**Loss of topsoil as a resource** When vegetation is cleared and the topsoil is stripped, the soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Construction vehicles driving on these soils causes compaction of soils and reduces the soils ability to be penetrated by root growth. Compaction also increases erosion potential. When soils are not stripped and stockpiled according to the soil stripping guidelines these soils would have lost their natural physical and chemical properties, reducing the topsoil's ability to be a plant growth medium. The above factors all contribute to a loss of the topsoil's ability to be a resource through alterations and removal.	**Prevent and reduce and remedy through management measures.** • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 4 m (the practical tipping height of dump trucks); • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • The topsoil 0.5 m of the soil profile should be stripped first and stockpiled separately; • The subsoil approximately 0.5 – 0.9 m thick will then be stripped and stockpiled separately; • Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; • Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; • The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil;	Impact avoided. All topsoil used in concurrent rehabilitation. Rehabilitation objectives and standards	Rehabilitation objectives and standards	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.5 m) then subsoil separately;			
	Loss of land capability Removal of soil layers will impact on the land capability, because vegetation can no longer be supported**.**	• Refer to the above mitigation measures	Impact avoided. All topsoil used in concurrent rehabilitation. Rehabilitation objectives and standards	Rehabilitation objectives and standards	Construction Phase
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	**Prevent and reduce and remedy through management measures** • Prevent any spills from occurring; • If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks; • All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and • Leaking vehicles will have drip trays placed under them where the leak is occurring; • All leaks will be cleaned up immediately using an absorbent material and spill kits, in the prescribed manner; and	Impact avoided. No signs of soil contamination and loss of topsoil due to contamination. Meet rehabilitation objectives and standards.	Rehabilitation objectives and standards Spill procedure Approved IWWMP Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • Section 2 Declaration of grouped hazardous substances; - Section 9 (1)	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• The approved Integrated Water and Waste Management Plan to be implemented.		Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) - Section 4 Duties of persons who may be exposed to hazardous chemical substances SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	
	If groundwater is used for supply, then localised dewatering could occur.	• Borehole abstraction should be sufficiently managed and water levels monitored at the abstraction wells and nearby boreholes.	Impact avoided. Monitoring standards	Monitoring standards	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Hydrocarbon spills from construction vehicles and fuel storage areas may contaminate the groundwater resource locally.	**Prevent and reduce through management measures** • Staff at workshop areas, yellow metal laydown zones and fuel storage areas should be sufficiently trained in hydrocarbon spill response; • Each area where hydrocarbons are stored or likely to spill should be equipped with sufficient spill response kits and personnel, contaminated soil should be disposed of correctly at a suitable location. • Also see mitigation measures for potential contamination of soils.	Impact avoided. No signs of spillages occurring. Meet rehabilitation objectives and standards.	Rehabilitation objectives and standards Spill procedure Approved IWWMP Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				Notice 1179 of 1995) - Section 4 Duties of persons who may be exposed to hazardous chemical substances SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact is caused by compaction of soil, removal of vegetation, surface water redirection during construction activities. Permanent changes to water flows including encroaching onto wetland habitat.	**Control through management measures.** • Limit the footprint of the development activities potentially encroaching onto the wetland areas; • A temporary fence or demarcation should be erected around No-go areas, outside the proposed works area, before commencement of construction, as part of the contractor planning phase, when compiling work method statements. This should be done to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the construction phase. This should be monitored as part of the EMPr. The stormwater management plan must also	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		be submitted to DWS as part of the Water Use License Application and approved for implementation before commencement of contstruction; • High energy stormwater input into the watercourses should be prevented at all costs. Changes to natural flow of water (surface water as well as soil flowing within the soil profile) should be taken into account during the design phase and mitigated effectively.			
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Construction activities will result in earthworks, soil disturbance and natural vegetation removal. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water.	• Consider various methods and equipment available and select the method of mitigation that will have the least impact on the water courses; • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water, reducing the risk of erosion. Effective sediment traps should be installed. • Construction in and around water courses must be restricted to the dryer winter months where possible. • Retain vegetation and soil in position as long as possible, removing it immediately ahead of construction / earthworks in that area (DWAF, 2005); • Remove only vegetation where essential for construction and any disturbance to	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		the adjoining vegetation should not be allowed; • Rehabilitation plans must be submitted and approved for rehabilitation of damaged during construction and the plan must be implemented immediately upon completion of construction. • Cordon off areas that are under rehabilitation and indicate as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access; • Measures must be put in place to control flow of excess water to prevent impacting on vegetation; • Protect all areas susceptible to erosion and ensure there is no undue soil erosion resulting from activities within and adjacent to the construction camp and work areas. • Runoff from the construction area must be managed to avoid erosion and pollution; • Implementation of best management practises; • Source directed controls; • Buffer zones to trap sediments; Monitoring of sedimentation to address timeously.			
	Introduction and spread of alien invasive species	**Reduce through management measures.** • Weed control should be implemented;	Rehabilitation Objectives and Standards	Alien and Invasive Species Management Plan	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	• Retain vegetation and soil in position for s long as possible, only removing it immediately ahead of construction / earthworks in a particular area and replacing it where possible afterwards; • Monitor the establishment of alien vegetation within areas affected by construction and maintenance and take immediate corrective action where invasive species are observed to establish; • Rehabilitate or revegetated disturbed areas; • Only vegetation falling directly in demarcated access routes or project sites should be removed; • No further vegetation clearance except for the removal of alien invasive species will be allowed; and • All remaining indigenous vegetation should be conserved wherever possible.	Alien and invasive vegetation management plan implemented and outcomes achieved. Proof of alien vegetation control. No listed species visible on the site.	Rehabilitation Objectives and Standards Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014) - Notice 2 Exempted Alien Species in terms of Section 66 (1) - Notice 3 National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-9 & 11 - Notice 4 Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-7, 9-10 & 12	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Loss and disturbance of water course habitat and fringe vegetation impact. Direct development within water course areas will cause loss and disturbance of water course habitat and fringe vegetation, due to direct development in the water course, as well as changes in management, fire regime and habitat fragmentation.	**Prevent and control through management measures.** • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented to minimise watercourse loss; • Other than approved and authorised structures, no other development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones; • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas; • Weed control in the buffer zone; • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed; • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish.	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Construction Phase
	Changes in water quality due to pollution Construction activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting	**Prevent and control through management measures.** • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone; • Implementation of appropriate stormwater management around the	Impact avoided. No signs of contamination. Meet rehabilitation objectives and standards.	Rehabilitation objectives and standards Spill procedure Approved IWWMP	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.	excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse; • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone; • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc.; • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use; • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer; • Control of waste discharges; • Maintenance of buffer zones to trap sediments with associated toxins; • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse; • Regular independent water quality monitoring should form part of operational procedures in order to identify pollution; • Treatment of pollution identified should be prioritized accordingly.		Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) - Section 4 Duties of persons who may be exposed to hazardous	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				chemical substances SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	
	Alteration of archaeological, historical and palaeontological resources that may be discovered during earthworks.	• Should culturally significant material or skeletal remains be exposed during development and construction phases, all activities must be suspended pending further investigation by a qualified archaeologist (Refer to the National Heritage and Resources Act, 25 of 1999 section 36 (6)); • Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed; • The ECO must inform SAHRA and contact an archaeologist and / or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission of the ECO and SAHRA; and	No loss of newly discovered material.	National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations. South African Heritage Resources Agency Guidelines.	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		If the newly discovered heritage resource is considered significant, a Phase 2 assessment may be required. A permit from the responsible authority will be required.			
	Visibility from sensitive receptors / visual scarring of the landscape as a result of the construction activities.	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and • Rehabilitation of disturbed areas and re-establishment of vegetation as soon and as far as possible to be implemented.	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Construction Phase
	The mining activities and infrastructure, will alter the agricultural sense of place of the study area to a mining sense of place.	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and • Rehabilitation of disturbed areas and re-establishment of vegetation as soon	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Construction Phase
	Added impact of security lighting on surrounding landowners and nocturnal animals.	**Reduce through controlling measures.** • Unnecessary lights should be switched off during the day and / or night to avoid light pollution;	Lights installed according to the design report.	Design Report	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• If lighting is required, the lighting will be located in such a place and such a manner so as to minimise any impact on the surrounding community; • Install lights that will not create a night sky glow; and • Security lighting should be designed in such a way as to minimise emissions onto undisturbed areas on site and neighbouring properties. Light fittings should face downwards.			
	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise and vibration impacts associated with the operation of construction vehicles and equipment.	**Reduce through controlling measures.** • Vehicles will be regularly serviced to ensure acceptable noise levels are not exceeded. Silencers will be utilised where possible; • Heavy vehicle traffic should be routed away from noise sensitive areas where possible; • Noise levels should be kept within acceptable limits. All noise and sounds generated should adhere to South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. No pure tone sirens or hooters may be utilised except where required in terms of SABS standards or in emergencies; • With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the Site Manager (SM) should liaise with local residents and how best to minimise impacts, and	Impact reduced. Records of service of all operational vehicles. Silencers utilised where applicable. All employees wears PPE where required.	Meet the South African National Standard SANS 10103:2008 Meet South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. Meet the requirements of the Mine Health and Safety Act (Act 29 of 1996)	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		the local population should be kept informed of the nature and duration of intended activities; • The SM should take measures to discourage labourers from loitering in the area, causing noise disturbance; • Noise impacts should be minimised by restricting the hours (between 06h00 and 18h00 from Monday to Saturday, during which the offending activities are carried out and, where possible, by insulating machinery and/or enclosing areas of activity; • Regular monitoring of noise levels at various, pre-determined locations. This will serve as the core of noise mitigation as it will enable the determination of problem areas; • Personal Protective Equipment to all persons working in areas where high levels of noise can be expected; Signs where it is compulsory; • Proper design of the plant areas and machinery where measures are taken to prevent noise generation such as silencers, mufflers and sound suppressing enclosures for parts/processes which can generate noise; • Regular inspections and maintenance of equipment, vehicles and machinery to prevent unnecessary noise;			

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Noise breaking barriers can be erected such as netting, walls or high growing trees; and • Placement of noise generating activities can be planned as far away as possible from affected areas or persons.			
	Increased dust pollution due to vegetation clearance and construction vehicles and activities.	• Dust suppression shall be implemented during dry periods and windy conditions; • All exposed surfaces should be minimised in terms of duration of exposure to wind and stormwater; • Excavation, handling and transportation of erodible materials shall be avoided under high wind conditions (excess of 35km/hr) / when visible dust plume is present; • Ensure that shortest routes are used for material transport; • Ensure that stockpile height is kept to a minimum and that any stockpiling occurs downwind of the stockpiles; • Minimise travel speed on paved roads; • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site; and • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed; • Spray areas to be cleared with water. • Ensure minimum travel distance between working areas and stockpiles.	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site. Dust fall monitoring programme should be implemented. Dust fallout and Particulate Matter (PM) levels may not exceed the limits as set out in the Dust Control Regulations above. Monitoring dust stands occurring on site.	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Ensure that topsoil for stockpiles is sprayed with water before tipping to prevent dust generation. • Ensure graded areas are sprayed with water. • Minimise the amount of graded areas. • Ensure that shortest routes is used for material transport. • Load and offload material, as far as possible, downwind of stockpiles. • Actively monitor dust fallout generated in the 8 major wind directions on the borders of the site. • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed.			
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	• All vehicles and machinery will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks and unnecessary emissions.	Impact minimised. All vehicles in good working order and serviced at appropriate intervals.	Service Plan for Vehicles	Construction Phase
	Generation of additional general waste, litter and building rubble and hazardous material during the construction phase.	**Control through management measures.** • The conditions of the Integrated Water Use License (IWUL) and the IWWMP must be implemented. • A central waste storage and transition area shall be established within the site camp; • The central waste storage and transition area shall be surfaced and demarcated appropriately;	Waste management on site visible.	Waste management on site visible. Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Portable wheelie bins shall be placed throughout the site camp as well as at the remainder of the site and at all working areas in the field; • Wheelie bins shall be colour coded and labelled to identify the waste stream for which it is intended; All portable wheelie bins and other containers shall be emptied at the central waste storage and transition area a minimum of once a week as to avoid waste build up; • The waste shall be removed (within 30 days) by a licensed waste service provider as shall be disposed of at a licensed waste landfill site and records of safe disposal (as required for hazardous wastes) shall be supplied to the Contractor. These records shall be kept on site by the ESM. • Wherever possible and practical, waste materials generated on site must be recycled; and • Waste specific (hazardous, timber, steel etc.) mitigation measures to be developed and included in the EMPR.		and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015) SANS 10234: 2008: Globally Harmonized	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				System of classification and labelling of chemicals (GHS)	
	Need for services i.e. water, electricity and sewerage systems during the construction phase causing additional strain on natural resources and service infrastructure.	**Reduce through controlling measures.** • Energy savings measures to be implemented at the mine, e.g.: ➢ No lights to be switched on unnecessarily. Only security lights to be switched on at night; • Energy saving bulbs to be installed; and • Water should be recycled as far as possible to avoid any additional water usage.	Impact avoided. Recycling of used and contaminated water through waste water and sewage treatment and reuse.	-	Construction Phase
	The change in traffic patterns as a result of traffic entering and exiting the site on the surrounding road infrastructure and existing traffic.	**Reduce and control through management measures.** • Where feasible, heavy vehicles should not operate on public roads during peak hours; and • Heavy vehicles should adhere to the speed limit of the road.	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site.	Reduce through controlling measures Set Speed Limits South African Road Signs Manual	Construction Phase
	Nuisance, health and safety risks caused by increased traffic on and adjacent to the study area including cars, busses and other heavy vehicles.	**Prevent through management measures.** • Drivers will be enforced to keep to set speed limits. • Trucks will be in a road-worthy condition. • Roads and intersections will be signposted clearly. Only main roads should be used;	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site. South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution	Reduce through controlling measures Set Speed Limits South African Road Signs Manual	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Where feasible vehicles should not operate on public roads during peak hours; • Vehicles should adhere to the speed limit of the road; • Heavy vehicles should always travel with their head lights switched on; • Heavy vehicles should not stop on the road to pick up hitchhikers – No stopping on the road approaching the mine will be allowed; • Single directional traffic shall be controlled through a stop-go system or any other appropriate traffic control method; • Brikor shall be responsible for ensuring that suitable access is maintained for public traffic to all relevant businesses and properties; and • All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual.	Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 Dust fall monitoring programme should be implemented. Dust fallout and Particulate Matter (PM) levels may not exceed the limits as set out in the Dust Control Regulations above. Monitoring dust stands occurring on site.	South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 Approved dust fall monitoring programme	
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	vi. The applicant site to acknowledge the road reserve requirements for the future Road K181. Part of the future route traverses the applicant site. The proposed basic planning as	Approval obtained from GDRT to continue Mining.	Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		shown in **Gautrans Drawing PRS No.: 88/167/12Bp**, is appended in **Annexure C**. Based on the information extracted from the **"Basic Planning Report of Road K181, between Roads 1683 & K12"**, Report Book No. 1416, the following technical aspects relates to the impact the future provincial road has on the applicant site: • No direct access permitted from the future route. • A line of no access is imposed along the future alignment of the route. • A building line restriction of 95m is imposed along the future centre line of the route and not the normal 16m measured from the road reserve. • No mining activities or any form of construction may take place within the future road reserve of the road. • A future intersection is proposed where the existing alignment of Marievale Road crosses the alignment of the future K-route. This proposed intersection will in future affect the access to the site. When the K-route is constructed, Marievale Road will function as a Class 3 or 4 road and the access to the site will have to be relocated to the west of the current position - at least 250m from the proposed intersection.			

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		vii. Any mining activities to be executed within the future road reserve to be approved by Gautrans. • Access to be provided from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.			
	Possibility of construction activities and workers causing veld fires, which can potentially cause injury and or loss of life to construction workers and surrounding landowners, visitors and workers.	**Prevent and control through management measures.** • All workers will be sensitised to the risk of fire; • Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; • The Applicant shall ensure that the basic fire-fighting equipment is available on the site; and • Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation • An Emergency Plan (including Fire Protection, Response and Evacuation Plan) (E.g. in Appendix 11) is to be prepared by the Applicant and conveyed to all staff on the site; and • Identify major risks to minimise the environmental impacts e.g. air pollution and contaminated effluent runoff.	Mine Health and Safety Act (Act 29 of 1996) An Emergency Plan (including Fire Protection, Response and Evacuation Plan) Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended] - Section 12 (1) Duty of the landowner to prevent fire from spreading to neighbouring properties.	Impact avoided. No incidents of fires occurring on site. No one smoking in unauthorised areas. Proof / records of training in terms of the risk of fire and of the emergency management plan. Basic fire-fighting equipment located in the correct locations on site.	Construction Phase
	Increased risk to public and worker safety: If not fenced off, the public and workers	**Prevent through controlling management measures.**	Mine Health and Safety Plan available on site and	Health and safety plan in terms of the Mine Health	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	may fall into excavated areas and trenches.	• A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • A health and safety control officer should monitor the implementation of the health and safety plan for the operational phase; • Regular health and safety audits should be conducted and documented; and a record of health and safety incidents should be kept on site and made available for inspection; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers. • Access to excavation must be controlled; • Excavated areas should be temporarily fenced-off; and • Excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible.	proof that it is being implemented. Proof of training in awareness of health and safety procedures. Proof / records of health and safety audits available on request. No health and safety incidents reported. Proof / record of stockpile and stacks inspections taking place. Health and safety signs on site at appropriate locations.	and Safety Act (Act 29 of 1996)	
	Positive: Potential creation of short term employment opportunities for the local	• Skills training to be in accordance with the approved Social and Labour Plan;	Meet the requirements of the Social and Labour Plan	Social and Labour Plan	Construction Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	communities, during the construction phase.	• Labourers should initially be sought locally and only regionally if skills are not available; and • The approved Social and Labour Plan should be implemented.			
	Multiplier effects on local economy	• Where possible, supplies to be bought locally.	Meet the requirements of the Social and Labour Plan	Social and Labour Plan	Construction Phase
	Community development social upliftment	• Implement the approved Social and Labour Plan.	Meet the requirements of the Social and Labour Plan	Social and Labour Plan	Construction Phase
OPERATIONAL PHASE MINING CONCURRENT REHABILITATION	**Loss of land capability and land use** Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent, because vegetation will be supported and, therefore, returned to the planned post mining land capability such as arable and or grazing.	• Stockpiles are to be maintained in a fertile, vegetated, and erosion free state • Stockpiles are to be clearly demarcated; • Ensure proper storm water management designs are in place; • Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; • If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; • Unauthorised borrowing of stockpiled soil materials should be prevented • The spoil returned to the opencast should be shaped taking the pre-mining landscape into consideration; • The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; • The yellow and red soils should be replaced in upland landscape positions; • Wetland soils should be put back in the reverse order of stripping;	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Rehabilitation objectives and standards Spill procedure Approved IWWMP Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Wetland soils should be placed in lower landscape positions; • The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; • The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; • Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan.		Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995). - Section 4 Duties of persons who may be exposed to hazardous chemical substances. SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	
	Hydrocarbon Pollution Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.	• Refer to the above mitigation measures	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Rehabilitation objectives and standards Spill procedure Approved IWWMP Hazardous Substances Act, 1973 (Act 15 of	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				1973) [as amended] Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995). - Section 4 Duties of persons who may be exposed to hazardous chemical substances. SANS 10234: 2008: Globally Harmonized	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				System of classification and labelling of chemicals (GHS)	
	Dewatering Groundwater depletion will take place in the areas surrounding the opencast pit.	**Prevent and mitigate through control measures** • No mitigation possible. • Although unlikely to occur, should any local groundwater user's resource be impacted on by operations at the mine the affected party should be provided with an alternative water source at the mine operator's cost. • Groundwater levels should be monitored regularly and should any negative trends in groundwater levels be observed suitable mitigation should be implemented. • Discharge water from the open pit should be disposed of in a safe manner, should the water become contaminated over time it should either be stored in dedicated PCD's for reuse at the plant or treated prior to discharging into the environment.	Monitoring of groundwater levels. Recycling practises implemented.	Monitoring standards Rehabilitation Obectives and Standards	Operational Phase
	Base case Scenario **Poor quality seepage** The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage	• Material at the berms should be capped to avoid oxidation of sulphide bearing minerals and possible seepage into the groundwater environment if they are not to be lined. • The waste rock berms should be maintained, and sufficient storm water management options should be installed	AMD Specific Monitoring Programme and Groundwater Management Plan Approved IWWMP Waste Classification and Management Regulations	AMD Specific Monitoring Programme and Groundwater Management Plan Approved IWWMP	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	(AMD) to the groundwater resource.	to prevent excessive infiltration of runoff to the material.	and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015) Mine Health and Safety Act (Act 29 of 1996) Rehabilitation objectives and standards Spill procedure Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Section 2	Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining,	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
			Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995). - Section 4 Duties of persons who may be exposed to hazardous chemical substances. SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	exploration or production operation (GN R. 632 of 2015) Mine Health and Safety Act (Act 29 of 1996)	
	Scenario 1 **Poor quality seepage** The waste material at the berms may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource.	• Berms should be lined to avoid possible contaminant seepage into the groundwater environment. • The waste rock berms should be maintained, and sufficient storm water management options should be installed to prevent excessive infiltration of runoff to the material.	AMD Specific Monitoring Programme and Groundwater Management Plan Approved IWWMP Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for	AMD Specific Monitoring Programme and Groundwater Management Plan Approved IWWMP Waste Classification and Management Regulations and	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
			disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015) Mine Health and Safety Act (Act 29 of 1996) Rehabilitation objectives and standards Spill procedure Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Section 2 Declaration of grouped hazardous substances; - Section 9 (1)	Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
			Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995). - Section 4 Duties of persons who may be exposed to hazardous chemical substances. SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	Mine Health and Safety Act (Act 29 of 1996)	
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact is caused by compaction of soil, removal of vegetation, surface water redirection during construction activities. Permanent changes to water flows including encroaching onto wetland habitat.	**Control through management measures.** • Limit the footprint of the development activities potentially encroaching onto the wetland areas; • A temporary fence or demarcation should be erected around No-go areas, outside the proposed works area, before commencement and during the operational phase. This should be done to prevent access to the adjacent portions of the watercourse. • Effective stormwater management should be a priority during the operational phase. This should be monitored as part of the EMPr. The	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		stormwater management plan must also be submitted to DWS as part of the Water Use License Application and approved for implementation before commencement of contstruction; • High energy stormwater input into the watercourses should be prevented at all costs. Changes to natural flow of water (surface water as well as soil flowing within the soil profile) should be taken into account during the design phase and mitigated effectively during the operational phase		Act, 1998 (Act No 36 of 1998)	
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Construction activities will result in earthworks, soil disturbance and natural vegetation removal. This could result in loss of topsoil, sedimentation of the watercourse and increase the turbidity of the water.	• Consider various methods and equipment available and select the method of mitigation that will have the least impact on the water courses; • Water may seep into trenching and earthworks. It is likely that water will be contaminated within these earthworks and should be cleaned or dissipated into a structure that allows for additional sediment input and slows down the velocity of the water, reducing the risk of erosion. Effective sediment traps should be installed. • Retain vegetation and soil in position as long as possible, removing it immediately ahead of mining a certain portion, (DWAF, 2005); • Remove only vegetation where essential for operational activities and any disturbance to the adjoining vegetation should not be allowed;	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Cordon off areas that are under rehabilitation and indicate as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access; • Measures must be put in place to control flow of excess water to prevent impacting on vegetation; • Protect all areas susceptible to erosion and ensure there is no undue soil erosion resulting from activities within and adjacent to the offices and work areas. • Runoff from the operational area must be managed to avoid erosion and pollution; • Implementation of best management practises; • Source directed controls; • Buffer zones to trap sediments; • Monitoring of sedimentation to address timeously.			
	Introduction and spread of alien invasive species The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien	**Reduce through management measures.** • Weed control should be implemented; • Retain vegetation and soil in position for s long as possible, only removing it immediately ahead of mining in a particular area and replacing it where possible afterwards; • Monitor the establishment of alien vegetation within areas affected by	Rehabilitation Objectives and Standards Alien and invasive vegetation management plan implemented and outcomes achieved.	Alien and Invasive Species Management Plan Rehabilitation Objectives and Standards Alien and Invasive Species Regulations	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	construction and maintenance and take immediate corrective action where invasive species are observed to establish; • Rehabilitate or revegetated disturbed areas; • Only vegetation falling directly in demarcated access routes or project sites should be removed; • No further vegetation clearance except for the removal of alien invasive species will be allowed; and • All remaining indigenous vegetation should be conserved wherever possible.	Proof of alien vegetation control. No listed species visible on the site.	(Government Notice 598 of 2014) and Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014) - Notice 2 Exempted Alien Species in terms of Section 66 (1) - Notice 3 National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-9 & 11 - Notice 4 Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-7, 9-10 & 12	
	Loss and disturbance of water course habitat and fringe vegetation impact. Direct development within water course areas will cause loss and disturbance of water course habitat and fringe vegetation, due to	**Prevent and reduce through management measures** • Where construction occurs in the demarcated watercourse and buffer, extra precautions should be implemented to minimise watercourse loss; • Other than approved and authorised structures, no other development or	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	direct development in the water course, as well as changes in management, fire regime and habitat fragmentation.	maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones; • Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas; • Weed control in the buffer zone; • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed; • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish; • Operational activities should not take place within watercourses or buffer zones, nor should ege effects impacts on these areas; • Operational activities should not impact on rehabilitated or naturally vegetated areas.		Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	
	Changes in water quality due to pollution Operational activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a	**Prevent and control through management measures.** • Provision of adequate sanitation facilities located outside of the watercourse or its associated buffer zone; • Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent	Impact avoided. No signs of contamination. Meet rehabilitation objectives and standards.	Rehabilitation objectives and standards Spill procedure Approved IWWMP	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	reduction in water course function, as well as human and animal waste.	contaminated runoff into the watercourse; • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone; • The development footprint must be fenced off from the watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc.; • After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that prior to use; • Maintenance of construction vehicles / equipment should not take place within the watercourse or watercourse buffer; • Control of waste discharges; • Maintenance of buffer zones to trap sediments with associated toxins; • Ensure that no operational activities impact on the watercourse or buffer area. This includes edge effects; • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse; • Regular independent water quality monitoring should form part of operational procedures in order to identify pollution;		Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) - Section 4 Duties of persons who may be exposed to hazardous chemical substances	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Treatment of pollution identified should be prioritized accordingly.		SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)	
	Alteration of archaeological, historical and palaeontological resources that may be discovered during mining.	• Should culturally significant material or skeletal remains be exposed during development and construction phases, all activities must be suspended pending further investigation by a qualified archaeologist (Refer to the National Heritage and Resources Act, 25 of 1999 section 36 (6)); • Should any objects of archaeological or palaeontological remains be found during construction activities, work must immediately stop in that area and the Environmental Control Officer (ECO) must be informed; • The ECO must inform SAHRA and contact an archaeologist and / or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work may be resumed in this area without the permission of the ECO and SAHRA; and • If the newly discovered heritage resource is considered significant, a Phase 2 assessment may be required. A	No loss of newly discovered material.	National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations. South African Heritage Resources Agency Guidelines.	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		permit from the responsible authority will be required.			
	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the stripped open cast area.	**Reduce through controlling measures.** • The structures need to be constructed in such a way that they are stable; • Rehabilitation should be implemented immediately upon completion of construction; • Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way; and • Rehabilitation of disturbed areas and re-establishment of vegetation as soon and as far as possible to be implemented.	Rehabilitaton objectives and standards	Rehabilitaton objectives and standards	Operational Phase
	Visibility of solid domestic and operational waste.	• The conditions of the Integrated Water Use License (IWUL) and the IWWMP must be implemented. • A central waste storage and transition area shall be established within the site camp; • The central waste storage and transition area shall be surfaced and demarcated appropriately; • Portable wheelie bins shall be placed throughout the site camp as well as at the remainder of the site and at all working areas in the field; • Wheelie bins shall be colour coded and labelled to identify the waste stream for which it is intended; • All portable wheelie bins and other containers shall be emptied at the central waste storage and transition area	Approved IWWMP Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a	Approved IWWMP Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		a minimum of once a week as to avoid waste build up; • The waste shall be removed (within 30 days) by a licensed waste service provider as shall be disposed of at a licensed waste landfill site and records of safe disposal (as required for hazardous wastes) shall be supplied to the Contractor. These records shall be kept on site by the ESM. • Wherever possible and practical, waste materials generated on site must be recycled; and • Waste specific (hazardous, timber, steel etc.) mitigation measures to be developed and included in the EMPR.	prospecting, mining, exploration or production operation (GN R. 632 of 2015) Mine Health and Safety Act (Act 29 of 1996) Rehabilitation objectives and standards Spill procedure Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] Section 2 Declaration of grouped hazardous substances; - Section 9 (1) Storage and handling of hazardous chemical substances - Section 18 Offences Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995). - Section 4 Duties of persons who may be exposed to hazardous chemical substances.	Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] and: Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015) Mine Health and Safety Act (Act 29 of 1996)	

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
			SANS 10234: 2008: Globally Harmonized System of classification and labelling of chemicals (GHS)		
	Removal of overburden, through blasting and equipment causes dust pollution, which in turn impacts on visibility on nearby roads and the aesthetic quality of the area.	**Reduce and control through management measures.** • Dust suppression shall be implemented during dry periods and windy conditions; • Minimise travel speed on paved roads; • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site; and • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed; • Ensure the access roads are all well maintained in terms of surface and especially dust suppression. • Ensure that shortest routes are used for material transport. • Ensure crushers are properly enclosed and/or fitted with water sprays to reduce dust generation. • Ensure that stockpile height is kept to a minimum and that any stockpiling occurs downwind of the stockpiles. • Ensure that areas where bulk earthmoving will occur is properly wetted in advance.	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site. South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 Dust fall monitoring programme should be implemented.	Reduce through controlling measures Set Speed Limits South African Road Signs Manual South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Spray unpaved roads with water/dust binding materials and limit travel speed to a minimum. • Minimise travel speed on paved roads. • Ensure that products and material handling occur as far as possible downwind of stockpiles. • Implement and actively monitor dust fallout generated in the 8 major wind directions on the borders of the site. • Implement monthly site inspection to check for possible areas of dust generation not addressed or not effectively managed.	Dust fallout and Particulate Matter (PM) levels may not exceed the limits as set out in the Dust Control Regulations above. Monitoring dust stands occurring on site.	Environmental Management: Air Quality Act 39 of 2004 Approved dust fall monitoring programme	
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, will cause a direct visual impact and also indirectly through the creation of dust.	• Refer to measures above	Refer to standards above	Refer to standards above	Operational Phase
	Potential increase in traffic and existing traffic to and from the site may cause a negative impact directly, and indirectly through creation of dust.	**Reduce and control through management measures.** • Refer to mitigation measures above.	Refer to standards above	Refer to standards above	Operational Phase
	Added impact of security lighting on surrounding landowners and nocturnal animals and the sense of place of the area.	**Reduce through controlling measures.** • Unnecessary lights should be switched off during the day and / or night to avoid light pollution; • If lighting is required, the lighting will be located in such a place and such a	Lights installed according to the design report.	Design Report	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		manner so as to minimise any impact on the surrounding community; • Install lights that will not create a night sky glow; and • Security lighting should be designed in such a way as to minimise emissions onto undisturbed areas on site and neighbouring properties. Light fittings should face downwards.			
	Should there not be enough backfill material to backfill open cast pits, a permanent void may be left after mining, which will scar the landscape permanently.	• As much as possible of the overburden and waste rock must be kept for rehabilitaton.	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Operational Phase
	Disturbance due to vibrations caused by vehicles.	**Reduce and control through management measures.** • Where feasible, heavy vehicles should not operate on public roads during peak hours; and • Heavy vehicles should adhere to the speed limit of the road.	Impact reduced. Records of service of all operational vehicles.	Meet the requirements of the Mine Health and Safety Act (Act 29 of 1996)	Operational Phase
	Blasting will cause noise pollution	• Surrounding communities should be warned in advance through site notices and in the local media of any blasting that will occur. • Blasting may not occur within 100 m of any residential area.	Impact reduced. Records of service of all operational vehicles. Silencers utilised where applicable. All employees wears PPE where required.	Meet the South African National Standard SANS 10103:2008 Meet South African Bureau of Standards (SABS) specifications for maximum allowable noise	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
				levels for construction sites. Meet the requirements of the Mine Health and Safety Act (Act 29 of 1996)	
	Blasting may cause ground vibration at the nearby houses and other buildings.	• Blasting may not occur within 100 m of any residential area; • All houses / buildings that may be affected, should be surveyed prior to blasting to establish baseline information regarding the structures.	Impact reduced. Records of service of all operational vehicles. Silencers utilised where applicable. All employees wears PPE where required.	Meet the South African National Standard SANS 10103:2008 Meet South African Bureau of Standards (SABS) specifications for maximum allowable noise levels for construction sites. Meet the requirements of the Mine Health and Safety Act (Act 29 of 1996)	Operational Phase
	Creation of dust through removal of overburden and ore may cause a decline in ambient air quality.	**Reduce through management measures.** • Refer to dust management measures.	Refer to standards for air quality	Refer to standards for air quality.	Operational Phase
	Creation of dust through blasting, may cause a decline in ambient air quality.	**Reduce through management measures.** • Refer to dust management measures.	Refer to standards for air quality	Refer to standards for air quality.	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Loading and hauling of overburden and ROM ore, and stockpiling of overburden and ROM ore, may cause a decline in ambient air quality.	**Reduce through management measures** Refer to the mitigation measures above.	Refer to standards for air quality	Refer to standards for air quality.	Operational Phase
	Potential increase in traffic and existing traffic to and from the site will create dust, which may cause a decline in ambient air quality.	Refer to dust management measures	Refer to standards for air quality	Refer to standards for air quality.	Operational Phase
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	The air quality impact assessment and the Air Pollution Prevention Plan to be completed and approved by the relevant competent authorities and implemented.	Impact reduced. Adherence to APPP	Air Pollution Prevention Plan National Environmental Management: Air Quality Act 39 of 2004 and associated regulations.	Operational Phase
	Generation and disposal of additional general waste, litter and hazardous material during the operational phase and operational waste i.e. waste rock.	Refer to waste management measures above.	Refer to standards for waste management	Refer to standards for waste management.	Operational Phase
	Need for services e.g. water, electricity and sewerage systems, causing additional strain on natural resources and service infrastructure.	**Reduce and control through management measures.** • Energy savings measures to be implemented at the mine, e.g.: ➢ No lights to be switched on unnecessarily. Only security lights to be switched on at night;	Impact avoided. Recycling of used and contaminated water through waste water and sewage treatment and reuse.	-	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Energy saving bulbs to be installed; and • Water should be recycled as far as possible to avoid any additional water usage.			
	The change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	**Prevent through management measures.** • Drivers will be enforced to keep to set speed limits. • Trucks will be in a road-worthy condition. • Roads and intersections will be signposted clearly. Only main roads should be used; • Where feasible vehicles should not operate on public roads during peak hours; • Vehicles should adhere to the speed limit of the road; • Heavy vehicles should always travel with their head lights switched on; • Heavy vehicles should not stop on the road to pick up hitchhikers – No stopping on the road approaching the mine will be allowed; • Single directional traffic shall be controlled through a stop-go system or any other appropriate traffic control method; • Brikor shall be responsible for ensuring that suitable access is maintained for public traffic to all relevant businesses and properties; and All traffic accommodation measures are to conform to the latest edition of the South African Road Signs Manual.	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site.	Reduce through controlling measures Set Speed Limits South African Road Signs Manual	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	**Prevent through management measures.** Refer to mitigation measures above.	Impact reduced. Speed limit roads signs, complying with the South African Road Signs Manual on site. South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution Meet the requirements of the National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 Dust fall monitoring programme should be implemented. Dust fallout and Particulate Matter (PM) levels may not exceed the limits as set out in the Dust Control Regulations above.	Reduce through controlling measures Set Speed Limits South African Road Signs Manual South Africa National Standard 1929:2005: Ambient Air Quality: Limits for common pollution National Dust Control regulations, 2013, as published in the Government Gazette (No. 36974) of 1 November 2013 (GNR 827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
			Monitoring dust stands occurring on site.	Approved dust fall monitoring programme	
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	viii. The applicant site to acknowledge the road reserve requirements for the future Road K181. Part of the future route traverses the applicant site. The proposed basic planning as shown in **Gautrans Drawing PRS No.: 88/167/12Bp**, is appended in **Annexure C**. Based on the information extracted from the **"Basic Planning Report of Road K181, between Roads 1683 & K12"**, Report Book No. 1416, the following technical aspects relates to the impact the future provincial road has on the applicant site: • No direct access permitted from the future route. • A line of no access is imposed along the future alignment of the route. • A building line restriction of 95m is imposed along the future centre line of the route and not the normal 16m measured from the road reserve. • No mining activities or any form of construction may take place within the future road reserve of the road.	Approval obtained from GDRT to continue Mining.	Gauteng Transport Infrastructure Act, 2001 (Act No. 8 of 2001) [as amended];	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• A future intersection is proposed where the existing alignment of Marievale Road crosses the alignment of the future K-route. This proposed intersection will in future affect the access to the site. When the K-route is constructed, Marievale Road will function as a Class 3 or 4 road and the access to the site will have to be relocated to the west of the current position - at least 250m from the proposed intersection. ix. Any mining activities to be executed within the future road reserve to be approved by Gautrans. • Access to be provided from Marievale Road, via the existing access road serving the Vlakfontein Coal Mine.			
	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	**Prevent and control through management measures.** • All workers will be sensitised to the risk of fire; • Smoking is only allowed in designated smoking areas and disposal of cigarette butts safely in sand buckets; • The Applicant shall ensure that the basic fire-fighting equipment is available on the site; and • Extinguishers should be located outside hazardous materials and chemicals storage containers; Fire response and evacuation	Mine Health and Safety Act (Act 29 of 1996) An Emergency Plan (including Fire Protection, Response and Evacuation Plan) Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended] - Section 12 (1) Duty of the landowner to prevent fire from spreading to neighbouring properties.	Impact avoided. No incidents of fires occurring on site. No one smoking in unauthorised areas. Proof / records of training in terms of the risk of fire and of the emergency management plan.	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• An Emergency Plan (including Fire Protection, Response and Evacuation Plan) (Example in Appendix 11) is to be prepared by the Applicant and conveyed to all staff on the site; and • Identify major risks to minimise the environmental impacts e.g. air pollution and contaminated effluent runoff.		Basic fire-fighting equipment located in the correct locations on site.	
	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	**Prevent through controlling management measures.** • A health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996) should be drawn up and implemented to ensure worker safety; • A health and safety control officer should monitor the implementation of the health and safety plan for the operational phase; • Regular health and safety audits should be conducted and documented; and a record of health and safety incidents should be kept on site and made available for inspection; • Any health and safety incidents should be reported to the Site Manager (SM) immediately; • First aid facilities should be available on site at all times; • Workers have the right to refuse work in unsafe conditions; • Material stockpiles or stacks should be stable and well secured to avoid collapse and possible injury to site workers.	Mine Health and Safety Plan available on site and proof that it is being implemented. Proof of training in awareness of health and safety procedures. Proof / records of health and safety audits available on request. No health and safety incidents reported. Proof / record of stockpile and stacks inspections taking place. Health and safety signs on site at appropriate locations.	Health and safety plan in terms of the Mine Health and Safety Act (Act 29 of 1996)	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
		• Access to excavation must be controlled; • Excavated areas should be temporarily fenced-off; and • Excavations, such as pipeline excavations, will be backfilled and landscaped as soon as possible.			
	Economic impact should there be an incident of public health and safety.	Refer to mitigation measures above	Refer to standards above	Refer to standards above	Operational Phase
	Positive: Extended employment provision allowing mining activities to continue for additional years.	• Social and Labour Plan to be approved by DMR and implemented.	Social and Labour Plan objectives	Social and Labour Plan objectives	Operational Phase
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	• Social and Labour Plan to be approved by DMR and implemented.	Social and Labour Plan objectives	Social and Labour Plan objectives	Operational Phase
	Social upliftment through: Infrastructure development, poverty eradication and community upliftment in the communities surrounding the operation. Upliftment projects include provision of nutritional information to guide healthy eating habits and also provision of healthy food and liquids to employees.	• Social and Labour Plan to be approved by DMR and implemented.	Social and Labour Plan objectives	Social and Labour Plan objectives	Operational Phase

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Employees are also provided with living wages in order to afford reasonable housing and receive discounts on bricks from the Brikor group in assisting to build there homes.				
Closure and Post-Closure Phase - Decommissioning and Rehabilitation	**Loss of topsoil as a resource**	Refer to mitigation measures during the operational phase	Refer to standards in operational phase	Refer to standards in operational phase	Closure and Post-Closure Phases
	Loss of land capability and land use	Refer to mitigation measures during the operational phase	Refer to standards in operational phase	Refer to standards in operational phase	Closure and Post-Closure Phases
	Hydrocarbon Pollution	• Refer to mitigation measures during the operational phase	Refer to standards in operational phase	Refer to standards in operational phase	Closure and Post-Closure Phases
	Restoration or improvement of land capability prior to mining.	• Positive impact	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Closure and Post-Closure Phases
	Groundwater Rebound Following cessation of mining operations, the groundwater levels at the site will rebound to their original level. Decant is unlikely.	• In order to avoid decant the pit should be concurrently backfilled and rehabilitated in a manner where the pit materials mimic the natural groundwater environment as far as possible.	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Closure and Post-Closure Phases
	Poor quality seepage The waste material at the berm areas may undergo oxidation over time, resulting in poor quality seepage to the groundwater resource. However, the footprint of these berms is small, and no	• The berm areas should be cleared and suitably vegetated to prevent any oxidation and poor-quality seepage from occurring. The pit should be concurrently backfilled and rehabilitated.	Rehabilitation objectives and standards	Rehabilitation objectives and standards	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	contaminants of concern have been identified. The pit area could also potentially undergo oxidation and result in poor quality seepage.				
	Changes in water flow regimes Changing the quantity and fluctuation properties of the floodplain and valley bottom wetlands by restricting water flow or increasing flood flows. This impact may be caused by incorrect rehabilitation.	• See mitigation measures in operational phase section	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	Closure and Post-Closure Phases
	Changes in sediment exiting and entering the system Changing the amount of sediment entering the water resource, and associated change in turbidity. Decommissioning and rehabilitation activities will result in earthworks and soil disturbance. This could result in loss of topsoil, sedimentation of the	• See mitigation measures in operational phase section	Impact reduced. Meet rehabilitation objectives and standards	Rehabilitation objectives and standards Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	watercourse and increase the turbidity of the water, if done incorrectly.			National Water Act, 1998 (Act No 36 of 1998)	
	Introduction and spread of alien invasive species The moving of soil and vegetation during the decommissioning and closure phases, if rehabilitation is done incorrectly, may result in opportunistic invasions after disturbance and the introduction of seed in building materials and on vehicles. Invasion of alien plants can impact on the hydrology, by reducing the quantity of water entering a watercourse, and outcompete natural vegetation, decreasing the natural biodiversity. Once in a system, alient plants can spread throughout the catchment. If allowed to seed before control measures are implemented, alient plants can easily colonise and impact on downstream users.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Changes in water quality due to pollution	• See mitigation measures in operational phase section	Impact reduced.	Rehabilitation objectives and standards	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Decommissioning and rehabilitation activities may cause the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles and the disposal of sewage resulting in the loss of sensitive biota in the wetlands/ rivers and a reduction in water course function, as well as human and animal waste.		Meet rehabilitation objectives and standards	Approved IWWMP Approved Storm Water Management Plan GN704 Regulations in terms of the National Water Act, 1998 (Act No 36 of 1998)	
	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Visibility of solid domestic and decommissioning waste.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy duty vehicles and equipment.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Disturbance due to vibrations caused by heavy duty vehicles.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Impact of security lighting on surrounding landowners and animals.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Increased dust pollution due to vegetation clearance and heavy duty vehicles and decommissioning and rehabilitation activities.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Gaseous emmissions from construction vehicles and machinery may cause an impact on ambient air quality.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Fugitive greenhouse gases may potentially be released during coal mining. Constituents of concern include carbon dioxide (CO^2) and methane (CH^4).	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Need for additional services i.e. water, electricity and sewerage systems during the closure phase causing additional strain on natural resources and infrastructure.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	The change in the traffic patterns as a result of traffic entering and exiting the proposed mine on the surrounding road infrastructure and existing traffic.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Impact on future planned Road K181: Part of the future route traverses the applicant site.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Increased risk to public and worker health and safety.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Economic impact should there be an incident of public health and safety.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases

Activity Including Size/ scale	Aspects and potential impacts	Mitigation type and Measures	Standards to be achieved	Compliance with standards	Phase and / or time period for implementation
	Positive: Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases
	Negative: Loss of jobs, household income, decline in local economy. The concentration of economic activity centred around the mine often increases the community's dependenc on the mining operation, making it vulnerable to downscaling or closure.	• See mitigation measures in operational phase section	See standards above during operational phase	See standards above during operational phase	Closure and Post-Closure Phases

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ( );

ACTIVITY whether listed or not listed. **(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.).**	**POTENTIAL IMPACT** **(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)**	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated **(e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)**	**MITIGATION TYPE** **(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)** **E.g.** • **Modify through alternative method.** • **Control through noise control** • **Control through management and monitoring** • **Remedy through rehabilitation..**	**STANDARD TO BE ACHIEVED** **(Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives) etc.**

Please refer to Table 24 for the above requested information.

f) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY whether listed or not listed. **(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.).**	**POTENTIAL IMPACT** **(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)**	**MITIGATION TYPE** **(modify, remedy, control, or stop) through** **(e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)** **E.g.** • **Modify through alternative method.** • **Control through noise control** • **Control through management and monitoring** **Remedy through rehabilitation**	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:- Upon cessation of the individual activity or Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)

Please refer to Table 24 for the above requested information.

i) Financial Provision

(1) Determination of the amount of Financial Provision.

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

Detailed closure objectives will be provided in the GNR 1147 required Annual Rehabilitation Plan and Final Rehabilitation and Decommissioning Plan.

- Creating a free draining post mining landscape that has been returned to a productive and safe post-mining land use;
- Creating a landscape that will prevent erosion in the long term;
- Creating a landscape that will reconnect fragmented habitats and increase biodiversity on the properties by rehabilitating and improve disturbed wetland and riparian areas;
- All the closure objectives identified by the specialists in the specialist reports, need to be included in the rehabilitation and closure plan;
- The closure objective regarding surface and groundwater is zero discharge of contaminated water to the environment and long term monitoring of water quality that may be impacted on by waste activities; and
- Creating post-mining employment opportunities for mine workers.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

Interested and Affected Parties will be provided with the opportunity to review this EIA/EMPr and to provide comments, to which the EAP will respond. Information on the following will be provided:

- The project description (site layout, alternatives investigated) and a description of the baseline environment;
- Findings from the specialist studies undertaken;

- Potential biophysical and socio-economic impacts during construction, operations, closure and phases of the project;
- Mitigation measures to prevent, minimise and manage environmental impacts;
- The closure objectives and financial provision; and
- Details on how stakeholders can comment on the EIA/EMPr.

(c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

The mine plans to commence with the review and assessment to comply with the financial regulations in terms of NEMA, and will be submitted to the DMR before the deadline.

The requirements for a final rehabilitation, decommissioning and mine closure plan, are outlined in Appendix 4 of the Regulations (GNR 1147) are to identify a post mining land use that is feasible through the following:

The requirements for a final rehabilitation, decommissioning and mine closure plan, are outlined in Appendix 4 of the Regulations (GNR 1147) are to identify a post mining land use that is feasible through the following:

(a) Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning and closure of the project;
(b) Outlining the design principles for closure;
(c) Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation;
(d) Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure;
(e) Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure;
(f) Identifying knowledge gaps and how these will be addressed and filled;

(g) Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
(h) Outlining, monitoring, auditing and reporting requirements.

(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation plan will assist the applicant to meet closure objectives, which will also be applicable to the existing and proposed waste management activities and facilities. These include:

Management objectives

- Creating a free draining post mining landscape that has been returned to a productive and safe post-mining land use;
- Creating a landscape that will prevent erosion in the long term;
- Creating a landscape that will reconnect fragmented habitats and increase biodiversity on the properties by rehabilitating and improve disturbed wetland and riparian areas;
- The closure objective regarding surface and groundwater is zero discharge of contaminated water to the environment and long term monitoring of water quality that may be impacted on by waste activities; and
- Creating post-mining employment opportunities for mine workers.

(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

Quantum of the financial provision for Grootfontein Mine

Brikor Limited has appointed Environmental Assurance (Pty) Ltd (ENVASS) to undertake the closure cost assessment for the Mine. This closure cost assessment has been completed in accordance with the requirements of the MPRDA, with particular reference to regulations 53 and 54 during the transitional period leading to the compliance date of the NEMA, Government Gazette 39425 (Notice Number GNR

1147) in February 2019. The transitional period has been extended to 39 months of the commencement of the Regulations (Government Gazette 40371 (Notice Number GNR 1314)). This assessment partially also responds to the requirements of NEMA GNR 1147.

The mine classification is summarised below in Table 25. The Mine Classification has been done in accordance with the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine.

Table 25: Mine Classification

Mine	Risk Class	Sensitivity	Terrain	Proximity to Urban Areas
Brikor	A	Medium	Flat	Urban

The Units Rates utilised for the assessment is presented in Table 26. The unit rates for each closure component is been in increased with CPI from 2005 to 2017. The 2017 CPI has been calculated at 5.5 based on the average change in CPI over the period from January 2017 to September 2017.

Table 26: DMR unit Rates – 2017

NO	Description	Unit	DME rates December 2017 CPI 5.5%
1,0	Dismantling of processing plant and related structures (including overland conveyors and power lines)	m^3	R 14,50
2(a)	Demolition of steel buildings and structures	m^2	R 201,93
2(b)	Demolition of reinforced concrete buildings and structures	m^2	R 297,58
3,0	Rehabilitation of access roads	m^2	R 36,14
4(a)	Demolition and rehabilitation of electrified railway lines	m	R 350,72
4(b)	Demolition and rehabilitation of non-electrified railway lines	m	R 191,30
5,0	Demolition of housing and facilities	m^2	R 403,86

NO	Description	Unit	DME rates December 2017 CPI 5.5%
6,0	Opencast rehabilitation including final voids and ramps	ha	R 205 544,80
7,0	Sealing of shafts, adits and inclines	m^3	R 108,41
8a	Rehabilitation of overburden and spoils	ha	R 141 139,34
8b	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	R 175 786,50
8c	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	R 510 567,32
9,0	Rehabilitation of subsided areas	ha	R 118 182,94
10,0	General surface rehabilitation	ha	R 111 806,17
11,0	River diversions	ha	R 111 806,17
12,0	Fencing	m	R 127,54
13,0	Water management	ha	R 42 511,85
14,0	2 to 3 years of maintenance and aftercare	ha	R 14 879,15

The quantum costs was calculated by Environmental Assurance (Pty) Ltd as presented in Table 27. The updated units rates was utilised for the assessment. The closure items are based on the mine works plan. Phase 1 will be a total area of 12.74ha and will consist out of 4 box cuts. Concurrent rehabilitation will be employed and the topsoil, subsoil and Waste rock dump will be approximately 2ha.

Table 27: Closure Cost Assessment

CALCULATION OF THE QUANTAM							
	Brickor - Closure Costs Assessment		Brickor - GROOTFONTEIN				
	Environmental Assurance	Date:	13-Nov-17				
			A	B	C	D	E=A*B*C*D
	Description:	Unit:	Quantity	Master rate	Factor 1	Factor 2	Amount (Rands)
	Class A (Low Risk)						
Component			Step 4.5	Step 4.3	Step 4.3	Step 4.4	
6	Opencast rehabilitation including final voids & ramps	ha	12,74	R 205 544,80	1,00	1,00	R 2 618 641
8(A)	Rehabilitation of overburden & spoils	ha	2,00	R 141 139,34	1,00	1,00	R 282 279

14	2 to 3 years of maintenance & aftercare	ha	12,74	R 14 879,15	1,00	1,00	R 189 560
Sub Total 1							
(Sum of items 1 to 15 Above)							**R 3 090 480**
	Weighing factor 2 (step 4.4)			1		**Sub Total 1**	**R 3 090 480**
	Preliminary and General			12% of Sub Total 1			R 370 857,57
	Contingency			10% of Sub Total 1			R 309 047,97
Sub Total 2							**R 3 770 385**
	VAT (14%)						**R 527 853,94**
GRAND TOTAL							**R 4 298 239,23**

(f) Confirm that the financial provision will be provided as determined.

It is confirmed that the financial provision for rehabilitation and closure requirements, is reviewed annually for sufficiency and will be amended to include requirements for new activities. During the annual review, confirmation will be provided that this amount can be provided for from operating expenditure.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) **Monitoring of Impact Management Actions**
h) **Monitoring and reporting frequency**
i) **Responsible persons**
j) **Time period for implementing impact management actions**
k) **Mechanism for monitoring compliance**

Table 28: Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
CONSTRUCTION PHASE				

Site preparation: Clearing of vegetation and topsoil	Groundwater pollution and abstraction.	Monitoring Boreholes at the to be monitored:
		
		Water quality parameters to be monitored should include, but not be limited to the following:
		
		Full Analysis
		
		• Physical Parameters:
		  o Groundwater Levels
		• Chemical Parameters:
		  o Field Measurements: pH; EC; Temperature
			Environmental Specialist	QUATERLY (QUALITY)
				
				MONTHLY (GROUNDWATER LEVELS)

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		○ Laboratory Analyses: Anions and Cations (Ca, Mg, Na, K, NO_3, NH_4, Cl, SO_4, F, Fe, Mn, Al, and Alkalinity); other parameters (pH, EC, TDS). An ICP metal scan should also be included. **Abbreviated Analysis** • Physical Parameters: ○ Groundwater Levels • Chemical Parameters: ○ Field Parameters: pH, EC, TDS ○ Laboratory Analyses: Major Anions and Cations (Ca, Mg, Na, K, Fe, Mn, Cl, NO_3, SO_4) and EC. Laboratory analysis techniques will comply with SABS guidelines. The groundwater monitoring database will be updated on a monthly basis as information becomes available. The database should be used to analyse the information and evaluate trends noted.		

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
	Surface water pollution	The current water quality monitoring plan must be maintained. (Please refer to the water monitoring report attached as Appendix 9. Water Sampling Techniques The following water sampling techniques is recommended: • Guidance on the preservation and handling of water samples SANS 5667-3:2006/ISO 5667-3:2003 (SABS ISO 5667-3) • Guidance on sampling from lakes, natural and man-made SANS 5667-4:1987/ISO 5667-4:1987 (SABS ISO 5667-4) • Guidance on sampling of drinking water from treatment works and piped distribution systems SANS 5667-5:2006/ISO 5667-5:2006 (SABS ISO 5667-5) • Guidance on sampling of rivers and streams SANS 5667-6:2006/ISO 5667-6:2005 (SABS ISO 5667-6) • Guidance on sampling of waste waters SANS 5667-10:2007/ISO 5667-10:1992 • Guidance on sampling of groundwater SANS 5667-11:1993/ISO 5667-11:1993	Environmental Specialist	MONTHLY

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		(SABS ISO 5667-11) • Guidance on sampling of sludges from sewage and water treatment works SANS 5667-13:2007/ISO 5667-13:1997 • Guidance on quality assurance of environmental water sampling and handling SANS 5667-14:2007/ISO 5667-14:1998		
	Dust and air quality pollution	Dust shall be controlled in accordance with the requirements of the National Dust Control Regulations (GN 827, November 2013). This shall include compliance with regards to: A: Dust fall out standards- (b) 1200 mg/m^2/day averaged over 30 days in areas other than residential and light commercial areas measured using reference method ASTM 01739. • A Gravimetric Dust Monitoring program must be implemented on the site as stipulated in section 4 of GN 827 – National Dust Control Regulations, in terms of section 53(o), read with section 32 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). • A minimum of eight dust buckets must be erected	Environmental Specialist	MONTHLY

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		around the site in the eight main wind directions. Monthly air quality report will be required as per the regulations to: • Ensure that the environmental mitigation and control measures are implemented; • Monitor environmental performance of the mining operations; • Tracking of progress due to pollution control measure implementation; • Verify compliance with all relevant legal and statutory requirements; • Promote environmental education and protection; and • Determine sources of significant pollution.		
	Spreading of alien invasive vegetation and impacts on habitat and vegetation.	Specialist monitoring on Faunal and Floral aspects include the monitoring of effects operational processes have on vegetation and accompanied animal life within the immediate or surrounding areas of the operations. • Alien vegetation control and management; • Habitat and vegetation management; • Rehabilitation services include the rehabilitation of operational	Environmental Specialist	Visual inspections during all phases of the activities.

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		disturbed areas and hydrocarbon spill areas; • Sloping and re-vegetation of disturbed area to surrounding landscape; and • Remediation of soil at spill sites.		
OPERATIONAL PHASE				
	Monitoring during the operational phase will be the same as during the construction phase.			
CLOSURE AND POST-CLOSURE PHASE				
	Monitoring during the closure and post-closure phase will be the same as during the operational phase.			

l) Indicate the frequency of the submission of the performance assessment report.

A Performance Assessment Review of the EMPR should be conducted bi-ennially and the environmental audit report will be submitted bi-ennially.

m) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Brikor Limited should delevop an Environmental Awareness Plan including the following:

The Environmental Site Manager, must ensure that all-contractor/s and employees are familiar with the EMPr requirements and have a basic level of environmental awareness training. All contractors/staff have to indicate that they understand the EMPr and that they will undertake to comply with the conditions therein. All new staff members shall undergo induction that includes environmental awareness programs prior to commencement of work on site. Topics to be covered by the training should include inter alia:

- What is meant by “environment”;
- Why the environment needs to be protected and conserved;
- Energy conservation;
- Water conservation;
- Recycling, reuse and reduce;
- Prevention of pollution;
- Worker conduct on site which encompasses a general regard for the social and ecological wellbeing of the site and adjacent areas;
- Occupational health and Safety issues.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

The procedure for dealing with environmental risk including the objectives, identification and calculation of environmental risks is described in the existing approved EMPR. An Environmental Risk Report in accordance with the financial provision regulations in GNR 1147 in terms of NEMA, will be submitted to DMR before the published deadline.

n) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually)

The financial provision for the proposed Grootfontein Mine, will be reviewed annually. No specific information has been required by the Competent Authority at this point in time.

2) UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☒

b) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

REFERENCES

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