ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR THE COZA IRON ORE PROJECT ON FARMS DRIEHOEKSPAN AND THAAKWANENG 675

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EXECUTIVE SUMMARY

GENERAL INTRODUCTION

COZA Mining (Pty) Ltd is proposing to develop the COZA Iron Ore Project located approximately 10 km north-northwest of Postmasburg Town in the Tsantsabane Local Municipality of the Northern Cape Province. Refer to Figure 0-1 for the regional setting. The proposed development is a green-fields project that will involve the mining of iron ore from an open pit on the farm Driehoekspan 435 (Remaining Extent) (Driehoekspan). Refer to Figure 0-2 for the local setting. At this stage no infrastructure is planned on the farm Thaakwaneng 675, although it has been included in the mining right application. It should be noted that Coza lodged applications in 2013 for open pit mining on the farm Doornpan 445 (Portion 1) (Doornpan). Refer to Figure 0-2 for the location of this farm, which is currently being handled in a separate application process.

In general terms, the open pit mining will be undertaken by means of truck and shovel. Mined ore will be crushed, screened and blended on site prior to being transported via rail for further processing off site.

Synergistics Environmental Services (Pty) Lt (Synergistics), an independent firm of environmental assessment practitioners, has been appointed to undertake the Scoping and Environmental Impact Assessment (EIA) process required for the COZA Iron Ore Project.

PROJECT MOTIVATION

The proposed project will result in positive socio-economic impacts (Refer to Appendix F for the detailed assessment). In this regard, the proposed development of the mine supports the national SA economy at a macro level by generating exports that will leverage foreign income to the country. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees. This is in line with the municipal Spatial Development Frameworks and Integrated Development Plans for the area which identify the promotion of mining job creation as one of the strategies to guide spatial development within the broader area given that mining forms the backbone of employment and is the main source of income within the local municipality. Further to this, through employment, persons at the proposed mine will gain skills in the construction and operation of a mine and development which contributes to the building of the nation. Management measures that will be implemented to further enhance positive socio-economic impacts include the employment of people in local communities (as far as possible), formal bursary and skills development provided to people in the closest communities and the implementation of a procurement mentorship programme which provides support to local businesses. Further to this, the proposed development will also ensure local economic development through the implementation of projects identified in the social and labour plan (SLP). The projects identified in the SLP will aim to contribute towards the socio-economic development of the area as well as the areas from which the majority of the workforce is sourced.

LEGAL FRAMEWORK

Prior to the commencement of the proposed project, environmental authorisation is required from the Department of Mineral Resources (DMR). These authorisations include:

- Environmental authorisation from the DMR in terms of National Environmental Management Act No.107 of 1998 (NEMA). The proposed project incorporates several listed environmental activities. The EIA regulations being followed for this project are Regulation 982 of 04 December 2014.
- A mining right and an environmental authorisation from the DMR in terms of the Mineral and Petroleum Resources Development Act No. 28 of 2002 (MPRDA).

STAKEHOLDER ENGAGEMENT

The stakeholder engagement process commenced prior to scoping (initial scoping phase) and has continued throughout the environmental assessment process. As part of this process, authorities and interested and affected parties (IAPs) were given the opportunity to attend public meetings, submit questions and comments to the project team, and review the background information document, scoping report and now the EIA and EMP report. All IAPs registered on the projects database have been notified and kept up to date of each phase of the project through press adverts in the Kathu Gazette and the Volksblad, via smses, postage and site notices placed at conspicuous locations in and around the project area. All comments that have been submitted to date by the authorities and IAPs have been included and addressed in the EIR and EMPr report. Further comments arising from report review process will be handled in a similar manner.

ENVIRONMENTAL SETTING, POTENTIAL IMPACTS AND MITIGATION

A summary of the environmental aspects that describe the pre-mining environment as informed by specialist studies are listed below. Each section also summarises the potential impacts and the key mitigation measures to manage the potential impacts to an acceptable level.

<u>Climate:</u>

The COZA Driehoekspan project falls in an area with a regional climate that is semi-arid with a mean annual precipitation of 318 mm. Temperatures ranged between -7.3 ℃ and 40 ℃. The highest temperatures occurred in December, January and February and the lowest in June, July and August. During the day, temperatures increase to reach maximum at around 15:00 in the afternoon. Ambient air temperature decreases to reach a minimum just before sunrise. The annual potential evaporation rate for the COZA Iron Ore study area is 2 450 mm. The highest evaporation rates occur during the hotter summer months of October to March. The mean annual evaporation is higher than mean annual precipitation (318 mm) which results in a net moisture deficit of 2 132 mm over the year. During the recording period (Nov 2011- Oct 2014), the wind field was dominated by winds from the north-east with an average wind speed of 3.4 m/s. The strongest winds (more than 6 m/s) were from the northern to north-western sectors and occurred mostly during the day. The average wind speed decreased from 4.1 m/d during the day to 2.7 m/s during the night.

Topography

The general topography within the study area is flat to undulating with slopes of approximately 2% - 3% with an average surface elevation of approximately 1 400 m above mean sea level (mamsl). The study area is flanked by hills to the west and east. The Klipfontein range of hills to the east of the study area runs in a north to south direction. The area is generally flat lying forming part of the eastern edge of the Kalahari, with remnant hills and local undulations to the west, north of the extensive Ghaap dolomite plateau and to the east of the Langeberg mountain range. The most prominent hills are the eastern and western remnants of the Maremane dome stretching north-south in a semi-arcuate form from Postmasburg to Kathu.

Potential topographic impacts include hazardous excavations, infrastructure and surface subsidence. These potential impacts can be mitigated to an acceptable level through the following measures:

- Prevention through access control
- Remedy through emergency response procedure.

Geology

The central part of the Maremane dome comprises a flat lying erosional plain consisting of dolomite of the Campbellrand Subgroup, with an eastern and western limb consisting of the iron formation of the Asbesheuwels Subgroup of the Transvaal Supergroup. North south striking westerly dipping listric faults has been reported as traversing the Maremane dome, representing the earliest phase of brittle deformation. These faults were formed during the first extensional event during transition from tectonic quiescence to passive rifting on the western margin of the Kaapvaal craton. On Driehoekspan, only the western extremity of the farm contains the ore zone which outcrops on three distinct topographic ridges with opposing and overturned dips on the western most exposures, the eastern remainder of the farm being the central flat lying erosional dolomite plain with occasional low hills of dolomite.

Potential geological impacts include the loss and sterilisation of mineral resources. This potential impact can be mitigated to an acceptable level through the following measures:

- Control through mine plan that will avoid sterilisation of resources.
- Ensure optimal extraction of resources

Soils and land capability

The soils in the region are generally shallow, normally not exceeding more than 300 mm in depth (ARC, 2013). he predominant soil types in the study area are soil-rock complexes of the Mispah and Coega forms and a shallow phase Hutton underlain by rock and sporadic limestone (Unit Hu1 and Hu2). Deeper Hutton and Oakleaf soils are confined to the drainage ways (Unit Hu3). Rock outcrops and stony lithosols (Mispah and Glenrosa soils) on the crests and upper midslopes dominate the steeper north-south stretching hills that occur in the western part of Driehoekspan Stony Hutton and Oakleaf soils of varying depths are on the lower midslopes and upper footslopes (Unit Oa1).

Soils in the area are generally very shallow, have a low clay content and thus a low water-holding capacity, contains coarse fragments in the topsoil or subsoil that decreases the water retention capacity, and has a low trace elements status (ARC, 2013). In addition to this, there is relatively low carbon content which limits plant growth due to limited availability of nutrients for plants. All these factors make the soils in the study area largely unsuitable for the production of crops. Coupled with the low average annual rainfall in the area, the agricultural potential in the study area is considered to be low. Soil unit Hu3 is however deeper and might be used for irrigation, this is however limited due to water scarcity in the area.

Potential soil and land capability impacts include the loss of soil resources and land capability through contamination and physical disturbance. These potential impacts can be mitigated to an acceptable level through the following measures:

- Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management
- Remedy through emergency response procedure
- Prevention by limiting the area of disturbance, effective topsoil stripping and management, and erosion management.

Groundwater

Information from exploration boreholes shows two aquifer types to be present in the project area. The first, the upper, unconfined to semi-confined aquifer occurs in the calcrete that cover most of the surface area. The aquifer is usually developed on the contact between the calcrete and underlying clay formations of Kalahari age or in localized pebble horizons within the calcrete and occurs within the upper 10 to 30 meters of the geological profile. Borehole yields in the calcrete aquifer generally vary from 0.2 to approximately 2 l/s. Although relatively low yields occur in this aquifer, it is developed widely throughout most of the project area and has been the reliable source of water supply to most of the farms in the area for more than a century. The second aquifer is associated with fractures, fissures, joints and other discontinuities within the consolidated bedrock and associated intrusives of the Transvaal/Griqualand West Sequences. The aquifer occurs at depths of more than 60 meters below surface in the project area.

A hydro-census was conducted in May 2013 by Aquatico to determine groundwater use, levels, and qualities as well as to conduct pump testing for the purposes of defining the aquifers on site. The water users in the area include farmers, mines and communities. Approximately half of the boreholes encountered were being used at the time, with the majority being used for both domestic and agricultural use. From the results of the groundwater survey, it is evident that farmers in the area rely heavily on groundwater as a major source of domestic water as well as for livestock and gardening.

The project area and its immediate surroundings are dominated by fresh, clean, relatively young groundwater that has started to undergo mineralization with especially magnesium ion exchange. The groundwater is dominated by calcium and magnesium cations, while bicarbonate alkalinity dominates the anion content (Groundwater Complete, 2014).

Potential groundwater impacts include the contamination of groundwater resources and the reduction of groundwater levels and availability. These potential impacts can be mitigated to an acceptable level through the following measures:

- Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management, monitoring of groundwater quality and compensation or water supply replacement if needed;
- Remedy through emergency response procedure.
- Remedy through the monitoring of third party borehole water levels and compensation or water supply replacement if needed

<u>Surface water</u>

The project site is located within quaternary catchment D73A of the Lower Vaal Management Area which in turn falls within the Orange River catchment area. According to the Water Resources of South Africa 2005 study (WR2005), quaternary catchment D73A is classified as a catchment area with no outlet. Rainfall in this system does not exit the catchment as surface flow, but may only leave as evaporation and seepage.

At the times of the site visits, there was no surface water flow within the identified drainage lines and therefore no surface water sampling was undertaken.

There are no surface water users identified within the surrounding area due to the arid nature of the site. Potential surface water impacts include the alteration of drainage patterns and the contamination of surface water resources. These potential impacts can be mitigated to an acceptable level through the following measures:

- Minimisation by limiting area of disturbance, diverting clean water away from site, implementing a stormwater management plan and rehabilitation including backfilling of the open pit.
- Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management, monitoring of surface water quality and compensation or water supply replacement if needed
- Remedy through emergency response procedure.

Biodiversity

The project area does not fall within any biodiversity priority area identified by the Mining and Biodiversity Guideline. The study area falls within the Eastern Kalahari Bushveld Bioregion of the Savanna Biome (Mucina & Rutherford, 2006). The vegetation of the southern Kalahari in general is relatively species-poor and less than 2.5 % of the total species list of the southern Kalahari is regarded as endemic, while less than 6 % of the plant species is regarded as near-endemic species (Van Rooyen & Van Rooyen 1998). The proposed development area does however fall within the Griqualand West Centre of Endemism (GWC) as defined by van Wyk and Smith (2001). According to van Wyk and Smith (2001), the GWC is considered a priority area for conservation in the Northern Cape, as the number of threats to the area is increasing rapidly, little research has been done and it is poorly understood. Two vegetation types, namely the Kuruman Thornveld and the Kuruman Mountain Bushveld.

Protected species occurring within the project area are listed below. Permits are required to remove these species.

- *Acacia erioloba* (Camel thorn)
- *Boscia albitrunca* (Shepherd's tree)
- *Olea europaea subsp africana* (Wild Olive)
- Boophone disticha (Bushmans' poison)
- *Cotyledon orbiculata*
- *Gymnosporia buxifolia*
- *Pachypodium succulentum*
- *Prepodesma orpenii*

- *Ruschia griquensis* (vygie)
- *Sarcostemma viminale* (melktou)

Faunal species diversity and numbers in the region is relatively low as is typical of semi-desert areas (Wilson, 2014). The area proposed for development and its immediate surrounds is largely undeveloped. However, considerable degradation of the natural habitat has occurred in the region due mainly to mining, especially on the iron and manganese ore hills and outcrops between Kathu and Postmasburg. A number of game farms are found in the region; most notably a game farm on the farm Thaakwaneng 675, situated approximately 8km north of the farm Driehoekspan.

Sensitive habitats are known to occur in the region. Areas with untransformed natural vegetation, high diversity and complexity, species of special concern and systems vital to sustaining ecological function are potentially sensitive. Examples of sensitive habitats include wetlands, seasonal pans, perennial and non-perennial rivers and streams (watercourses) and ecological corridors with high connectivity to other ecosystems. Highly sensitive habitats often contain larger and/or healthier populations of species of special concern, or a higher species diversity of these particular species, and are considered to be of higher conservation value and more sensitive than areas with fewer or sparsely distributed species of special concern.

Potential impacts on the biodiversity include the destruction and disturbance of the biodiversity. These potential impacts can be mitigated to an acceptable level through the following measures:

- Prevention by limiting the area of disturbance, avoidance of sensitive areas, monitoring and management of invasive species is to be undertaken at the mine, allowing animal movement where feasible
- Remedy by rescueing species where possible and obtaining relevant permits to do this as required, re-establishment of key tree species, effective rehabilitation
- Prevention by training of workers on the value of biodiversity, zero tolerance of the killing or collecting of any biodiversity by anybody working for or on behalf of COZA, banning of domestic animals to be banned from site, taking into account avifauna in infrastructure designs such as powerlines
- Minimisation by limiting lighting, speed control, managing dust and waste effectively, implementation of a stormwater management plan.

Air quality

Air quality sensitive receptors generally include places of residence and areas where members of the public may be affected by atmospheric emissions generated by mining/industrial activities. The nearest towns to the proposed mine area include Postmasburg, Lohatla and Beeshoek which are all more than 10 km away. These towns will therefore not be sensitive receptors for the mine. Current potential air emissions sources within the study area include blasting activities from the nearby mines, the use gravel access roads, vehicle exhaust emissions and farming activities which could generate dust.

From ambient air quality data recorded at Postmasburg between September 2011 and March 2013, it is evident that air quality in the area is generally good with respect to most of the criteria pollutants. Recorded ambient concentrations of PM2.5, NO^2 and SO^2 were all below the respective National Ambient Air Quality Standards (NAAQS) (GN 1210, 24 December 2009) limit values and no exceedences recorded with respect to these pollutants. Recorded PM_{10} concentrations were high, however with the NAAQS limit value of 75 µg/m^3 exceeded a total of 8 days during 2012.

Potential air quality impacts include air pollution. Air pollution can be mitigated to an acceptable level through the following measures:

- Prevention through a range of management measures aimed at limiting the area of disturbance, dust suppression, traffic control measures, enclosing dusty equipment where feasible, monitoring air quality
- Remedy through corrective action if third party health impacts occur.

Traffic

The main roads near the study area include the R325 that connects Postmasburg to Kathu and the R385 which connects the area to Kimberley. The R385 lies approximately 10 km west of the proposed mine and the R325 lies approximately 3 km east of the proposed mining area. The R325 will be the road used during the mine construction and operation phase. This road will be largely used for the transportation of ore from the mine as well as for staff and visitors coming to the mine during the operational phase. This road serves a number of mines between Postmasburg and Kathu and therefore carries a large volume of heavy trucks which damages the road (TTH Traffic, 2014). Due to the relatively low traffic volumes, no operational problems are experienced by vehicles at either of the Doornpan or the Driehoekspan intersections with R325.

Potential traffic impacts include road disturbance and traffic safety. These impacts can be mitigated to an acceptable level through the following measures:

- Prevention through construction of a dedicated mine access road, speed control and training of workers on road safety
- Remedy through emergency response procedure.

Noise

The project area is located in an area that can be classified as a rural district. Baseline noise monitoring was conducted on the 5th and 6th of December, 2013 at three separate locations near potential sensitive receptors. The current baseline noise levels is well within SANS 10103 outdoor noise levels for rural districts for all measured receptors except for one receptor (receptor 3 – see section 7.4.1.10) which is located near the provincial road R325.

Potential noise impacts include noise pollution. Noise pollution can be mitigated to an acceptable level through the following measures:

- Prevention through the use of vibration isolators where feasible, maintenance of equipment and vehicles, monitoring in the event of complaints
- Minimise though communication of blast times to local people
- Remedy through corrective action if unacceptable third party impacts occur.

<u>Cultural and Heritage Resources</u>

Archival and historical research has revealed a long and significant history in terms of the surroundings of the study area (PGS Heritage, 2015).The historical research highlighted that there might be some historical and archaeological sites within the study area which may be associated with the histories of the Thlaro and Thlaping. The surroundings of Postmasburg and the study area also contain a number of well-known pre-colonial mining sites, rock art sites as well as Stone Age sites, most notably Blinklopkop, a pre-colonial specularite mine located approximately 10 km southeast of the study area.

With respect to palaeontological resources, the study area is underlain by chemical and clastic sedimentary sequences of the Campbell and Postmasburg Groups of the Transvaal Supergroup. These sedimentary sequences are associated with BIFs in the Postmasburg region, close to where mining is envisaged. The dolomite sequences can contain good examples of stromatolite structures that are of medium palaeontological significance and although no palaeontological resources were found on site, the possible presence of stromatolites should be taken into account by project planners

Potential heritage/cultural and palaeontological impacts include loss of heritage, cultural and palaeontological resources. These impacts can be mitigated to an acceptable level through the following measures:

- Preventing through additional archeological survey, training of workers to recognise heritage sites including stromatolites and not disturbing heritage sites outside of footprint area
- Remedy through limiting area of disturbance and destruction of heritage sites, obtaining approval where required for destruction of heritage sites, and chance finds procedure.

<u>Socio-Economic Environment</u>

The proposed project is located on land owned by the Maremane Community. The land is registered under the Maremane Communal Property Association (MCPA). The MCPA represents members of the community that have legal right over the land.

Members of the Maremane community were dispossessed of their land for the purposes of establishing the Lohatla Military Base in the 1970's. The displaced people were taken to places such as Laxey, Pepsi and the surrounding areas of Kuruman (The New Age, 24 April 2012). According to the Rural Development and Land Reform's former deputy minister in 2010 Mr Thulas Nxesi, the Maremane community lost approximately 12 million hectares of land (South African Government Information, 4 December 2010). Post 1994 the community lodged a claim to have their land returned and in 2010 the community was handed over 11 200 ha of land on properties surrounding the military base. Figure 7-26 illustrates areas where some members of the Maremane Community are currently located near the study area. The majority of the people are currently residing in an informal settlement located on Farm Lohatla this settlement area is currently referred to as "Lohatla" by its inhabitants. There are little economic activities occurring in the area except for a local shop and a crèche. During the public meeting held with the community, it was evident that the unemployment rate is low. There are also a small number of people forming part of the Maremane community located on Farm Driehoekspan. This group of people is involved in agricultural activities (goat and sheep farming). The current areas where the Maremane community are residing are not included in the local municipality's town planning scheme and therefore there are some challenges with service delivery.

Two local farmers approximately 5 km north west of Driehoekspan who are involved in low intensity stock farming (cattle and sheep) also surround the study area

The area had an estimated population of 63 243 or 17 931 households in 2013. The average household size amounts to approximately 3.5 members per household. The population growth is averaged at 1.4 % per annum (Demacon, 2013).

The area has moderate figures of illiteracy with 9.3 % having had no schooling. 27.6% of the market population has at least Grade 12 or obtained higher education.

The majority of the market population is economically active (88.6 %) while 11.4 % are not economically active. The low level of unemployment can be ascribed to the rural nature of the study area, with people only moving in the area for employment purposes to work in the mining or government sectors as the major employment sectors.

The socio-economic environment can be impacted positively through enhancement of local employment and procurement where feasible, and implementation of Social and Labour Plan projects. Inward migration is a potential negative impact of the socio-economic environment. Inward migtration impacts can be mitigated to an acceptable level through the following measures:

- Minimisation through proper communication of opportunities to local communities, implementation of health policy, accommodation of construction staff on site, incentivising permanent employees to live in formal housing with adequate services, working with local government to manage social impacts.

<u>Current land use</u>

The project area is within a rural district, zoned for agricultural use. Driehoekspan is currently used as grazing land by the Maremane Community and Thaakwaneng has a game farm. The dominant land use in the area surrounding the COZA Driehoekspan project is livestock farming. Due to the arid nature of the climate, intensive commercial agriculture is not possible. There is also human settlement to the east and north of the study areas, these include two local farmers (~ 5 km) and the Maremane Community (~ 700 m). Mining activities and the infrastructure associated with mining activities (powerlines and railway) are also prevalent in the area, due to the presence of iron ore.

Land use impacts can be mitigated to an acceptable level through the authorising land use through zoning, rehabilitation including backfilling of the open pit.

PROJECT TIMING

Subject to acquiring the necessary authorisation, it is envisaged that construction phase activities will commence during the first quarter of 2017 and will continue for a period of approximately 12 months. The life of mine is expected to be approximately 10 years.

SUMMARY OF IMPACT RATINGS

The table below provides a summary of the impact ratings of each identified impact both before and after mitigation.

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified with a +)	
		Unmitigated	**Mitigated**
Geology	Loss and sterilization of mineral resource	**H**	**L**
Topography	Hazardous excavations and infrastructure, surface subsidence and the dangers they present to animals and humans	**H**	**M**
Soils and land capability	Loss of soil resources and land capability through contamination	**M**	**L**
	Loss of soil resources and land capability through physical disturbance	**H**	**L**
Biodiversity	Physical destruction of biodiversity	**H**	**M**
	General disturbance of biodiversity	**H**	**L**
Surface water	Alteration of natural drainage patterns during construction, operations and decommissioning	**H**	**M**
	Alteration of natural drainage patterns during closure	**H**	**L**
	Contamination of surface water resources	**H**	**L**
Groundwater	Reduction of groundwater levels and availability during operations, decommissioning and closure	**M**	**L**
	Contamination of groundwater resources during operations, decommissioning and closure	**M**	**L**
Air quality	Air pollution	**H**	**M**
Noise	Noise pollution	**M**	**L**
Blasting	Blast damage	**H**	**M**

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified with a +)	
		Unmitigated	Mitigated
Heritage/cultural and palaeontological resources	Loss of heritage/cultural and palaeontological resources	**H**	**L**
Visual impacts	Negative visual impacts during construction, operations and decommissioning	**H**	**M**
	Negative visual impacts during closure	**H**	**L**
Traffic	Road disturbance and traffic safety	**H**	**M**
Socio-economic impacts	Inward migration impact	**H**	**M**
	Economic impact	**H+**	**H+**
	Loss of current land use during construction, operations and decommissioning	**H**	**M**
	Loss of current land use during closure	**H**	**L**

CONCLUSION

The cumulative assessment (incremental contribution of the proposed project plus existing baseline conditions) of the proposed project presents the potential for significant positive economic impacts and significant negative environmental and social impacts, in the unmitigated scenario.

The mine will go a long way to mitigating the potential negative impacts by committing to apply the findings of the cumulative assessment and related mitigation objectives and actions to this project. In this respect, all of the impacts can be mitigated to moderate or low significance levels. This is based on current assessment and project description information.

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Detail
AMD	Acid Mine Drainage
AP	Acid Potential
ABA	Acid Base Accounting
BID	Background Information Document
BIF	Banded Iron Formations
CPA	Community Property Association
CO	Carbon Monoxide
DALRD	Department Of Agriculture Land Reform And Rural Development
DEM	Digital Elevation Model
DTM	Digital Terrain Model
DE	Diesel Exhaust
dBA	Decibel (measure of noise)
DMR	Department of Minerals Resources
DWEA	National Department of Water and Environmental Affairs
DWS	Department of Water and Sanitation
DWA	Department of Water Affairs
EAPs	Environmental assessment practitioners
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
EMP Report	Environmental Management Programme Report (synonym for EMPR)
EMPr	Environmental Management Programme Report (synonym for EMP Report)
GN R.	Government Notice Regulation
GIS	Geographical Information System
ha	hectare
HDPE	High Density Polyethylene
IAP	Interested or Affected Parties
km	Kilometre
km^2	Kilometre squared
kVA	Kilo-volt-ampere
LOM	Life of mine
m	Meter
m^2	Metre squared

Abbreviation	Detail
m^3	Cubic metre
m/d	Metres per day
m^2/d	Metres squared per day
m^3/d	Cubic metres per day
m/s	metres per second
l/s	Litres per second
l/h	Litres per hour
Mg/l	Milligram per litre
MAMSL	Metres above mean sea level
Ml	Million litres
mm	Millimetre
MRPDA	Mineral and Petroleum Resources Development Act, 28 of 2002
MCPA	Maremane Communal Property Association
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act, 107 of 1998
NDVI	Normalised Difference Vegetation Index
NDCR	National Dust Control Regulations
NEM:WA	National Environmental Management: Waste Act, 59 of 2008
NEM:BA	National Environmental Management: Biodiversity Act, 10 of 2004
NFA	National Forests Act, 84 of 1998
NFEPA	National Freshwater Priority Areas and the Environmental Potential Atlas
NCNCA	Northern Cape Nature Conservation Act, 9 of 2009
NPAES	National Protected Area Expansion Strategy
NP	Neutralising Potential
NPR	Neutralising Potential Ratio
NNP	Nett Neutralising Potential
NO_x	Nitrogen oxides
NWA	National Water Act, 36 of 1998
O_2	Oxygen
$PM_{2.5}$	Fine particulate matter with diameter less than 2.5 microns
PM_{10}	Fine particulate matter with diameter less than 10 microns
ROM	Run of Mine
RDLR	Rural Development and Land Reform
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Botanical Institute

Abbreviation	Detail
SANS	South African Code of Practice for Mine Residue Deposits
SLP	Social and Labour Plan
SRTM	Space Radar Topography Mission
SO_2	Sulphur dioxide
SO_4	Sulphate
Synergistics	Synergistics Environmental Services (Pty)
TSP	Total suspended particulates
TDS	Total suspended solids
VOC	Volatile Organic Compounds
WRD	Waste Rock Dump

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR THE COZA IRON ORE PROJECT ON FARMS DRIEHOEKSPAN AND THAAKWANENG 675

INTRODUCTION

Introduction to the proposed project

COZA Mining (Pty) Ltd is proposing to develop the COZA Iron Ore Project located approximately 10 km north-northwest of Postmasburg Town in the Tsantsabane Local Municipality of the Northern Cape Province (refer to Figure 0-1). The proposed development is a green-fields project that will involve the mining of iron ore from an open pit on the farm Driehoekspan 435 (Remaining Extent) (Driehoekspan) (refer to Figure 0-2). At this stage no infrastructure is planned on the farm Thaakwaneng 675, although it has been included in the mining right application. It should be noted that Coza lodged applications in 2013 for open pit mining on the farm Doornpan 445 (Portion 1) (Doornpan) (refer to Figure 0-1 for the location of this farm), which is currently being handled in a separate application process.

In general terms, the open pit mining will be undertaken by means of truck and shovel. Mined ore will be crushed and blended on site prior to being transported via rail for further processing off site.

Synergistics Environmental Services (Pty) Ltd (Synergistics), an independent firm of environmental assessment practitioners, has been appointed to undertake the Scoping and Environmental Impact Assessment (EIA) process required for the COZA Iron Ore Project.

Authorisation requirements

Prior to the commencement of the proposed project, environmental authorisation is required from various government departments. These include:

- A mining right in terms of the Mineral and Petroleum Resources Development Act (No 28 of 2002) which is regulated by the Department of Mineral Resources (DMR).
- Environmental authorisation from the DMR in terms of National Environmental Management Act (NEMA) (Act 107 of 1998) (NEMA). The proposed project incorporates several listed environmental activities. The applicable list of activities is provided in Section 4.1 of this report. The EIA regulations being followed for this project are Regulation 983, 984 and 985 (December 2014 EIA Regulations).
- A waste management licence from the DMR in terms of the National Environmental Management: Waste Act (NEM:WA) (Act 59 of 2008). The applicable list of activities is provided in Section 4.1 of this report.
- A water use license from the Department of Water and Sanitation (DWS) in terms of the National Water Act (NWA) 36 of 1998. At this stage, the following water uses have been identified:
    - 21 (a) and (j): abstraction of water (dewatering and borehole abstraction) and removing water from the open pit to create a safe working environment (dewatering)

  - 21 (b): storage of clean water
  - 21 (c) and (i): altering the bed, banks course or characteristics of a watercourse and impeding the flow of water in a watercourse (floodline encroachment and river crossings)
  - 21 (g): Disposing of waste in a manner which could detrimentally impact upon a water resource (residue facilities and backfilling of the open pit, dust supression)
- Prior to damaging or removing heritage resources, permissions are required from the South African Heritage Resources Agency (SAHRA) in terms of the National Heritage Act, 25 of 1999
- Prior to removing or damaging any protected plant species, the necessary permits will be obtained from Department of Africulture, Forestry and Fisheries (DAFF) in terms of the National Forests Act, 84 of 1998
- Prior to storage, handling, transportation and disposal of explosives the relevant licenses and written permissions are required in terms of the Explosives Act, 25 of 1956, and the Mine Health and Safety Act, 29 of 1996, as amended.

EIA AND EMP PHASE OBJECTIVES

The objectives of the environmental assessment process are as follows:

- The identification of policies and legislation that is relevant to the proposed project
- To describe the need and desirability of the proposed project
- To describe the proposed project including alternatives that are being considered
- To charecterise the environmental and social baseline of the project area
- To provide an assessment of the environmental and social impacts taking into account all project alternatives
- To identify measures to avoid, manage or mitigate identified impacts including the residual risks that need to be managed and monitored.

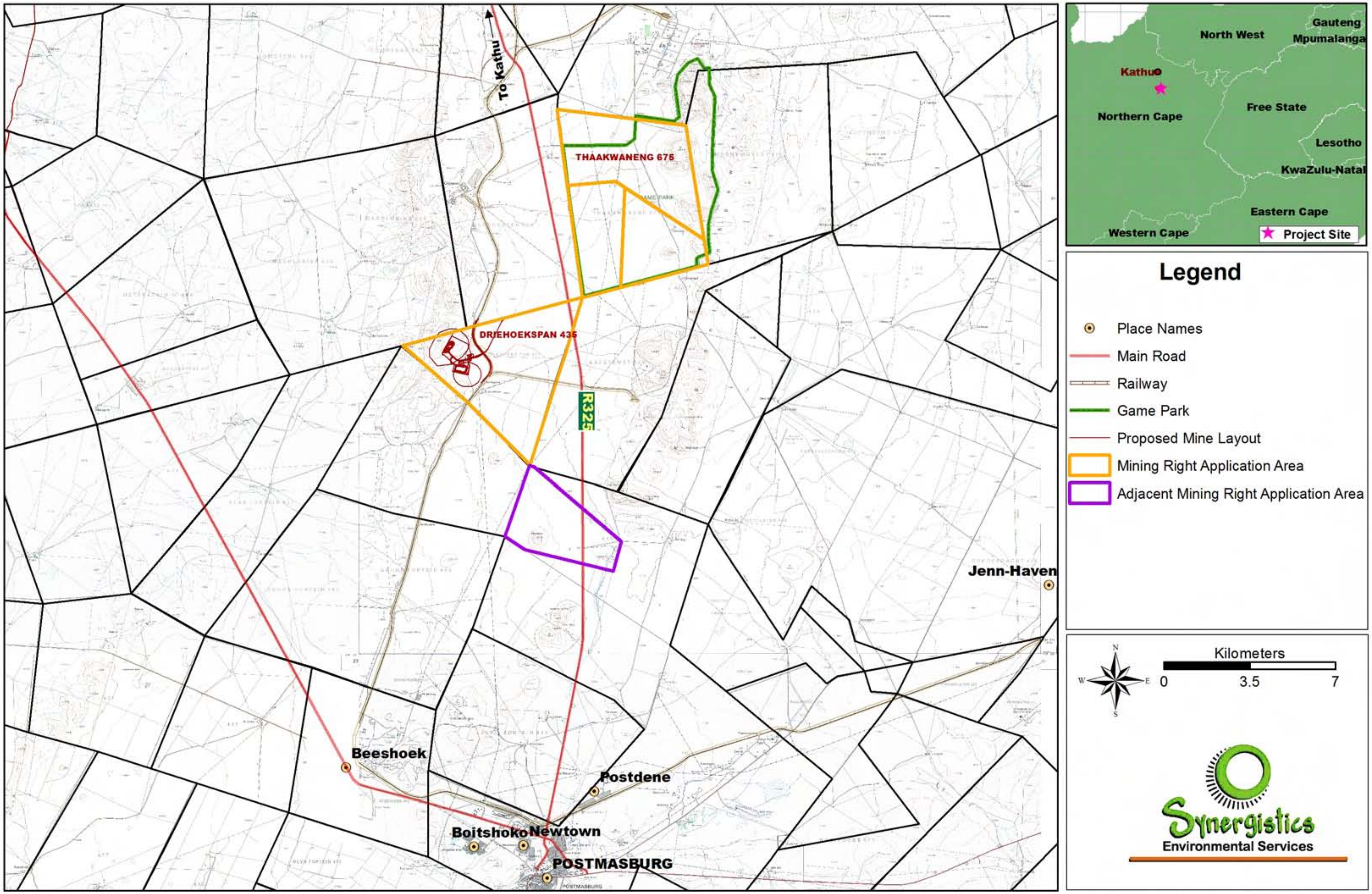


Figure 0-1: Regional Setting	SO707	Coordinate System DMS	
		Spheroid WGS84	Central Meridian LO

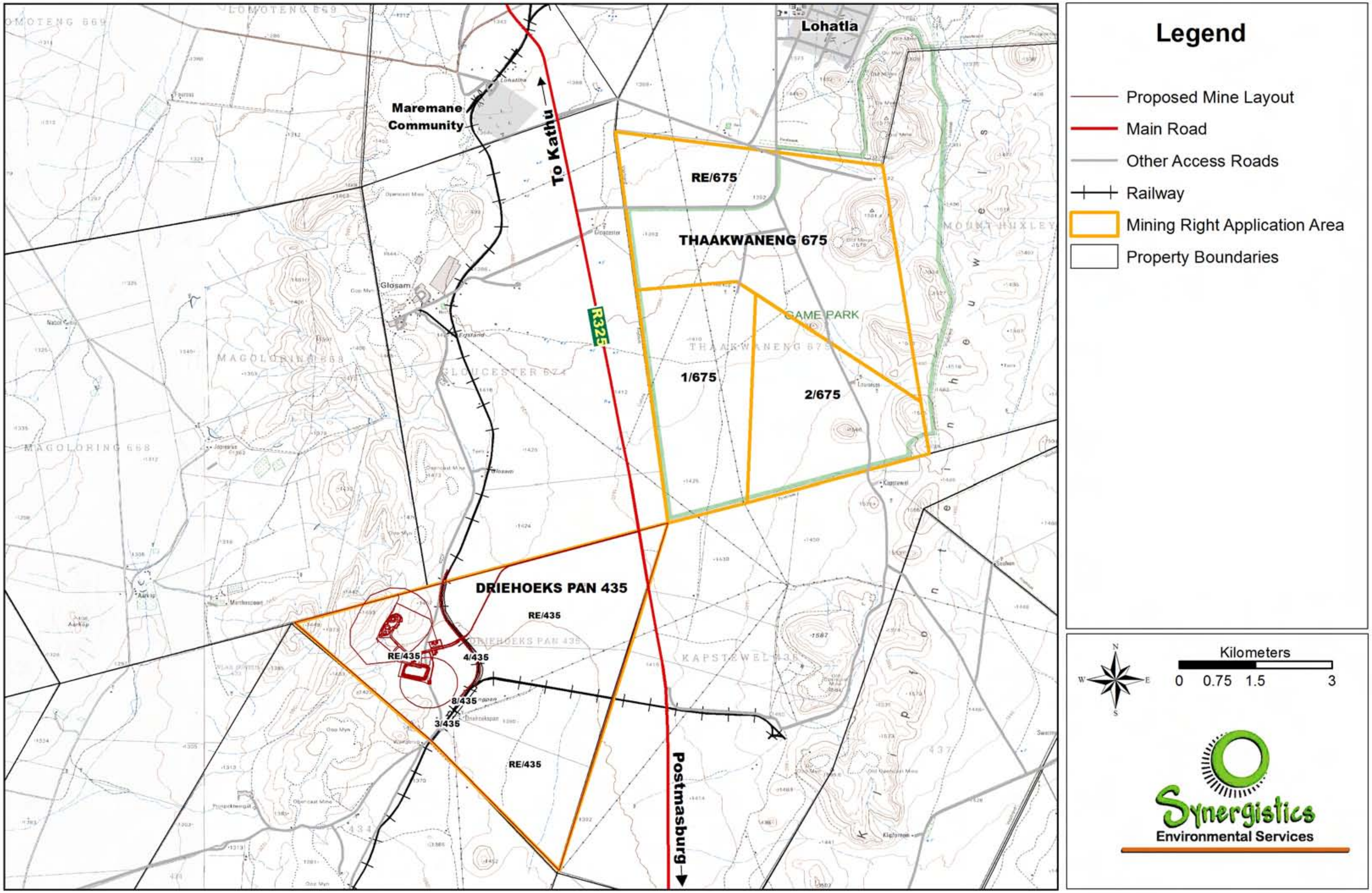


Figure 0- 2: Local Setting

SO707

Coordinate System DMS

Spheroid WGS84

Central Meridian LO

PART A – SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

1.1 DETAILS OF THE EAP

1.1.1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

The details of the environmental assessment practitioners (EAPs) that were involved in the preparation of this EIR and EMPr report are provided in Table 1-1 below.

TABLE 1-1: DETAILS OF THE EAP

Details	Project manager	Reviewer
Name of the practitioner	Zama Khumalo Linda Munro (update to report)	Alex Pheiffer
Responsibility on the project	EAP	Reviewer
Tel No.:	(011) 467 0945	(011) 467 0945
Fax No.:	(011) 467 0978	(011) 467 0978
Postal address	P O Box 1596, Cramerview, 2060, South Africa	P O Box 1596, Cramerview, 2060, South Africa
E-mail address	lmunro@slrconsulting.com	apheiffer@slrconsulting.com

1.1.2 QUALIFICATIONS AND EXPERIENCE OF THE EAP

Zama Khumalo holds a Bachelor of art Degree in Geography and Industrial Psychology and has over 7 years of relevant experience in the assessment of impacts associated with mining operations. Both Linda and Alex hold Masters Degrees in Environmental Management, have over 15 years of relevant experience each in the assessment of impacts associated with mining operations. Both Linda and Alex are registered as Natural Scientists with the South African Council for Natural Scientific Professions (SACNASP). Zama, Linda and Alex have been involved in several impact assessments for mining development in Southern Africa. Proof of registrations of the relevant practitioners is provided in Appendix A and relevant curricula vitae are attached in Appendix B.

1.2 SPECIALIST TEAM FOR THE PROJECT

Name and Affiliation	Qualification	Role
Bheki Khumalo Synergistics Environmental Services	B.Sc. Geology and Applied Geology B.Sc. (Hons) Environmental Modelling and Monitoring	GIS and Mapping
Gerhard Steenekamp Groundwater Complete	M.Sc. Geology Pr.Sci.Nat	Geohydrological Assessment and Modelling
Phillip Hull Jeffares & Green	M.Sc. Hydrology Pr. Sci. Nat	Hydrological Assessment and Modelling Environmental Water Balance

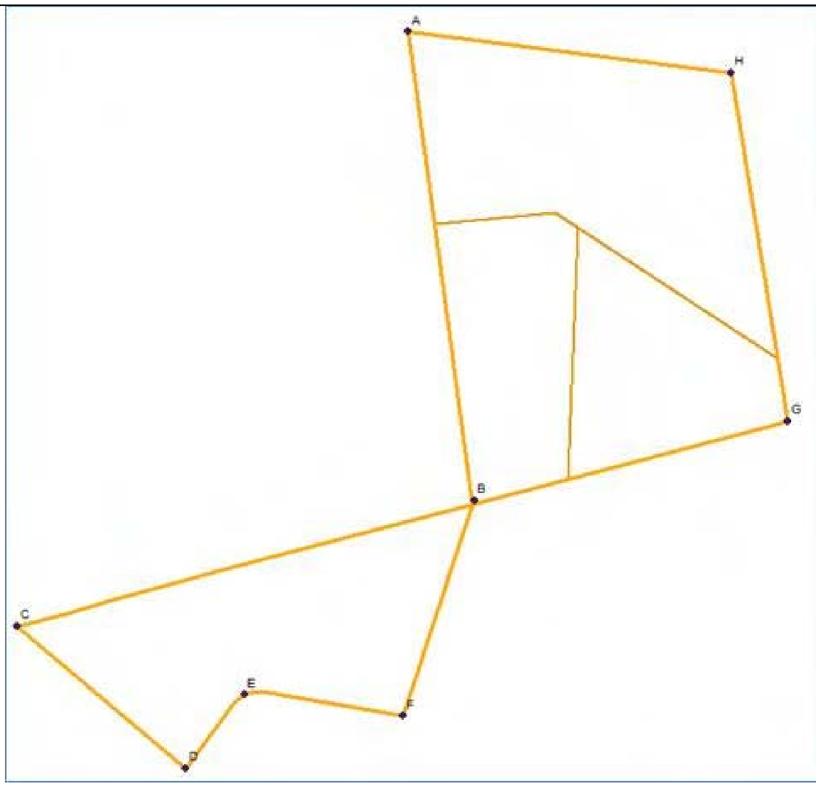
Name and Affiliation	Qualification	Role
Tania Anderson Plant Ecologist	M.Sc. Environmental Management	Floral Assessment
Beryl Wilson McGregor Museum	M.Sc. Zoology	Faunal Assessment
Nicolette von Reiche Airshed Planning Professionals	B.Eng Hons. Mechanical Engineering	Air Quality Impact Assessment
David Dayson Demacon Market Studies	B.Sc. Tourism & Business Management & Economics	Economic Assessment
Polke Birkholtz PGS Heritage & Grave Relocation Consultants	BA, Archaeology, Anthropology and History	Heritage, Archaeological and Palaeontological Survey
Garry Patterson ARC Institute for Soil, Climate & Water	M.Sc. Soil Science	Soil Survey Land Capability Impact Assessment
Andries Joubert Jeffares & Green	B.Sc. Civil engineering, B.Eng. (Hons) (Tpt), M.Eng (Tpt)	Traffic Impact Assessment

Neither SLR nor any of the specialists involved in the environmental assessment process have any interest in the project other than fair payment for consulting services rendered as part of the environmental assessment process.

2 DESCRIPTION OF THE PROPERTY

A description of the property on which the proposed project is located is provided in Table 2-1.

TABLE 2-1:DESCRIPTION OF THE PROPERTY

<table>
<tr><td>Farm Name</td><td>Driehoekspan 435 (Remaining Extent) and the farm Thaakwaneng 675</td></tr>
<tr><td>Corner of property point co-ordinates</td><td>


<table>
<tr><th>Corner point</th><th>Longitude</th><th>Latitude</th></tr>
<tr><td>A</td><td>23° 4' 19.48" E</td><td>28° 3' 3.24" S</td></tr>
<tr><td>B</td><td>23° 4' 54.20" E</td><td>28° 7' 9.34" S</td></tr>
<tr><td>C</td><td>23° 0' 53.61" E</td><td>28° 8' 15.70" S</td></tr>
<tr><td>D</td><td>23° 2' 22.16" E</td><td>28° 9' 30.19" S</td></tr>
<tr><td>E</td><td>23° 2' 53.14" E</td><td>28° 8' 51.74" S</td></tr>
<tr><td>F</td><td>23° 4' 16.64" E</td><td>28° 9' 2.94" S</td></tr>
<tr><td>G</td><td>23° 7' 38.73" E</td><td>28° 6' 27.74" S</td></tr>
<tr><td>H</td><td>23° 7' 9.18" E</td><td>28° 3' 24.60" S</td></tr>
</table>
</td></tr>
<tr><td>Application area (Ha)</td><td>Approximately 3 076 ha</td></tr>
<tr><td>Magisterial district</td><td>Hay Magisterial District</td></tr>
<tr><td>Distance and direction from nearest town</td><td>Approximately 3km west of Thaakwaneng lies a small settlement (Glosam Park).</td></tr>
<tr><td>21 digit Surveyor General Code for each farm portion</td><td>C 00310000000043500000
C 00410000000067500002</td></tr>
</table>

	C 00410000000067500000 C 00410000000067500001

3 LOCALITY MAP

The local and regional setting of the proposed project area illustrated in Figure 0-1 and Figure 0-2.

4 DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

This section describes the proposed project and specifies relevant listed activities.

4.1 LISTED AND SPECIFIED ACTIVITIES

The activities and infrastructure associated with the proposed project are listed in Table 4-1 below and are illustrated in Figure 4-1 (where relevant). In each case the relevant NEMA and/or possible NEM:WA listed activities which will be triggered by the proposed project for the various activities and infrastructure has been provided in Table 4-1. A description of each of the listed activities identified is provided in Table 4-2.

TABLE 4-1: LIST OF ACTIVITIES/INFRASTRUCTURE ASSOCIATED WITH THE PROPOSED PROJECT

NAME OF ACTIVITY	**Aerial extent of the Activity** **Ha or m²**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** **(*GNR 983, GNR 984 or GNR 985)***	**WASTE MANAGEMENT AUTHORI-SATION** **(Mark with an X)**	**APPLICABLE LISTING NOTICE** **(*GNR 921 and GNR 633 of 2015)***
Site Clearance:					
Selective site clearance in line with the biodiversity management plan and soil management plan (clearance of the following areas: pit, waste rock dump, infrastructure, stockpile, crushing, explosive magazine, pollution control dam)	Total area ~175 ha	X	GN R 984 Activity 15		
Digging of foundations and trenches	~43.1ha	X	GN R 984 Activity 15		
Set up of contractor's facilities					
Construction of contractor's offices	Approximately 500 m^2				
Mining					
Drilling and blasting	~ 36 ha				
Mining of iron ore in open pits (requires a mining right in terms of the MPRDA).	Open pit ~9 ha	X	GNR 984, activity 17		
Processing					
Primary processing of ore: crushing will take place on site. Crushed ore will then be blended prior to transport off-site where it will be further processed.	~6 ha	X	GNR 984, activity 21		
Water supply, use and management					
Bulk pipelines for dewatering activities/water reticulation and stormwater. These pipelines are likely to exceed 1 000 metres in length with an internal diameter of 0.36 metres or more with peak throughput of 120	Dependent on mine plan	X	GNR 983, activity 9.		

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY (Mark with an **X** where applicable or affected).	APPLICABLE LISTING NOTICE (***GNR 983, GNR 984 or GNR 985)***	WASTE MANAGEMENT AUTHORI-SATION (Mark with an X)	APPLICABLE LISTING NOTICE (***GNR 921 and GNR 633 of 2015)***
litres per second or more.					
Bulk pipelines to transport return water/effluent from the sewage treatment facility and waste water from mining activities. These pipelines may exceed 1 000 metres in length with a diameter of 0.36 metres or more or a peak throughput of 120 litres per second or more.	~2 km	X	GNR 983, activity 10		
Construction/development of mine infrastructure (waste rock dump, stockpile area, mine pit), within 32 metres of a watercourse.	~21 ha	X	GNR 983, activity 12		
Construction of pollution control/attenuation dams, water supply tanks for the Driehoekspan mine.	~ 1ha	X	GNR 983, activity 13		
Development of the mine pit near the watercourse. The mining activities and the construction of infrastructure will cross watercourses, requiring earthworks (excavation/fill) of more than 5 cubic meters.	~ 9 ha	X	GNR 983, activity 19		
Construction of dewatering pipelines. The pipelines may transfer 50 000 cubic metres of water from the mine pit catchment area to other catchments within the mine property. Pipelines can potentially transfer up to 50 000m^3 of water a day between	To be determined	X	GNR 984, activity 11		

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY (Mark with an **X** where applicable or affected).	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)*	WASTE MANAGEMENT AUTHORI-SATION (Mark with an X)	APPLICABLE LISTING NOTICE (*GNR 921 and GNR 633 of 2015)*
impoundments/attenuation dams on site during peak flows.					
Construction of pollution control dam/s or attenuation dams.	~3 ha	X	GNR 984, activity 16		
The storage of water containing waste, i.e. pumped from the pits, wash bays, workshop area and waste rock dumps, requires a water use license in terms of the NWA which governs the release of waste.	~ 1 ha	X	GNR 984, activity 6.		
Transportation and Access Roads					
Construction of haul roads and access and service roads at the mine. Some of the roads will be wider than 8 metres.	~5 km	X	GNR 983, activity 24		
The expansion of the district road intersection with the mine access road to accommodate passing lanes. `	To be determined	X	GNR 983, activity 56		
Power Supply					
Power generation through the use of backup generators during construction and operations of up to 10 megawatts covering an area greater than 1 hectare.	Approx. 1 ha	X	GNR 983, activity 2		
The storage of a dangerous goods up to 80 cubic metres	14		GNR 983, activity 14		
Waste Management (Non-mineralised and Mineralised)					
Construction of the waste rock dump	~ 13 ha			X	GNR 921 Category B: activity 7, 10, 11

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY (Mark with an **X** where applicable or affected).	APPLICABLE LISTING NOTICE (*GNR 983, GNR 984 or GNR 985)*	WASTE MANAGEMENT AUTHORI-SATION (Mark with an X)	APPLICABLE LISTING NOTICE (*GNR 921 and GNR 633 of 2015)*
					and

TABLE 4-2: DESCRIPTION OF THE LISTED ACTIVITIES APPLIED FOR AS PART OF THE PROPOSED PROJECT

Activity number	Listed activity
NEMA Listing Notice 1 GNR.983	
2	"The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where-" (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or "ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare."
9	"The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water-" (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- "(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or" (b) where such development will occur within an urban area.
10	The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve; or (b) where such development will occur within an urban area.
11	The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.
12	The development of- (i) canals exceeding 100 square metres in size (ii) channels exceeding 100 square metres in size (iii) bridges exceeding 100 square metres in size (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size;

Activity number	Listed activity
	(viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.
13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.
14	The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.
19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.
24	The development of - (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; (ii) a road with a reserve wider than 13.5 metres, or where no reserve exists where the road is wider than 8 metres but excluding – (a) roads which are identified and included in activity 27 of Listing Notice 27 in Notice 2 of 2014; or roads where the entire road falls within an urban area
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development:

Activity number	Listed activity
	(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.
50	The expansion of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, where the combined capacity will be increased by 50000 cubic metres or more.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 km – (iii) where the existing reserve is wider than 13.5 metres; or (iv) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.
NEMA Listing Notice 2: GNR.984	
6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.
11	The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following - (i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes.
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more.
17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.

Activity number	Listed activity
27	The development of - (i) a national road as defined in section 40 of the South African National Roads Agency Limited and National Roads Act, 1998 (Act No. 7 of 1998); (ii) a road administered by a provincial authority; (iii) a road with a reserve wider than 30 metres; or (iv) a road catering for more than one lane of traffic in both directions; but excluding the development and related operation of a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies.
28	Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:WA Listed Activities GNR 921	
Category B 4(7)	The disposal of any quantities of hazardous waste to land
Category B 4(10)	The construction of a facility for a waste management activity listed in Category B of this schedule
Category B 4(11)	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

It is possible that some Listing Notice 3 activities may be triggered by the Ga-Thlose Nature Reserve which was proclaimed in 1890, but on which a military training base and game farm has been established. The status of this reserve is therefore uncertain and it is not included on protected area databases interogated for this project. The military base lies 8 km away from the mine site. However is should be noted that the higher or equivalent threshold activities have been applied for with respect to Listing Notices 1 and 2.

4.2 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

4.2.1 OVERVIEW OF PROJECT

The proposed COZA Ore Iron Project: Driehoekspan Section will involve the mining of iron ore from an open pit on the Remainder of farm Driehoekspan 435. The proposed development will be a green-fields project with an estimated area of disturbance of 175 ha at Driehoekspan. The site layout is presented in Figure 4-1. At this stage, no infrastructure or activities are planned on the farm Thaakwaneng, although it has been included in the mining right application. The life of mine is currently estimated at 6 years.

4.2.2 CONSTRUCTION PHASE

CONSTRUCTION PHASE ACTIVITIES

The key construction activities associated with the proposed project include:

- Setting up a contractor's laydown area and construction camp
- Clearing of vegetation in areas designated for surface infrastructure (excluding the open pit as this will be cleared progressively during the operational phase as the pit advances) in line with a biodiversity management plan to be developed for the project
- Stripping and stockpiling of soil resources in areas designated for surface infrastructure (excluding the open pit as this will be cleared progressively during the operational phase as the pit advances) in line with a soil conservation procedure to be developed for the project
- Digging and/or blasting foundations and trenches
- Establishing haul roads
- Establishing the explosives magazine
- Delivery of materials and removal of waste
- Excavating process and water storage dams as required
- Preparing the residue disposal area
- General building activities including the erection of structures including pipelines.

CONSTRUCTION PHASE INFRASTUCTURE

Construction phase infrastructure is envisaged to include:

- Contractors lay down areas
- Workshops, stores, wash bays, lay-down areas, fuel handling and storage area, offices, ablution facilities such as chemical toilets
- Handling and storage area for construction materials (paints, solvents, oils, grease) and waste
- Generators for temporary power supply
- Water management infrastructure
- Explosive magazine

- Temporary access roads and haul roads
- Temporary services (water, electricity)
- Drill rigs for drilling.

These facilities would either be removed at the end of the construction phase or incorporated into the layout of the operational mine.

WATER SUPPLY AND MANAGEMENT FOR THE CONSTRUCTION PHASE

Stormwater control for construction

Stormwater measures outlined in Section 4.2.3.4 will be established at the start of the construction phase.

Potable water

During the construction phase, potable water will be made available from on-site boreholes. The total daily requirement for potable water will be verified at a later stage.

TRANSPORTATION (ROUTES AND MECHANISMS) FOR THE CONSTRUCTION PHASE

Access to the proposed site

An access road linking the proposed mine to the R325 will be required. Figure 4-1 shows the location of the proposed road. The road will be gravel, 4 km long and will be more than 6 metres wide in order to accommodate two lanes of traffic. A bridge will need to be constructed over the railway line. In addition to this, the district road will need to be widened to accommodate passing lanes and possibly become controlled intersections for safety reasons.

Internal Haul and Service Roads

Gravel haul roads will be constructed to link the pit, waste rock dump, crushing plant, offices and waste storage facilities. The haul roads will have a width of approximately 25 m for bi-directional roads. It must be noted that the lengths and placement of haul roads may change depending on schedule and design requirements.

On-site gravel service roads will be constructed for use by private vehicles, buses, minibuses and some heavy vehicles for the transportation of material and staff around the site. The access roads are anticipated to be wider than 8m.

Transportation of workers, supplies

During the construction phase it is anticipated that most workers requiring transport will be from Postmasburg Town. In addition to this, trucks will be supplying input materials and machinery, consumables. This mine traffic will enter and exit the mine using the R325. It is however expected that the construction phase will be limited to approximately 12 months and that only the appointed contractor with a small work force will be accessing site during this time. Construction phase trip generation calculations have therefore not been provided as part of the specialist traffic impact assessment.

Pipelines

Pipelines will be established at the start of the construction phase.

POWER SUPPLY AND USE FOR THE CONSTRUCTION PHASE

During the construction phase limited power will be required for drilling, welding and construction lighting, and it is expected that this power will be sourced from generators.

NON-MINERALISED WASTE MANAGEMENT FOR THE CONSTRUCTION PHASE

Domestic and industrial waste

Facilities for the temporary storage of non-mineralised waste associated with the project will be provided. The types of waste that could be generated during the construction phase include: hazardous industrial waste (such as packaging for hazardous materials, used oil, lubricants), general industrial waste (such as scrap metal, contaminated wood and building rubble), and domestic waste (such as packaging and food waste). These wastes will be temporarily handled and stored on site before being removed for recycling by suppliers and approved waste handling companies, reuse by scrap dealers or final disposal at permitted waste disposal facilities at either Kuruman, Deben, Hotazel or Kimberley.

Sewage

Construction workers will make use of portable toilets that will be serviced on a regular basis. The sewage will be removed off-site by a certified contractor and disposed at a licensed facility in either Kuruman, Deben, Hotazel or Kimberley.

EMPLOYMENT AND HOUSING FOR THE CONSTRUCTION PHASE

The proposed project will create jobs during the construction phase. This workforce will be accommodated within a temporary construction camp (mobile containers) located on site. The construction camp will be provided with a septic tank, water tank and reticulation pipeline, and a temporary waste storage facility.

OPERATING HOURS FOR THE CONSTRUCTION PHASE

It is anticipated that the construction phase will consist of one shift per day from 07h00 to 16h30 from Monday to Friday. In cases where emergency action is required or critical activities are required, motivation will be made for the extension of these hours within the provisions of the regulations.

SECURITY AND ACCESS CONTROL

A fence will be established around the perimeter of the proposed project site. A designated access control and security office will be established at the access of the mine leading off the R325.

CONSTRUCTION PHASE TIMING

It is envisaged that construction phase activities will commence during the first quarter of 2018 and will continue for a period of approximately 12 months.

4.2.3 OPERATIONAL PHASE

Operational phase surface infrastructure is listed below:

- Open pit area
- Stockpile area which will include Run of Mine (ROM) stockpile, crusher and product stockpile
- Topsoil stockpile area
- Waste Rock Dump and Low-Grade ROM
- Haul and service roads
- Vehicle Washbay
- Fuel storage area
- Heavy Vehicle Parking and Service Bay
- General parking area
- Waste storage area
- Offices including kitchen and ablution facility
- Change rooms
- Explosive Magazine
- Stormwater management infrastructure such as berm, canals and pollution control dam (PCD)
- Water supply infrastructure
- Weighbridge
- Security gate and office.

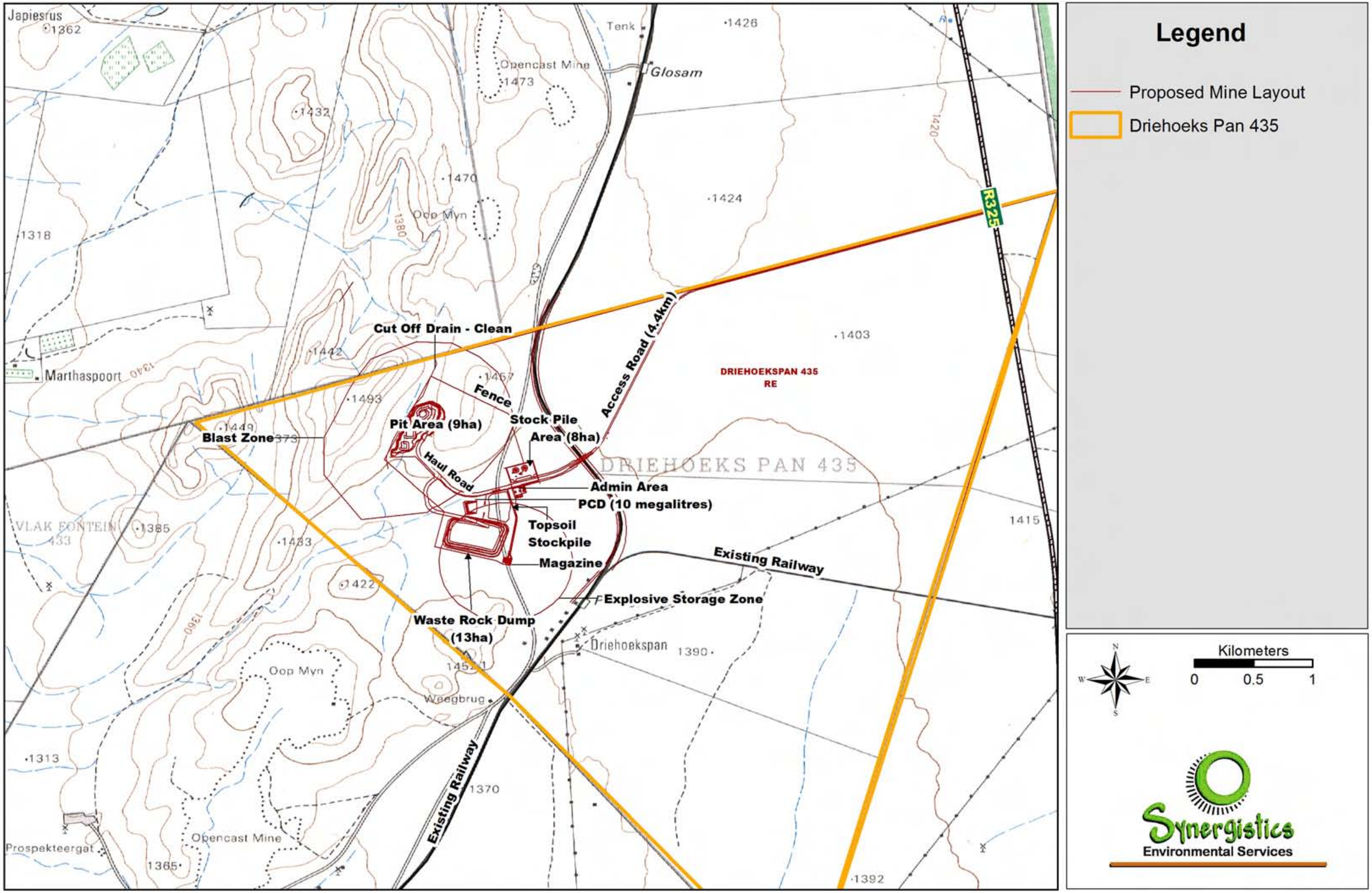


Figure 4-1: Driehoekspan Mine Layout

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO23

4.2.3.1 Open Pit Mining Method

The proposed project will comprise conventional open cast strip mining methods. Following site preparation and initial earthworks, both excavation and drill and blast methods will be used to loosen the overburden rock and ore. Truck and shovel methods will be used to load and haul the box cut materials to the overburden rock stockpiles and the run-of-mine (ROM) to the relevant delivery point. Topsoil and overburden rock stripped during the mining operations will be used in the on-going rehabilitation processes. Table 4-3 summaries the associated open cast activities. Table 4-4 includes project data that provides perspective and scale to the proposed project. The proposed open pit area is illustrated in Figure 4-1. Production of iron ore is expected to be a total of 1,254,000 tonnes of ore (1,705,000 tonnes if off-grade material can be sold).

TABLE 4-3: SUMMARY OF OPEN CAST ACTIVITIES

Activity	Description
Topsoil and vegetation stripping	Topsoil and vegetation will be stripped and soils stockpiled separately in accordance with the soil conservation management and biodiversity management procedures.
Drilling and blasting	Once the topsoil and soft overburden material has been removed, the hard overburden rock will be drilled as per a predetermined design. Charges for blasting will be designed to prevent excessive ground vibration, fly rock and air blast.
Removal of overburden rock	The removal of the overburden rock above the ore body will be done by means of dozing / loading and hauling with large equipment. Apart from the overburden rock stockpile that is required for the initial box cut, the overburden rock material will be placed into the previously mined out void. Some overburden rock will be utilised for the establishment of platforms and internal haul roads.
Mining progression and concurrent rehabilitation	The initial box cut will be developed on the western boundary of the open pit where the ore seam is the shallowest. Mining will then progress towards the east. Topsoil will be placed on top of the backfilled overburden thus ensuring that the rehabilitation is done concurrently to the mining (rollover mining).
Removal of ore	The run of mine (ROM) ore will be transported via truck to the crushers before being trucked to the product stockpile and despatched.
Dewatering	Dewatering activities at the Driehoekspan section will be required from year 4 to 6.

TABLE 4-4: PROJECT DATA THAT PROVIDES PERSPECTIVE AND SCALE OF THE PROPOSED PROJECT

Feature	Detail
Target ore body	The resource to be mined is the iron ore body of the Asbesheuwels Subgroup of the Transvaal Supergroup.
Depth of the open pit	The average depth of the open pit will be 50 m.
Open pit footprint	Approximately 175 ha.
Tonnages	Following a preliminary resource estimation process, it is estimated that just under total of 1,254,000 tonnes of ore (1,705,000 tonnes if off-grade material can be sold) is available to be mined at Driehoekspan.
Grade target	Average target grade is 62% (this includes Doornpan and the Jenkins project).

Feature	Detail
	(The Jenkins project is a separate open cast iron ore mine currently being authorised by COZA ore mine on the farm Jenkins 562 located approximately 24 km south of Kathu_

4.2.3.2 Mineral Processing

Mineral processing activities at the Driehoekspan Mine Section will be limited to primary crushing. A mobile crusher will be located at the stockpile area. Crushed run of mine material will then be stockpiled at the product stockpile area where it will then be transported off site by truck for further processing (further crushing to be followed by screening) approximately 30 km north of the site. No tailings facilities will be required at Driehoekspan.

4.2.3.3 Transportation Requirements and Access Roads

Acess to Site

The main mine access road will link the mine to the R325 as discussed in Section 4.2.2. In addition to this, the district road will need to be widened to accommodate passing lanes and possibly become controlled intersections for safety reasons.

Internal Haul and Service Roads

Internal gravel haul roads will be constructed as discussed in Section 4.2.2. On-site gravel service roads will be constructed for use by private vehicles, buses, minibuses and some heavy vehicles for the transportation of material and staff around the site.

Transportation of workers, supplies and product

During the operational phase it is anticipated that most workers requiring transport will be from Postmasburg Town and surrounding areas. In addition to this, trucks will be supplying input materials and machinery, consumables. This mine traffic will enter and exit the mine using the R325.

Run of mine will be transported by 32 ton ore trucks via the R325 to off-site loading facilities for transport via rail (the rail transportation of ore does not form part of this assessment).

Table 4-5 sets out the calculated trips required for the transportation of waste rock, ore, as well as the transportation of mine employees and supplies.

TABLE 4-5:NUMBER OF OFF SITE TRIPS REQUIRED DAILY DURING THE OPERATIONAL PHASE

Vehicle Type	Purpose and Route	Road to be used	Number of trips/day

Vehicle Type	Purpose and Route	Road to be used	Number of trips/day
Tankers and trucks	Delivery of fuel and materials.	R325	12 trips
32 t Ore trucks	Transporting RoM from the site to offloading areas via the R325	R325	5 trips
Passenger bus	Mine employees from Postmasburg to the mine and back	R325	6 trips
Private Vehicles	Visitors, suppliers, contractors	R325, Mine Access Road and Internal service roads	20 trips

4.2.3.4 Water Requirements, Supply and Storage

Water Requirements

Potable and raw water will be required for domestic purposes, and mine operation activities such as dust suppression, washing of mine machinery and vehicles at the wash bay. Potable water will be supplied to the following facilities:

- Administration areas
- Change room
- Workshop
- Store rooms.

Potable water will be used for both domestic and for firefighting purposes. Raw water will be used for mining operations and for dust suppression on haul roads. A separate raw water pipe network will be provided to enable re-use of stormwater and sewage treatment works effluent without contamination of the potable water system.

Service water will be supplied to the following areas:

- Mining operations within the pit
- Road tanker bowser positions

Calculated water requirements are given below:

TABLE 4-6: WATER DEMAND AT DRIEHOEKSPAN

Water demand at Driehoekspan	
Raw Water	1 371.8 m^3/month for the pit mining operations
	915 m^3/month for dust suppression
Potable Water	125 m^3month
Total Water Demand	**2411.8 m^3/month**

Water Supply and Storage

Potable water will be sourced from boreholes at the mine and the Ga-Mogara pipeline. Service water will initially be sourced from boreholes and later from pit dewatering activities. The water supply borehole for the first four years will be sourced from a single borehole (WATER HOLE) indicated in Figure 4-1. It is expected that approximately 2 416 m^3/month will be pumped from this borehole for year 1-4 and 1 961m^3/day for year 5 and 1 809 m^3/day for year 6. Water will be pumped from boreholes to reservoirs with capacity to supply 48 hours storage. High lift pump stations will supply elevated tanks to cater for peak demand and reserved fire storage.

The pollution control dam will be supplied with water from pit dewatering activities, return water from the workshop area and contaminated stormwater. Water from the dam will be abstracted via submersible pumps for use in mining operations and dust suppression. The sizing of the water supply infrastructure is given below:

TABLE 4-7: WATER INFRASTRUCTURE SIZING

Type of facility	Storage capacity
Ground Reservoir (kℓ)	150 kℓ
Elevated Tank (kℓ)	100 kℓ
High Lift Pump Station	22 ℓ/s @ 20m head
Pollution Control Dam	10Mℓ

Storm water Management

Storm water management infrastructure will be required for the management of clean and dirty water at the mine during the construction and operation phase. Water management infrastructure will include water storage facilities, pipelines, canals and berms. All stormwater management infrastructure will be sized to accommodate a 1:50 year return period storm event and maintain the freeboard required by Regulaiton 704.

Dirty storm water consists of rainwater that falls on areas, which could contain ore / ore dust or any pollution resulting from mining, processing and stockpiling activities. Clean and polluted storm water will be separated by cut-off berms diverting clean storm water around polluted areas. A cut-off berm will be constructed north of the proposed mine area and contaminated rainwater will be collected through stormwater channels as indicated in Figure 4-2. Contaminated rainwater will be directed towards the pollution control dam. A 10Mℓ pollution control dam will be provided to contain polluted run-off, preventing spills into the environment. The position of the dam is shown in Figure 4-2.

The dam will be designed as earth embankment dam provided with suitable HDPE lining and sub soil drainage. The dirty water dam will also have spillways that can accommodate the 1 in 100 year flood event. Silt traps will be provided for the water flowing into the dam and will be designed to trap silt particles during the expected daily inflows.

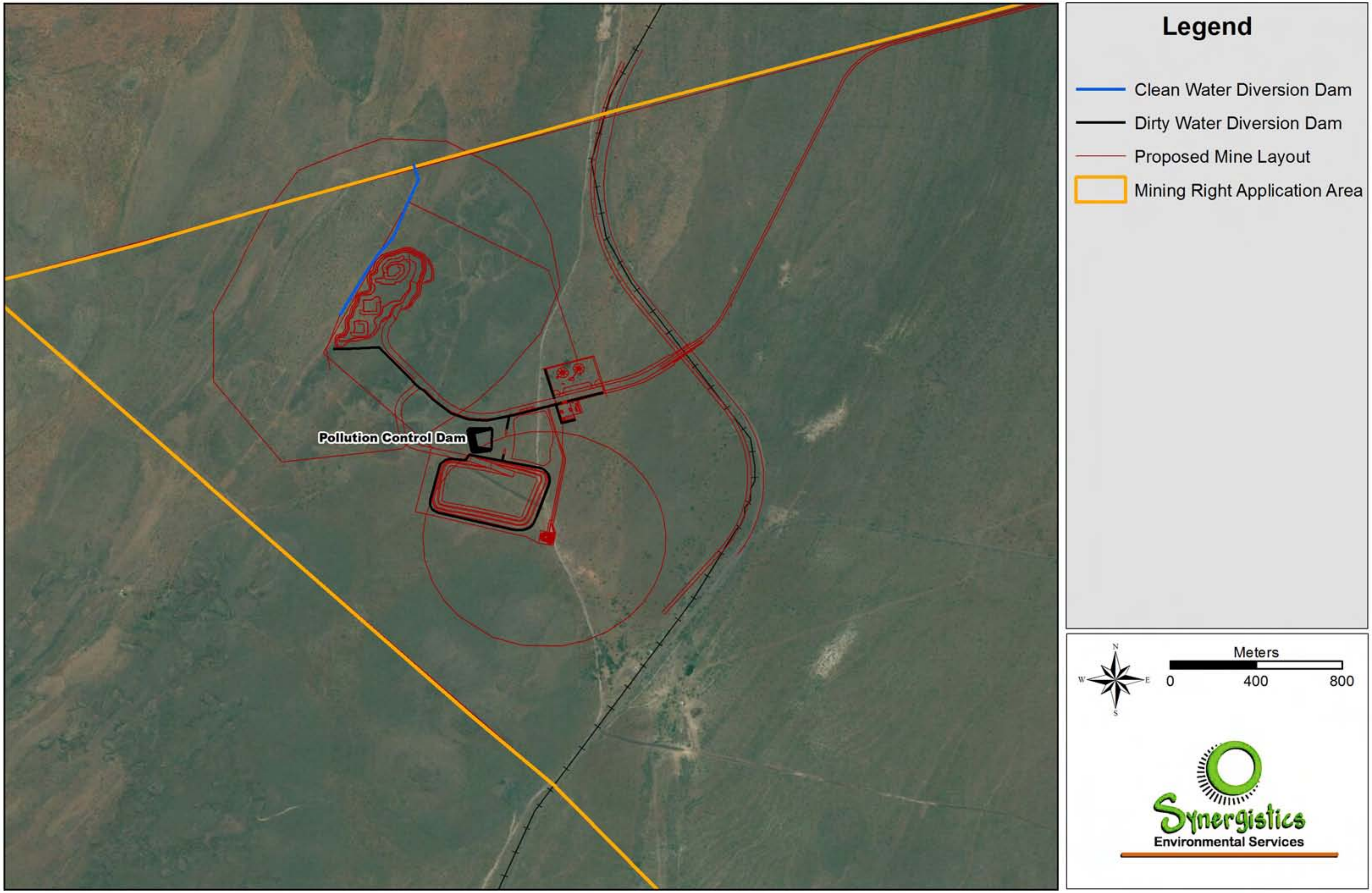


Figure 4-2: Storm Water Management Plan for Driehoekspan Mine

SO707	Coordinate System DMS	
	Spheroid WGS84	Central Meridian LO23

Mine Water Balance

Process water requirements for the mine are approximately 2 416 m^3/month. This is based on a daily water requirement of 45 m^3/day for the mining operations (open faces and drill rigs) and approximately 30 m^3/day used for dust suppression. Potable water requirements were based on a staff compliment of 80 people each using approximately 50 litres of water a day. This equates to a potable water demand of approximately 4 m^3/day or 125 m^3/month. Jeffares & Green prepared a conceptual water balance for the project. Three water balances were prepared for the life of mine. The water balances show average monthly water requirements in cubic metres. The first water balance is for year 1-4 presented in Figure 4-3. From the water balance, it is evident that a total of 2 416 m^3/month which equates to a daily demand of 79 m^3/day will be required from boreholes.

The amount of water required from boreholes from year 5-6 is expected to be less due to ingress of groundwater into the open pit. It is expected that 15m^3/day will ingress into the pit in year 5 and 20 m^3/day will ingress in year 6.

Figure 4-4 and Figure 4-5 show the water balances for year five and six respectively. In year 5, the demand decreases to approximately 65 m^3/day and in year 6 the demand decreases to 60 m^3/day.

No water will be discharged from the mine once operational.

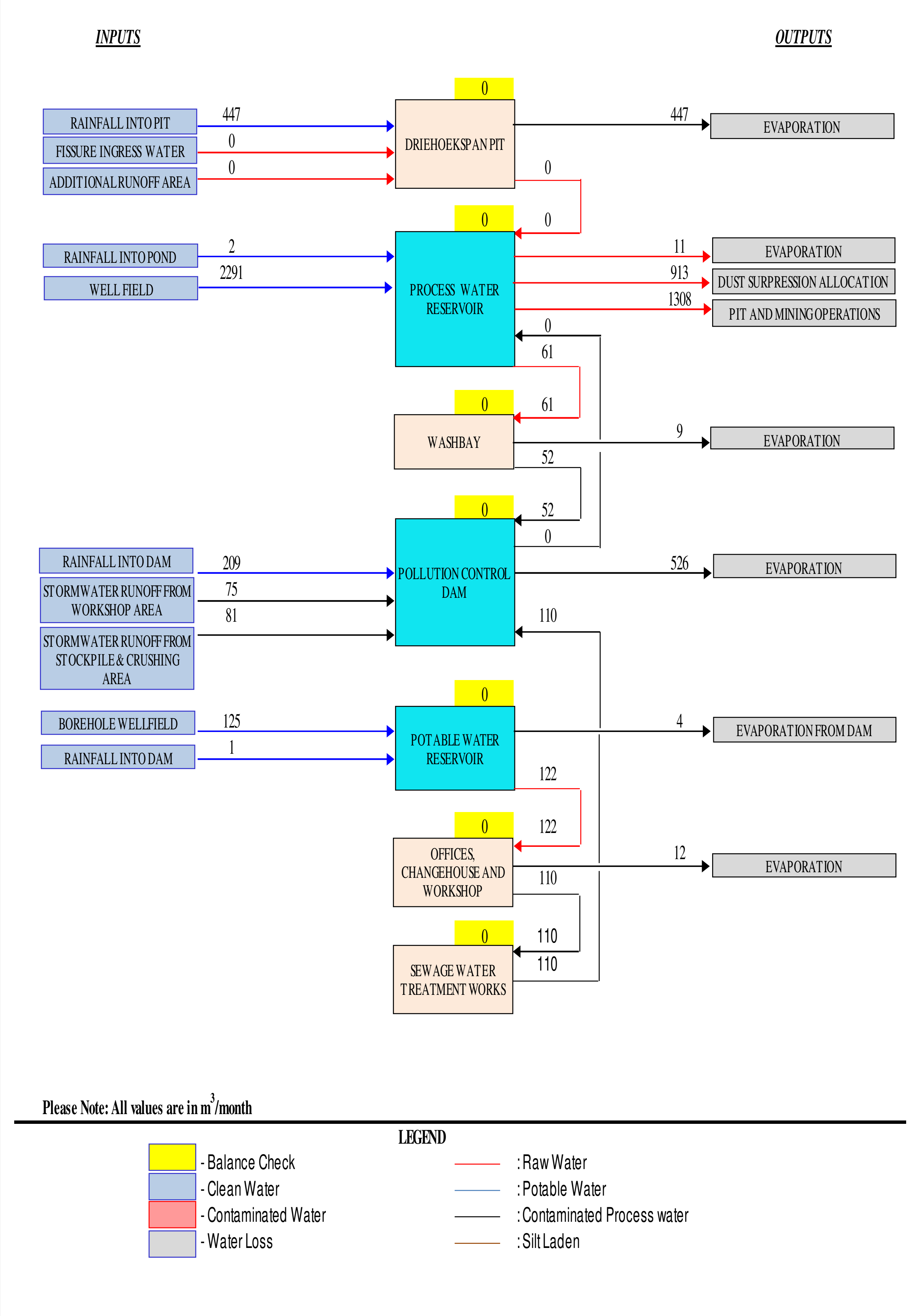


FIGURE 4-3: CONCEPTUAL MINE WATER BALANCE FOR YEAR 1-4

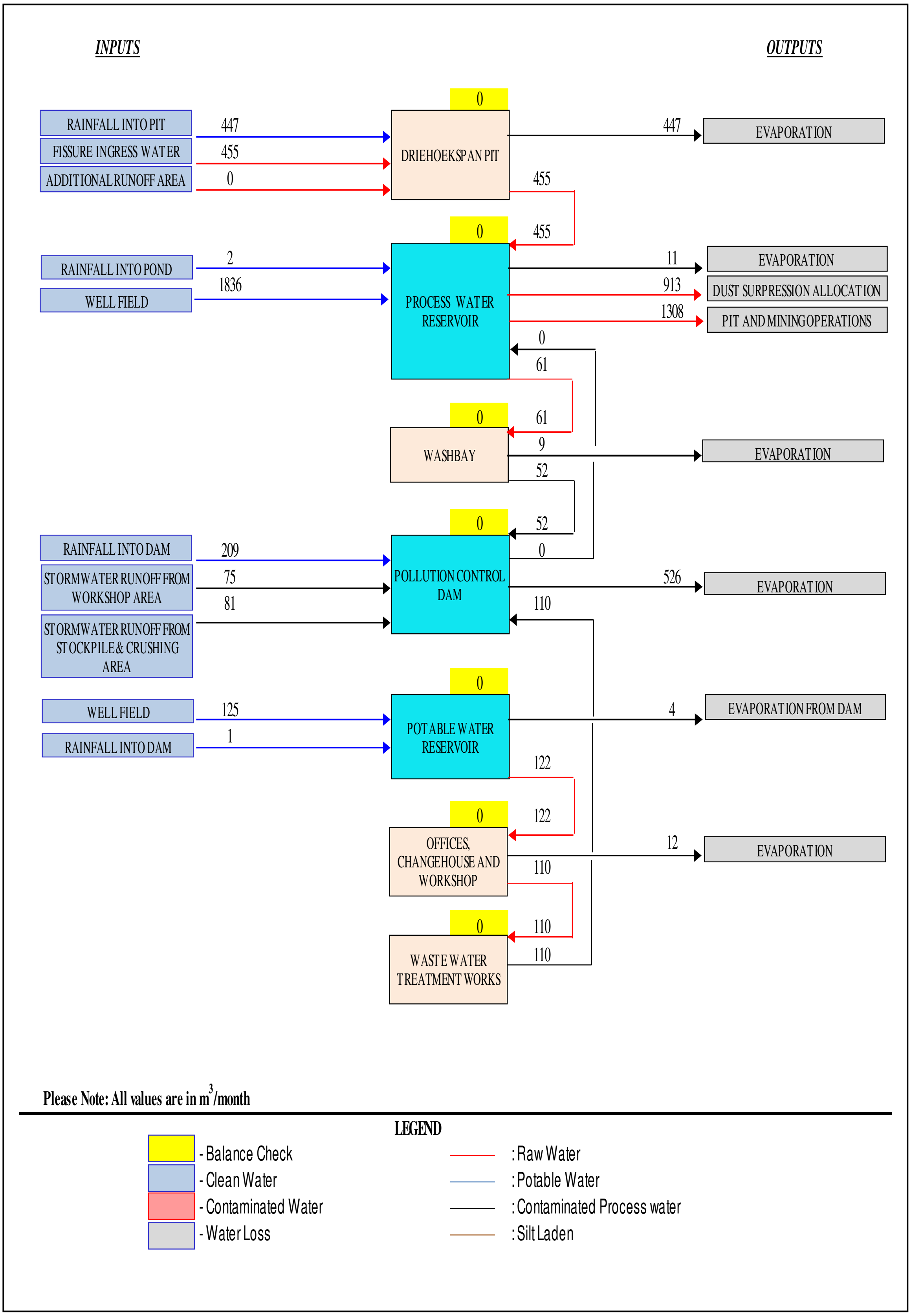


FIGURE 4-4: CONCEPTUAL MINE WATER BALANCE FOR YEAR 5

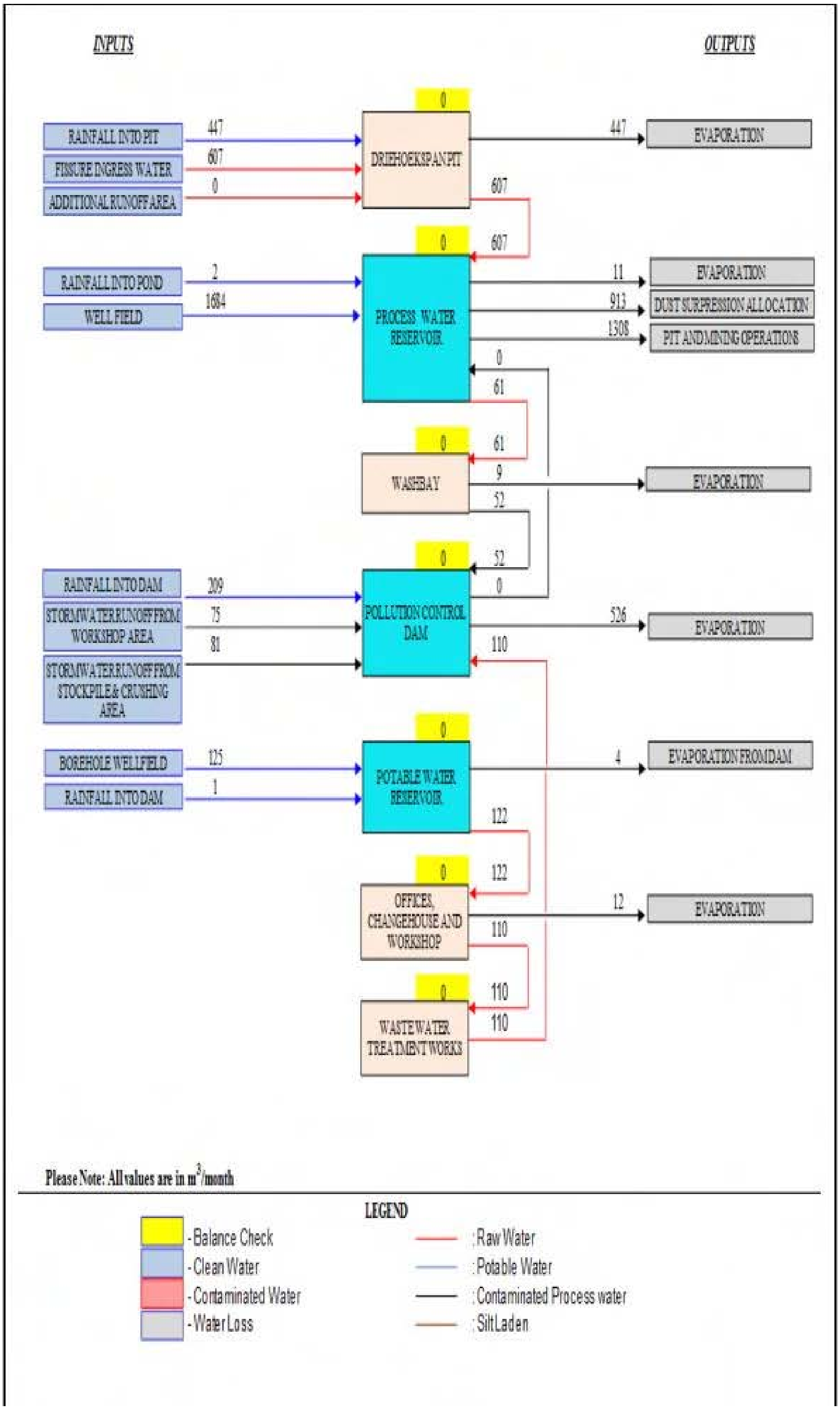


FIGURE 4-5: CONCEPTUAL MINE WATER BALANCE FOR YEAR 6

4.2.3.5 Power Supply

Due to small electrical load requirement and limited life of mine at Driehoekspan, power supply for operational activities will be sourced from a 60 kVA diesel powered generator. This will provide sufficient power to service the administration and office area, security area and water supply/reticulation. Mining equipment, including the primary crusher, will be diesel powered.

4.2.3.6 Waste Management

Minerological Waste

Overburden/waste rock associated with the proposed project will be temporarily stockpiled and then backfilled into the open pit as part of the concurrent rehabilitation initiative. The calculated amount of mineralogical mine waste that will be produced throughout the life of mine is summarised in Table 4-1.

In compliance with Section 4 of GN. 632 of the NEM:WA, the design characteristics associated with the overburden/waste rock stockpile are provided in Table 4-8 below.

TABLE 4-8: DESIGN CHARACTERISTICS FOR THE WASTE ROCK DUMP

Feature	Detail
Physical Dimensions	Foot print area: approximately 13 ha
	Height: Approximately 30 m
Physical Characteristics	Size distribution: To be determined
	Void ratio: Approximately 0.5
Chemical Characteristics	It was not possible to obtain waste rock samples from Driehoekspan because no recent drilling work has been conducted. However, geochemical testing was conducted on samples collected from the Coza Jenkins project which has similar geology (see section 7.4.1.3). These geochemical tests and analysis indicate that in both the ore and waste rock, the neutralising potential (NP) exceeds the acid potential (AP), which result in positive NNP values. Accordingly, both samples are therefore considered to be non-acid forming. Similarly, the results of the leach tests indicate that both the ore and waste rock from the project area are mostly inert and any leachate generated by planned ore stockpiles and/or WRDs should be of an acceptable quality. The only metal found to be present in the leachate at significant concentrations were aluminium and managanese.
Transport and placement	All material will be loaded onto trucks and transported to designated stockpiles
Stormwater management	Stormwater trenches / berms around the upstream boundaries of the overburden stockpiles that direct clean stormwater run-off around and away from the overburden stockpile. Dirty water runoff and/or seepage will be collected in dirty water paddocks which will be sized to comply with GN 704 and from which water may be abstracted for use in the circuit or left to evaporate.
Lining	No liner required.
Under Drains	No underdrains required.
Monitoring	Groundwater monitoring as illustrated in Figure 30-2
Access and Access control	Internal haul roads will be used for access. A perimeter fence is not planned around the overburden stockpile. Rather a perimeter fence is proposed around the whole proposed mine area.
Waste Minimisation	Waste rock will be used for concurrent rehabilitation and final closure of the open pit. If required, waste rock will also be used for the construction of platforms and roads, where required.

Feature	Detail
Dust control	No dust control will be provided at the overburden stockpile because these are not seen as a significant dust emission sources given the particle size distribution.
Closure	All the stockpile material will be removed for final closure of the open pit.

The safety classification for the overburden/waste rock stockpiles has been determined in accordance with the South African Code of Practice for Mine Residue Deposits (SANS 10286:1998) and the requirements of Section 3(c) of GN 527 of the MPRDA. The summarised safety classification is included in Table 4-9 below.

TABLE 4-9: SAFETY CLASSIFICATION CRITERIA FOR THE WASTE ROCK/OVERBURDEN STOCKPILE

Criteria No.	Criteria		Comment	Safety Classification
1	No. of Residents in Zone of Influence	0 (Low hazard)	No residents were noted within the zone of influence.	Low Hazard
		1 -10 (Medium hazard		
		>10 (High hazard)		
2	No. of Workers in Zone of Influence	<10 (Low hazard)	Minimal workers will be located in the zone of influence as the main activities will take place in the pit area	Low Hazard
		11 – 100 (Medium hazard)		
		>100 (High hazard)		
3	Value of third party property in zone of influence	0 – R2 Million (Low hazard)	No formal assessment of the value of property has been done in the zone of influence. The characteristics of the overburden dumps are such that catastrophic failures will be localised and no extended flow will be experienced.	Low Hazard
		R2 – R20 million (Medium hazard)		
		>R20 million (High hazard)		
4	Depth to underground mine workings	>200 m (Low hazard)	No underground activities are located within the zone of influence	Low Hazard
		50 m – 200 m (Medium hazard)		
		<50 m (High hazard)		

With reference to Table 4-9 above, the waste rock stockpiles is classified as a low safety risk.

Waste assessment for the overburden stockpile

In accordance with Section 5 GN. 632 of the NEM:WA, overburden stockpiles need to be classified taking into account Regulation 8 of GN R. 634 of 2013, which references the following associated National Norms and Standards:

- National Norms and Standards for the assessment of waste for landfill disposal (GN R.635 of 2013).
- National Norms and Standards for disposal of waste to landfill (GN R. 636 of 2013).

No site specific or proxy waste rock/overburden samples were available for a waste assessment. SLR has however been involved in a number of waste assessments for overburden/waste rock in the Northern Cape region. In this regard, the outcomes of previous assessments indicate that depending on interpretation, waste rock/overburden material may be a Type 3 or 4 waste which would indicate a Class C or D liner system. Furthermore, risk based considerations are required to ensure that the end solution matches potential risk. In this regard, although baseline groundwater quality is good (used for domestic purposes), the modelled results of the groundwater assessment (which assumes no liner) indicate that the pollution plume was simulated not to exceed a maximum distance of approximately 100 meters in the down gradient direction at a time of 50 years post closure. The surrounding groundwater users should not be affected.

It is therefore recommended that there is less focus on implementing a liner and more focus on the control of dirty water runoff from the temporary waste rock/overburden facility. Moreover, a network of monitoring boreholes is required to closely track the potential for pollution migration emanating from the overburden/waste rock facility. The end mitigation measure is removal of the waste rock dump and disposal of this into the final pit void. This will eliminate the source, although it should be noted that some waste rock may remain on surface due to bulking.

In addition, it is not practically possible to line an open pit that is designed with con-current backfilling. There are multiple reasons for this. A key consideration is that the method of blasting overburden from one new strip into the previously mined strip will damage any liner system. A related issue is that the side and footwalls of the open pit are not smooth surfaced making it impossible to introduce a liner system. The pit will be at its deepest at approximately 50 m. No liner will completely withstand this type of loading without deformation.

Non-Minerological Waste

General and Hazardous Waste

General and hazardous waste as defined under NEM: WA will be generated at the mine. General waste will comprise concrete, rubble, glass, plastics and recyclable metals, whereas hazardous waste will include used oils, oily rags and some paints. Temporary waste storage facilities will be constructed for hazardous and general waste within the mine infrastructure area. A facility for the bailing and sorting of waste will be provided for within the temporary storage areas. Provision will be made for the following at the storage area:

- Drums containing hazardous waste will be sealed
- All liquids will be stored in a bunded area. Containment of spillage within a bund capable of containing 110% of the largest container volume.

No disposal of waste will take place at the mine; once a week, a designated service provider shall be responsible for transporting the waste from the mine sites to a designated, authorised disposal site.

<u>Storage of Waste tyres</u>

Mine vehicles tyres will be changed at the service area within the workshop area. Waste tyres will then be stored at the workshop area. Waste tyres will be stored in accordance with the norms and standards for waste tyre storage.

<u>Sewage</u>

Sewage will be directed through a piped network to a central conservancy tank. The conservancy tank will be routinely emptied by tankers and treated at an authorised sewage treatment plant off site.

4.2.3.7 Stockpile Management

A Run of Mine (ROM) and product stockpile area will be established at the mine. The foundation of the ROM and product stockpile pad will be constructed using overburden from the mine pit. The ROM stockpile will have capacity to store 1,705kt. Ore from ROM will be sent to a primary crusher and then loaded onto trucks and taken to offsite for further processing. Run off from stockpile area will be directed toward the stormwater management dam via dirty stormwater runoff channels.

4.2.3.8 Controlled blasting

Blasting will be undertaken during daylight hours. Controlled blasting methods will be employed at the mine. Typical controlled blasting strategies utilize small diameter blast holes detonated as a pre-shear line in harder massive rock or as a post-shear (cushion) line in weak or heavily fractured rock. This blasting method reduces the production of flyrock.

4.2.3.9 Storage of Dangerous Goods

Fuel Storage

An area for the storage of bulk fuel and lubricants to operate mechanised fleet will be required at the mine. The fuel storage area will be located close to the office areas. The facility will accommodate self-contained, containerized storage tanks and dispensing units. The total storage of fuel and lubricants will not exceed 80 000 litres. Provision will be made for the following at the storage area:

- Dispensing of diesel fuel and lubricants to vehicles at the storage facility
- Containment of spillage within a bund capable of containing 110% of the largest container volume
- Collection and storage of old oils ready for collection for disposal
- Dispensing of all lubricant products for lubrication/greasing, oil fills and top ups.

Fuel will be delivered on a weekly basis at the mine, details of the fuel storage area is given in Table 4-10 below.

TABLE 4-10:FUEL FARM TANK DETAILS

Fuel Farm Tank Details	
Fuel Requirement (ℓ)	53 060
Fuel Farm Holding Capacity (ℓ)	74 000
Delivery Interval	7 days
Description	1 x 74 000 self bunded tank, complete with delivery and dispersing pumps
Lubrication Requirement (ℓ)	Variable but averaging less than 6000
Delivery Interval	To be delivered as per maintenance schedule, tanks to be kept full at all times
Description	One large tank separated into compartments for the different oils and lubricants.

Explosive Magazine

The explosives / detonators will be stored in explosive magazine containers with a protective blast berm built around them and the facility will be securely fenced off. There will be four M3.5 container units that will be placed a minimum of 500 m away (see Figure 4-1) from any buildings and activities that could lead to personnel injuries or a fatality should an accidental explosion occur.

4.2.3.10 Other Support Services and Facilities

Other support infrastructure includes:

- Communication infrastructure: communication at the mine will either be serviced via Telkom or a cellular link. No cellphone mast will be required.
- Admin offices: Two mobile offices will be established at the mine, the offices will occupy an area of approximately 36 m^2
- Security at main gate: A single mobile container unit will be assembled as a security office.
- Store area: This will comprise of a single container unit
- Washbay: Washbay for light and heavy motor vehicles. It will occupy an area of approximately 150 m^2
- Ablutions and change rooms: Two mobile units for male and female ablution blocks will be assembled at the admin block
- Mine Fencing, security at main gate and lighting protection masts
- Parking area: Two separate parking areas for heavy vehicles and light vehicles. The heavy vehicle parking area will also have a service bay. Dirty water from the service bay will be directed towards the stomwater dam.

4.2.3.11 Labour Requirements and Accommodation

The total staff requirement at full production for is estimated at 80 persons. It should be noted that contractors will be appointed for the operation of the mine. During the operational phase, staff are expected to be accommodated within existing towns in Postmasburg or surrounding areas.

4.2.3.12 Operating hours

At this stage it is expected that the proposed mine will be operational 20 hours a day for 5½ days a week (Monday to Friday and half of Saturday). It is anticipated that there will be two 10 hour shifts per day for 5 days and one 10 hour shift on Saturday.

4.2.3.13 Life of mine

It is anticipated that mining and processing activities will reach full production in 2019. The anticipated life of mine is approximately 6 years.

4.3 DECOMISSIONING PHASE

The closure objective will be to rehabilitate the land to a state that is close to the pre-mining potential or as agreed with the land owner and the relevant authorities. At a conceptual level, decommissioning is a reverse of the construction phase with infrastructure and activities very similar to those described for the construction phase. The conceptual decommissioning plan is as follows:

- All surface infrastructure will be removed from site
- The open pit will be progressively backfilled with rollover mining, however due to bulking, some waste rock from the initial boxcut may remain on surface
- Areas where infrastructure has been removed will be levelled and topsoil restored
- Remove all waste and contaminated soil and water from the project area and dispose of appropriately.

<u>Mineralised waste facility decommissioning:</u>

- The remaining material on the waste rock dump (if any) will be shaped to prevent ponding and to create slopes that allow vegetation to establish on the facility
- Runoff and eroded material from the dump surface will be captured behind a perimeter bund and allowed to evaporate until vegetation has been properly established
- Aftercare and maintenance will be designed and implemented for the post closure phase
- Surface and groundwater quality will be monitored regularly for a period to be agreed upon with the relevant authorities.

<u>The open pit:</u>

- The open pit will be fully backfilled with waste rock or overburden material in order to mimic the natural topography as far as practically possible and prevent ponding of rainfall
- Allow vegetation to re-establish itself.

<u>All other surface components:</u>

- All other surface infrastructure will be broken down and reused or disposed of as waste
- Contaminated soils underlying the structures will be excavated and disposed of appropriately

- The soil and vegetation function of the land will be restored to be free draining as far as practically possible. Hard surface may need to be ripped
- Any residual excavations (excluding the open pit void) will be backfilled and levelled with selected overburden material and covered with between 300 mm and 500 mm of topsoil.

5 POLICY AND LEGISLATIVE CONTEXT

This section outlines the key legislative requirements applicable to the proposed project. Table 5-1 below provides a summary of the applicable legislative context and policy.

TABLE 5-1: LEGAL FRAMEWORK

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Mineral and Petroleum Resources Development Act No. 28 of 2002 (MPRDA) and Regulations	As outlined in Table 5-2	COZA has applied for a mining right in terms of the MPRDA. A mining right application was submitted on 03 July 2015 to the Department of Mineral Resources.
National Environmental Management Act No. 107 of 1998 (NEMA)	As outlined in Table 5-2	An application for environmental authorisation in terms of listed activities in accordance to NEMA has been applied for. The NEMA application was submitted on 03 July 2015 to the Department of Mineral Resources. A copy of the application form is attached in Appendix E.
Regulations 983 (Listing Notice 1), 984 (Listing Notice 2) and 985 (Listing Notice 3) in terms of NEMA	As outlined in Section 4.1.	
National Environment Management: Waste Act No. 59 of 2008 (NEM:WA)	As outlined in Section 4.1.	An application for a waste management license in terms of the NEM:WA was submitted on 03 July 2015 to the Department of Mineral Resources.
Regulation 921 in terms of NEM:WA	As outlined in Section 4.1.	
National Water Act No. 36 of 1998 (NWA)	Section 7.4.1.6, 7.8 and 28	A water use license application will be submitted to the Department of Water and Sanitation for various water uses in accordance to Section 21 of the NWA. As part of the water use license application, exemption in terms of Regulation 704 of 1999 will be applied for.
Regulation 704 of 1999 in terms of the NWA	Section 7.4.1.6, 7.8 and 28	
National Environmental Management: Biodiversity Act No. 10 of 2004 (NEM:BA)	Section 7.4.1.7	A permit will be required if there is a need to capture faunal protected species on site for search and rescue measures.
Mining and Biodiversity Guideline (DEA *et al*, 2013)	Section 7.4.1.7	Not applicable
National Freshwater Ecosystem Priority Areas 2011 (NFEPA)	Section 7.4.1.7	Not applicable
National Veld and Forest Fire Act No. 101 of 1998	Section 7.4.1.7	Not applicable
International Union for Conservation of Nature (IUCN)	Section 7.4.1.7	Not applicable
National Forest Act No. 84 of 1998 (NFA)	Section 7.4.1.7	An integrated permit application will be submitted to obtain the required permission to remove and/or translocate protected species in terms of the NFA and the NCNCA.
Northern Cape Nature Conservation Act No. 9 of 2009 (NCNCA)	Section 7.4.1.7	
Conservation of Agriculture Resources Act No. 43 of 1983	Section 7.4.1.7	Agriculture has been taken into account as part of project planning.
National Protected Areas Expansion Strategy 2008 (NPAES)	Section 7.4.1.7	Biodiversity has been taken into account as part of project planning.
South African National Botanical Institute (SANBI) Integrated Biodiversity Information	Section 7.4.1.7	Biodiversity has beem taken into account as part of project planning.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Heritage Resource Act No. 25 of 1999	Section 0	Hertiage has been taken into account as part of project planning
Northern Cape Planning and Development Act No. 7 of 1998	Section 7.4.1.7	A re-zoning application will be submitted by Coza in due course.
Spatial Planning and Land Use Management Act No. 16 of 239.		
South African Code of Practice for Mine Residue Deposits (SANS 10286:1998)	Section 4.2	Mine residue planning has been taken into account as part of project planning.

This document has been prepared strictly in accordance with the DMR EIR and EMPr Report template format, and was informed by the guidelines posted on the official DMR website. This is in accordance with the requirements of the MPRDA. In addition, this report complies with the requirements of the National Environmental Management Act (NEMA) (Act 107 of 1998). The relevant criteria are indicated in Table 5-2.

TABLE 5-2: REPORT REQUIREMENTS

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
Part a of DMR report template	**Appendix 3 of the nema regulations**	**-**
The EAP who prepared the report	Details of the EAP who prepared the report.	Section 1.1
Expertise of the EAP	Details of the expertise of the EAP, including curriculum vitae.	Section 1.1.2 and Appendix B
Description of the property	The location of the activity, including - the 21 digit Surveyor General code of each cadastral land parcel. Where available the physical address and farm name. Where the required information is not available, the coordinates of the boundary of the property or properties.	Section 2
Locality plan	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	Section 3.
Description of the scope of the proposed overall activity	A description of the scope of the proposed activity, including all listed and specified activities triggered.	Section 4.1
Description of the activities to be undertaken	A description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for and a description of the associated structure and infrastructure related to the development	Section 4.1
Policy and legislative context	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and	Section 5

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
	responds to the legislation and policy context	
Need and desirability of the proposed activity	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Section 6
Motivation for the preferred development footprint within the approved site including	A motivation of the preferred development footprint within the approved site including	Section 7
A full description of the process followed to reach the proposed development footprint within the approved site	A full description of the process followed to reach the proposed development footprint within the approved site	Section 7
Details of the development footprint alternatives considered	Details of all the alternatives considered.	Section 7.1
Details of the public participation process followed	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.	Section 7.2
Summary of issues raised by IAPs	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	Section 7.3
Environmental attributes associated with the development footprint alternatives	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	Section 7.4
Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree of the impacts	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed and mitigated.	Section 7.5
Methodology used in determining the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks.	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.	Section 7.6
The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternative will have on the environment and the community that may be affected.	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	Section 7.7
The possible mitigation measures that could be applied and the level of risk	The possible mitigation measures that could be applied and level of residual risk.	Section 7.8
Motivation where no alternative sites were considered	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such.	Section 7.9
Statement motivating the alternative development location within the overall site	A concluding statement indicating the preferred alternatives, including preferred location within the approved site.	Section 7.10

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
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) through the life of the activity	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structure and infrastructure will impose on the preferred location through the life of the activity including a description of all environmental issues and risks that were identified during the environmental impact assessment process and 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.	Section 8
Assessment of each identified potentially significant impact and risk	An assessment of each identified potentially significant impact and risk including cumulative impacts, the nature, significant and consequence of the impact and risk, the extent and duration of the impact and risk, the probability of the impact and risk occurring, the degree to which the impact can be reversed, the degree to which the impact and risk may cause irreplaceable loss of a resources and the degree to which the impact and risk can be mitigated.	Section 9
Summary of specialist reports	Where applicable the summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 10
Environmental impact statement	An environmental impact statement which contains a summary of the key findings of the environmental impact assessment, a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Section 11
Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr	Based on the assessment, and where applicable, 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	Section 12
Final proposed alternatives	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment	Section 13
Aspects for inclusion as conditions of authorisation	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 14

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
Description of any assumptions, uncertainties and gaps in knowledge	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 15
Reasoned opinion as to whether the proposed activity should or should not be authorised	Reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 16
Period for which environmental authorisation is required	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	Section 17
Undertaking	An undertaking under oath or affirmation by the EAP in relation to the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&Aps, the inclusion of inputs and recommendations from the specialist reports where relevant and any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	Section 18
Financial provision	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Section 19
Deviation from the approved scoping report and plan of study	An indication of any deviation from the approved scoping report, including the plan of study, including any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and a motivation for the deviation	Section 20
Other information required by the competent authority	Any specific information required by the competent authority.	Section 21
Other matter required in terms of section 24(4)(a) and (b) of the Act.	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	Section 22
PART B OF THE DMR REPORT TEMPLATE	**APPENDIX 4 OF THE NEMA REGULATIONS**	-
Details of EAP	Details of the EAP who prepared the EMPr and the expertise of that EAP to prepare the EMPr, including a curriculum vitae	Section 23
Description of the aspects of the activity	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 24
Composite map	A map 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	Section 25

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
Description of impact management objectives including management statements	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including planning and design, pre-construction activities, construction activities, rehabilitation of the environment after construction and where applicable post closure; and where relevant, operation activities	Section 26
The determination of closure objectives		Section 26.1
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	-	Section 26.2
Potential acid mine drainage	-	Section 26.3
Steps taken to investigate, assess and evaluate the impact of acid mine drainage	-	Section 26.4
Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage	-	Section 26.5
Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage	-	Section 26.6
Volumes and rate of water use required for the mining	-	Section 26.7
Has a water use license been applied for?	-	Section 26.8
Impacts to be mitigated in their respective phases	-	Section 26.9
Impact management outcomes	A description and identification of impact management outcomes required for the aspects contemplated in paragraph	Section 27
Impact management actions	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes be achieved, and must, where applicable, include actions to avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; comply with any prescribed environmental management standards or practices; comply with any applicable provisions of the Act regarding closure, where applicable comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.	Section 28
Financial provision		Section 29
Mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon	The method of monitoring the implementation of the impact management actions	Section 30
	The frequency of monitoring the implementation of the impact management actions	

EIR and EMPr report requirement as per the dmr template	EIR and EMPr report requirements as per the 2014 nema regulations	Reference in the EIR/EMPr report
	An indication of the persons who will be responsible for the implementation of the impact management actions	
	The time periods within which the impact management actions must be implemented	
	The mechanism for monitoring compliance with the impact management actions	
	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	
Environmental Awareness Plan	An environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks must be dealt with in order to avoid pollution or the degradation of the environment	Section 31
Specific information required by the competent authority	Any specific information that may be required by the competent authority	Section 32
Undertaking	-	Section 33

6 NEED AND DESIRABILITY OF THE PROPOSED PROJECT

On the 20th of October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. The key components are listed and discussed below:

- Securing ecological sustainable development and use of natural resources
- Promoting justifiable economic and social development.

6.1 SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES

A full suite of detailed studies on the environment were conducted for the proposed project. Key findings are summarised in the relevant baseline sections and indicate sensitivities within the mining right application area related to biodiversity. The proposed mine plan has taken all identified sensitives into account and adjusted the project plan as follows:

- Surface infrastructure has been limited to the less sensitive areas avoiding disturbace of surface water features, heritage sites and identified protected plant species.
- Preffered alternative of the WRD will be closer to the open pit so as to prevent long haulage distances and associated diesel fume emissions.

The relevant specialist studies found that the potential impacts associated with the current site layout and mine plan can be mitigated to an acceptable level, assuming effective implementation of the management and mitigation measures. Specific management and mitigation measures are outlined in the EMPr.

6.2 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

The proposed project will result in positive socio-economic impacts (Refer to Appendix FP for the detailed assessment). In this regard, the proposed development of the mine supports the national SA economy at a macro level by generating exports that will leverage foreign income to the country. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees. This is in line with the municipal Spatial Development Frameworks and Integrated Development Plans for the area which identify the promotion of mining job creation as one of the strategies to guide spatial development within the broader area given that mining forms the backbone of employment and is the main source of income within the local municipality. Further to this, through employment, persons at the proposed mine will gain skills in the construction and operation of a mine and development which contributes to the building of the nation. Management measures that will be implemented to further enhance positive socio-economic impacts include the employment of people in local communities (as far as possible), formal bursary and skills development provided to people in the closest communities and the implementation of a procurement mentorship programme which provides support to local businesses. Further to this, the proposed development will also ensure local economic development through the implementation of projects identified in the social and labour plan (SLP). The projects identified in the SLP will aim to contribute towards the socio-economic development of the area as well as the areas from which the majority of the workforce is sourced.

Due to the expectation of employment associated with mining projects there is potential for negative socio-economic impacts to occur (Refer to Appendix F for the detailed assessment). In this regard, an influx of job seekers to an area increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. Management measures that will be implemented to manage and remedy these impacts include the implementation of a health policy on HIV/AIDs and tuberculosis, working together with local and regional authorities to address social service constraints and to monitor and prevent the development of informal settlements. In addition to this, no housing will be established on-site and formal communication structures and procurement procedures will be developed (Refer to Section 28 for further detail).

7 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT ON THE SITE INCLUDING THE PROCESS FOLLOWED TO DEFINE THE PREFERRED DEVELOPMENT ALTERNATIVES

7.1 DETAILS OF THE DEVELOPMENT FOOTPRINT CONSIDERED

This section describes land use or development alternatives, alternative means of carrying out the operation, and the consequences of not proceeding with the proposed project.

The main project alternatives that were presented in the Scoping phase and are considered in the EIA include:

- The no go alternative
- Alternative land use
- Project Infrastructure alternative
- Water Supply alternative.

7.1.1 NO-GO ALTERNATIVE

If the COZA Iron Ore Project is not undertaken, the potential negative impacts on the environment and socio-economic environment will be avoided. However this would also mean that the positive economic benefits for investors, local communities and society in general will not be realised. These positive economic benefits include the creation of direct employment opportunities during the construction and operation phase of the mine. Employed individuals, and their dependants, will benefit economically from the employment. Through employment, persons at the mine will also gain skills involved in the construction and operation of a mine. Persons from the local area employed at the mine will be spending their income in these communities therefore contributing to the local economy. The design, construction and operation of the mine could make use of local consulting and manufacturing companies. The proposed development will also ensure local economic development through the implementation of projects identified in the Social and Labour Plan. COZA Mining is fully committed to implementing development plans and projects that will facilitate local community and rural development in the area surrounding the COZA Iron Ore Project in line with the provisions of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry. These potential benefits will not be realised if the proposed operation does not proceed.

From an environmental perspective, the COZA Iron Ore Project will not result in significant environmental impacts that cannot be adequately mitigated, largely as a result of the fact that the project, besides being relatively small and short-lived for a mine, will take place in a disturbed area.

When considering the economic gain and environmental impacts of the project the no-go alternative is not preferred as it will result in a substantial contribution to the economy not being realised.

7.1.2 LAND USE ALTERNATIVES

An economic assessment was undertaken to determine the impacts of change in land use as well as to advise on the best land use alternative considering mining and the current land use which is grazing land. For the assessment, an area of approximately 1 983 ha was considered. The land is currently used for livestock grazing by the Maremane Community. Demacon 2014, estimated that total project site can accommodate approximately 86 livestock units with a value of R59 318 (Net Income). Assuming that infrastructure will stay in place for 10 years, which is a conservative estimate, the value of potential agricultural economic activity lost due to the development of the mine totals R593 180 over the life of mine (2014 values) (Demacon, 2014 - Appendix P).

The development of the mine at Driehoekspan will however create new economic activity in the area, as there is currently limited activity taking place on the site. The development of the mine will result in both short term (construction) and long term (annual sustained) economic activity that will create direct and indirect opportunities within the economy. According to Demacon (2014), the combined direct and indirect economy wide impact of the proposed mining operation could create an additional R3.1 billion annually in new business sales, R2.1 billion in additional Gross Geographic Product (GGP) annually, as well as 4 600 sustained employment opportunities Based on economic value, converting the current land use to mining will have a significant benefit to society in general.

The site is also located in an area that has already been disturbed and will therefore not result in significant environmental impacts. Identified environmental impacts can also be mitigated or manged to acceptable levels.

7.1.3 SITE LAYOUT ALTERNATIVES

Three alternatives for the location of the Waste Rock Dump (WRD) were presented in the Scoping Report. The location of the alternative sites is provided in Figure 7-27. No significant differences are expected with respect to the waste rock dump alternatives, with the exception of topography and distance to the open pit. Alternative 3 is preferred due to favourable topography and proximity to the open pit (refer to Section 7.7 for more detailed discussion).

7.1.4 WATER SUPPLY ALTERNATIVES

During the scoping phase, two alternatives for water supply were identified which included sourcing water from boreholes or from the Vaal-Gamagara Pipeline. An assessment of potential water availability at the mine was undertaken and it was determined that the boreholes on site would be suitable to supply the mine with water for construction and operation phase. This is therefore the preferred option.

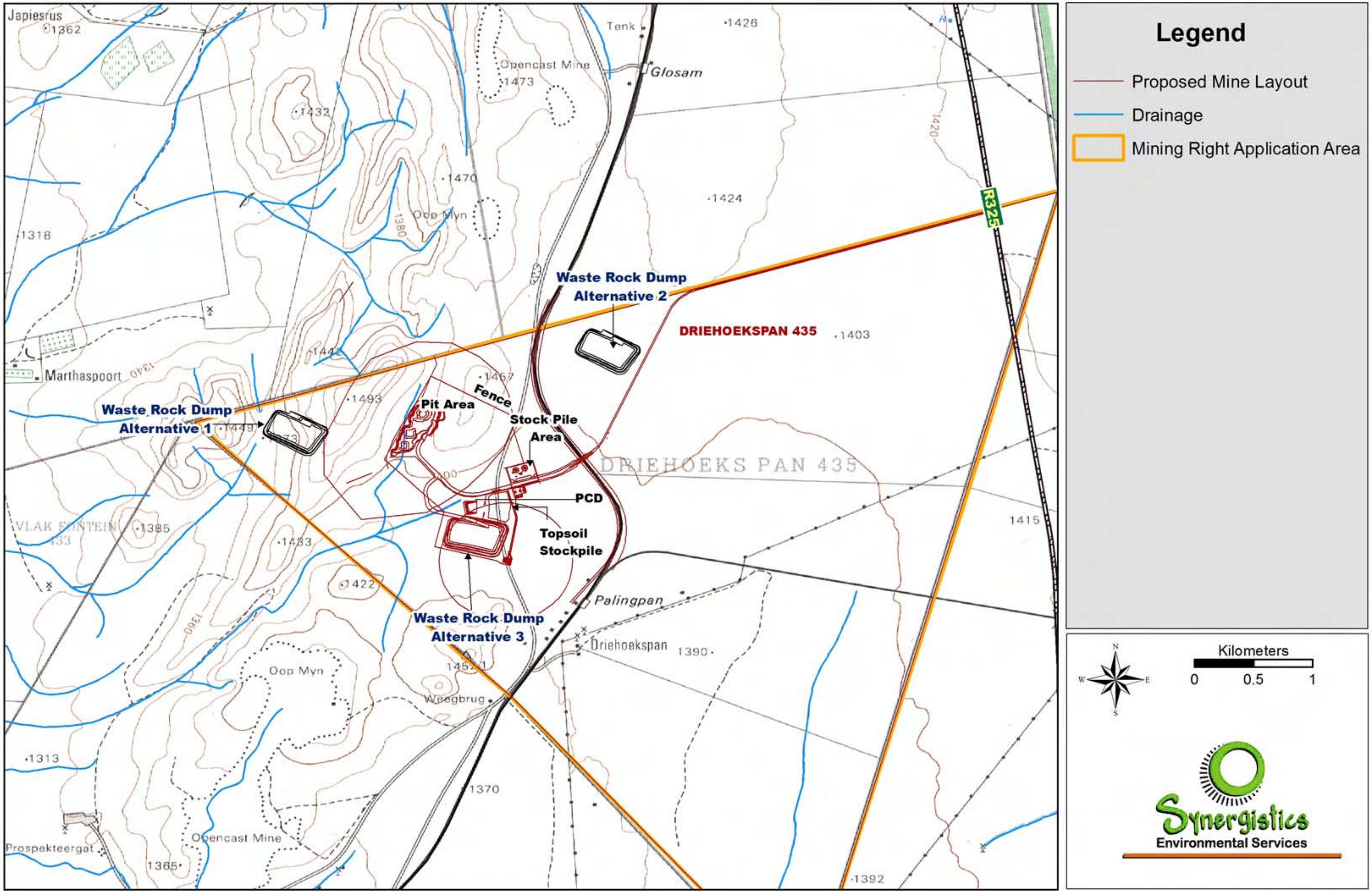


Figure 7-1: Waste Rock Dump Alternatives

SO707	Coordinate System: DMS		
	Spheroid: WGS84	Central Meridian: LO	

7.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

This section describes the information provided to landowners, adjacent landowners, regulatory authorities and other interested and affected parties (IAPs) to inform them in sufficient detail of what the proposed project will entail on the land, in order for them to assess what impact the operation will have on them or the use of the land.

7.2.1 INITIAL SCOPING PHASE CONSULTATION

The initial scoping public consultation process was for the proposed development on Doornpan and Driehoekspan and was carried out between May and June 2013. At that stage Thaakwaneng was not part of the project planning.

IAP database

The proposed project's public involvement database was developed by sourcing IAPs details relating to immediate landowners and adjacent landowners by means of a deed search. In addition to this, the project's public involvement database was supplemented with information on IAPs provided in the scoping meetings. A copy of the project's public involvement database is included in Appendix E.The database will be updated on an on-going basis throughout the environmental process.

Direct letter to the landowners

A letter was sent to Mr More Matsididi as a representative of the Maremane Community and a member of the Community Property Association (CPA). Mr Matsididi signed the acknowledgment of receipt on the 8th of March 2013 and signed consent to undertake the additional waste management listed activities in terms of NEM: WA on portion 1 of Doornpan 445 and the remaining extent of Driehoekspan 435. Consultations with the other members of the Maremane community subsequently revealed that there were other members of the CPA that needed to be consulted. Synergistics consulted with the DALRD to establish members of the CPA and it was confirmed that Mr Mastididi was in fact the relevant representative. In addition Mr Tshwaro Mothlabedi was identified as another representative to be consulted. Notification letters were sent to Mr Tshwaro as well.

Distribution of a Background Information Document

BIDs were circulated by hand between the 9th and 10th of May 2013 to all adjacent landowner, mines and communities. Other IAPs, including regulatory authorities, received the BID via email. The BID was also provided at the information sharing meeting on 23 May 2013.

Press and site notification

Press adverts were placed in the following newspapers:

- Kathu Gazette in English on the 18th of May 2013

- Volksblad in Afrikaans on the 15 May 2013.

Site notices (A2 and A3) were placed on the 9 and 10th of May 2013 at the following areas:

- Main entrance to Farms Driehoekspan and Doornpan (English and Afrikaans)
- Tsantsabane Local Municipality's notice board (English, Afrikaans and Setswana)
- Maremane Community at the local shop (Setswana)

The press and site notification was undertaken to elicit interest from other IAPs that might not have been identified during the stakeholder identification process. The advert and site notice are included in Appendix E.

Public Information Sharing meetings

Information sharing meetings were held on the 23rd of May 2013. Meetings were held at the following areas:

- Postmasburg Town Hall at 10h00-12h00
- Maremane Community Hall at 13h30-15h30

The purpose of the meetings was to introduce the COZA Iron Project to IAPs as well as to advise them of the EIA process that is currently being undertaken by Synergistics. The meeting also afforded IAPs the opportunity to raise any issues of concern regarding the project and the EIA process. The meeting in Postmasburg was held in English whilst the Maremane Community meeting was held in Setswana. The list of attendees and minutes of the meeting are attached as Appendix E.

7.2.2 SUPPLEMENTARY SCOPING PHASE CONSULTATION

The public consultation process was resumed in 2015 when the farm Thaakwaneng was added to the application area and the Doornpan EIA was separated from the Driehoekspan EIA.

Notification of IAPs

In 2015 IAPs were notified of the proposed development via site notices and advertising. Notifications letters of the project and availability of the Scoping Report were provided in English, Afrikaans and Setswana where required (see Appendix E for notification letter). It was not deemed necessary to hold additional scoping phase public meetings because the information presented on the plans for Driehoekspan in 2013 remains unchanged and no surface infrastructure is planned for Thaakwaneng. As such the issues and concerns from the 2013 process have been included in the issues report for this application process.

Direct letter to the landowners

A notification letter was sent to Mr More Matsididi on 10 June 2015 as a representative of the Maremane Community indicating that the current application now included the farm Thaakwaneng. Proof of submission is included in Appendix E.

Press and site notification

Press adverts were placed in the following newspapers:

- Kathu Gazette in English on 8 May 2015
- Volksblad in Afrikaans on 7 May 2015

Site notices (A2 and A3) were placed on the 8 May 2015 at the following areas:

- R325, entrance to Farm Thakwaaneng (English and Afrikaans)
- R325, entrance to Farm Driehoekspan (English and Afrikaans)
- Entrance to Farm Driehoekspan (RE) (English and Afrikaans)
- Tsantsabane Local Municipality's Library (English, Afrikaans and Setswana)
- Maremane Community at the local shop (Setswana).
- R325, Manganore off-turn (Afrikaans, English and Setswana)

The press and site notification was undertaken to elicit interest from other IAPs that might not have been identified during the earlier stakeholder identification process. The advert and site notice are included in Appendix E.

Public review of the Scoping Report

The scoping report was made available for public and regulatory authority review on 10 June 2015 until 16 July 2015. The report was made available via email, in hard copy at the Postmasburg Library and at the SLR offices in Johannesburg. A full copy was also sent to the Maremane Community.

7.2.3 CURRENT SCOPING PHASE CONSULTATION

On 24 July 2015 the Minister of Environmental Affairs amended the list of waste management activities (GNR. 633) in terms of the National Environmental Management Waste Act No. 59 of 2008 (NEM:WA) to include a new activity, amongst others: activity 4(11) of Category B: *The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002*).

Due to this change in legislation, activity 4(11) of Category B was been added to the application for this project in February 2016 in order to allow the development of a waste rock dump.

Public review of the Scoping Report

The scoping report was revised to include the additional Listed Activity and made available for public and regulatory authority review on 10 February 2016 until 15 March 2016. The report was made available via email, in hard copy at the Postmasburg Library and at the SLR offices in Johannesburg. A full copy was also sent to the Maremane Community.

Public review of the EIR and EMPr report

This EIR and EMPr report will be made available for public and regulatory authorities review for a period of 30 days. The report will made available via email, in hard copy at the Postmasburg Library and at the SLR offices in Johannesburg. A full copy will also be sent to the Maremane Community. Summaries of the report will be sent by post or e-mail to all IAPs and regulatory authorities that were registered on the public involvement database.

7.3 SUMMARY OF ISSUES RAISED BY IAPS

A summary of the issues and concerns raised by IAPs and regulatory authorities is provided in Table 7-1 below.

TABLE 7-1: SUMMARY OF ISSUES RAISED BY IAPS AND REGULATORY AUTHORITIES

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
AFFECTED PARTIES			
Landowner/s and lawful occupiers (Maremane Community)			
Mr Boniface Masiame Maremane Community	23 May 2013	• Asked if any people from the communities are required for the process in terms of labour (specialist studies). • Raised the issue that the information of the meeting was not appropriately marketed toward the Maremane Community. • Asked if the Department of Rural Development and Land Reform (RDLR). Was consulted as they were key in the Maremane Community land claim process • Indicated that there are people that are not in the area but who at a later stage will be relocated to the land and will be affected by this development. He asked how these people would be accommodated. • Raised the issue that some of the people from the Maremane Community are from the Kuruman area and this meeting and the project is very far from Kuruman. As such the people will not know what is happening • Asked whether meetings can be held in Kuruman • Raised a concern that Maremane community members from Kuruman are being excluded from the public participation process and problems may arise if people come to Maremane from Kuruman. • Referring to a DMR document from 2010, the IAP asked about the prospecting and mining right and why COZA are not mining in all the areas.	• Specialist studies are conducted by qualified specialists who go to site to scope the area to gather data. They are usually only there for limited time. The specialist work does not require labour as they do the work themselves. As such, specialist studies do not provide opportunities to the people from the community in terms of labour. • The community were identified through the distribution of BIDs. Synergistics also consulted Mpho Mashila , the ward councillor, and Joseph Madupe , who are representatives of the Maremane community. The Maremane community said they knew of the Postmasburg meeting but it was too far, thus another meeting was organised for them at the Maremane Community Hall • Regarding the department of Rural Development and Land Reform, this department has been notified of the project, received BIDs and have been notified of the EIA process. The Department of Mineral Resources (DMR), in their report, also wants to find out if the department of RDLR has been consulted. • The consultation process involved community representatives and they in turn report back to the other members of the Maremane Community. • It would not be possible to have meetings with people from all over the area like Kuruman. We are dealing with people that are most likely to be directly impacted by the project. People from Kuruman are not being excluded however • Kuruman is too far for the people from Maremane and Kuruman is not an area that will be directly affected by the project. The ideal option would for the

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
			leaders of the Kuruman communities to come to the Maremane meetings and give feedback to the people of the community. • People who register will be kept informed throughout the process. Synergistics would like the leaders to get involved to inform the other communities. • COZA were granted prospecting rights for various farms but only plan to mine on certain porions of this land
Mr Ephraim Sibanda Maremane Community	23 May 2013	• Questioned whether the people from the Maremane Community would benefit in terms of employment if the processing will be undertaken elsewhere. He indicated that he believes processing creates more employment opportunities than mining. • Requested an organogram for COZA Mining • Queried if COZA Mining has a mining licence.	• The resource does not warrant the location of a processing plant within the mine areas. There is another area of interest for COZA that may have sufficient resource to support a processing plant. In terms of job opportunities, COZA's Social and Labour Plan (SLP) would have to consider the people at all mining areas and the other areas of interest. • COZA Mining is still a new company and an organogram is not yet available. The community should liaise directly with Synergistics and the project manager Mr Tabi Kowet to get further details. • COZA does not have a mining right but have a prospecting right. The current EIA process is undertaken as part of the process to apply for a mining right. The mining right application for Driehoekspan and Thakwaneng was submitted in March 2015
Lebogang Kunere Maremane Community	23 May 2013	• Asked what would be done for the community once they start to mine and they gain profit. He indicated that the community needs to get an idea of what benefits they will receive from the project. • Queried if there would be a survey of the resource before mining commences. • Enquired what income was received from prospecting and where was the money spent	• A social and labour plan is being developed as part of the mining right application. The community will be consulted on community development projects that will form part of the SLP. Because the SLP is currently in the process of being developed, COZA is not as yet in a position to communicate the community benefits. This information will be communicated once the SLP has been finalised. • Prospecting activities have already been undertaken for the project and the project team is currently at the

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
			resource estimation process. • No money was obtained from prospecting
Mathapelo Kgotlaekae Maremane Community	23 May 2013	• Indicated that the community is fearful that once COZA is granted a mining right, there will be no benefits for the community. • Requested that the community must be consulted when preparing the SLP	• The SLP is still being drafted. This document will present the plans for community involvement. These will be communicated with the community once the plans have been drafted • The SLP is still being drafted and COZA believe that there has been some community interaction. COZA will confirm if there has been community interaction and establish who was consulted when drafting the SLP and provide a response. Post meeting note, the SLP consultants consulted with the authorities i.e. the DMR and local municipality.)
Hilda Sibanda Maremane Community	23 May 2013	• Indicated that she is reluctant to believe independent environmental consultants. She indicated that the community was previously consulted by independent consultants for the Sedibeng Mine, however they were not notified when the mine started. She indicated that the community was fearful that the same process would occur with the COZA project. • Asked why the application for environmental authorisation to the Northern Department of Environment and Nature Conservation was submitted before consultation with communities?	• As consultants Synergistics are bound by law to notify IAPs of authority decisions in terms of the National Environmental Management Act (No 107 of 1998) (NEMA). As such the Maremane community will be notified via post or sms of the decision from authorities. She indicated that members of the community will be kept informed of progress throughout the EIA process She explained that the Public Participation Process (PPP) allows for the involvement of communities. Post meeting note: a condition will be included in the EMPr that COZA should notify registered IAPs of commencement with construction and mining activities at least one (1) week prior to commencement. • The NEMA application was submitted as it was required by law. She advised that the application serves to notify the Department of the intention to commence with the EIA process
Mathapelo Kgotlaekae Maremane Community	23 May 2013	• Indicated that the Maremane Community are sceptical that Synergistics will return to meet with the community	• There will be a feedback meeting, where Synergistics presents the findings of the EIA. She indicated that the community would also be notified of the availability of the environment reports for review as well as the authority decisions.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
Landowners or lawful occupiers on adjacent properties			
None received			
Jan Olivier Adjacent Landowner, Roscoe 563	3 September 2015	Thank you for the opportunity to comment. • I am concerned about the safety of my family and farm animals. Will a proper security fence be erected along the property boundary? • I am concerned about the pollution and extraction of underground water • I am concerned about additional noise and air pollution • I am concerned about the effect of blasting on the structure of my farm buildings • I am concerned about vibrations caused by rock crushing and breaking, as already experiencing from the adjacent Khumani Mine • I am concerned about bystanders and workers entering my property illegally	Thank you for your comments. • Hazardous structures and excavations will be fenced off to keep third parties and animals out. This issue is discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report. • A specialist groundwater study was conducted to assess the potential impacts of pollution and abstraction of water and modelling found that no third parties should be negatively impacted. This is discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report. • Specialist air and noise studies were conducted and found that third parties should not be significantly impacted upon with management measures implemented. This issue is discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report. • The potential impacts of blasting are discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report. • Socio-economic impacts are discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report.
Municipal councillors			
Mpho Mashile	Estimated 22 April 2013 (telephonic conversation)	• Please hold a meeting at the Maremane community as well	• The meeting was held at the Maremane
Municipalities			
None received			

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
Communities			
Graig Katz Posmasburg	23 May 2013	• Asked how the community will benefit from the project in terms of employment. • Asked how the project will be able to decrease the high unemployment.	• The proposed development will workers during construction and workers during the operational phase. COZA Mining will endeavour to employ local persons as much as possible but this will be dependent on the type of skills required and availability of required skills locally. • It should also be noted that as part of the mining right application, COZA Mining has prepared a Social and Labour Plan which details a plan for socio-economic upliftment for the area hosting the COZA Iron Ore Project.
Rowena Jacobs Posmasburg	23 May 2013	• Requested that they be kept up to date with the project and asked how the community will benefit from the project.	• IAPs registered on the IAP database will receive project communication information throughout the EIA process. As part of the mining right application, COZA has prepared a Social and Labour Plan which details a plan for socio-economic upliftment for area hosting the COZA Iron Ore Project.
Itumeleng Moss Posmasburg	23 May 2013	• Enquired as to how the project and mining will benefit local communities. • Queried whether the municipality was consulted	• A Social and Labour Plan has developed for the mine which has identified local economic development projects. • Invitations were sent to the Municipal Mayor, Manager and Environmental Manager as well as the local Economic Development Officer. The ward councillor, was phoned to be invited and during the telephonic conversation advised Synergistics to also hold a meeting with the Maremane community. This was done.
Mimi Swart Posmasburg	23 May 2013	• Raised a concern regarding the prominence of mining in the area and the many problems that are not being appropriately dealt with. Indicated that there are problems related to groundwater and dust due to mining in the area. She raised a concern regarding the potential cumulative impacts of the mining in the area.	• Impacts on groundwater and air quality are discussed Section 9 and Appendix F. • The process is now at EIA stage.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		• Asked what stage the process is at currently.	
Mr Brandon Adams	5 June 2013	• An information sharing meeting was held on 23 May 2013, however no prior notice was given to Interested and Affected parties. The meeting should have been communicated in the local newspaper (The Ghaap, Diamond Field Advertiser. • When projects of this magnitude are taken, the locals are generally excluded to participate in the development and wealth of their minerals mined. Lack of excess to this wealth creation opportunity is hampered by "red tape" rules and regulations, that make it impossible to participate and once the investors are making their riches, they vanish and left the local residents high & dry. • My objection purely relates to the following issues Environmental Impact – pollution will affect all the communities around your operations and what remedies is available to alleviate this	• The information sharing meeting was advertised in the Kalahari Bulletin and Kathu Gazette. These newspapers circulate in the study area and its surroundings. • COZA are fully committed to implementing development plans and projects that will facilitate local community and rural development as part of their Social and Labour Plan (SLP). However, the project is still in its initial stages and COZA are still formulating their SLP. At this stage no specific information can be provided on the different community development initiatives that will be implemented by COZA. Additional information on potential social and economic impacts associated with the project is provided in Section 9 and Appendix F. • The potential pollution impacts have been identified and discussed in this report. In addition, measures to prevent and/or manage the potential pollution impacts have been provided. Further detail is provided in Section 9 and Appendix F.
Alfred Pegram Kimberley	23 May 2013	• Asked how far the project will be from Portion 3 of the Farm 445.	• The mining area will be approximately 3 km from Portion 3 of the Farm 445.
Mr Jim Bredenkamp Posmasburg	9 July 2013	• Requested the electronic copy of the report in CD-ROM	• A copy of the Draft Scoping report was posted on 15 July 2013.
Organs of State, Department of Land Affairs, Department of Environmental Affairs and Other Competent Authorities affected			
Mr Philane Msimango Department of Water and Sanitation	22 February 2016 Comments on Scoping Report	This Department has evaluated the scoping report and has no objections for its approval, provided, the following issues are addressed and strictly adhered to: a) Should the project continue, a site pre-consultation meeting followed by application of Water Use Authorisation must be submitted to DWS in terms of the National Water Act, 1998 (Act 36 of 1998) before any mining activities take place.	Thank you for your comments. a) The proponent will ensure a pre-consultation meeting and site visit is held with your department to initiate the water use licence application process.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		b) The Environmental Management Plan (EMP)/Environmental Impact Assessment (EIA) must clearly show all water courses as defined in the National Water Act, 1998 (Act 36 of 1998) as well as the delineation 1:100 year flood lines. No activity may occur within the 1:100 year flood line of a river/drainage line without authorisation. No activity may occur within the 500 metres of a pan/wetland (perennial/non perennial) without authorisation. c) The EMP/EIA must clearly show the methods for collecting, storing, transporting and finally disposing of all waste products produced as well as the responsible and accountable persons. This includes written consent from the relevant accredited waste disposal site/sewage dispoal/oil disposal in handling the waste. All applicable sections of the National Environmental Management: Waste Act 59 of 2008 should be strictly adhered to. d) The EIA/EMP must clearly identify all risks that are associated with the project that can affect the water resources in and around the project area and state all implementable measures to prevent and respond to accidents and abnormal events that may occur. e) The EMP/EIA must clearly show through a responsibility matrix and organogram the responsible persons for implementing the mitigation measures and reporting lines, in the event of an accident. f) The EMP/EIA must show in written form that the developer has made a legally binding commitment to implement the proposed mitigation measures and that these measures are not only suggestions and recommendations. g) The EIA/EMP must clearly show the process followed if the developer does not comply with the legal requirements of the EMP and National Water	b) The EMPr shows all watercourses and pans, as well as relevant floodlines. Refer to Section 7.4.1.6 c) All applicable sections of the National Environmental Management: Waste Act 59 of 2008 will be strictly adhered to. A waste management plan has been provided in Table 28-2:Waste management procedures for general and hazardous waste. COZA will put in place all required contracts with waste service providsers in advance of the construction phase. d) The potential impacts on surface and groundwater is described in the impact assessment appendix, and relevant management plans are provided in Table 28-1:Description of Impact Management Actions e) The management plans provided in Table 28-1:Description of Impact Management Actions include responsible parties f) The management plans provided in Table 28-1:Description of Impact Management Actions include responsible parties are legally binding commitments as per the EMPr report requirements g) Regular auditing of the EMPr is required in terms of the MPRDA and NEMA and any non-compliance

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		Act, 1998 (Act No 36 of 1998). <u>General Conditions</u> The regulations on the use of water for mining and related activities aimed at the protection of the Water Resources as published in the Government Notice No. 704 on 4 June (Government Gazette No. 20119) must be complied with. Every person in control of a mine or activity must take reasonable measures to comply with the following conditions: a) Prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or by seepage, and must retain or collect such substance or water containing waste for use, re-use, evaporation or for purification and disposal in terms of the Act; b) Design, modify, locate, construct and maintain all water systems, including residue deposits, in any area so as to prevent the pollution of any water resource through the operation or use thereof and to restrict the possibility of damage to the riparian or in-stream habitat through erosion or sedimentation, or the disturbance of vegetation, or the alteration of flow characteristics; c) Cause effective measures to be taken to minimise the flow of any surface water or floodwater into mine workings, opencast workings, other workings or subterranean caverns, through cracked or fissured formations, subsided ground, sinkholes, outcrop excavations, audits, entrances or any other openings; d) Design, modify, construct, maintain and use any dam or any residue deposit or stockpile used for the disposal or storage of mineral tailings, slimes, ash, or other hydraulic transported substances, so that the water or waste therein, or falling therein, will not result in the failure thereof or impair the stability thereof;	issues will be reported accordingly. The mine will comply with the requirements of R704. A detailed stormwater management plan is provided in Section 4.2.3.4 and Table 28-1:Description of Impact Management Actions.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		e) Prevent the erosion or leaching of materials from any residue deposit or stockpile from any area and contain material or substances so eroded or leached in such area by providing suitable barrier dams, evaporation dams or any other effective measures to prevent this material or substance from entering and polluting any water resources; f) Ensure that water used in any process at a mine or activity is recycled as far as practicable, and any facility, sump, pumping installation, catchments dam or other impoundment used for recycling water, is of adequate design and capacity to prevent the spillage, seepage or release of water containing waste at any time; g) At all times keep any water system free from any matter or obstruction which may affect the efficiency thereof; and h) Cause all domestic waste, including wash-water, which cannot be disposed of in a municipal sewage system, to be disposed of in terms of an authorisation under the Act • This reply does not grant any exemption from the requirements of any applicable Act, Ordinance, Regulation or By-law. • Please also note that any use of water without authorisation is unlawful as it is in contravention of the National Water Act, 1998 and is punishable by law. • You are invited to contact Mr P. Msimango of this office should you have any enquiries	Noted. Noted. Noted.
Ms Jacoline Mans Department of Agriculture, Forestry and Fisheries	15 May 2013	• The BID stated that the affected areas of the proposed open pit iron ore and associated infrastructure will be approximately 25 hectares on the farm Doornpan and 80 ha on farm Driehoekspan. Since vegetation clearance will be required, you may need a Forest Act Licence (from DAFF) and a Flora Permit (from Nature Conservation)	• Applications will be submitted to the relevant authorities for the removal of protected plant and tress species. • The act has been considered and applications for the removal of protected plants will be submitted prior to removal. • A CD copy of the EIA and EMPR report together with

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		• The BID listed the most important environmental legislation applicable to the project. The Northern Cape Nature Conservation Act (Act 9 of 2009) (NCNCA should also be consulted • Kindly supply this office with copies of the relevant documental for comments, especially the specialist biodiversity/ecological assessment and EMPR (once available). Please note that the office cannot download such documentation from the internet and it should be provided on a CD or in hardcopy format • Please ensure that the anticipated impacts on protected trees are assessed and try to design the mine in such a manner as to minimise the impact (if any) on such slow growing tree species. Where impacts cannot be avoided, appropriate mitigation may be required.	specialist studies will be submitted to your department • Impacts on flora have been assessed in the EIA report. See Section 9 and Appendix F.
Jacoline Mans	23 July 2015	• The report confirms the presence of NFA listed protected tree species on the site and stated that applications will be submitted to the relevant authorities for removal of such trees. The developer should note that a licence is not automatically issued. The DAFF can and has refused licenses in the past. It is therefore of utmost importance to try and minimise impacts on slow growing protected trees by placing infrastructure in areas where it will have the least impact on such trees. • The report indicated that the open pit will be on Farm Driehoekspan and that the total development footprint will be approximately 175 ha. It also stated that vegetation will be cleared in accordance to the biodiversity management plan to be developed (page 4-7). At what stage of the development and/or EIA process will this biodiversity plan be developed and will it be made available for comments.	• Your comment is noted. One of the key considerations during the preliminary assessment of alternative mine layouts was the disturbance of protected plant and tree species. COZA moved infrastructure (where possible) outside of areas where protected plant and tree species are located. There will however be disturbances to protected tree species within the pit area due to the location of the resource. • The biodiversity management plan will be made available for review when the draft EIA has been completed. All stakeholders will be notified on the availability of the EIA report as per legislative requirements. • This section outlines the key legislative requirements applicable to the proposed project. Table 5-1 below provides a summary of the applicable legislative context and policy.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		• Page 5-14 of the report refers to the applicable legislation. Kindly note that the NFA (already confirmed applicable) was not mentioned; neither was the Northern Cape Nature Conservation Act, 9 of 2009 (NCNCA) which will also be applicable if 175 ha of indigenous vegetation needs to be cleared. • What is the current zoning of the affected properties: mining or agriculture? If it is zoned as Agriculture, then other legislation may also be applicable such as the subdivision of Agricultural Land Act, act 70 of 1950 (SALA). • The report emphasised that the affected vegetation types, as classified by Mucina & Rutherford, is rated as "least concern". Kindly note the vegetation map is a very broad scale classification system and there might be a lot of variation on a local level. Hence it is crucial to get a specialist to assess the potential impacts on plants of special concern, since the site falls within the Griqualand West Centre of Endemism. The report mentioned that a total of 116 plants species may be present in the study area, which is quite rich in terms of biodiversity if compared to other study sites where the average number of plant species found was in the order of 35 to 45. The study site is also in close proximity to Ghaap Plateau vegetation type, which is regarded as sensitive and not protected at all. • The report indicated that two to three NFA listed protected tree species occur in the project area. In some places it stated two species and in others three. Kindly provide a list of all plant species encountered on site. • Page 8-68 of the report stated that only one (1) large Acacia (*Vachellia) erioloba* tree and about 220 Boscia Albitrunca trees and about 220 Boscia	• in this report has been updated to include the two acts mentioned. • The properties are currently zoned for agriculture and therefore This section outlines the key legislative requirements applicable to the proposed project. Table 5-1 below provides a summary of the applicable legislative context and policy. • has been updated to include the Agricultural Land Act, act 70 of 1950. • A vegetation specialist has been appointed to conduct an vegetation impact assessment due to the proposed project. The results and findings of the specialist will be presented in the EIA report. • The list of species encountered on site is included in Appendix 6 of this report. • Thank you for the information. The relevant applications will be submitted in due course.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		albitrunca trees were observed in the project area. Kindly note that Boscia albitrunca is dually protected in terms of the NFA and the NCNCA and hence a Forest Act Licence as well as a Flora Permit will be required prior to disturbance of any such species.	
Natasha Higgit	16 February 2016 Comments on Scoping Report	• It has been noted that heritage resources are discussed in the Scoping Report. Please ensure that a separate Heritage Impact Assessment is completed that considers the impacts of the activities as described in the Scoping Report and is submitted for comment. • In terms of the National Heritage Resources Act, no 25 of 1999, heritage resources, including archaeological or palaeontological sites over 100 years old, graves older than 60 years, structures older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resources authority. This means that before such sites are disturbed by development it is incumbent on the developer to ensure that a Heritage Impact Assessment is done. This must include the archaeological component (Phase 1) any other applicable heritage components. Appropriate (Phase 2) mitigation, which involves recording, sampling and dating sites that are to be destroyed, must be done as required. • In your application received by SAHRA there was no indication of an assessment of the archaeological resources. The quickest process to follow for the archaeological component would be to contract a specialist (see www.asapa.org.za) to provide a Phase 1 Archaeological Impact Assessment Report. • The Phase 1 Impact Assessment Report will identify the archaeological sites and assess their significance. It should also make recommendations	Thank you for your comments. A full heritage impact assessment study was conducted which included archaeological resources. The impacts on heritage resources are discussed in Appendix F and relevant management measures are provided in section 28 of the EIR and EMPr report.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		(as indicated in section 38) about the process to be followed. For example, there may need to be a mitigation phase (Phase 2) where the specialist will collect or excavate material and date the site. At the end of the process the heritage authority may give permission for destruction of the sites. If the property is very small or disturbed and there is no significant site the specialist may choose to send a letter to the heritage authority to indicate that there is no necessity for any further assessment. • Where bedrock is to be affected, or where there are coastal sediments, or marine or river terraces and in potentially fossiliferous superficial deposits, a Palaeontological Desk Top study must be undertaken to assess whether or not the development will impact upon palaeontological resources - or at least a letter of exemption from a Palaeontologist is needed to indicate that this is unnecessary. If the area is deemed sensitive, a full Phase 1 Palaeontological Impact Assessment will be required and if necessary a Phase 2 rescue operation might be necessary (see www.palaeontologicalsocitey.co.za). • Any other heritage resources that may be impacted such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewscapes must also be assessed	
Traditional Leaders			
None received		•	
OTHER AFFECTED PARTIES			
Mr. S.E Fiff Transnet Limited	20 May 2013	• Requested to be registered as an IAP	• Mr Fiff has been registered in the IAP database.
L Ramatladi	22 May 2013	Your email dated the 22th of May 2013 refers.	Your concerns are noted and have been forwarded to the

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
Transnet Limited		• Electrical: Need to comply to the regulations and clearances not to obstruct Transnet productivities of trains due to blasting. • Technical Support: There is a need for a Geological Assessment (depending on how close the mine will be to the existing railway line) to ensure that later developments of tracks are avoided Comments and concerns from our Civil department: • The following two portions of our railway line fall directly in the middle of the farm Driehoekspand 435: · From 226 750km to 230 300km on the Kamfersdam-Hotazel line (including Palingpan station) · From 0 km to 2 837km on the Palingpan-Manganore Line • The exact location of the mining operation is not indicated in the proposal and this needs to be known before we can adequately comment on the proposal. • **Our immediate concerns would be:** 1. How close will the mine be to our railway line? Mines too close to the railway line have a negative impact on our operations as we continually have to stop our operations so that the mines may blast 2. Our railway lines dissect the farm in more or less three equal portions. Depending on the mine operations it may be necessary for heavy vehicles to cross the railway on a regular basis. There are many curves on the railway line on the farm, including a station; all these could have a negative impact on safe sighting distance at level crossings. This in turn would make crossing the railway line by means of level crossings extremely dangerous.	applicant for further discussion. With respect to the potential blasting impacts, blasting will be limited to the open pit which lies approximately 750m away from the railway line. The management measures outlined in Section 28 provides limits for peak velocity and air blast at third party structures in addition to limiting the fly rock zone. The blasting procedure also requires communication of blast times to third parties and monitoring of blasts to ensure that the management measures are complied with. With respect to the access road which will need to cross the railway line, a new access road will be constructed from the mine to the R325 in order to allow safe crossing of the railway line. A bridge will need to be constructed over the railway line. This is outlined in Section 28 of the EIR and EMPr report.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
Islay Jane Sparks Kumba Iron Ore's Kolumela Mine	23 May 2013	• Asked how much the mine will produce • Enquired about the possibility for further expansion and whether exploration is still continuing.	• Since the project is still in the concept phase it is difficult to estimate, but the quantity will be approximately 500,000 million tons of ore per annum during the operational phase. • Post meeting note: production of iron ore is expected to be just over 1 million tonnes in total • There are opportunities for further expansion. COZA is currently working on their resource estimation. There are also other areas of mining interest for COZA Mining in the Northern Cape.
INTERESTED PARTIES			
JanMan Makelaars	17 May 2013	• Requested to be registered as an IAP	• Mr Makelars was registered in the IAP database
Mr Tumisang Tugane Afribits	22 May 2013	• Requested to be registered as an IAP	• Mr Tugane and Mrs Erasmus have been registered in the IAP database.
Mrs Alretha Erasmus Postmasburg Landbou Unie	24 June 2013	• Requested to be registered as an IAP	
Albertus Viljoen	4 October 2013	• Requested an electronic copy of the Final Scoping Report	• An electronic copy of the Draft Scoping report was posted to Mr Viljoen on the 4th of October 2013
Tom Ferreira	24 April 2014	• Requested to be registered as an IAP and a concise project description	• Mr Ferreira was provided with a compressed copy of the Draft EIA and registered in the IAP database.
Mr Albertus Viljoen Tshiping WUA	10 April 2014	• Alternatives for the management of excess water are to be finalised prior to commencement with construction activities in consultation with key stakeholders. This includes the DWA. It will be advisable to add Sedibeng Water and Tshiping WUA • The DWA has been notified of the project through the circulation of the BID on the 10th of May 2013. A copy of the draft scoping report was also couriered to the Department on 9 September 2013. A water use licence will be submitted in July 2017 to DWA in terms of the NWA. Does this date coincide with the planned mining activities?	• Noted. Synergistics will advise COZA Mining to include Sedibeng Water and Tshiping WUA in the water use license consultation process. • The water use licence application will follow at a later stage, after the feasibility study has been completed. • Noted. At this stage COZA Mining does not plan to utilise groundwater from privately owned boreholes. If COZA however decide that it is an option they would like to pursue, this will be done only if an agreement has been entered into with the landowner and all legislative requirements have been met. • All the findings from the hydro-census have been included in the Geohydrological Investigation Report

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		• It is not advisable to utilise groundwater from privately owned boreholes, irrespective of agreements. A WUL is required. • A hydro-census was conducted on the 13-17 May 2013 by Aquatico. Please supply a copy of the report.	provided in Appendix H of the EIR and EMPr..
Werner Voigt	12 October 2014	• Requested to be registered as an IAP	• Mr Voigt has been registered in the IAP database
Albertus Viljoen Tshiping WUA	19 June 2015	In reply to the Draft Scoping Report, the following comments: 1. Monitor third party boreholes to determine if the water level is being affected. 2. If dewatering causes a loss of water supply to third parties, an alternative equivalent water supply will be provided by Coza until such time as the dewatering impacts cease. a. Monitoring water levels alone is not sufficient to establish a baseline on water supply. b. I suggest that pump tests are considered to establish the true potential of possible impacted water sources. 3. Objective: prevent unacceptable negative impacts on surrounding land uses Conceptual mitigation measures include: a. Effectively manage noise, dust, surface and groundwater quality, blasting hazards, social impacts and visual impacts. i. Water quality is not the only impact to mitigate; quantity is part of that equation. 4. The groundwater detailed investigation will address dewatering and pollution aspects. The investigation will include the following tasks: i. I suggest a complete baseline document is compiled	Thank you for your comments. 1. Monitoring of third party boreholes is included in the monitoring programme outlined in section 30 of the EIR and EMPr 2. Monitoring of water levels should adequately monitor for any changes in water levels in third party boreholes. Pump testing was conducted as part of the hydrocensus and used to determine aquifer properties which were then used as input parameters to model potential impacts on groundwater. 3. Noted. The potential impact of dewatering and groundwater abstraction is outlined in Appendix F of the EIR and EMPr report. 4. The full groundwater report is included in Appendix H of the EIR and EMPr. The full report will undergo public review and an electronic copy will be provided to the Tshiping WUA. All comments will be included in the final report to be submitted to the DMR.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues (adapted for the current EIA process)
		on water availability, quality, etc. ii. This document to be finalised with associated IAP and possible impacted land owners. iii. Final baseline document to be approved by these parties involved.	
Elize Nel Tshiping WUA	03 July 2014	• According to the records Coza Iron Ore Mine has appointed Synergistics as their Consultants and we therefore would like to know if you already have submitted their IWULA application. • Coza Iron Iore Mine falls in the D73A catchment and must register with us as member. • I hereby attached the necessary membership application form and believe it will have your immediate attention	Thank you for this information. Tshiping has been registered in our IAP database and we have previously consulted with Mr Albertus Viljoen. A water use licence application has not yet been submitted. The application form has been passed on to COZA Mining.
Werner Voigt	13 November 2015	• What will be the process from now onwards?	• COZA still has to submit their mining right application. We are still in the scoping phase of the project. We will be circulating meeting invitations around the end of October towards November
Nicole Abrahams The South African National Roads Agency (SANRAL)	25 February 2015	• Requested to be registered as an IAP and a copy of the locality plan indicating the proximity of the project in relation to the nearest national road	• Nicole Abrahams (on behalf of SANRAL) was registered in the IAP database and provided with locality map showing the proximity to the nearest national road.

7.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROJECT AND ALTERNATIVES

The baseline information provided is aimed at giving the reader perspective on the existing status of the cultural, socio-economic and biophysical environment. Where appropriate it includes the detail derived from the specialist reports and other research undertaken for the EIA.

7.4.1 BASELINE ENVIRONMENT AFFECTED BY THE PROPOSED ACTIVITY

7.4.1.1 Climate

INTRODUCTION AND LINK

The climate of a particular area will determine the weather, rainfall and temperature characteristics of a given region. This can influence land use patterns and mine planning.

As a baseline, this section provides an understanding of the climatic features relevant to the project site and surrounding area.

DATA SOURCE

Climate data was obtained from Airshed Planning Professional Air quality Report (2015) as well as the Coza Iron Ore Project Hydrology Assessment Report (Jeffares & Greens, 2013) included in Appendix L.

Temperature and wind data was sourced by Airshed from Anglo America's Postmasburg weather station.

RESULTS

Regional Climate

The COZA Driehoekspan project falls in an area with a regional climate that is semi-arid with a mean annual precipitation of 318 mm.

Ambient Temperatures

Temparature data between November 2011 to October 2014 given in Table 7-2 was sourced from Postmasburg monitoring and weather station. Temperatures ranged between -7.3 °C and 40 °C. The highest temperatures occurred in December, January and February and the lowest in June, July and August. During the day, temperatures increase to reach maximum at around 15:00 in the afternoon. Ambient air temperature decreases to reach a minimum just before sunrise.

TABLE 7-2: MONTHLY TEMPARATURE SUMMARY (POSTMASBURG, NOV 2011 – OCT 2014)

Hourly Minimum, Hourly Maximum and Monthly Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	8.9	7.8	5.0	1.8	-5.0	-6.1	-7.3	-6.1	-5.0	1.1	2.3	6.1
Maximum	40.0	38.9	37.8	32.8	32.3	27.3	28.3	32.3	35.0	36.1	37.8	40.0
Average	26.6	25.2	22.6	17.0	14.6	10.0	10.3	12.7	16.3	20.1	23.5	24.3

Precipitation and Evaporation

Rainfall data for the area of the COZA Driehoeksapn project site was obtained from the SAWS rainfall station 0320828 W. This rainfall station is located approximately 14 km southwest of the project site. The mean monthly rainfall over the period 1950 to 2000 is presented in Figure 7-2. From Figure 7-2, it is evident that the precipitation tends to fall in summer and autumn (November to April). It is also noted that small amounts of rainfall are recorded over the winter and spring months (May to October).

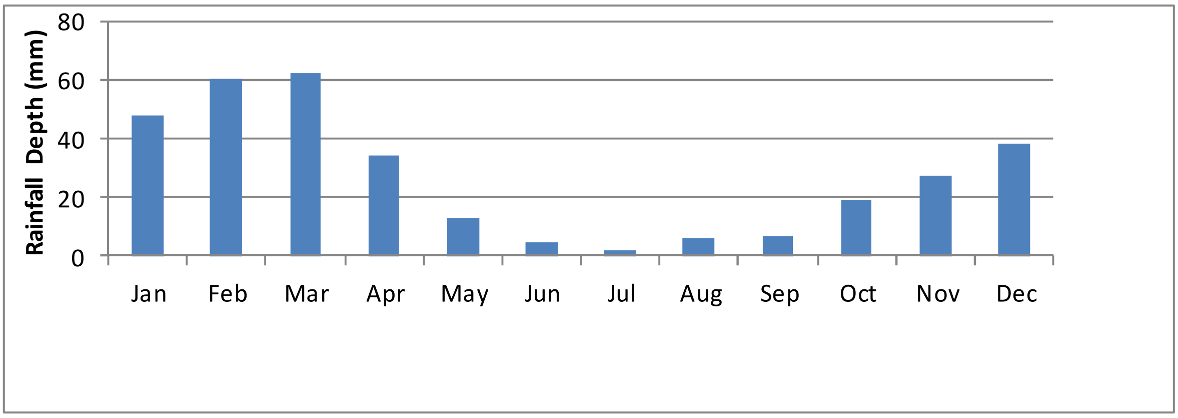
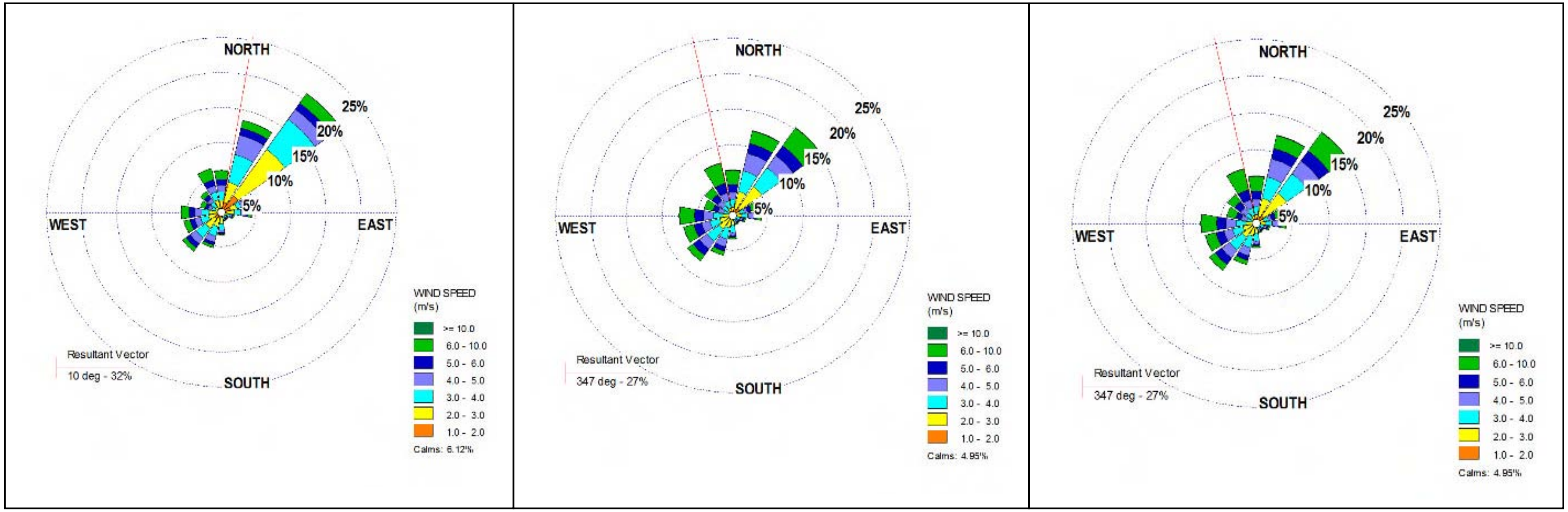


FIGURE 7-2: LONG-TERM AVERAGE MONTHLY RAINFALL FOR THE STUDY AREA FOR THE PERIOD 1950 TO 2000 (JEFFARES &GREEN, 2013)

The annual potential evaporation rate for the COZA Iron Ore study area is 2 450 mm. The highest evaporation rates occur during the hotter summer months of October to March. The mean annual evaporation is higher than mean annual precipitation (318 mm) which results in a net moisture deficit of 2 132 mm over the year.

Wind Direction and Speed

Wind direction data was obtained from the Postmasburg weather station for the period of September 2012 to March 2013.



(a) Period average wind field **(b) Day-time wind field (06:00 to 18:00)** **(c) Night-time wind field (18:00 to 06:00)**

FIGURE 7-3: WIND FIELD POSTMASBURG, NOV 2011 TO OCT 2014 (AIRSHED, 2015)

During the recording period (Nov 2011- Oct 2014), the wind field was dominated by winds from the north-east with an average wind speed of 3.4 m/s. The strongest winds (more than 6 m/s) were from the northern to north-western sectors and occurred mostly during the day. The average wind speed decreased from 4.1 m/d during the day to 2.7 m/s during the night.

7.4.1.2 Topography

INTRODUCTION AND LINK

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

- The flow of surface water, and in many cases, also groundwater
- The depth of soils and the potential for soil erosion, for example, in the case of steep slopes
- The type of land use, for example flat plains are more conducive to crop farming
- The aesthetic appearance of the area.

The topography can also influence climatic factors such as wind speeds and direction, for example, wind will be channelled in between mountains and along valleys.

Project-related activities have the potential to alter the topography of the site through the establishment of surface infrastructure and mining method chosen. Depending on the design and layout of the project, this in turn could result in changes to drainage patterns, landforms which could prove hazardous to people and animals, as well as changes to the visual character. As a baseline, this section provides an understanding of the topographical features relevant to the project site and surrounding area from which to measure potential change.

DATA SOURCE

Data on topography was sourced by SLR through the studying of topographical GIS data, satellite imagery and observations made by the SLR and specialist team during site visits.

RESULTS

The general topography within the study area is flat to undulating with slopes of approximately 2% - 3% with an average surface elevation of approximately 1 400 m above mean sea level (mamsl). The study area is flanked by hills to the west and east (Figure 7-4) The Klipfontein range of hills to the east of the study area runs in a north to south direction. The area is generally flat lying forming part of the eastern edge of the Kalahari, with remnant hills and local undulations to the west, north of the extensive Ghaap dolomite plateau and to the east of the Langeberg mountain range. The most prominent hills are the eastern and western remnants of the Maremane dome stretching north-south in a semi-arcuate form from Postmasburg to Kathu.

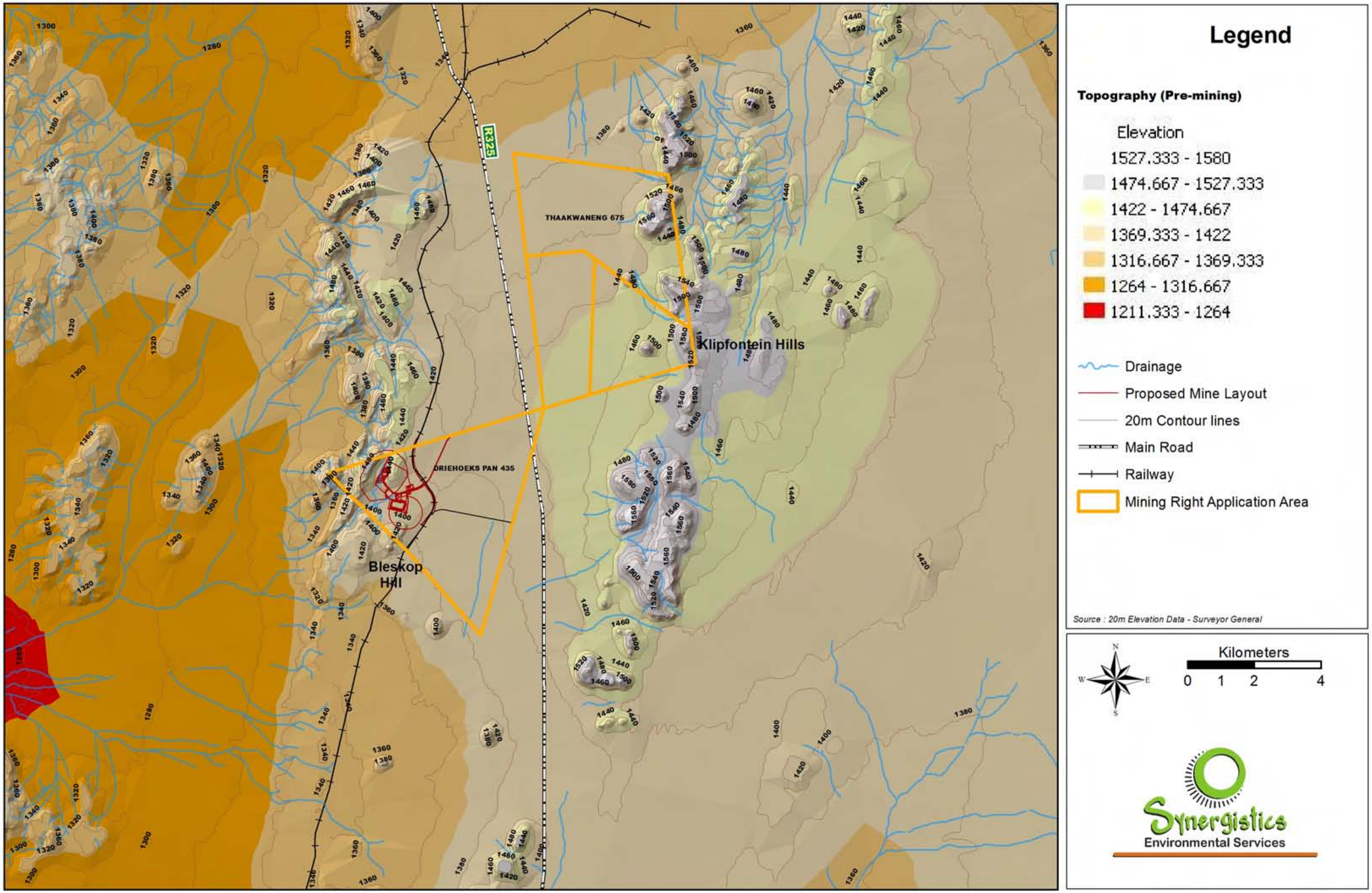


Figure 7-4: Topography for the Project Area

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO

7.4.1.3 Geology

INTRODUCTION AND LINK

The geology, geological processes and associated structural features and stratigraphy of a particular area influence the the type of soils present since the soils will be derived from the parent rock material, the presence and quality of groundwater and the movement of the groundwater in the rock strata, the presence of paleontological resources in the rock strata and the presence of economical reserves.

DATA SOURCE

Geological data was sourced from COZA Mining (Pty) Ltd concept phase report: Chapter 2. Geology & Mineral Resources and the Groundwater Impact Assessment by Groundwater Complete (2014) included in Appendix H.

Geochemical testing was conducted on two samples collected from drilling exploration holes. Thsteing included the Modified Sorbek method for acid base accounting (ABA), and distilled Water Leach test.

RESULTS

Regional Geology

The central part of the Maremane dome comprises a flat lying erosional plain consisting of dolomite of the Campbellrand Subgroup, with an eastern and western limb consisting of the iron formation of the Asbesheuwels Subgroup of the Transvaal Supergroup.

The dome is a north-south plunging anticline elongated to form a semi-arcuate feature, with the eastern limb dipping gently to the east and the western limb dipping to the west. The structure of the dome has been considerably modified by later tectonics and is a remnant of a much larger palaeo feature with considerable amounts of ore material, mainly from Griquatown Iron Formation, having been removed by erosion. Only the eastern half of the dome is exposed with the western half covered unconformably by the Gamagara succession of diamictite, quartzite and basaltic andesites, with an unconformity produced by thrusting from the west caused by the low angle Black Ridge thrust fault.
High to medium grade hard hematite iron ore deposits are considered as type examples of the ancient enrichment of Precambrian Banded Iron Formations. These deposits are situated on the Klipfontein hills ridge, part of the eastern edge of the Maremane dome where BIF overlies the core of dolomite.

Along the Klipfontein hills forming in the eastern edge of the dome structure, scattered outcrops of BIF and chert breccia occur. The Sishen and Beeshoek iron ore deposits are hosted within the Manganore Iron Formation which is generally regarded as an altered equivalent of the Kuruman Iron Formation and the Griquatown Iron Formation of the Asbesheuwels Subgroup.

The distribution of chert bearing dolomite has influenced the development of karst type subsurface into which high grade iron ore deposits have developed and been preserved. The two major types of iron ore deposits are the micro-crystalline hematite ores derived from supergene enrichment of the Asbesheuwels iron formation below the angular Gamagara unconformity and the conglomeratic ore derived from erosion of the underlying laminated ores. The conglomeratic ores can thicken considerably into karst (solution) palaeo lows in the dolomite which can produce ore deposits with irregular floor and thickness distributions.

Regional Structure

North south striking westerly dipping listric faults has been reported as traversing the Maremane dome, representing the earliest phase of brittle deformation. These faults were formed during the first extensional event during transition from tectonic quiescence to passive rifting on the western margin of the Kaapvaal craton.

The Kalahari orogeny, the later Kheis orogeny and the Namaqua-Natal orogeny gave rise to the structurally complex nature evident over a wide area and probably caused the west verging isoclinal folding against the rigid basement of the Maremane dome, clearly evident on Driehoekspan and Magoloring, reported on and illustrated by the literature, on Japiesrust to the north.

Compressional tectonics of varying intensity from the west has produced low angle thrust faults with associated deformation, brecciation, uplift and erosion. It is the varying degree of these tectonic forces from the west which has produced quite different structural features, particularly on Jenkins, Driehoekspan and Doornpan.

Property Geology

On Driehoekspan, only the western extremity of the farm contains the ore zone which outcrops on three distinct topographic ridges with opposing and overturned dips on the western most exposures, the eastern remainder of the farm being the central flat lying erosional dolomite plain with occasional low hills of dolomite.

Compression tectonics from the west has produced steep to vertical and possibly overturned isoclinal folding, the frequency and amplitude of which decreases rapidly eastwards. This is evidenced by three separate outcrop exposures of both ferrous and ferro-manganiferous oxide material, decreasing in altitude from the west.

The lithological data obtained by COZA was used to construct the following surfaces as DTM's:

- Surface
- Quartzite – shale contact

- Shale – BIF contact
- BIF – Dolomite contact

Two thrust planes were identified during the modelling exercise which is probably related to the Black Ridge thrust fault. The geological section shown below (Figure 7-5) was constructed using these surfaces and the presence of sinkholes in the dolomite floor is demonstrated.

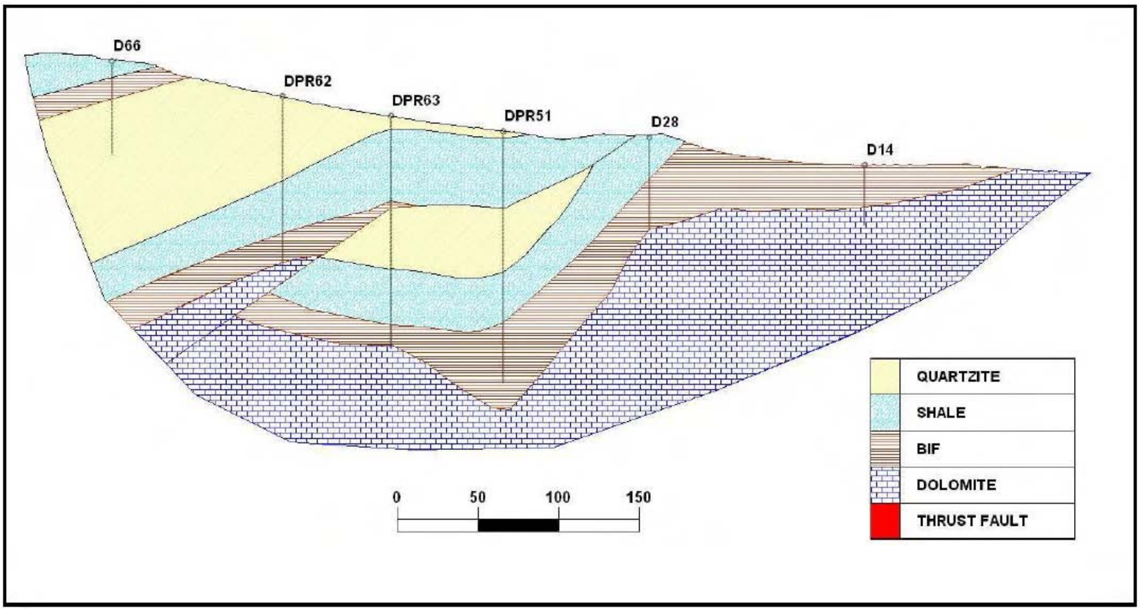


FIGURE 7-5: EAST WEST GEOLOGICAL SECTION THROUGH DRIEHOEKSPAN

<u>Lineaments</u>

A geophysical investigation was undertaken as part of the geohydrological study to identify geological structures such as faults and intrusive features like dolerite dykes. Dykes may act as preferential pathways for groundwater flow and mass transportation. Dykes are known to occur throughout the wider study area and some of the more prominent ones are easily identifiable on aerial and satellite imagery. Fractures are typically formed along the sides of a dyke due to rapid cooling during the intrusion process. These fractures are wholly responsible for most dykes being able to hold significant volumes of groundwater and also to act as preferred pathways. However, these fractures are generally superficial and do not affect the structural integrity of the dyke. This means that a dyke may also act as an effective barrier for the flow of groundwater perpendicular to its strike. In an area, such as the project area, where numerous dykes occur in various strike directions, groundwater compartments are formed, which may be independent from one another with regards to groundwater levels and chemistry. A combination of magnetic and electro-magnetic methods was used during the survey. During the survey of five traverses a total of six anomalies were identified and their positions are indicated in Figure 7-6. These anomalies could represent structures with higher permeabilities, and as such some of these anomalies were targeted for drilling.

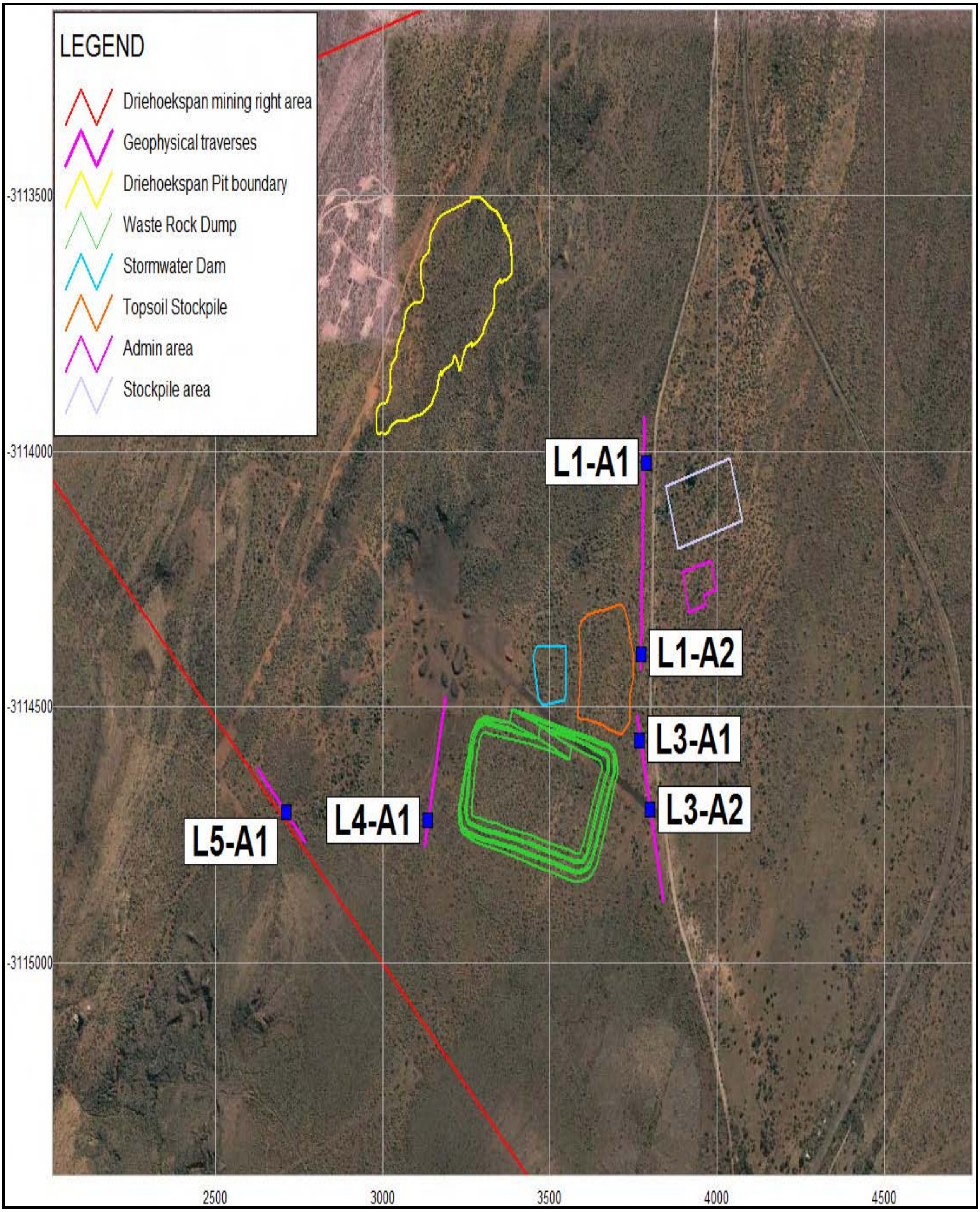


FIGURE 7-6: POSITIONS OF ANOMOLIES IDENTIFIED DURING GEOPHYSICAL SURVEY

Geochemistry analysis – Acid Base Accounting (ABA)

Acid–Base Accounting (ABA) is an internationally accepted analytical procedure that was developed to screen the acid-producing and acid-neutralizing potential of rocks. Two samples were obtained from the drilling of exploration boreholes and were used to determine the acid drainage potential associated with the waste rock dump (WRD) and material to be used as part of the construction of road and platforms.

The two most common processes by which groundwater is contaminated include “interstitial release” and “ion exchange release”. Argillaceous sediments such as shale and mudstone are known to contain pore water with high saline content. Significant amounts of contaminants may therefore be released as these sediment structures disintegrate because of weathering or when exposed and crushed through the mining process. The most commonly released ions during this weathering process are sodium and chloride. Pyrite and base metal sulphides are very prone to oxidation when brought into contact with water under oxidation conditions. The chemical reactions are collectively referred to as acid mine drainage (AMD). The root of the problem lies in chemical and bacteriological oxidation of pyrite typically occurring in coal, other carbonaceous material and base metals.

The ABA results indicate that both samples collected are classified as Type III (non-acid forming) according to the sulphur content and NPR classification. Typoe III samples have a total sulphur percentage of less than 0.25 % and a neutralising potential: acid potential of 1:3 or greater. In both samples the neutralising potential (NP) exceeds the acid potential (AP), which results in positive NNP values – refer to Table 7-3. According to the NNP classification both samples are therefore considered to be non-acid forming. Similar to the surrounding iron ore mines the conclusion is therefore drawn that both the ore and overburden material are non-acid forming.

TABLE 7-3: RESULTS OF ABA TESTS (GROUNDWATER COMPLETE, 2014)

Analyses (Modified Sobek, EPA- 600)	Driehoekspan Overburden Composite	Driehoekspan Ore Composite
Paste pH	7.8	7.6
Total Sulphur (%)	0.13	0.03
Acid Potential (AP) (kg/ton)	4.06	0.938
Neutralisation Potential (NP) (kg/ton)	9.08	1.97
Nett Neutralisation Potential (NNP)	5.01	1.03
Neutralising Potential Ratio (NPR)	2.23	2.10
Classification	III	III

Geochemistry analysis – Leachate potential

In addition to ABA tests, leachate tests were undertaken. In basic terms a leaching test involves the percolation of a liquid through a finely crushed rock sample after which the leachate retrieved from the sample (extract) is analysed to determine what chemical changes have occurred.

The results of the leach tests are provided in Table 7-4 and Table 7-5 and are compared against the South African National Standards (SANS) for drinking water (Table 7-6). The results of the leach tests show that both ore and overburden are mostly inert and any leachate generated from this material should be of acceptable quality. The only metal found to be present in the leachate at concentrations exceeding the SANS standard for drinking water quality was aluminium.

TABLE 7-4: RESULTS OF LEACH TESTS (GROUNDWATER COMPLETE, 2014)

Analyses	**Driehoekspan Overburden Composite**		**Driehoekspan Ore Composite**	
TCLP / Acid Rain / Distilled Water / H_2O_2	**Distilled Water**		**Distilled Water**	
Dry Mass Used (g)	**250**		**250**	
Volume Used (mℓ)	**1000**		**1000**	
pH Value at 25˚C	6.7		7.6	
Electrical Conductivity in mS/m at 25℃	6.8		3.8	
Inorganic Anions	**mg/ℓ**	**mg/kg**	**mg/ℓ**	**mg/kg**
Total Alkalinity as $CaCO_3$	20	80	<5	<20
Chloride as Cl	5	20	<5	<20
Sulphate as SO_4	<5	<20	7	28
Nitrate as N	0.2	0.8	<0.2	<0.8
Fluoride as F	0.2	0.8	0.2	0.8
ICP-OES Scan	See Table 7-5		See Table 7-5	

TABLE 7-5: RESULTS OF LEACH - METALS (MG/L) GROUNDWATER COMPLETE, 2014)

Sample Id	Ag	Al	As	Au	B	Ba
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Overburden Composite	<0.010	0.828	<0.010	<0.010	0.298	1.36
Driehoekspan Ore Composite	<0.010	0.658	<0.010	<0.010	0.267	0.337
Sample Id	**Be**	**Bi**	**Ca**	**Cd**	**Ce**	**Co**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Overburden Composite	<0.010	<0.010	6.20	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	1.28	<0.010	<0.010	<0.010
Sample Id	**Cr**	**Cs**	**Cu**	**Dy**	**Er**	**Eu**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Overburden Composite	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sample Id	**Fe**	**Ga**	**Gd**	**Ge**	**Hf**	**Ho**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Overburden Composite	0.491	0.524	<0.010	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	0.492	0.134	<0.010	<0.010	<0.010	<0.010
Sample Id	**In**	**Ir**	**K**	**La**	**Li**	**Lu**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	<0.010	<0.010	1.9	<0.010	0.019	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	0.7	<0.010	0.100	<0.010
Sample Id	**Mg**	**Mn**	**Mo**	**Na**	**Nb**	**Nd**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	1.20	0.323	<0.010	6.38	<0.010	<0.010
Driehoekspan Ore Composite	0.591	0.176	<0.010	5.26	<0.010	<0.010
Sample Id	**Ni**	**Os**	**P**	**Pb**	**Pd**	**Pt**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	0.013	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sample Id	**Rb**	**Rh**	**Ru**	**Sb**	**Sc**	**Se**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sample Id	**Si**	**Sm**	**Sn**	**Sr**	**Ta**	**Tb**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	1.7	<0.010	<0.010	0.181	<0.010	<0.010
Driehoekspan Ore Composite	1.1	<0.010	<0.010	0.031	<0.010	<0.010
Sample Id	**Te**	**Th**	**Ti**	**Tl**	**Tm**	**U**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	<0.010	<0.010	0.034	<0.010	<0.010	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	0.024	<0.010	<0.010	<0.010
Sample Id	**V**	**W**	**Y**	**Yb**	**Zn**	**Zr**
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Det Limit	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**	**<0.010**
Driehoekspan Overburden Composite	<0.010	<0.010	<0.010	<0.010	0.185	<0.010
Driehoekspan Ore Composite	<0.010	<0.010	<0.010	<0.010	0.156	<0.010

TABLE 7-6: SOUTH AFRICAN NATIONAL STANDARDS FOR DRINKING WATER *(SANS 241:2011)*

Determinant	Risk	Unit	Standard limits
Physical and aesthetic determinants			
Free chlorine	Chronic health	mg/L	≤ 5
Monochloramine	Chronic health	mg/L	≤ 3
Colour	Aesthetic	mg/L Pt-Co	≤ 15
Conductivity at 25 °C	Aesthetic	mS/m	≤ 170
Odour or taste	Aesthetic	–	Inoffensive
Total dissolved solids	Aesthetic	mg/L	≤ 1 200
Turbidity	Operational	NTU	≤ 1
	Aesthetic	NTU	≤ 5
pH at 25 C	Operational	pH units	≥ 5 to ≤ 9.7
Chemical determinants - macro-determinants			
Nitrate as N	Acute health – 1	mg/L	≤ 11
Nitrite as N	Acute health – 1	mg/L	≤ 0.9
Sulfate as SO_4^{2-}	Acute health – 1	mg/L	≤ 500
	Aesthetic	mg/L	≤ 250
Fluoride as F^-	Chronic health	mg/L	≤ 1.5
Ammonia as N	Aesthetic	mg/L	≤ 1.5
Chloride as Cl^-	Aesthetic	mg/L	≤ 300
Sodium as Na	Aesthetic	mg/L	≤ 200
Zinc as Zn	Aesthetic	mg/L	≤ 5
Chemical determinants - micro-determinants			
Aluminium as Al	Operational	µg/L	≤ 300
Antimony as Sb	Chronic health	µg/L	≤ 20
Arsenic as As	Chronic health	µg/L	≤ 10
Cadmium as Cd	Chronic health	µg/L	≤ 3
Total chromium as Cr	Chronic health	µg/L	≤ 50
Cobalt as Co	Chronic health	µg/L	≤ 500
Copper as Cu	Chronic health	µg/L	≤ 2 000
Cyanide (recoverable) as CN^-	Acute health – 1	µg/L	≤ 70
Iron as Fe	Chronic health	µg/L	≤ 2 000
	Aesthetic	µg/L	≤ 300
Lead as Pb	Chronic health	µg/L	≤ 10
Manganese as Mn	Chronic health	µg/L	≤ 500
	Aesthetic	µg/L	≤ 100
Mercury as Hg	Chronic health	µg/L	≤ 6
Nickel as Ni	Chronic health	µg/L	≤ 70
Selenium as Se	Chronic health	µg/L	≤ 10
Uranium as U	Chronic health	µg/L	≤ 15
Vanadium as V	Chronic health	µg/L	≤ 200

7.4.1.4 Soils and land capability

INTRODUCTION AND LINK

Soil is a vital component of life on earth. It supports a variety of life forms and plants and new soil is created by breaking down rocks and sand. Furthermore, soil characteristics determine the natural capability of land. Soil resources have the potential to be lost through physical disturbance, erosion by wind and water, and contamination. As a baseline, this information will be used to identify sensitive soil types, to guide the mine in the preservation of soil and rehabilitation of disturbed land and aid in informing an end land use for the project site.

DATA SOURCE

Soil information was obtained from the Soils and Agricultural Potential Specialist Report compiled by the ARC-Institute for Soil, Climate and Water (2013) for the COZA Driehoekspan project and included in Appendix I.

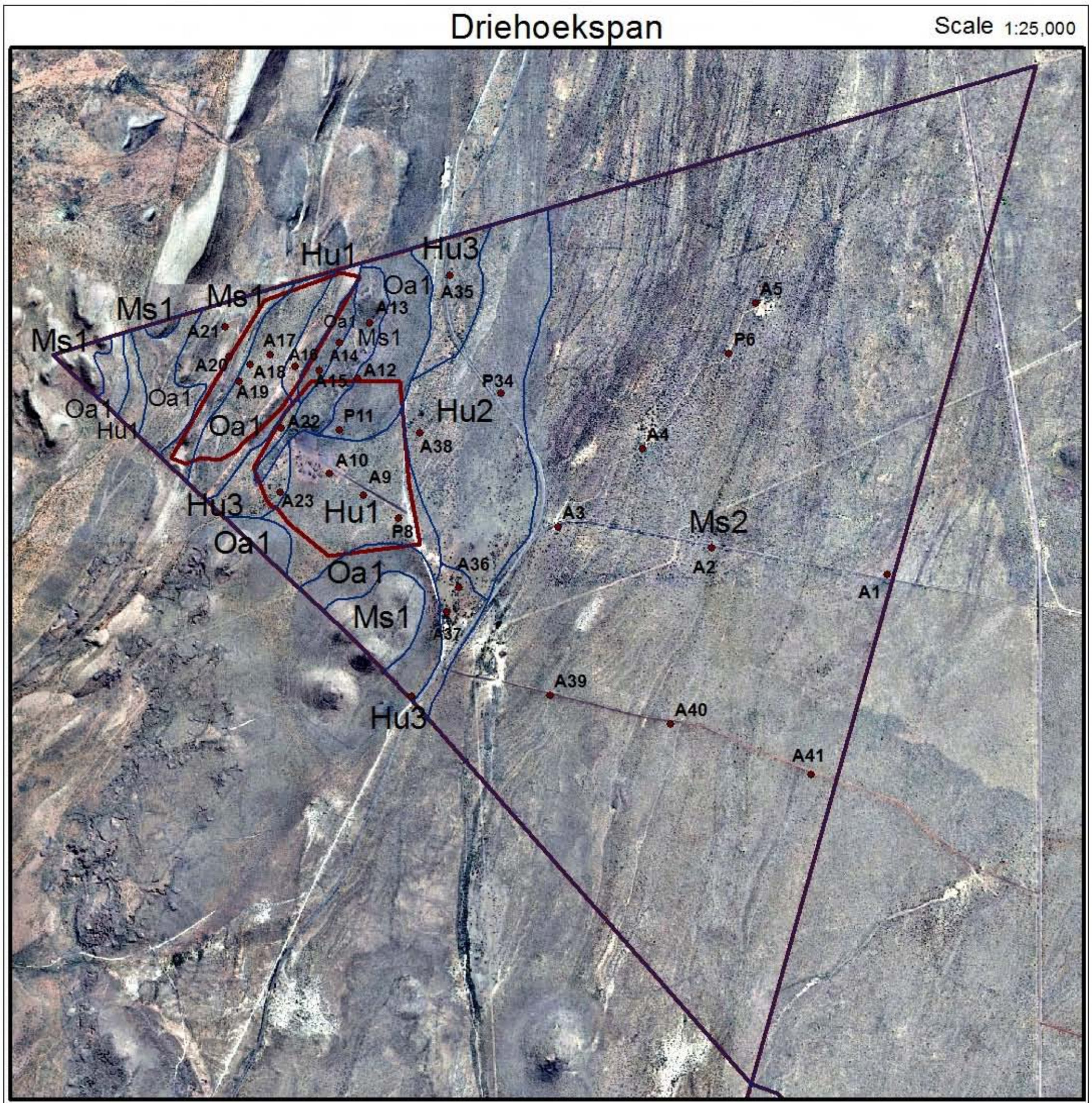
RESULTS

The soils in the region are generally shallow, normally not exceeding more than 300 mm in depth (ARC, 2013). Figure 7-7 indicates the diferent soil units in the study area. The predominant soil types in the study area are soil-rock complexes of the Mispah and Coega forms and a shallow phase Hutton underlain by rock and sporadic limestone (Unit Hu1 and Hu2). Deeper Hutton and Oakleaf soils are confined to the drainage ways (Unit Hu3). Rock outcrops and stony lithosols (Mispah and Glenrosa soils) on the crests and upper midslopes dominate the steeper north-south stretching hills that occur in the western part of Driehoekspan Stony Hutton and Oakleaf soils of varying depths are on the lower midslopes and upper footslopes (Unit Oa1).

A total of 12 soil samples were taken from site for chemical analysis and Table 7-7 presents results. The samples represented either the A (topsoil) or B (subsoil) horizon. Analysis of soil samples taken in the study area reveals that soils generally have a light texture, which varies from loamy fine sand to sandy loam (ARC, 2013). The soils have low clay content which limits water holding capacity as well as wind water erosion susceptibility. Coupled with the low rainfall, this means that the soils are susceptible to wind and water erosion if vegetation is disturbed or removed. Organic carbon content of soils is also relatively low. The pH values show that the soils are mainly slightly acidic with calcium (Ca) as the dominat cation).

TABLE 7-7: SOIL ANALYSIS RESULTS (ARC INSTITUTE, 2013)

Sample No.	P6_A	P8_A	P11_A	P11_B	P25_A	P25_B	P26_A	P26_B	P27_A	P33_A	P34_A	P34_B
Depth (mm)	0-100	0-100	0-300	300-700+	0-250	250-750+	0-250	250-750	0-150	0-100	0-200	200-450
Clay (%)	10	14	14	16	14	16	12	12	8	10	14	10
Silt (%)	4	8	8	6	6	6	2	4	2	4	4	6
Sand (%)	86	78	78	78	80	78	86	84	90	86	82	84
Org. C (%)	0.22	0.29	1.50	0.39	0.31	0.24	0.21	0.15	0.19	0.58	0.13	0.12
pH (H_2O)	6.9	6.49	6.46	7.10	6.16	5.92	6.24	6.67	6.73	7.32	6.47	6.41
Na (cmol(+)kg^{-1}	0.070	0.079	0.082	0.080	0.068	0.074	0.076	0.069	0.076	0.076	0.072	0.090
K (cmol(+)kg^{-1}	0.555	0.461	0.999	0.534	0.369	0.196	0.418	0.495	0.345	0.436	0.388	0.226
Ca (cmol(+)kg^{-1}	4.233	3.035	7.913	5.468	1.760	2.062	2.802	3.265	3.942	10.330	4.007	4.721
Mg (cmol(+)kg^{-1}	1.425	1.212	1.822	1.274	0.665	0.827	0.800	0.929	1.168	0.859	1.528	2.380
S Value	6.283	4.786	10.816	7.356	2.862	3.160	4.096	4.758	5.531	11.701	5.995	7.416
CEC*	10.310	7.886	11.546	8.793	4.244	4.658	5.128	5.330	6.263	6.708	7.661	7.830



LEGEND

Map units
Footprints
A1 Observations
P6 Sample points

N

Map unit	Dominant Soil form/family >40%	Subdominant Soil form/family < 40%	Other soilforms < 15%	Effective depth (mm)	GENERAL DESCRIPTION
Ms1	Ms1100	Rock, Gs1211	Hu3100	100 - 150	Rock outcrops in association with very shallow, stony, reddish-brown, fine grained, sandy Mispah-, Glenrosa and Hutton soils underlain by rock, occurring on the crests and steeper upper midslopes.
Ms2	Ms1100	Rock, Hu3100	Cg1000, Py1000	100 - 300	Soil – rock complex. Very shallow, dark reddish brown, fine grained, sands with underlying rock and limestone in some places. Sporadic occurrence of deeper sandy Hutton soils (400- 700 mm) was found in the vicinity of the weakly developed drainage lines.
Hu1	Hu3100	Ms1100	Rock	100 - 400	Very shallow, dark reddish brown, fine grained, Hutton- and Mispah soils with underlying rock
Hu2	Hu3100	Oa1210	Rock	300 - 750	Shallow, dark reddish brown, fine sand to loamy sand Hutton- and Oakleaf soils, derived from local alluvium/colluvium with underlying rock and sporadic occurrence of limestone.
Hu3	Hu3100	Oa1210		600 - 1000	Moderately deep, dark reddish brown, fine sand to loamy sand Hutton- and Oakleaf soils derived from local alluvium/colluvium, underlain by rock or stones and occurs in the lower footslopes and valley bottoms.
Oa1	Oa1210	Hu3100	Rock, Ms1100	400 – 900+	Shallow to moderately deep, very stony, dark reddish brown, fine grained sandy Hutton- and Oakleaf soils, derived from local colluvium and/or insitu rock. Soils underlain by rock and occurs on the lower midslopes and upper footslopes.
Du1	Du2220			600 – 1000	Moderately deep , reddish brown, fine grained and calcareous sandy Dundee soils derived from alluvium , underlain by rock or stones.

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Institute for Soil, Climate and Water
Agricultural Research Council

FIGURE 7-7: SOIL MAP OF THE STUDY AREA (ARC INSTITUTE, 2013)

Land Capability and Agricultural Potential

Soils in the area are generally very shallow, have a low clay content and thus a low water-holding capacity, contains coarse fragments in the topsoil or subsoil that decreases the water retention capacity, and has a low trace elements status (ARC, 2013). In addition to this, there is relatively low carbon content which limits plant growth due to limited availability of nutrients for plants. All these factors make the soils in the study area largely unsuitable for the production of crops. Coupled with the low average annual rainfall in the area, the agricultural potential in the study area is considered to be low. Soil unit Hu3 is however deeper and might be used for irrigation, this is however limited due to water scarcity in the area.

According to Schoeman et al, 2004 as cited in ARC, 2013, the only agricultural activities in the area are livestock and/or game farming. The average grazing capacity for the study area is 22-25 ha per animal unit and the long-term annual average Normalised Difference Vegetation Index (NDVI) is moderate to low.

The study area falls within the land capability class VII according to Schoeman et al. (2004), indicating that the area has very severe limitations that make it unsuited to cultivation, restricting use largely to grazing (see Figure 7-8).

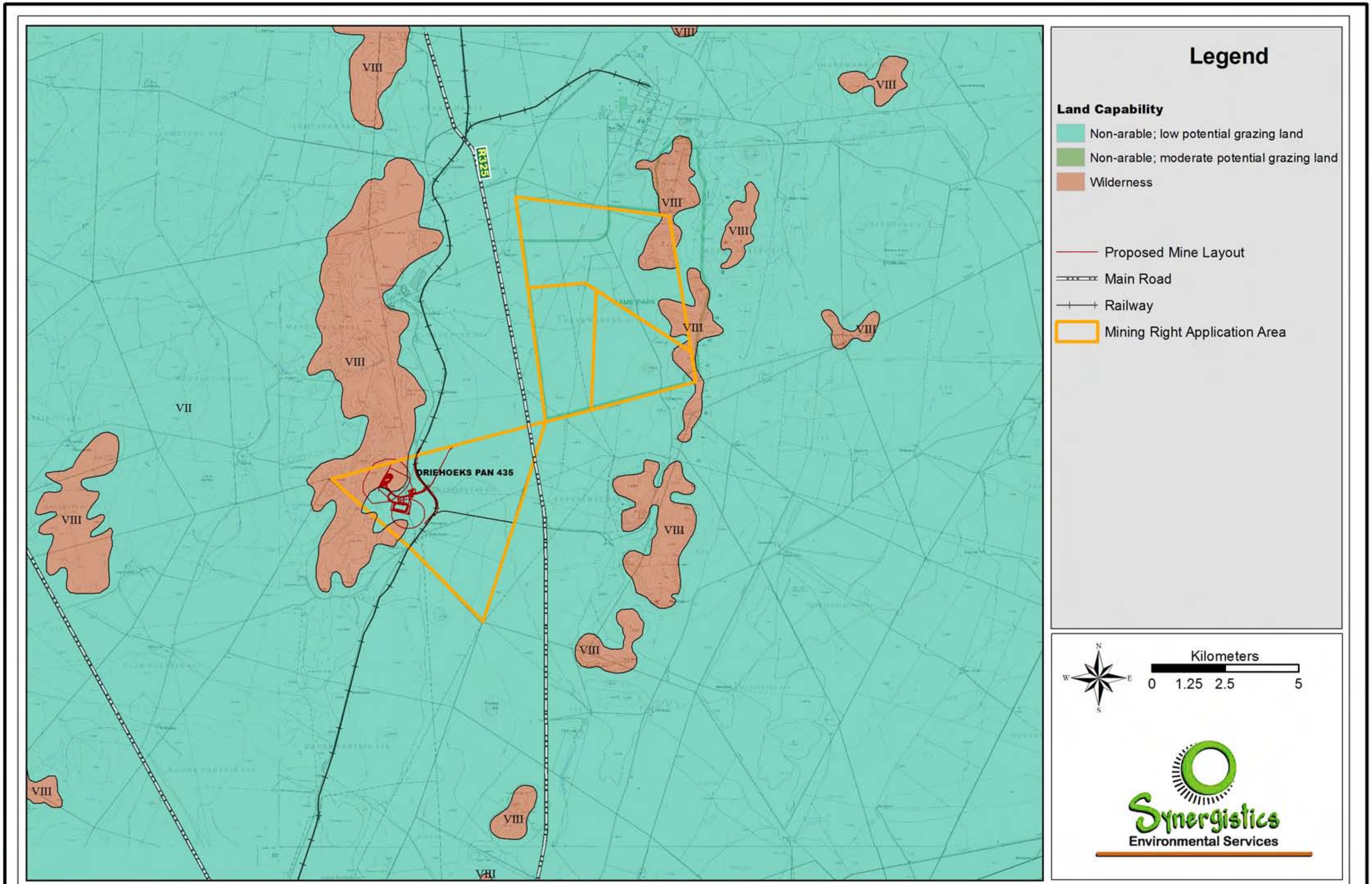


Figure 7-8: Land Capability	SO707	Coordinate System DMS	
		Spheroid WGS84	Central Meridian LO

7.4.1.5 Groundwater

INTRODUCTION AND LINK

Groundwater is a valuable resource and is defined as water which is located beneath the ground surface in soil/rock pore spaces and in the fractures of lithological formations. Project related activities such as handling and storage of hazardous materials, mineralised and non-mineralised wastes have the potential to result in the pollution of groundwater resources. In addition to this, where mining requires groundwater as a source, or dewatering to ensure safe working conditions, there is a potenitial for a cone of depression developing which may result is lowering groundwater levels for surrounding users. To understand the basis of these potential impacts, a baseline description of groundwater resources in the project area is given below:

DATA SOURCE

The information presented in this section was sourced from the groundwater study (Groundwater Complete, 2014) (Appendix H).

A desktop study of available information and studies was undertaken to gain a better understanding of the geology and geohydrology of the area. This included Groundwater Resources Information (GRA II) Project (DWAF, 2006) and review of regional datasets maintained by the DWS.

A project-specific hydrocensus was undertaken in May 2013 to identify existing groundwater users around the project area. The hydrocensus focussed on a 10 km radius of the project site. A total of 41 boreholes were located. Boreholes were surveyed to detemine position, water levels, quality and use.

Pump testing and recovery tests were perfomed on exploration boreholes for input in determining aquifer parameters such as transmissivity, storativity.

RESULTS

<u>Aquifer Characterisation and yields</u>

Information from exploration boreholes shows two aquifer types to be present in the project area. The first, the upper, unconfined to semi-confined aquifer occurs in the calcrete that cover most of the surface area. The aquifer is usually developed on the contact between the calcrete and underlying clay formations of Kalahari age or in localized pebble horizons within the calcrete and occurs within the upper 10 to 30 meters of the geological profile. Borehole yields in the calcrete aquifer generally vary from 0.2 to approximately 2 l/s. Although relatively low yields occur in this aquifer, it is developed widely throughout most of the project area and has been the reliable source of water supply to most of the farms in the area for more than a century. According to the Parsons Classification system the aquifer is usually regarded as a minor or even a non-aquifer system.

The second aquifer is associated with fractures, fissures, joints and other discontinuities within the consolidated bedrock and associated intrusives of the Transvaal/Griqualand West Sequences. The aquifer occurs at depths of more than 60 meters below surface in the project area. It is semi-confined and has greatly varying yields that are directly associated with the geology and geological structure. The aquifer yield may be as high as 40 liters per second in mainly the chert breccia (Manganese Marker) and banded iron formation and iron ore formations. The dolomite in the mining area is not a significant aquifer and the yields of no more than 2 to 4 litres per second have been recorded. The dolomite is however considered to have good storage properties for groundwater. According to the Parsons Classification system the aquifer could be regarded as a major aquifer system.

Pump tests were performed on five exploration boreholes, these pump tests were performed using a low yield (< 1 l/s) pump with the main aim of determining the transmissivity and storage characteristics of the aquifer. From the pump testing results, the transmissivity of the aquifer matrix (between fracture zones) in the proposed Driehoekspan area generally vary between ± 0.3 and 0.7 m^2/d with an average of 0.5 m^2/d. These transmissivities calculate to a representative hydraulic conductivity of ± 0.017 m/d for the area. The representative transmissivity of the fractures in the area vary between ± 1.1 and 3.4 m^2/day with an average of 2.2 m^2/d. The average hydraulic conductivity of the fractures is therefore in the region of 0.073 m/d.

Aquifer Recharge

The mean annual recharge to the aquifer underlying the project area varies between approximately 13.5 to 19.4 mm (See Figure 7-9), which based on an average rainfall of approximately 300 mm/year translates to a recharge percentage varying between anything from 5 to 7%. This recharge is much higher than in Karoo type aquifers (typically between 1 and 3%) found over large parts of South Africa. The main reasons for the relatively high effective recharge percentage are:

- The dolomitic aquifers occurring over large portions of the project area,
- Kalahari sand and transmissive calcrete cover where outcrop does not occur, and
- Very low clay content of soils that are present, allowing for easy infiltration.

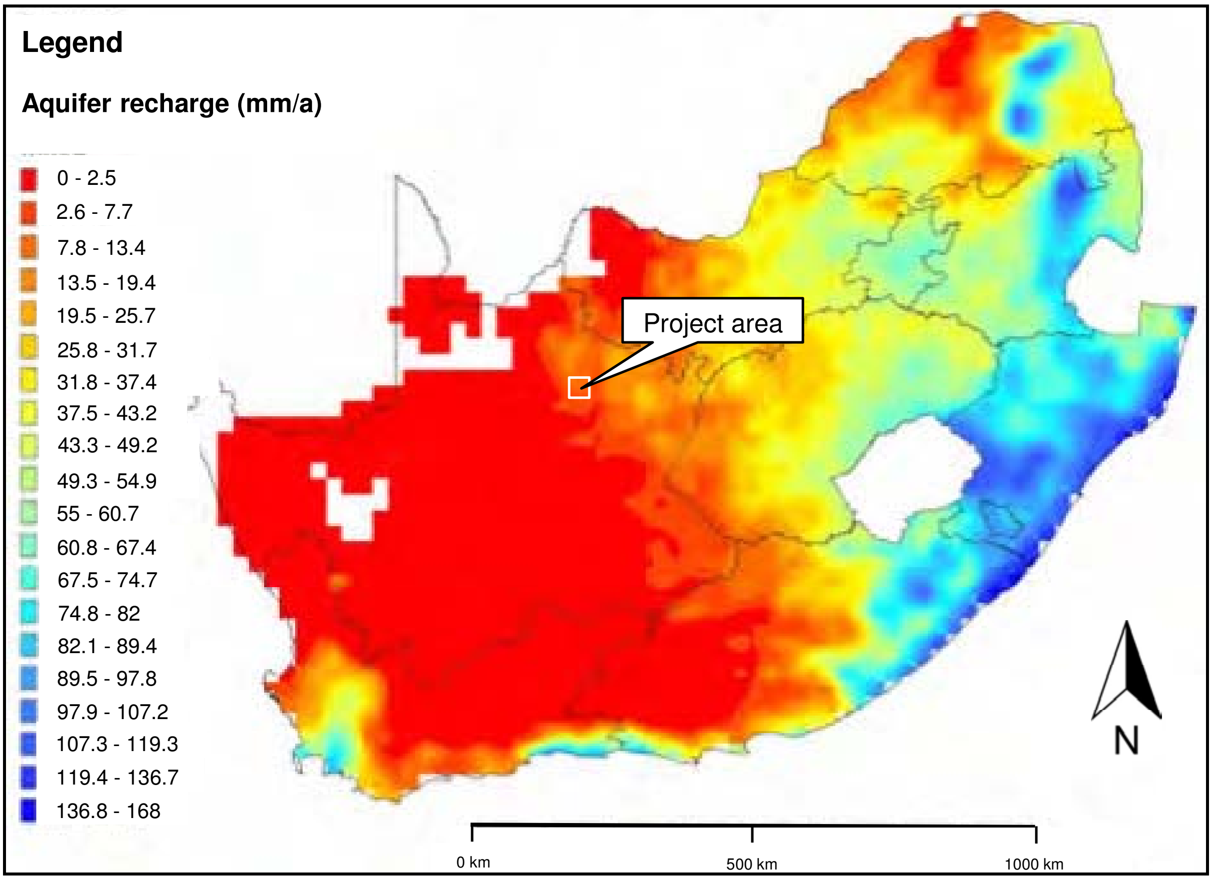


FIGURE 7-9: MEAN ANNUAL AQUIFER RECHARGE FOR SOUTH AFRICA *(DENNIS ET AL, 2012)*

Based on this estimate, the annual recharge to the Driehoekspan area was estimated to vary between ± 297 000 and 415 700 m^3. Figure 7-10 below indicates the higher areas of recharge for the project area.

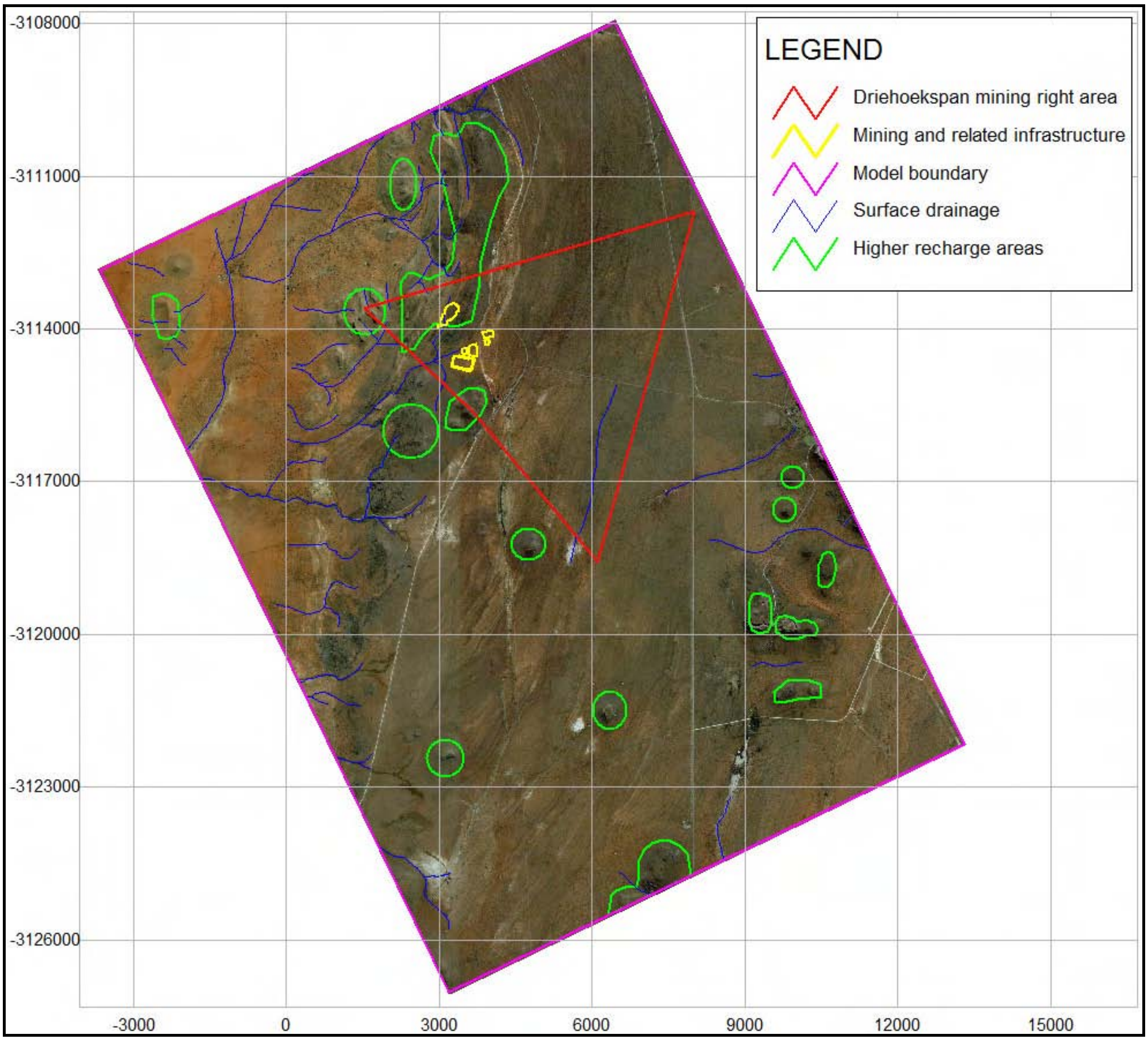


FIGURE 7-10: EXPECTED AREAS OF HIGHER AQUIFER RECHARGE (GROUNDWATER COMPLETE, 2014)

Groundwater Flow

The pre-mining static groundwater contours are presented in Figure 7-11 and were constructed with the use of Bayesian interpolation and steady state numerical groundwater flow model calibration. Flow occurs faster where contours are closer together and gradient are thus steeper. On the relatively steeper sloping hillocks where groundwater gradients are higher, groundwater seepage rates are correspondingly higher. Seepage rates on the other hand are much lower in the flat plateaus and valley bottoms. Average groundwater gradients were calculated from the water level elevation data. The general groundwater gradient in the proposed Driehoekspan mining area is approximately 2% west/south-westwards.

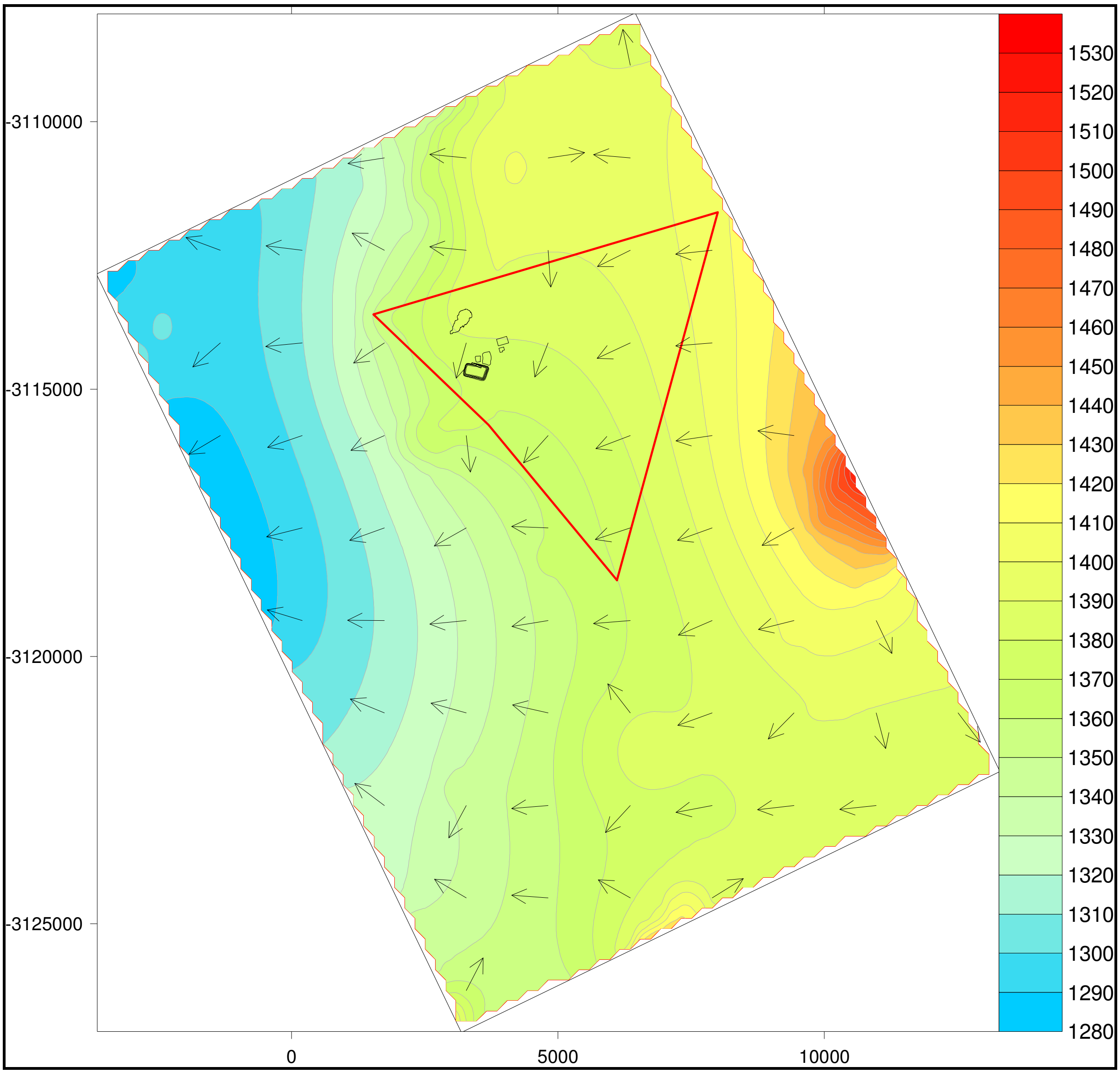


FIGURE 7-11: MODELLED GROUNDWATER LEVEL CONTOUR MAP OF THE STUDY AREA (GROUNDWATER COMPLETE, 2014)

Groundwater use, depth and yield

A hydro-census was conducted in May 2013 by Aquatico to determine groundwater use, levels, and qualities as well as to conduct pump testing for the purposes of defining the aquifers on site. A total of 14 boreholes were subjected to the hydrocensus as illustrated in Figure 7-12. The information collated during the hydro-census is given in Table 7-8. The water users in the area include farmers, mines and communities. Approximately half of the boreholes encountered were being used at the time, with the majority being used for both domestic and agricultural use. From the results of the groundwater survey, it is evident that farmers in the area rely heavily on groundwater as a major source of domestic water as well as for livestock and gardening.

Groundwater levels in the project were available from monitoring boreholes, surrounding groundwater user boreholes as well as exploration boreholes that were located during the hydrocensus survey. Measured groundwater levels varied between ± 3 and 113 metres below surface.

Borehole yield information could not be obtained for the majority of boreholes encountered in the hydrocensus, however yields varying between ± 2 500 l/h and 25 000 l/h were indicated by Christiaan and Louis Claasens on Farms Morolong and Vlakfontein respectively.

TABLE 7-8: RESULTS OF THE HYDROCENSUS (GROUNDWATER COMPLETE, 2014)

Borehole Description	Borehole Location		Owner	Elevation	Water level	Water Use	Sampled
	South (WGS84)	East (WGS84)					
B08	-28.20831	22.96312	Adam Wahl & Mark Oosthuizen & Christiaan Claasens	1480	7.0	N/A	Yes
CC01	-28.13076	23.00103	Christiaan Claasens & Louis Claasens	1315	-	Approx. 25 000 l/h	Yes
CC02	-28.13341	23.00146	Christiaan Claasens & Louis Claasens	1319	11.3	Approx. 6 000 l/h	Yes
CC03	-28.11254	23.01716	Christiaan Claasens & Louis Claasens	1340	32.9	6 000 - 9 000 l/h	Yes
CC04	-28.12964	23.01777	Christiaan Claasens & Louis Claasens	1343	36.3	Approx. 3 000 l/h	Yes
CC05	-28.12955	22.99029	Christiaan Claasens & Louis Claasens	1311	6.0	N/A	N/A
CC06	-28.12958	22.99044	Christiaan Claasens & Louis Claasens	1310	17.4	N/A	Yes
CHRISJAN01	-28.13119	22.98676	Chrisjan Claasen	1310	12.1	Irrigation, Livestock, Domestic	Yes
CHRISJAN02	-28.12869	22.90909	Chrisjan Claasen	1306	-	Irrigation, Livestock, Domestic	Yes
DOOR01	-28.24170	23.02900	Mark Oosthuizen	1348	13.9	N/A	Yes
DOOR02	-28.24740	23.03190	Mark Oosthuizen	1356	7.4	N/A	Yes
DOOR07	-28.23660	23.04070	Mark Oosthuizen	1355	-	N/A	N/A
DOOR10	-28.24120	23.03410	Mark Oosthuizen	1353	3.1	N/A	Yes
DP01	-28.20814	23.09285	More Matsidi & Onkemetse Gill	1390	15.8	N/A	Yes
DP02	-28.21489	23.09053	More Matsidi & Onkemetse Gill	1390	14.9	N/A	Yes
DP03	-28.07689	23.07689	More Matsidi & Onkemetse Gill	1385	-	N/A	Yes
DP04	-28.16928	23.07611	More Matsidi & Onkemetse Gill	1385	-	N/A	Yes
DRIE01	-28.15453	23.04500	More Matsidi & Basil Louw	1385	-	N/A	Yes
DRIE02	-28.14572	23.03075	More Matsidi & Basil Louw	1380	-	N/A	Yes
DRIE03	-28.09194	23.05519	More Matsidi & Basil Louw	1390	-	N/A	Yes
DRP20	-28.13800	22.97135	Driehoekspan exploration	1438	74.6	Exploration	Yes
FARM434	-28.06271	22.96260	Farm at Assmang property		-	Irrigation, Livestock	Yes
FARM437	-28.20382	22.96301	Farm437	1279	-	N/A	Yes
FARM446	-28.06285	22.96258	Assmang	1338	12.0	N/A	Yes
GLOU01	-28.09951	23.07181	Gloucester	1416	-	N/A	Yes
GLOU_COMM	-28.07956	23.07280	Gloucester mining area	1412	-	N/A	Yes

Borehole Description	Borehole Location		Owner	Elevation	Water level	Water Use	Sampled
	South (WGS84)	East (WGS84)					
GO102NC	-28.23340	23.06590	Mark Oosthuizen	1385	-	N/A	Yes
KAPSTEWEL	-28.20391	22.96276	Kapstewel	1416	7.0	N/A	Yes
KAR06	-28.24250	23.07760	More Matsidi & Onkemetse Gill	1435	36.0	N/A	Yes
KOOT01	-28.08497	22.97538	Koot Claasen	1416	-	Irrigation, Livestock, Domestic	Yes
KOOT02	-28.08497	22.97538	Koot Claasen	1416	-	Irrigation, Livestock, Domestic	Yes
KOOT03	-28.08497	22.97538	Koot Claasen	1416	12.0	Irrigation, Livestock, Domestic	Yes
KVF01	-28.18895	22.96762	Christiaan Claasens	1278	-	Approx. 2 500 l/h	Yes
KVF02	-28.18558	22.98623	Christiaan Claasens	1296	-	N/A	Yes
N02	-28.16630	22.95929	No Farmer	1276	-	Irrigation, Livestock	Yes
NIEMAND01	-28.18706	22.95180	No Farmer	1276	-	Irrigation, Livestock	Yes
NIEMAND02	-28.18911	22.96706	No Farmer	1281	-	Irrigation, Livestock	Yes
SWART_ MODDER01	-28.20381	22.96295	Swartmodder farm		-	Irrigation, Livestock, Domestic	Yes
WATER_HOLE	-28.14399	22.96554	Driehoekspan exploration	1389	11.3	Exploration	Yes
WVR01	-28.15420	22.97397	Willem van Rensburg	1297	-	Irrigation, Livestock, Domestic	Yes
WVR02	-28.15420	22.97397	Willem van Rensburg	1297	-	Irrigation, Livestock, Domestic	Yes

Groundwater Quality

Groundwater quality data was sourced from user boreholes and monitoring boreholes from Doornpan Section. Water quality data was obtained from 40 boreholes indicated in Figure 7-12 below and the results are presented in Table 7-9.

With respect to Table 7-9, the following can be noted:

- Groundwater TDS concentrations vary between ± 50 mg/l and 690 mg/l, which are well below the permissible SANS value of 1 200 mg/l.
- The sulphate content of groundwater measured within a ± 10 km radius of the project area vary from below the detection limit of 0.04 mg/l to approximately 130 mg/l, which are below the permissible SANS value of 500 mg/l.
- Groundwater nitrate concentrations measured in the majority of boreholes are below the permissible SANS value of 11 mg/l. Exceptions do however occur as the nitrate content measured in DO-BH04, DP04, FARM434, KOOT01/02/03, NIEMAND01 and WVR01/02 all exceed the permissible SANS concentration for drinking water . Due to once off analysis, the source of contamination cannot be accurates identified however the nitrate contamination could likely be from pit latrines or feedlots.
- Groundwater chloride concentrations are all well below the permissible SANS value of 300 mg/l and vary from below the detection limit to approximately 100 mg
- The groundwater pH conditions are more or less neutral with values ranging between 7.7 and 9.1. The neutral pH conditions restrict the mobilisation of metals, which are also sensitive to groundwater redox conditions.

The project area and its immediate surroundings are dominated by fresh, clean, relatively young groundwater that has started to undergo mineralization with especially magnesium ion exchange. The groundwater is dominated by calcium and magnesium cations, while bicarbonate alkalinity dominates the anion content (Groundwater Complete, 2014).

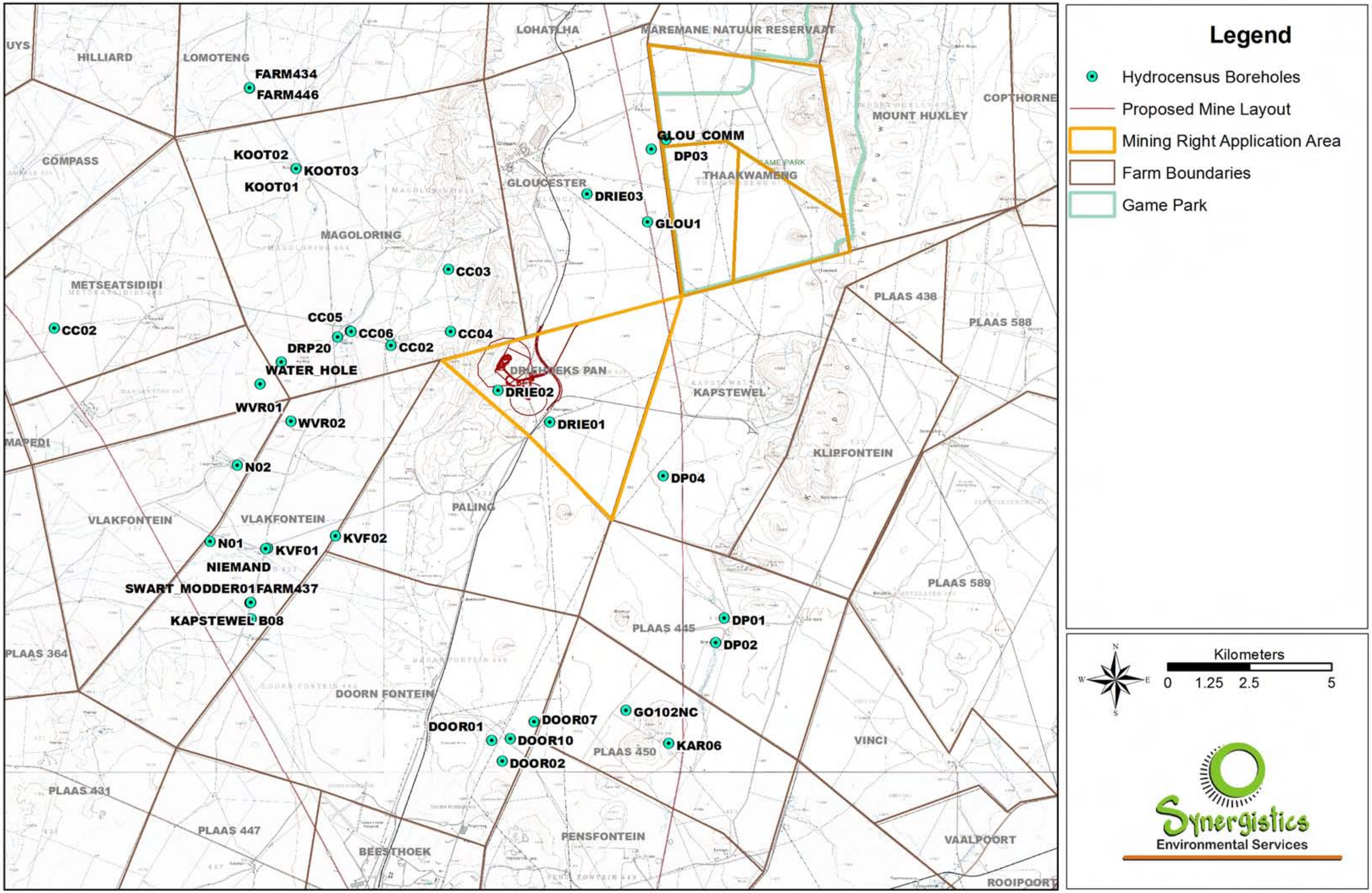


Figure 7-12: Location of Monitoring Boreholes and those Included in the Hydrocensus

SO707	Coordinate System DMS	
	Spheroid WGS84	Central Meridian LO

TABLE 7-9: RESULTS OF CHEMICAL ANALYSIS OF SAMPLES COLLECTED DURING THE HYDROCENSUS

Borehole Description	Date Meas.	pH	TDS mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	PO4 mg/l	F mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Al mg/l	Fe mg/l
SANS 241 (2015)	**Drinking Water**	**5 - 9.7**	**1200**	**300**	**500 (acute health) 250 (aesthetic)**	**11**		**1.5**			**200**		**0.3**	**2 (chronic health) 0.3 (aesthetic)**
Risk Type		**Operational**	**Aesthetic**	**Aesthetic**	**Acute Health - 1 and Aesthetic**	**Acute health -1**		**Chronic health**			**Aesthetic**		**Operational**	**Chronic health and aesthetic**
B08	2013/05/24	8.45	49.00	<0.423	<0.04	0.15	0.08	0.19	16.10	2.82	<0.013	0.34	<0.003	<0.003
CC01	2013/05/24	8.25	346.00	7.03	60.70	0.09	0.05	0.66	76.50	31.20	14.30	2.25	<0.003	<0.003
CC02	2013/05/24	8.19	324.00	3.66	70.60	0.10	0.03	0.81	71.70	26.80	11.60	1.86	<0.003	<0.003
CC03	2013/05/24	7.75	423.00	19.90	54.10	0.65	0.05	0.36	89.30	39.60	21.60	2.93	<0.003	<0.003
CC04	2013/05/24	7.91	309.00	12.40	35.70	0.34	0.03	0.28	55.50	20.20	33.00	2.37	<0.003	<0.003
CC06	2013/05/24	7.92	436.00	97.60	<0.04	0.16	<0.008	0.22	35.10	31.70	17.70	26.60	<0.003	1.71
CHRISJAN01	2013/05/24	8.04	432.00	27.30	33.50	6.00	0.04	0.37	99.10	40.30	22.30	2.41	<0.003	<0.003
CHRISJAN02	2013/05/24	8.44	281.00	9.40	20.90	1.76	0.21	0.34	54.10	38.90	8.04	0.97	<0.003	<0.003
DO-BH01	2013/05/24	7.72	637.00	13.70	28.20	4.38	0.02	0.39	89.90	123.00	7.50	<0.018	<0.003	<0.003
DO-BH02	2013/05/24	7.33	519.00	1.96	15.70	2.89	0.01	0.23	108.00	71.10	<0.013	<0.018	<0.003	<0.003
DO-BH03	2013/05/24	7.43	517.00	7.06	13.80	7.82	0.01	0.27	109.00	80.30	<0.013	<0.018	<0.003	<0.003
DO-BH04	2013/05/24	7.54	524.00	14.60	14.40	11.70	0.02	0.26	98.50	77.60	1.88	1.33	<0.003	<0.003
DOOR01	2013/05/24	7.75	567.00	12.10	20.90	9.20	0.03	0.33	95.80	82.40	5.19	4.34	<0.003	<0.003

Borehole Description	Date Meas.	pH	TDS mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	PO4 mg/l	F mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Al mg/l	Fe mg/l
SANS 241 (2015)	**Drinking Water**	**5 - 9.7**	**1200**	**300**	**500 (acute health) 250 (aesthetic)**	**11**		**1.5**			**200**		**0.3**	**2 (chronic health) 0.3 (aesthetic)**
Risk Type		**Operational**	**Aesthetic**	**Aesthetic**	**Acute Health - 1 and Aesthetic**	**Acute health -1**		**Chronic health**			**Aesthetic**		**Operational**	**Chronic health and aesthetic**
DOOR02	2013/05/24	7.77	460.00	12.50	12.90	4.27	0.06	0.31	88.50	64.60	4.49	0.94	<0.003	<0.003
DOOR10	2013/05/24	8.09	513.00	13.00	21.00	8.81	0.05	0.30	97.50	74.00	4.71	0.73	<0.003	<0.003
DP01	2013/05/24	7.78	397.00	14.40	4.81	5.13	0.03	0.26	77.80	56.70	4.75	1.08	<0.003	<0.003
DP02	2013/05/24	9.07	409.00	38.30	15.00	1.80	0.01	0.24	6.39	103.00	17.30	3.24	<0.003	<0.003
DP03	2013/05/24	8.33	655.00	18.80	35.60	2.92	0.15	0.34	97.90	96.80	10.10	5.42	<0.003	<0.003
DP04	2013/05/24	7.78	593.00	41.00	26.70	14.90	0.04	0.26	92.60	83.20	15.20	3.47	<0.003	<0.003
DRIE01	2013/05/24	7.66	580.00	12.80	24.50	5.34	0.04	0.26	109.00	80.40	1.92	<0.018	<0.003	<0.003
DRP20	2013/05/24	8.04	76.00	3.35	11.80	2.89	0.04	0.26	13.60	9.10	2.66	3.15	<0.003	<0.003
FARM434	2013/05/24	8.54	297.00	17.50	16.30	13.40	0.04	0.33	65.40	32.90	19.00	0.76	<0.003	<0.003
FARM437	2013/05/24	8.28	549.00	54.30	36.70	7.97	0.04	0.35	94.40	88.70	10.20	0.70	<0.003	<0.003
FARM446	2013/05/24	8.70	355.00	12.40	43.30	0.30	0.04	0.95	47.10	40.80	40.70	0.75	<0.003	<0.003
GLOU_COMM	2013/05/24	8.50	552.00	63.40	78.80	1.94	0.04	0.42	88.80	55.40	53.10	5.64	<0.003	<0.003
GLOU01	2013/05/24	8.47	689.00	83.70	127.00	1.23	0.04	0.25	91.80	85.00	62.50	0.47	<0.003	<0.003
GO102NC	2013/05/24	8.01	665.00	22.40	43.20	5.75	0.04	0.31	124.0	89.30	8.08	0.19	<0.00	<0.003

Borehole Description	Date Meas.	pH	TDS mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	PO4 mg/l	F mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Al mg/l	Fe mg/l
SANS 241 (2015)	**Drinking Water**	**5 - 9.7**	**1200**	**300**	**500 (acute health) 250 (aesthetic)**	**11**		**1.5**			**200**		**0.3**	**2 (chronic health) 0.3 (aesthetic)**
Risk Type		**Operational**	**Aesthetic**	**Aesthetic**	**Acute Health - 1 and Aesthetic**	**Acute health -1**		**Chronic health**			**Aesthetic**		**Operational**	**Chronic health and aesthetic**
									0				3	
KAPSTEWEL	2013/05/24	8.59	420.00	15.60	5.91	4.91	0.04	0.26	83.10	64.10	6.03	1.04	<0.003	<0.003
KOOT01	2013/05/24	8.42	463.00	66.10	29.50	33.20	0.04	0.25	89.20	63.50	25.80	2.91	<0.003	<0.003
KOOT02	2013/05/24	8.30	453.00	66.30	30.20	32.80	0.05	0.27	82.00	59.50	25.60	2.63	<0.003	<0.003
KOOT03	2013/05/24	8.47	462.00	66.80	30.50	32.30	0.04	0.30	86.10	59.40	25.40	2.69	<0.003	<0.003
KVF01	2013/05/24	8.52	429.00	21.80	36.20	8.42	0.04	0.31	87.80	58.90	10.10	1.06	<0.003	<0.003
KVF02	2013/05/24	8.44	484.00	9.87	9.82	2.05	0.04	0.31	100.00	69.70	4.75	1.23	<0.003	<0.003
NIEMAND01	2013/05/24	8.10	359.00	25.20	31.10	15.80	0.04	0.32	87.00	35.90	18.10	0.16	<0.003	<0.003
NIEMAND02	2013/05/24	8.55	417.00	24.50	33.60	8.66	0.04	0.32	90.60	53.20	9.51	0.77	<0.003	<0.003
SWART_MODDER01	2013/05/24	8.67	429.00	21.90	12.30	9.43	0.04	0.35	75.80	71.70	8.71	0.99	<0.003	<0.003
N02	2013/05/24	8.57	430.00	33.30	43.50	9.72	0.03	0.42	99.80	42.00	18.70	2.61	<0.003	<0.003
WATER_HOLE	2013/05/24	8.32	560.00	26.20	44.30	2.63	0.05	0.32	90.70	92.50	12.00	1.19	<0.003	<0.003
WVR01	2013/05/24	7.77	382.00	46.10	57.90	26.70	0.04	0.24	90.90	41.50	15.70	0.30	<0.003	<0.003
WVR02	2013/05/24	7.73	380.00	45.90	57.80	26.20	0.04	2.45	91.10	39.40	14.40	0.19	<0.003	<0.003

7.4.1.6 Surface Water

INTRODUCTION AND LINK

Surface water resources include rivers, non-perennial drainage lines and paths of preferential flow of stormwater runoff. Project-related activities have the potential to alter the drainage of surface water through the establishment of infrastructure and/or result in the contamination of the surface water resources through seepage and/or spillage of project-related materials. As a baseline, this section provides an understanding of the hydrological catchments that could be affected by the project and the status of surface water features in the project area.

DATA SOURCE

The information presented in this section was obtained from Jeffares & Green's Floodline Assessment and Hydrology Report (2013) included in Appendix L.

RESULTS

The project site is located within quaternary catchment D73A of the Lower Vaal Management Area which in turn falls within the Orange River catchment area. According to the Water Resources of South Africa 2005 study (WR2005), quaternary catchment D73A is classified as a catchment area with no outlet. Rainfall in this system does not exit the catchment as surface flow, but may only leave as evaporation and seepage. Information on the quaternary catchment D73A is provided in Table 7-10. The MAR equal to 0 is due to the nature of the catchment, all surface flow drains into pans where it either enters the groundwater system or evaporates. Table 7-10 indicates that the MAR depth is 14.7, this means that the depth of water that would flow to the respective pans on average during a year is 14.7mm.

TABLE 7-10: QUATERNARY CATCHMENT D73A DETAILS (JEFFARES &GREEN, 2013)

Quaternary Catchment	Catchment Area (km^2)	Evaporation Zone	Rain Zone	Water Management Area	MAR (MCM)	MAR Depth (mm)	MAP (mm)
D73A	3 236	7A	D7C	10	0	14.7	323

<u>Surface Water Features</u>

Drainage lines and catchment areas have been delineated based on a combination of 20 m interval contour lines extracted from 1:50 000 topographic maps, and freely available Space Radar Topography Mission (SRTM) Digital Elevation Model (DEM) data.

From the delineation exercise, three ephemeral drainage lines traversing Farm Driehoekspan were identified. However, using 1 m contours for floodline determiniation purpose, it was observed that within the proposed mining area there were no defined drainage lines as indicated in the 1: 50 000 topo map. Runoff within the mining area will largely be undefined surface sheet flow. Drainage lines and catchment areas contributing to overland and defined flow are depicted in Figure 7-13.

In order to determine floodlines for the drainage lines, a Rational Method was used to calculate peak discharge values. The Rational Method is widely used method for determining peak floods of small to medium catchment (100km^2 or less). The method is based on a peak flow equation based on runoff coefficient, average intensity and the effective are of the catchement. The 1:50 and 1: 100 year floodlines based on the peak discharge values presented in Table 7-11 are depicted in Figure 7-14.

TABLE 7-11: DESIGN FLOOD RESULTS OF VARIOUS CATCHMENTS WITHIN DRIEHOEKSPAN MINING AREA

River Name	Area Km^2	Catchment C-Factor		Design Rainfall		Peak Discharge (m^3/s)	
		1:50	1:100	1:50	1:100	1:50	1:100
Catchment 1	0.70	0.346	0.350	103.6	117.3	6.98	8.32
Catchment 2	0.83	0.346	0.350	91.3	103.3	7.18	8.56
Catchment 3	0.56	0.346	0.350	127.1	143.9	6.73	8.03
Main Catchment	2.57	0.346	0.350	127.1	143.9	22.90	27.27

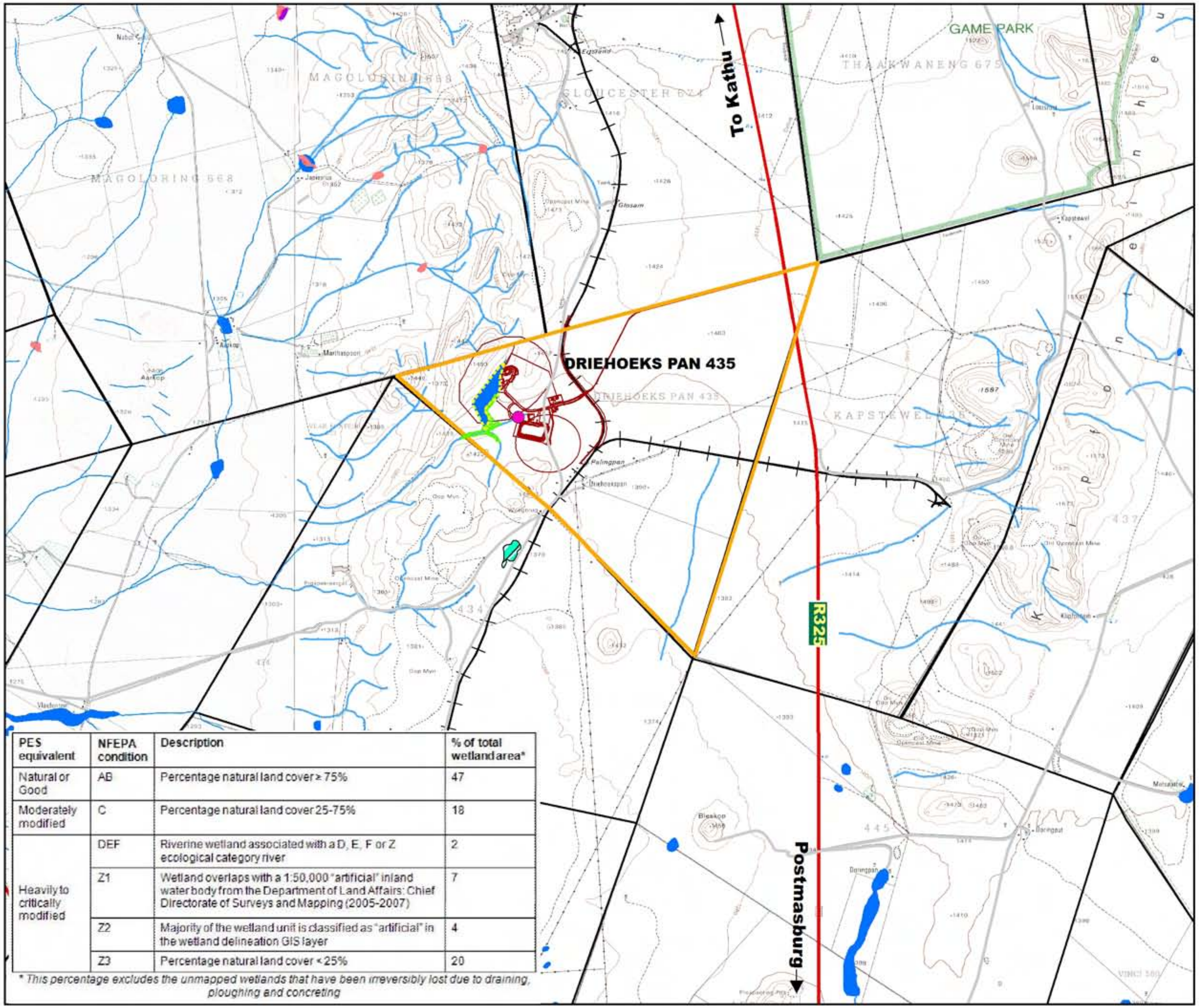
Jeffares & Green conducted a desktop analysis to determine the surface water features on site. The desktop analysis was conducted using information from the National Freshwater Priority Areas (NFEPA, 2011) and the Environmental Potential Atlas (ENPAT, 2000 & 2002). According to NFEPA data, there is a wetland between the proposed open pit and infrastructure footprint area on Farm Driehoekspan. A site visit was undertaken by Jeffares & Green to verify the desktop results, based on site assessment there were no hydromorphic plants, signs of surface wetness and topographical charecteristics suggesting the presence of a wetland or pan. Therefore there are in fact no wetlands within the project area. A pan is however present outside of the mining area south of the project area as depicted in Figure 7-13..

<u>Water Quality</u>

During site visits, there was no surface water flow within the identified drainage lines and therefore no surface water sampling was undertaken.

<u>Water Users</u>

There are no surface water users identified within the surrounding area due to the arid nature of the site. However, there are a number of groundwater users which are discussed in Section 7.4.1.5.



PES equivalent	NFEPA condition	Description	% of total wetland area*
Natural or Good	AB	Percentage natural land cover ≥ 75%	47
Moderately modified	C	Percentage natural land cover 25-75%	18
Heavily to critically modified	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2
	Z1	Wetland overlaps with a 1:50,000 "artificial" inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as "artificial" in the wetland delineation GIS layer	4
	Z3	Percentage natural land cover < 25%	20

*This percentage excludes the unmapped wetlands that have been irreversibly lost due to draining, ploughing and concreting

Legend

- Water Borehole
- **Wetlands**
  - AB
  - Z2
  - Z3
- Google Earth Identified Pan
- *Unconfirmed NFEPA Wetland
- Drainage
- Floodlines (Jeffares & Green)
- Proposed Mine Layout
- Main Road
- Other Access Roads
- Railway
- Property Boundaries

**No Actual Wetland Found on Site*

Kilometers
0 0.75 1.5 3

Synergistics Environmental Services

Figure 7-13: Surface Water Features

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO

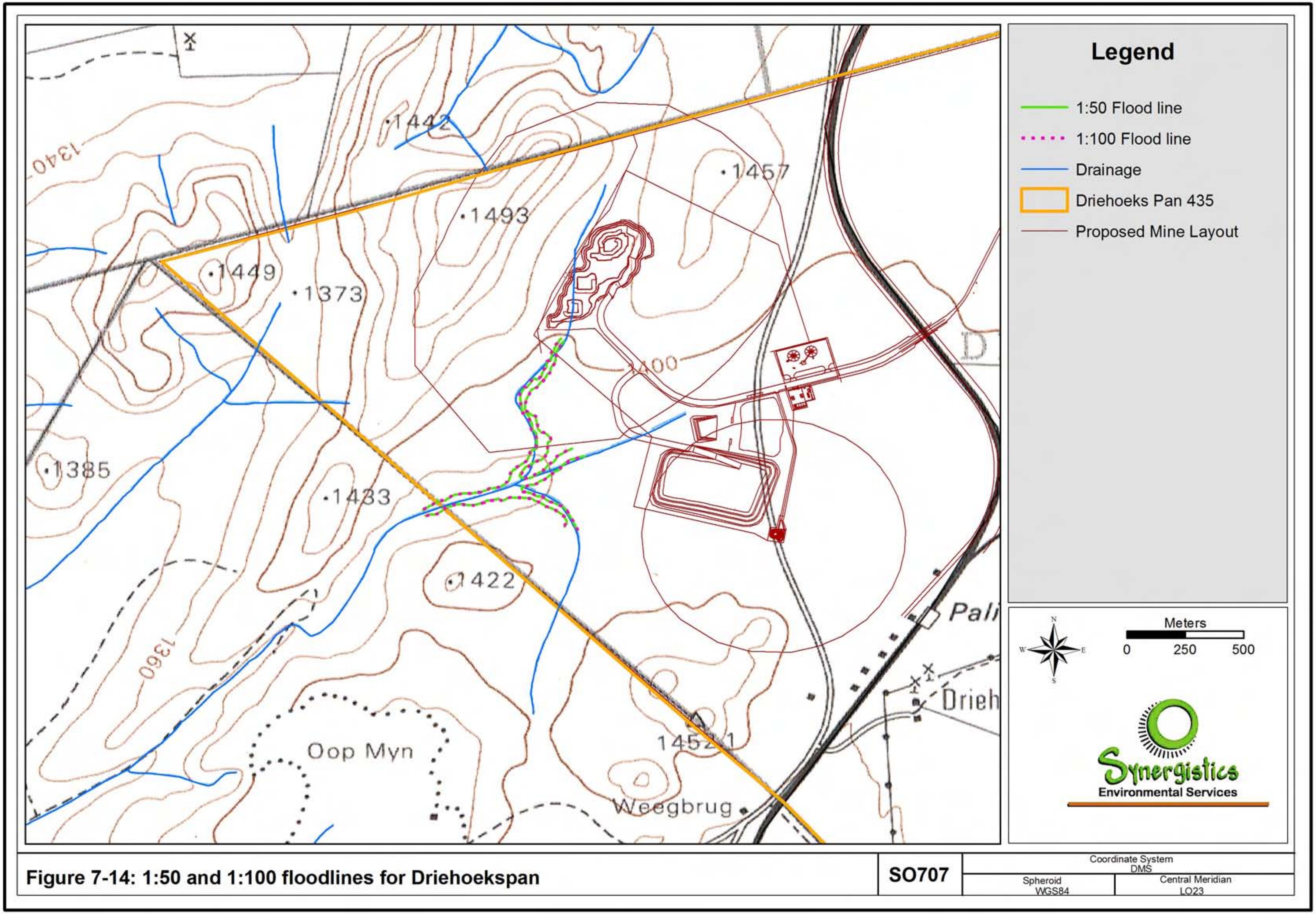


Figure 7-14: 1:50 and 1:100 floodlines for Driehoekspan

7.4.1.7 Biodiversity

INTRODUCTION AND LINK

In the broadest sense, vegetation provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of vegetation is as follows:

- Soil formation and fertility maintenance
- Primary production through photosynthesis, as the supportive foundation for all life
- Provision of food and fuel
- Provision of shelter and building materials
- Regulation of water flows and water quality
- Regulation and purification of atmospheric gases
- Moderation of climate and weather
- Maintenance of genetic resources (key for medicines, crop, and livestock breeding).

DATA SOURCE

Information was obtained from the specialist vegetation study conducted by the ecologist Tania Anderson (Appendix J). The methodology used included a literature review as part of desktop study for information on the ecology of the region. Plant species records were obtained from the Plants of South Africa (POSA PRECIS) database of the South African National Biodiversity Institute (SANBI) and KMG Herbarium, McGregor Museum, Kimberley. The Red Data List of Plants (SANBI 2010) was used to list the potential presence of species of special concern, and the list of protected trees of the National Forests Act for protected trees.

Faunal information was obtained from the fauna specialist study conducted by the zoologist & field biologist Beryl Wilson of theMcgregor Museum (Appendix K). The general approach adopted for the study was to identify any potential faunal species that may be affected by the proposed greenfields mining project on farm Driehoekspan focusing on rare, threatened, protected and conservation-worthy species, the presence of which are most likely to be negatively impacted upon in an ecological sense.

RESULTS

National and Regional Guidelines

The DEA, DMR, Chamber of Mines, South African Mining and Biodiversity Forum, and SANBI published the Mining and Biodiversity Guideline in 2013. This guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects and where biodiversity may limit the potential for mining. The guideline distinguishes between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view, as well as the implications for mining. These categories include (DEA *et al*, 2013):

- Legally Protected Areas
- Highest Biodiversity Importance
- High Biodiversity Importance

- Moderate Biodiversity Importance.

The project area does not fall within any biodiversity priority area identified by the Mining and Biodiversity Guideline.

A National Protected Area Expansion Strategy (NPAES) has been developed by the South African National Botanical Institute (SANBI) and aims to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. According to the NPAES database, the project area does not fall within an area earmarked for expansion of a National Protected Area.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing of threatened or protected ecosystems. Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value. The project area falls within Kuruman Mountain Bushveld and Kuruman Thornveld which are not listed as threatened or protected ecosystems.

SANBI also developed the national freshwater ecosystem priority (NFEPA) database to define the aquatic ecology of the rivers systems of ecological importance in the country. According to the database, there is a FEPA wetland on the farm Driehoekspan (refer to Figure 7-13). A site visit was undertaken by Jeffares & Green to verify the NFEPA database information. However, based on site assessment there were no hydromorphic plants, signs of surface wetness and topographical characteristics suggesting the presence of a wetland or pan.. Therefore there are no wetlands within the project area. A wetland/pan was identified based on Google Earth imagery to the south of Driehoekspan (refer to Figure 7-13) however this has not been verified in the field as it lies outside of the project area.

<u>Flora</u>

The study area falls within the Eastern Kalahari Bushveld Bioregion of the Savanna Biome (Mucina & Rutherford, 2006). The vegetation of the southern Kalahari in general is relatively species-poor and less than 2.5 % of the total species list of the southern Kalahari is regarded as endemic, while less than 6 % of the plant species is regarded as near-endemic species (Van Rooyen & Van Rooyen 1998). The proposed development area does however fall within the Griqualand West Centre of Endemism (GWC) as defined by van Wyk and Smith (2001). According to van Wyk and Smith (2001), the GWC is considered a priority area for conservation in the Northern Cape, as the number of threats to the area is increasing rapidly, little research has been done and it is poorly understood.

Two vegetation units have been identified at the site and these include the Kuruman Thornveld, Kuruman Mountain Bushveld (See Figure 7-15). The Kuruman Thornveld is found on the flat plains and the hills are covered with Kuruman Mountain Bushveld. The vegetation types do not have a high conservation status. The vegetation units are described in more detail below:

- The Kuruman Thornveld hosts smaller trees which include Blackthorn (*Acacia mellifera subsp. Detinens*) and Shepherd's tree (*Boscia albitrunca).* Taller shrubs are Velvet Brandybush (Grewia flava), River Honeythorn (*Lycium hirsutum*), Camphor Bush (*Tarchonanthus camphoratus*) and Common Spike-Thorn (*Gymnosporia buxifolia).* Small shrubs present are Besembossie (*Gnidia polycephal*), *Helichrysum species* (e.g. Golden Everlasting), *Hermannia species* (e.g. Doll's Rose) and *Plinthus sericeus.* Common grasses are Arrowfeather Threeawn (*Aristida meridionalis*), A. stipitata and Lehmann Lovegrass (*Eragrostis lehmanniana*).
- The Kuruman Mountain Bushveld covers the hills with generally gentle to moderate slopes and hill pediment areas, with an open to closed shrubveld. The grass layer is fairly well developed. Common large shrubs include Blackthorn (*Acacia mellifera ssp. Detinens*), common Guarri Euclea undulate, Bloubos Diospyros lycioides, Searsia tridactyla, Yellow Pomegranate (*Rhigozum obovatum*) and Vaalbos (*Tarchonanthus camphoratus and T. obovatus*). Shepherd's trees (*Boscia albitrunca*) are occasional. Several rock figs (*Ficus cordata*) grow on the peaks of the hills where large boulders or sheer rock outcrops are a feature. Common grasses include Black Spear Grass (*Heteropogon contortus, Enneapogon sp., Eragrostis sp*)., Koperdraadgras (*Aristida diffusa*) and Oxtail Buffalo Grass (*Cenchrus ciliaris*). Dwarf shrubs and herbaceous species include (*Hermannia species, Eriocephalus sp., Helichrysum*) species and a variety of small legume species such as *Indigofera sp.*

In addition a dry watercourse ecological unit has been identified which hosts a number of scattered Camel Thorn trees which are protected under the National Forests Act. This habitat is considered of high sensitivity based on its ecological function as a watercourse and ecological corridor.

<u>Species of Conservation Concern</u>

Protected species occuring within the project area are listed in Table 7-12. The location of these protected species is shown on Figure 7-16. Permits are required to remove these species.

TABLE 7-12: POPULATION ESTIMATES OF SPECIES OF SPECIAL CONCERN (ANDERSON, 2014)

Species	**Estimated number of trees/ population size in mine footprint area**	**Relevant law**
Acacia erioloba (Camel thorn)	+ 115 > 2m in height. + 50 < 2m in height.	National Forests Act (NFA) (1998) Northern Cape Nature Conservation Act (NCNCA, 2009)
Boscia albitrunca (Shepherd's tree)	+ 45 >2m in height, stem diameter < 40cm. No < 2m trees observed.	NCNCA, 2009
Olea europaea subsp africana Wild Olive	± 100 trees > 2m in height	
Boophone disticha (Bushmans' poison)	± 500	

Species	**Estimated number of trees/ population size in mine footprint area**	**Relevant law**
Cotyledon orbiculata	± 1000	
Gymnosporia buxifolia	< 100	
Pachypodium succulentum	± 5000	
Prepodesma orpenii	None.	
Ruschia griquensis (vygie)	> 5000	
Sarcostemma viminale (melktou)	> 100	

FAUNA (ANIMAL LIFE)

Faunal species diversity and numbers in the region is relatively low as is typical of semi-desert areas (Wilson, 2014). The area proposed for development and its immediate surrounds is largely undeveloped. However, considerable degradation of the natural habitat has occurred in the region due mainly to mining, especially on the iron and manganese ore hills and outcrops between Kathu and Postmasburg. A number of game farms are found in the region; most notably a game farm on the farm Thaakwaneng 675, situated approximately 8km north of the farm Driehoekspan.

A faunal specialist, Beryl Wilson, was commissioned to compile a list of fauna of conservation concern that could be in the development areas and immediate surrounds (Wilson, 2014 – See Faunal Specialist Study, (Appendix K).

Current literature, museum records and various past surveys in the region by the specialist indicated an approximate total of 56 mammal, 266 bird, 45 reptile and 11 amphibian and uncalculated arachnid naturally-occurring species to have been recorded in the region (Wilson, 2014). Of these, 14 mammal, 14 bird, two reptile, one amphibian and five arachnid species of conservation significance are thought to potentially occur in the general area of which only seven are predicted as having a high chance of occurrence (Wilson, 2014).

The seven that have a high chance of occurrence include the Bushveld Sengi Elephantulus intufi (Data Deficient), the Bushveld Gerbil *Gerbilliscus leucogaster* (Data Deficient), the African Wild Cat (*Felis silvestris lybica*) (Least Concern / Protected Species), Rock Monitor *Varanus albigularis* (Globally Vulnerable / Protected Species), two species of Burrowing Scorpion (Protected Species), and a species of Creeping Scorpion (Protected Species). Species of conservation concern include those listed in the NEMBA Threatened or Protected SpeciesToPS list (February 2007) for Protected Species. .

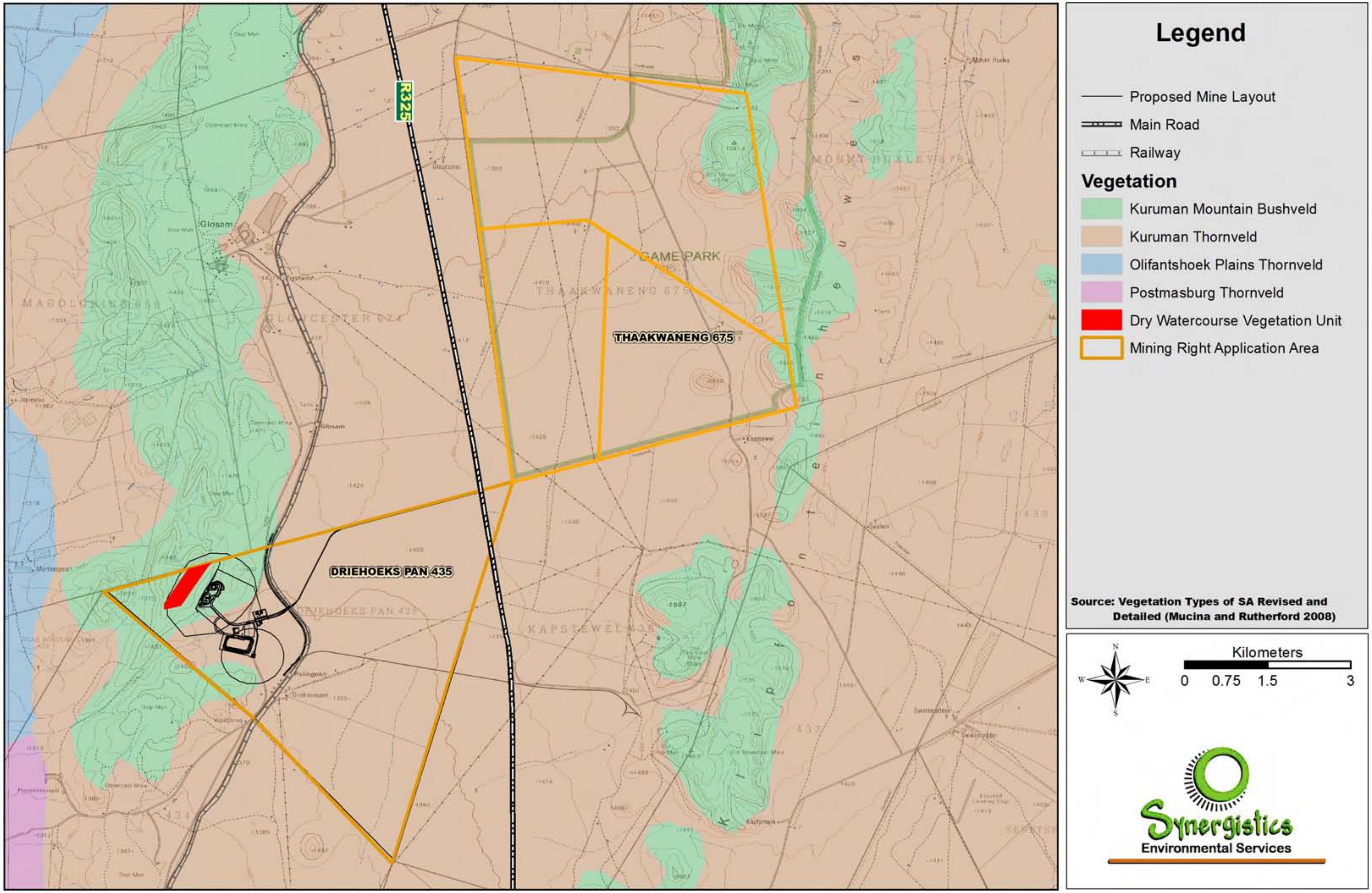


Figure 7-15: Vegetation Units within the Project Area

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO

Ecological Sensitivity

Sensitive habitats are known to occur in the region. Areas with untransformed natural vegetation, high diversity and complexity, species of special concern and systems vital to sustaining ecological function are potentially sensitive. Examples of sensitive habitats include wetlands, seasonal pans, perennial and non-perennial rivers and streams (watercourses) and ecological corridors with high connectivity to other ecosystems. Highly sensitive habitats often contain larger and/or healthier populations of species of special concern, or a higher species diversity of these particular species, and are considered to be of higher conservation value and more sensitive than areas with fewer or sparsely distributed species of special concern.

The ecosystem status of vegetation types in the study area is considered to be least threatened, meaning that no significant disruption of ecosystem functioning as more than 80 % of their original extent is untransformed (Anderson, 2014). In general, the habitat is not predicted to be critical to the survival, in terms of breeding, roosting or foraging of any of the locally occurring conservation-worthy faunal species (Wilson, 2014). In addition, the area is fairly significantly degraded due to historical overutilisation. The area is also not under consideration in the National Protected Area Expansion Strategy (2010).

In terms of fauna, the site has a low sensitivity based on the fact that only Least Concerned, Data Deficient and Near Threatened species are routinely recorded in the area and veld type in general. In addition, it is unlikely that the area constitutes critically important habitat or resources of the species of conservation concern. Any pans or streams in the area are however considered to have a medium sensitivity, due to the use of them by Giant Bullfrogs in the area, which are a Near Threatened and a Protected Species.

Areas with untransformed natural vegetation, high diversity and complexity, species of special concern and systems vital to sustaining ecological function are potentially sensitive. The analysis of the vegetation on Driehoekspan indicates that the watercourse on Driehoekspan is considered an area of high sensitivity, and sections of the hills on Driehoekspan are of medium-high sensitivity.

The sensitivity map is provided in Figure 7-16.

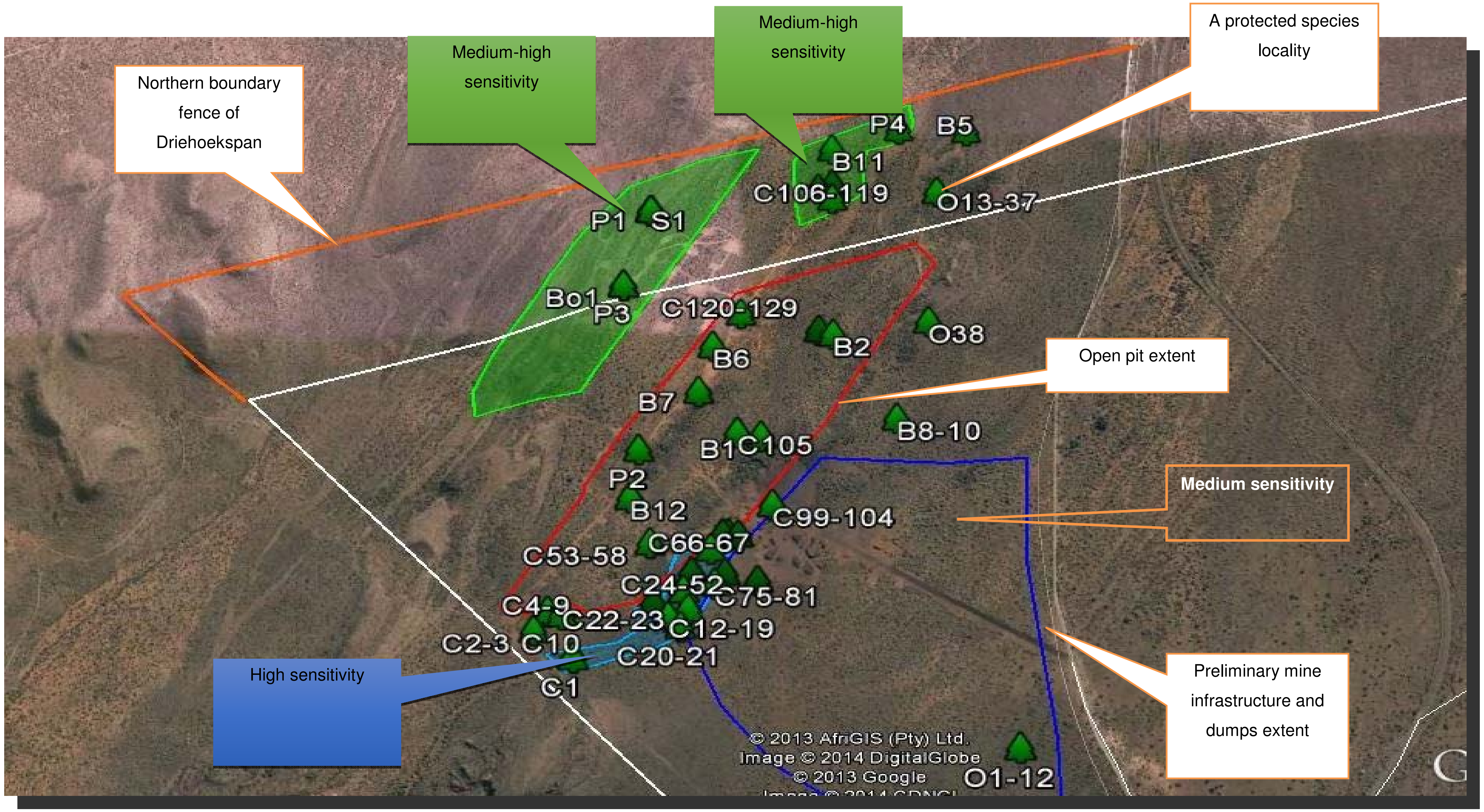


FIGURE 7-16: TERRESTRIAL SENSITIVITY MAP (ANDERSON, 2014)

The protected species codes are: C = camel thorn, B = Boscia albitrunca (shepherd's tree), O = Wild Olive (Olea europaea), P = Pachypodium succulentum, Bo = Boophone disticha, S = Sarcostemma viminale.

7.4.1.8 Air Quality

INTRODUCTION AND LINK

Identification of existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. Meteorological characteristics of a site govern the dispersion, transformation and eventual removal of pollutants from the atmosphere. A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance to nearby receptors. Potential receptors in the area include private farmsteads and the natural environment. As a baseline, this section provides a description of the climatic environment as it relates to air dispersion and aims to identify existing ambient air concentrations that may be impacted by project emissions.

DATA SOURCE

Information in this section was sourced from the air specialist study included in (Airshed 2014) (Appendix M).

In the absence of on-site meteorological data, data from Anglo American's weather and ambient monitoring station in Postmasburg was used. This station is located approximately10 km south of the site. Data for the period between 11 November 2011 to 13 October 204 was used for the specialist report and is presented in the results section below.

RESULTS

Sensitive receptors

Air quality sensitive receptors generally include places of residence and areas where members of the public may be affected by atmospheric emissions generated by mining/industrial activities. The nearest towns to the proposed mine area include Postmasburg, Lohatla and Beeshoek which are all more than 10 km away. These towns will therefore not be sensitive receptors for the mine.

The nearest receptors will be scattered farmsteads which are illustrated in Figure 7-17 below. The closest of these to proposed activities on the farm Driehoekspan lie approximately 600 m to the south-east and 1.4 km to the south-west of the proposed mine perimeter fence (no. 3 and no. 4). It should be noted that receptor 4 is an old unused Transnet Building.

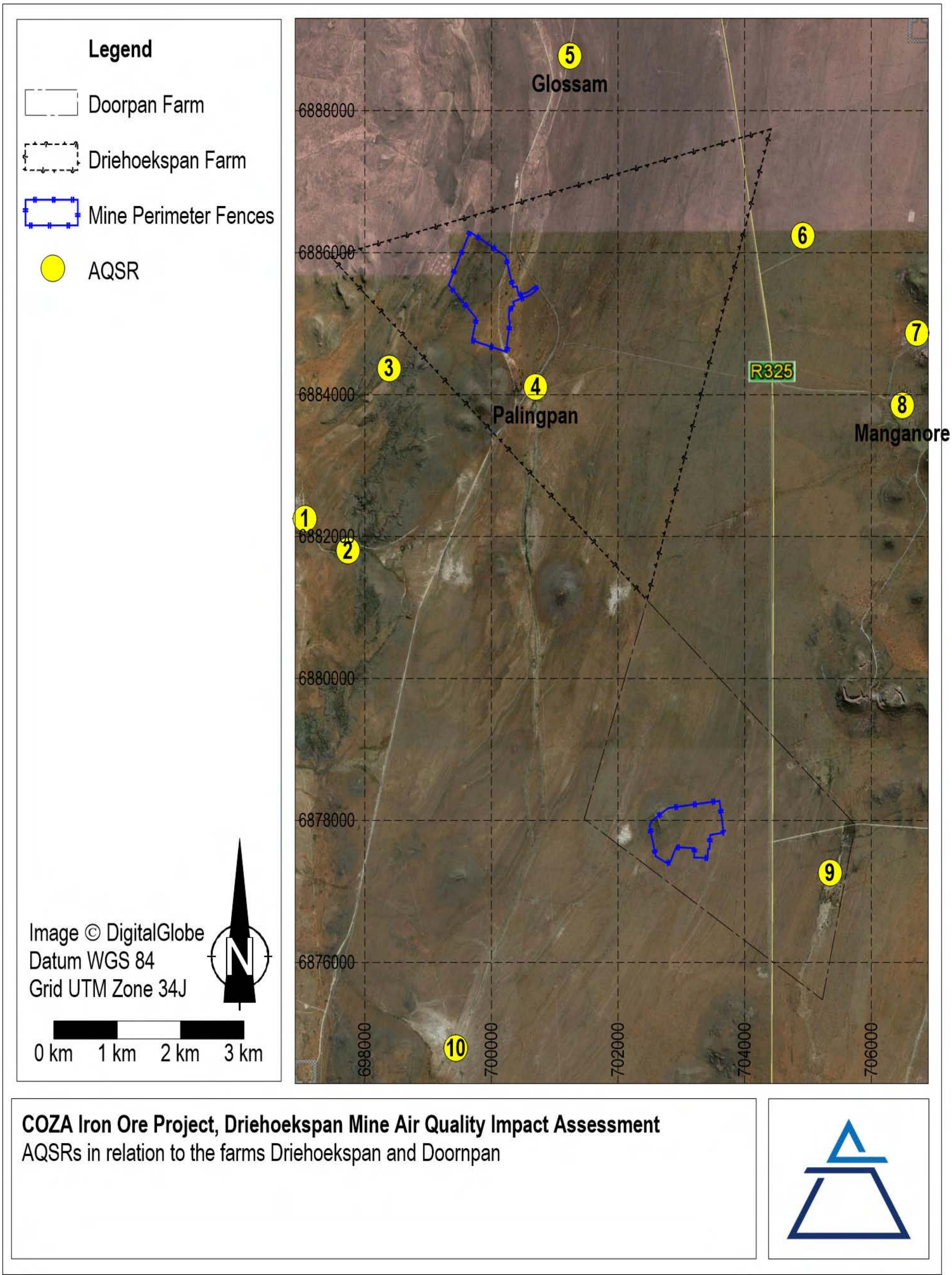


FIGURE 7-17: NEARBY SENSITIVE RECEPTORS IN TERMS OF AIR QUALITY (AIRSHED, 2015)

Baseline Emission Sources

Current potential air emissions sources within the study area include blasting activities from the nearby mines, the use gravel access roads, vehicle exhaust emissions and farming activities which could generate dust.

Baseline Air Quality

Ambient NO_2, O_3, PM10, PM2.5 and SO_2 concentrations are recorded at the Postmasburg ambient monitoring station which is approximately 10 km from the site. Reference is made to data recorded between September 2011 and March 2013 in describing existing (or pre-development) ambient pollutant concentrations in the area.

A summary of recorded and calculated average and median concentrations of criteria pollutants recorded at Postmasburg are provided in Table 7-13 below.

TABLE 7-13:SUMMARY OF AMBIENT CONCENTRATIONS OF POLLUTANTS OF CONCERN RECORDED NEAR POSTMASBURG (AIRSHED, 2015)

Parameter	$PM_{2.5}$	PM_{10}	SO_2	NO_2
Data Availability	89%	91%	88%	92%
1-hour Average Minimum Concentration	-	-	0 µg/m3	0 µg/m3
1-hour Average Maximum Concentration	-	-	32 µg/m3	42 µg/m3
Exceedances of the 1-hour NAAQS Limit Value	-	-	0 hours	0 hours
24-hour Average Minimum Concentration	2.91 µg/m3	5.83 µg/m3	0.38 µg/m3	-
24-hour Average Maximum Concentration	29.7 µg/m3	93.9 µg/m3	14.5 µg/m3	-
Exceedances of the 24-hour NAAQS Limit Value	0 days	8 days (1%)	0 days	-
Average Concentration	9.53 µg/m3	30.0 µg/m3	2.18 µg/m3	2.60 µg/m3
Median SO2 Concentration	8.00 µg/m3	22.0 µg/m3	2.00 µg/m3	2.00 µg/m3

From ambient air quality data recorded at Postmasburg between September 2011 and March 2013, it is evident that air quality in the area is generally good with respect to most of the criteria pollutants. Recorded ambient concentrations of PM2.5, NO2 and SO2 were all below the respective National Ambient Air Quality Standards (NAAQS) (GN 1210, 24 December 2009) limit values and no exceedences recorded with respect to these pollutants. Recorded PM_{10} concentrations were high, however with the NAAQS limit value of 75 µg/m^3 exceeded a total of 8 days during 2012.

7.4.1.9 Traffic

INTRODUCTION AND LINK

Traffic from mining developments has the potential to affect the capacity of existing road networks as well as result in noise, air quality and public road safety issues. This section provides an overview of the current road network, conditions and road use. Understanding the layout, use and conditions of transport systems relevant to the project site provides a basis for understanding a change as a result of project contributions.

DATA SOURCE

Information was sourced from the traffic specialist study (TTH Traffic, 2014) (Appendix N). The study comprised sourcing relevant data from a site inspection of the existing road network, traffic counts, calculations and reference to relevant traffic impact assessment guideline documents.

The site investigation, undertaken on 26 and 27 November 2013 included:

- A visual inspection of the site, site access track, and haulage route
- A general review of other roads near to the study area
- Traffic count survey at the R325 North of the access point, R325 South of access point and on the Access Road DR3395.

Methodologies used are detailed in the specialist report (Appendix N).

RESULTS

The main roads near the study area include the R325 that connects Postmasburg to Kathu and the R385 which connects the area to Kimberley. The R385 lies approximately 10 km west of the proposed mine and the R325 lies approximately 3 km east of the proposed mining area. The R325 will be the road used during the mine construction and operation phase. This road will be largely used for the transportation of ore from the mine as well as for staff and visitors coming to the mine during the operational phase. This road serves a number of mines between Postmasburg and Kathu and therefore carries a large volume of heavy trucks which damages the road (TTH Traffic, 2014). Due to the relatively low traffic volumes, no operational problems are experienced by vehicles at either of the Doornpan or the Driehoekspan intersections with R325.

Transport and Traffic Technology Africa (Pty) Ltd conducted traffic counts on the R325 to establish baseline traffic volumes. The counts were conducted for heavy vehicles and cars over a 12 hour period between 06:00 and 18:00 on 2 consecutive days at each access on the main road (R325). The counts were done on normal weekdays outside of school holidays on the 26 and 27th of November 2013. The results of the traffic count is presented in Table 7-14 below for a 12 h period. The Average Daily Traffic (ADT) is the average 2 way traffic volume per day averaged over a full year.

TABLE 7-14:RESULTS OF TRAFFIC COUNTS FOR A 12 HOUR PERIOD WITH ADT ESTIMATES (TTH TRAFFIC, 2014)

Count station	Date	Main road R325 North of access	Main Road R325 South of access	Access Road DR3395
Driehoekspan 2A	Tuesday 26 Nov 2013	2 227 (12h) 2 800 ADT est	2 229 (12h) 2 800 ADT est	20 (12h) 25 ADT est
Driehoekspan 2B	Wednesday 27 Nov 2013	3 629 (12h) 4 600 ADT est	3 526 (12h) 4 500 ADT est	145 (12h) 180 ADT estimated

Peak hour traffic for the 26 and 27th November is shown in Figure 7-18 and Figure 7-19 below which also shows the percentage of heavy vehicles. Due to relatively low traffic volumes, no operational problems are experienced by vehicles at either of the Doornpan or the Driehoekspan intersections with R325.

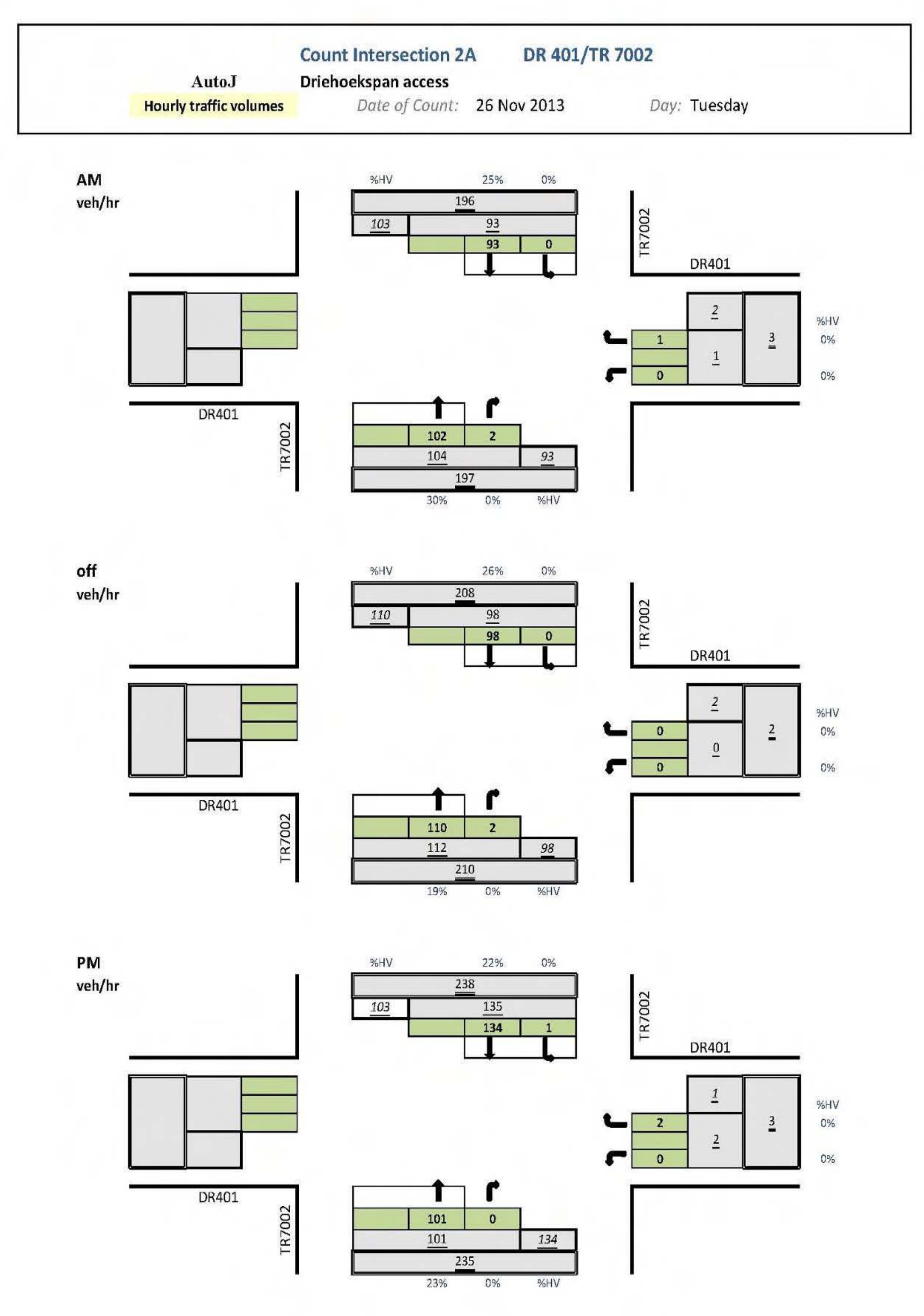


FIGURE 7-18: TRAFFIC COUNTS TAKEN AT INTERSECTION OF R325 ON THE 26TH OF NOVEMBER (TTH TRAFFIC, 2014)

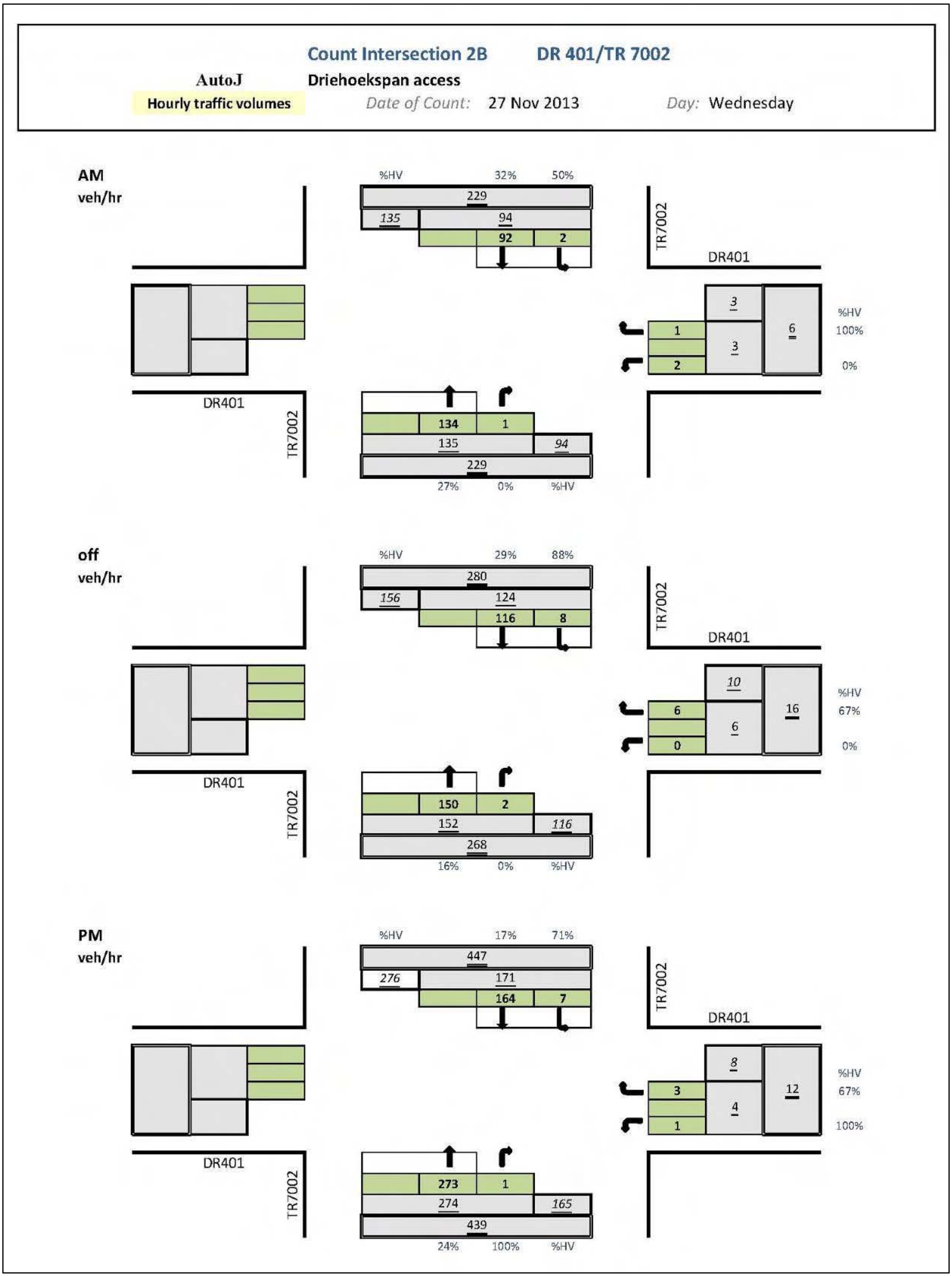


FIGURE 7-19: TRAFFIC COUNTS TAKEN AT INTERSECTION OF R325 ON THE 27TH OF NOVEMBER (TTH TRAFFIC, 2014)

7.4.1.10 Noise

INTRODUCTION AND LINK

Noise generating activities associated with the project may cause an increase in ambient noise levels in and around the site. This may cause a disturbance to nearby receptors. Potential receptors in the area include private farmsteads, nearby mines and the natural environment. As a baseline, this section provides an understanding of existing conditions in the area from which to measure changes as a result of project-related noise.

DATA SOURCE

Information was sourced from baseline noise monitoring data collected by Synergistics in 2013. To quantify the current day and night ambient noise levels, noise monitoring was undertaken at three sampling points near to the project site. The monitoring was conducted for both day and night. Meteorological conditions and the location of sampling points were taken into consideration when determining ambient noise levels. Methodologies used are detailed in the specialist report.

RESULTS

The project area is located in an area that can be classified as a rural district. Table 7-15 indicates the allowable noise levels as per SANS 10103 for different districts. Baseline noise monitoring was conducted on the 5th and 6th of December, 2013 at three separate locations near potential sensitive receptors. Baseline noise monitoring results indicate:

- An average night time noise level of 22-24 dB at receptors 1 & 2, distant from potential noise sources.
- An average night time noise level of 30-35 dB at receptor 3, near the busy provincial road R325.
- An average day time noise level of 32-37 dB at receptors 1 & 2, distant from potential noise sources.
- An average day time noise level of 51-59 dB at receptor 3, near the busy provincial road R325.

The current baseline noise levels is well within SANS 10103 outdoor noise levels for rural districts as indicated in Table 7-15 for all measured receptors except for receptor 3 which is located near the provincial road R325.

TABLE 7-15: EQUIVALENT CONTINUOUS RATING LEVELS FOR OUTDOOR NOISE (SANS 10103)

Type of District	SANS 10103: Equivalent Continuous Rating Levels for Outdoor Noise (dBA)		
	Day/Night	Day	Night
Rural districts	45	45	35
Suburban districts with little road traffic	50	50	40
Urban districts	55	55	45
Urban districts with one or more of the following: workshops, business premises and main roads.	60	60	50

Type of District	SANS 10103: Equivalent Continuous Rating Levels for Outdoor Noise (dBA)		
Central business districts	65	65	55
Industrial districts	70	70	60

7.4.1.11 Cultural and Heritage Resources

INTRODUCTION AND LINK

This section describes the existing status of the heritage and cultural environment that may be affected by the proposed project. Heritage (and cultural) resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

Paleontological resources are fossils, the remains or traces of prehistoric life preserved in the geological (rock stratigraphic) record. They range from the well-known and well publicized (such as dinosaur and mammoth bones) to the more obscure but nevertheless scientifically important fossils (such as palaeobotanical remains, trace fossils, and microfossils). Paleontological resources include the casts or impressions of ancient animals and plants, their trace remains (for example, burrows and trackways), microfossils (for example, fossil pollen, ostracodes, and diatoms), and unmineralised remains (for example, bones of Ice Age mammals).

DATA SOURCE

Information in this section was sourced from the Phase 1 Heritage Impact Assessment undertaken by PGS Heritage & Grave Relocation Consultants (Appendix O).

As part of the heritage/cultural and palaeontological studies information was sourced from the review of available literature and through on-site observations.

RESULTS

Archival and historical research has revealed a long and significant history in terms of the surroundings of the study area (PGS Heritage, 2015).The historical research highlighted that there might be some historical and archaeological sites within the study area which may be associated with the histories of the Thlaro and Thlaping. The surroundings of Postmasburg and the study area also contain a number of well-known pre-colonial mining sites, rock art sites as well as Stone Age sites, most notably Blinklopkop, a pre-colonial specularite mine located approximately 10 km southeast of the study area.

With respect to palaeontological resources, the study area is underlain by chemical and clastic sedimentary sequences of the Campbell and Postmasburg Groups of the Transvaal Supergroup. These sedimentary sequences are associated with BIFs in the Postmasburg region, close to where mining is envisaged. The dolomite sequences can contain good examples of stromatolite structures that are of medium palaeontological significance and although no palaeontological resources were found on site, the possible presence of stromatolites should be taken into account by project planners. A stromatolite is a dome-shaped structure consisting of alternating layers of carbonate or silicate sediment and fossilized algal mats. Stromatolites are produced over geologic time by the trapping, binding, or precipitating of sediment by groups of microorganisms, primarily cyanobacteria.

During the fieldwork undertaken to identify possible resources of heritage value, a total of eight sites were identified, with three additional sites previously identified during an archaeological impact assessment on a section of the present study area carried out in 2010 (Webley & Halkett, 2010) (see Table 7-16). These included Stone Age (ESA, MSA and LSA) sites including find spots and surface scatters. As indicated in Table 7-16, five of these 12 heritage sites (DRHP 5, DRHP 6, DRHP 7, DRHP 11 and DRHP 12) are expected to occur within the proposed development footprint of the project. Risk calculations undertaken by PGS Grave Solutions for above five sites shows that that the impact risk of the proposed development on these sites fallls within Impact Class 2 representing a Low Impact Risk. While heritage sites within the proposed project area are protected, according to the SAHRA classification standards, sites of low heritage significance can be destroyed without obtaining permits.

TABLE 7-16: HERITAGE SITES WITHIN DRIEHOEKSPAN MINING AREA (PGS, 2015).

Site	Latitude	Longitude	Description	Significance
DRHP 1	28° 8' 59.66"S	23° 2' 21.55"E	Ox wagon associated with a low density surface scatter of historic material	Low
DRHP 2	28° 8'57.19"S	23° 2'21.07"E	LSA findspot	Low
DRHP 3	28° 8'54.96"S	23° 2'3.01"E	Low density surface scatter of MSA / LSA lithics	Low
DRHP 4	28° 8'52.00"S	23° 1'50.53"E	ESA findspot	Low
DRHP 5	28° 8'50.26"S	23° 2'5.10"E	Low density surface scatter of predominantly MSA lithics	Low
DRHP 6	28° 8'39.69"S	23° 2'6.58"E	Low density surface scatter of MSA / LSA lithics	Low
DRHP 7	28° 8'31.42"S	23° 2'11.12"E	Low density surface scatter of predominantly MSA lithics	Low
DRHP 8	28° 8'29.10"S	23° 1'44.60"E	Structure	Low
DRHP 9	28° 8'29.10"S	23° 1'44.60"E	ESA findspot	Low
DRHP 10	28° 8'19.50"S	23° 1'35.90"E	Low density surface scatter of LSA lithics	Low
DRHP 11	28° 8'25.70"S	23° 2'28.20"E	Low density surface scatter of MSA / LSA lithics	Low
DRHP 12	28° 8'27.90"S	23° 2'29.60"E	Low density surface scatter of historic material	Low

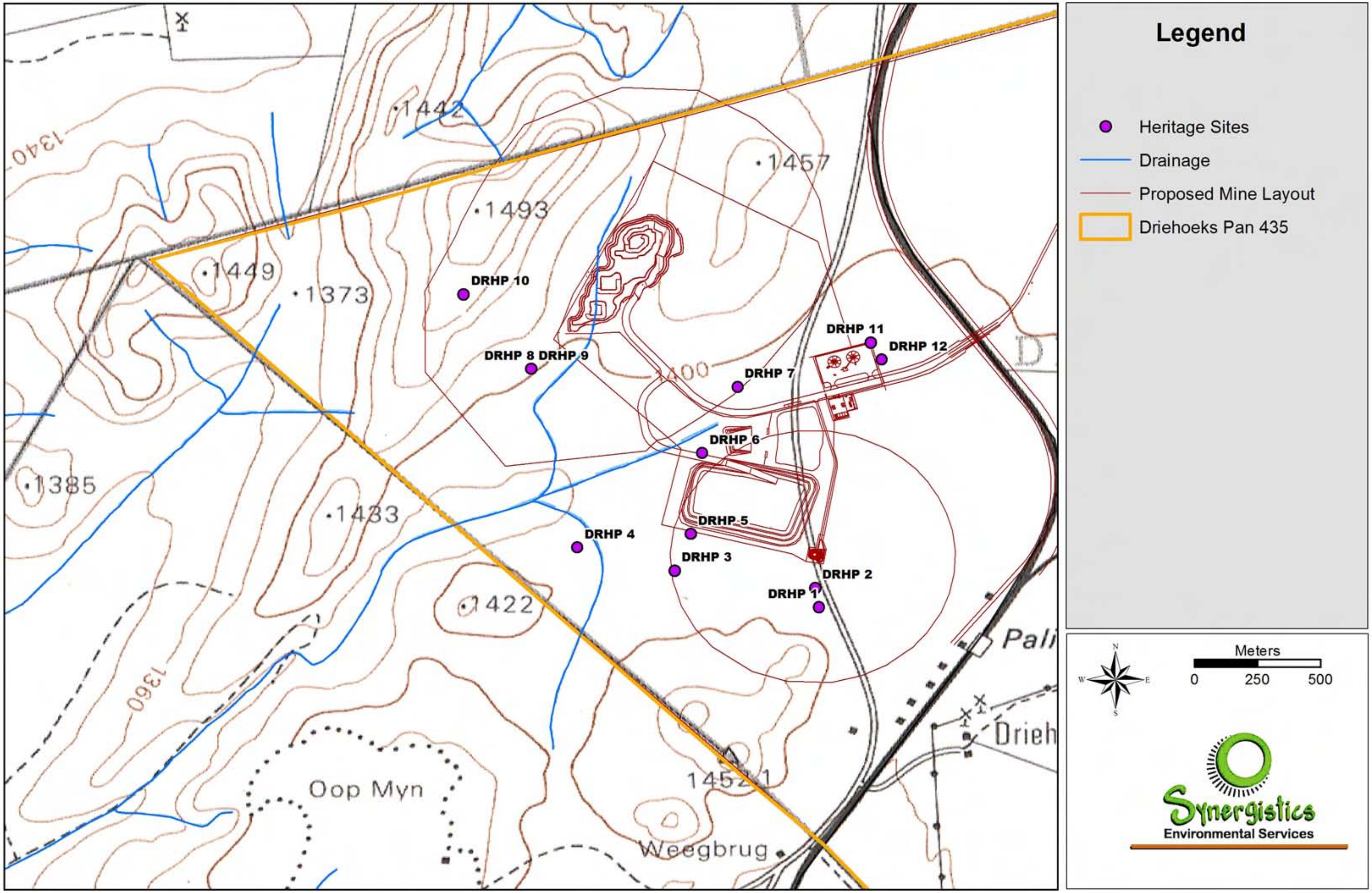


Figure 7-20: Heritage Sites on the Farm Driehoekspan

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO23

7.4.1.12 Socio-Economic Environment

INTRODUCTION AND LINK

Project-related activities have the potential to alter the socio economic environment of the surrounding area which can give rise to social impacts. As a baseline, this section provides an understanding of the socio economic aspects of the project against which to measure potential change as a result of the project

DATA SOURCE

Information was sourced from the social impact assessment specialist study (SLR 2014) (Appendix P), which includes information from Demacon Market Studies (2013).

RESULTS

Land Tenure

The proposed project is located on land owned by the Maremane Community. The land is registered under the Maremane Communal Property Association (MCPA). The MCPA represents members of the community that have legal right over the land.

Description of Local Communities

Maremane Community

Members of the Maremane community were dispossessed of their land for the purposes of establishing the Lohatla Military Base in the 1970's. The displaced people were taken to places such as Laxey, Pepsi and the surrounding areas of Kuruman (The New Age, 24 April 2012). According to the Rural Development and Land Reform's former deputy minister in 2010 Mr Thulas Nxesi, the Maremane community lost approximately 12 million hectares of land (South African Government Information, 4 December 2010). Post 1994 the community lodged a claim to have their land returned and in 2010 the community was handed over 11 200 ha of land on properties surrounding the military base. Figure 7-26 illustrates areas where some members of the Maremane Community are currently located near the study area. The majority of the people are currently residing in an informal settlement located on Farm Lohatla this settlement area is currently referred to as "Lohatla" by its inhabitants. There are little economic activities occurring in the area except for a local shop and a crèche. During the public meeting held with the community, it was evident that the unemployment rate is low. There are also a small number of people forming part of the Maremane community located on Farm Driehoekspan. This group of people is involved in agricultural activities (goat and sheep farming).

The current areas where the Maremane community are residing are not included in the local municipality's town planning scheme and therefore there are some challenges with service delivery.

Farming Community

Two local farmers approximately 5 km north west of Driehoekspan who are involved in low intensity stock farming (cattle and sheep) also surround the study area (see Figure 7-26 for location of farmers). There is a game farm on Farm Thakwaaneng 675 which is approximately 6 km northeast of Driehoekspan planned operations.

Regional Demographic Information

Demacon Market Studies conducted a baseline socio-economic assessment of the study area. A 50 km radius as illustrated in Figure 7-21 was determined as the area of the study for the baseline description. The area had an estimated population of 63 243 or 17 931 households in 2013. The average household size amounts to approximately 3.5 members per household. The population growth is averaged at 1.4 % per annum (Demacon, 2013).

Figure 7-21 shows the age profiles within the study area. The study area is characterised by a relative large percentage of young adults between the ages of 20-34 years (30.5%). This can be attributed to the employment opportunities due to mining developments in the area.

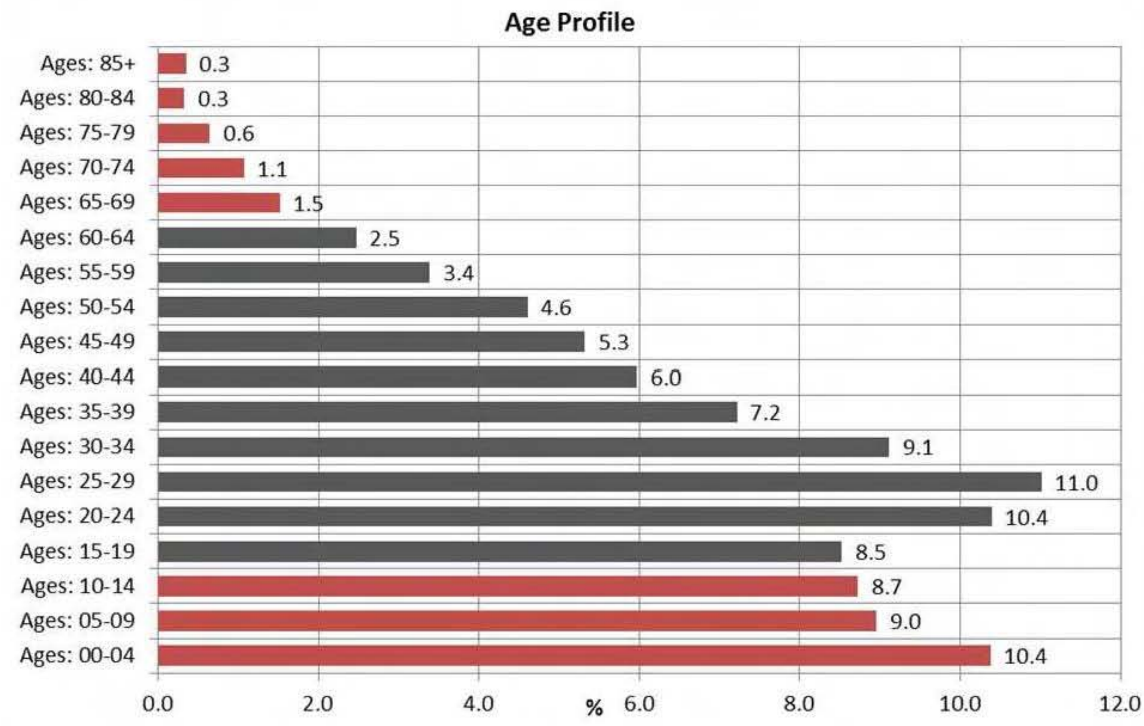


FIGURE 7-21: AGE PROFILE WITHIN THE STUDY AREA (DEMACON MARKET STUDIES, 2013)

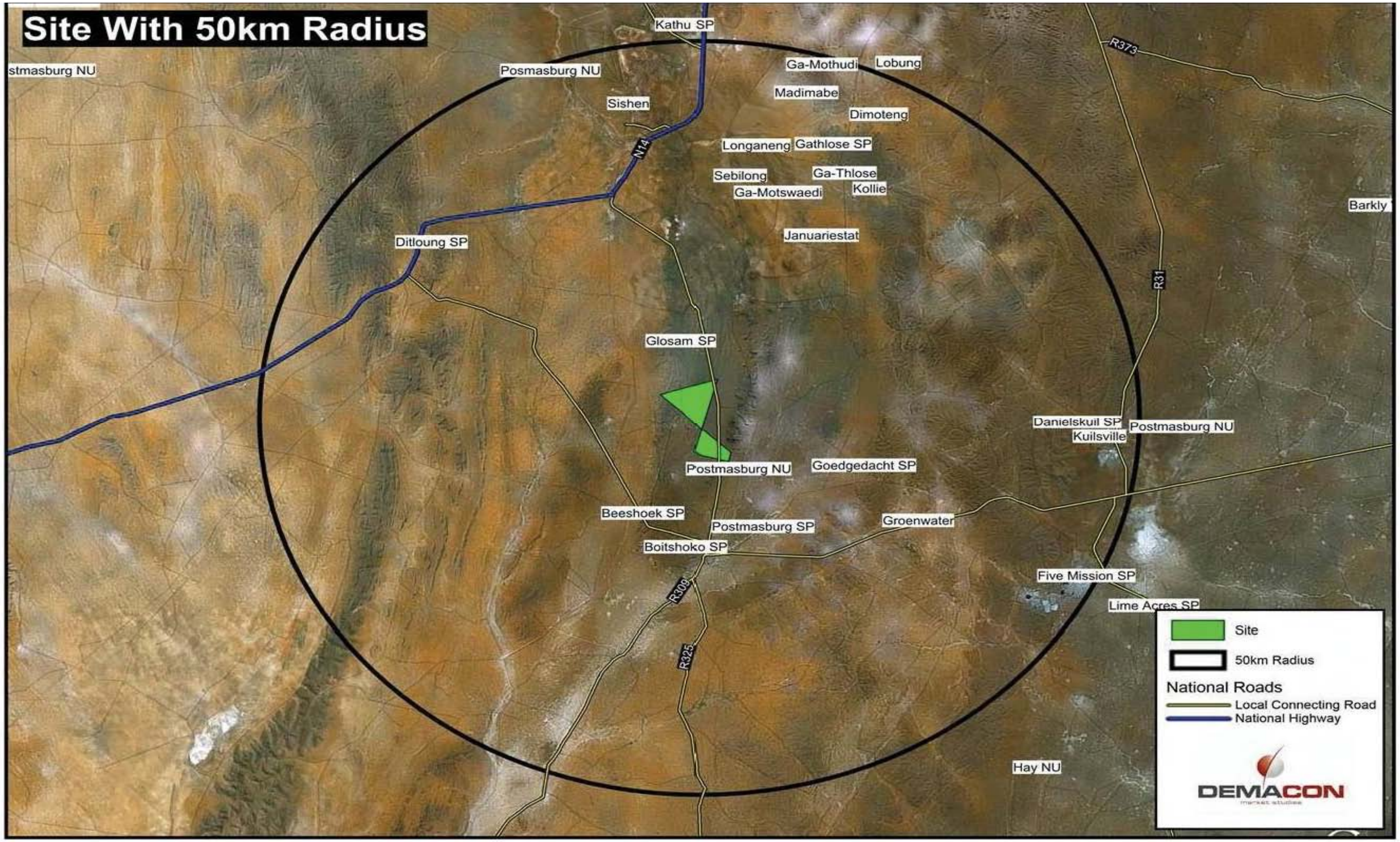


FIGURE 7-22: SOCIO-ECONOMIC STUDY AREA (DEMACON MARKET STUDIES, 2013)

Education Profile

The education profile of the study area is indicated in Figure 7-23. The area has moderate figures of illiteracy with 9.3 % having had no schooling. 27.6% of the market population has at least Grade 12 or obtained higher education.

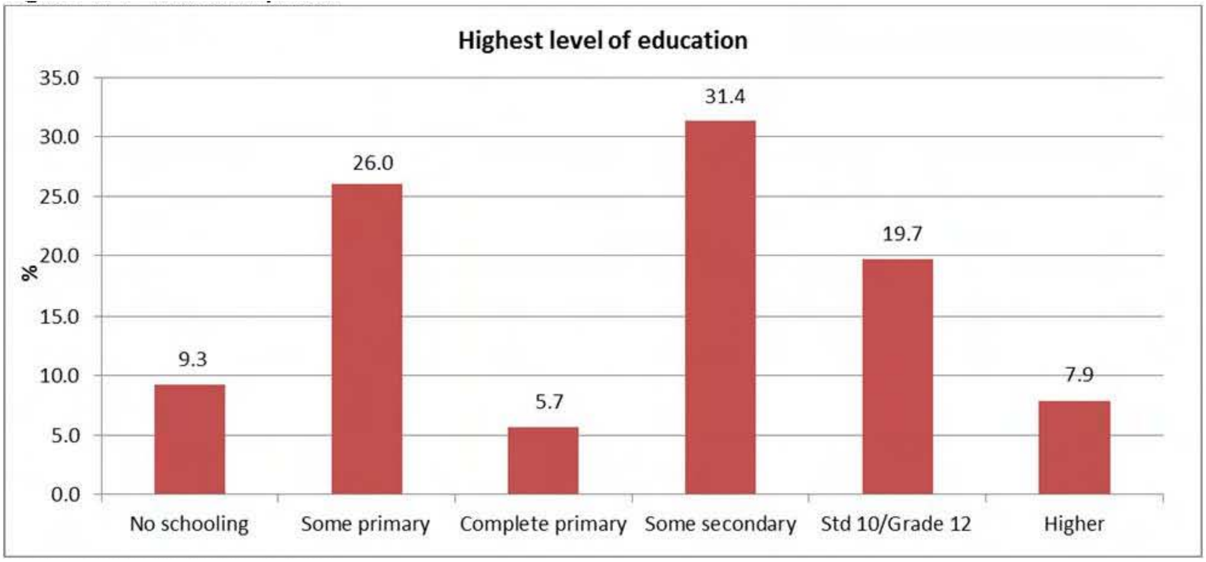


FIGURE 7-23: EDUCATION PROFILE (DEMACON MARKET STUDIES, 2013)

Employment Profile

The majority of the market population is economically active (88.6 %) while 11.4 % are not economically active. Figure 7-24 shows that of the 88.6 % that are economically active, 84.4 % are employed while 15.6 % are unemployed. The low level of unemployment can be ascribed to the rural nature of the study area, with people only moving in the area for employment purposes to work in the mining or government sectors as the major employment sectors.

The employment profile of the surrounding communities is likely to be different from the overall study area as described above. During consultations meetings the community indicated high unemployment amongst the youth. Members of the community that are employed, are largely employed by surrounding mines.

Regional and local economic structure

Tsantsabane's local economy contributes to approximately 17 % of the district's economy and it is the third largest economy in the district. The municipality hosts one of the country's largest iron ore reserves, and as such, mining is an important sector within the municipality contributing approximately 39% of the local economy in 2011, see Figure 7-24.

The affected area for the mining development is characterised by low intensity goat/sheep farming with some historic but abandoned mining activity. The local communities are involved in informal economic activities such as local shops, crèches or small scale agricultural activities (chicken farms, vegetation).

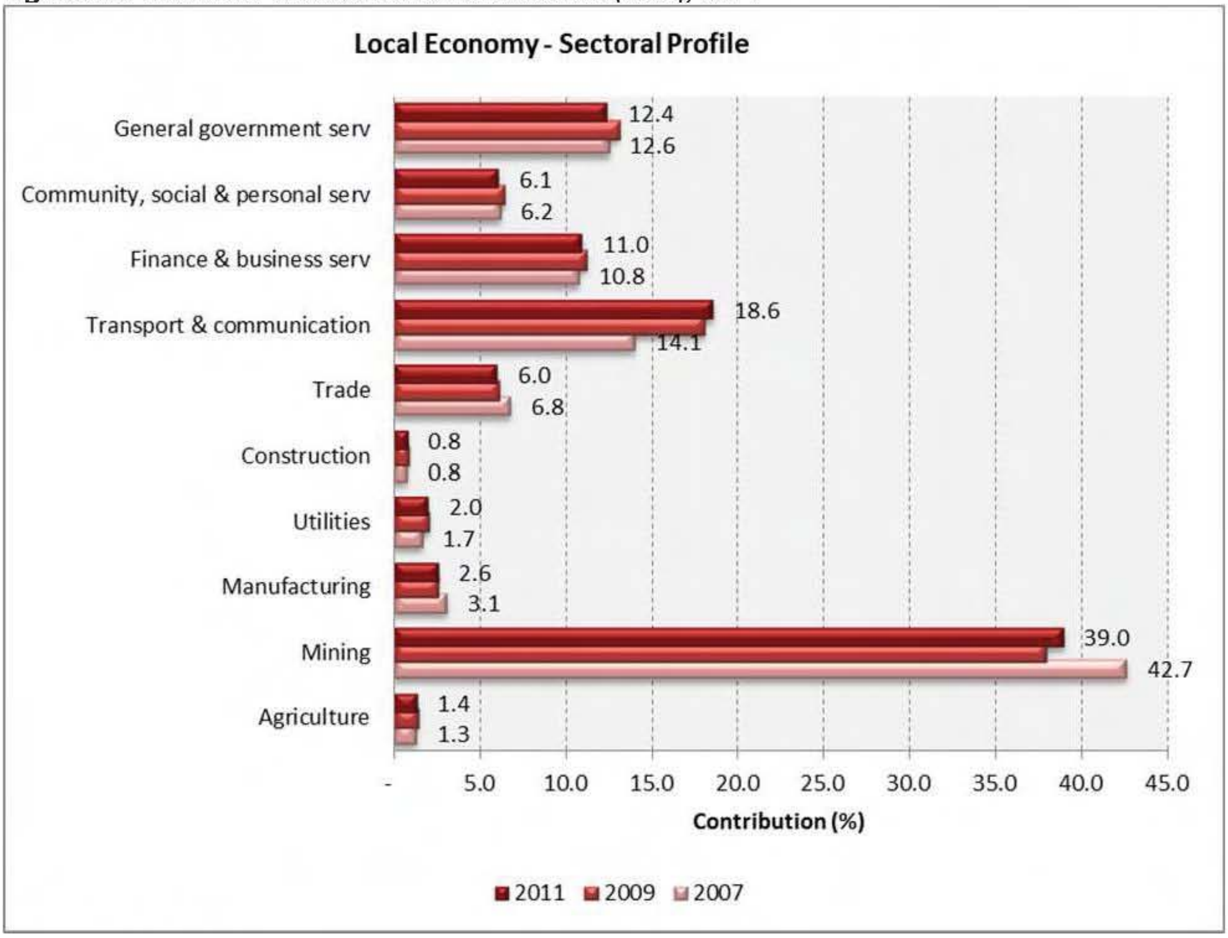


FIGURE 7-24: ECONOMIC STRUCTURE AND PERFORMANCE (GVA), 2011 (DEMACON MARKET STUDIES, 2013)

Level of Economic Diversity

The level of economic diversity of a region can be measured using the tress index. A tress index of zero represents a totally diversified economy and the higher the tress index (closer to 100), the more concentrated or vulnerable the region's economy. Figure 7-25 shows the tress index for the nation, province and on a local level. Tsantsabane local economy dependence on its driving sectors decreased from 64.1 in 2001 to 60.2 in 2011. The growth in transport and communications sector over the past few years has led to the decrease in dependency on the mining sector.

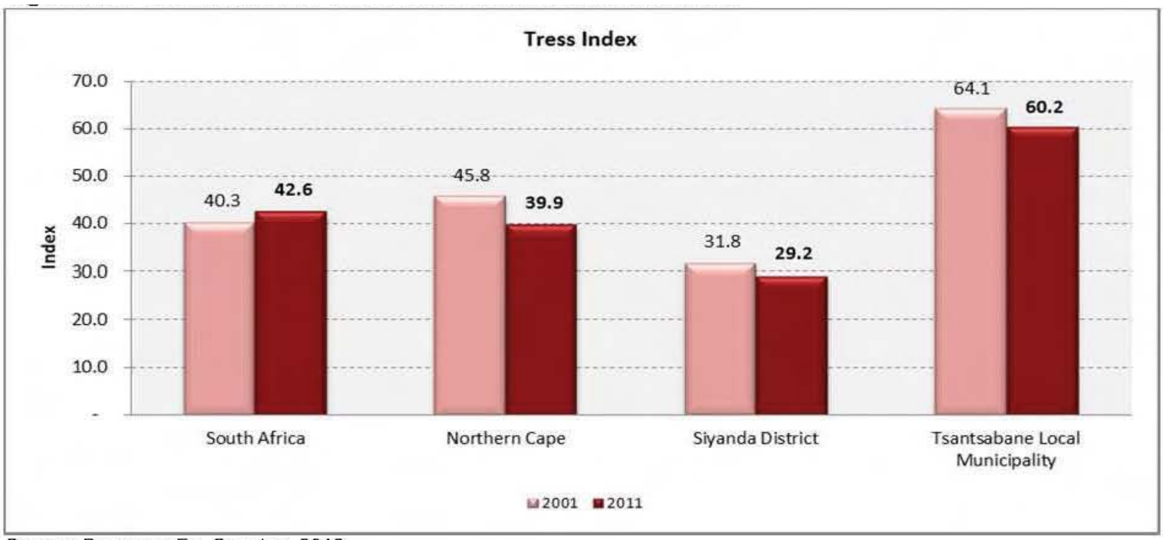


FIGURE 7-25: TRESS INDEX FOR THE AFFECTED ADMINISTRATIVE AREAS (DEMACON MARKET STUDIES, 2013)

7.4.2 CURRENT LAND USE

INTRODUCTION AND LINK

Mining activities have the potential to affect land uses both within the project area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key related potential environmental impacts are: loss of soil, loss of biodiversity, pollution of water, dewatering, air pollution, noise pollution, damage from blasting, visual impacts and the influx of job seekers with related social ills. To understand the basis of the potential land use impacts, a baseline situational analysis is described below.

DATA SOURCE

Data on the visual resource was collected by SLR from 1:50 000 topographical maps, Google Earth Maps, site observations and photos taken of the study area. This data was then evaluated qualitatively to provide a description of the land use.

RESULTS

The project area is within a rural district, zoned for agricultural use. Driehoekspan is currently used as grazing land by the Maremane Community and Thaakwaneng has a game farm. The dominant land use in the area surrounding the COZA Driehoekspan project is livestock farming. Due to the arid nature of the climate, intensive commercial agriculture is not possible. There is also human settlement to the west and north of the study area, these include two local farmers (~ 5 km) and the Maremane Community (some scattered dwellings occur within ~ 700 m). Mining activities and the infrastructure associated with mining activities (powerlines and railway) are also prevalent in the area, due to the presence of iron ore.

The Transnet freight railway line linking Beeshoek Mine to Sishen Mine and ultimately to the Sishen Saldanha export line passes through the farm Driehoekspan. There are a number of abandoned buildings associated with the railway line on Farm Driehoekspan.

The R325 to Kathu crosses farm Driehoekspan east of the proposed mining area. Approximately 8 km northeast of the project area is the Lohatla Military Base, which is used as a training area for the South African National Defence Force. The military base is located in an area that was proclaimed as a nature reserve (Ga-Thlose Nature Reserve) in 1890. Part of the farm where the military base is located is now currently used as a game park (see Figure 7-26 for the current land use). The status of this reserve is uncertain as the military trainining area has been declared a restricted military area.

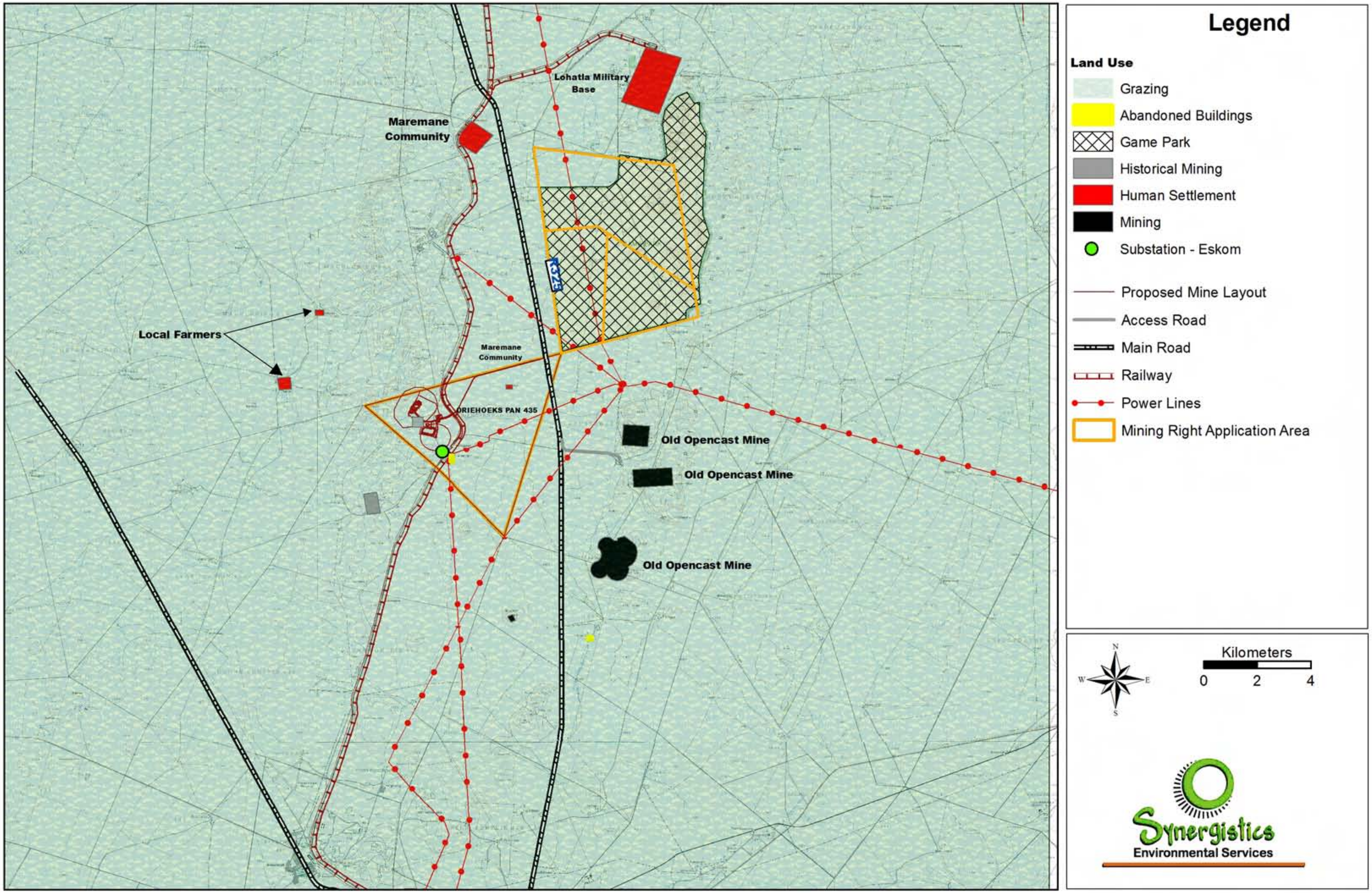


Figure 7-26: Current Land Use

SO707	Coordinate System DMS	
	Spheroid WGS84	Central Meridian LO

7.5 ENVIRONMENTAL IMPACTS AND RISKS OF THE ALTERNATIVES

This section provides a list of potential impacts on environmental and socio-economic aspects that have been identified in respect of each of the main project actions / activities and processes for each of the project phases (Table 4-1) in terms of the project alternatives. A discussion of the negative and positive impacts of the project alternatives is provided in Section 7.7. The ratings for consequence, probability and significance of each of the impacts in the unmitigated scenario (which assumes that no consideration is given to the prevention or reduction of environmental and social impacts) are also provided in Table 7-17 below in accordance with the DMR report template.

TABLE 7-17: LIST OF IMPACTS IDENTIFIED FOR THE PROPOSED PROJECT INCLUDING ALTERNATIVES

The assessment ratings provided in this table are for the unmitigated scenario only which assumes that no consideration is given to the prevention or reduction of environmental and social impacts. The only alternative considered in this matrix is the three possible waste rock dump positions – refer to Figure 7-1 for alternatives 1, 2 and 3 referred to in the table below.

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
GEOLOGY											
Loss a of mineral resources	Surface infrastructure establishment and open pit mining	1,2,3	Construction, operation, decommissioning and closure	H	H	M	H	H	Cannot be reversed	Definite	Cannot be avoided
TOPOGRPAHY											
Hazardous structures and excavations	Construction activities requiring foundations, cranes, scaffolding, trenches, voids, water dams; stockpiling, open pit mining and concurrent backfilling, crushing, waste rock disposal, backfilling open pit final void.	1,2,3	Construction, operation, decommissioning and closure	H	H	M	H	H	Cannot be reversed in the event of death Partially in the event of injury	Possible	Can be avoided, managed/mitigated to acceptable levels
SOILS AND LAND CAPABILITY											
Loss of utilisable soils through physical destuction	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing,	1,2,3	Construction, operation, decommissioning and closure	M	H	L	H	M	Fully	Unlikely	Can be avoided, managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.										
Loss of utilisable soils through physical disturbance	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.	1,2,3	Construction, operation, decommissioning and closure	H	H	L	H	H	Fully	Unlikely	Can be managed/mitigated to acceptable levels
BIODIVERSITY											
Physical destruction of biodiversity	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation	1,2,3	Construction, operation, decommissioning and closure	H	H	H	H	H	Partially	Possible due to prescence of protected trees – exact number to be determined prior to construction.	Can be managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	activities.										
General disturbance of biodiversity	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.	1,2,3	Construction, operation, decommissioning and closure	H	H	M	H	H	Partially	Unlikely	Can be managed/mitigated to acceptable levels
SURFACE WATER											
Altering Drainage Patterns	Surface infrastructure establishment, open pit mining and concurrent backfilling, backfilling open pit final void, rehabilitation activities.	1,2, 3	Construction, operation, decommissioning and closure	M	H	M	M	H	Fully	Unlikely	Can be managed/mitigated to acceptable levels
Pollution of Surface Water	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal,	1,2,3	Construction, operation, decommissioning and closure	H	H	M	M	H	Fully	Unlikely	Can be managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	backfilling open pit final void, use of support services, rehabilitation activities.										
GROUNDWATER											
Reduction of groundwater availability to third parties	Dewatering activities, sourcing water from boreholes and water level recovery.	1,2,3	Construction, operation, decommissioning and closure	M	H	M	M	M	Fully	Unlikely	Can be managed/mitigated to acceptable levels
Groundwater pollution	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.	1,2,3	Construction, operation, decommissioning and closure	M	H	L	M	M	Partially	Unlikely	Can be avoided, managed/mitigated to acceptable levels
AIR QUALITY											
Air Pollution	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing,	1,2,3	Construction, operation, decommissioning and closure	H	H	M	H	H	Fully	Unlikely	Can be managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.										
NOISE											
Noise Pollution	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.	1,2,3	Construction, operation, decommissioning.	H	M	M	M	M	Fully	Unlikely	Can be managed/mitigated to acceptable levels
BLASTING											
Blasting impacts	Opn pit mining	1,2,3	Operations	H	H	M	M	H	Cannot be reversed in the event of death Partially in the event of injury	Possible	Can be avoided
VISUAL											
Negative visual impacts	Surface infrastructure establishment,	1,2,3	Construction, operation, decommissioning.	H	H	M	H	H	Fully upon closure with proper	Unlikely	Can be managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.								rehabilitation		
TRAFFIC											
Road disturbance and traffic safety impact	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.	1,2,3	Construction, operation, decommissioning.	H	H	M	M	H	Cannot be reversed in the event of death Partially in the event of injury	Possible	Can be avoided
HERITAGE											
Loss of or damage to heritage/palaeontological resources	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste	1,2,3	Construction, operation, decommissioning, closure.	H	H	L	H	H	Cannot be reversed as sites will be destroyed	Unlikely as sites to be destroyed are of low heritage significance	Can be managed/mitigated to acceptable levels

Potential impact	Source of Impact	Alternative	Project phases	Consequence			Probability	Significance	Degree to which impact		
				Severity	Duration	Spatial scale			Can be reversed	Causes irreplaceable loss of resources	Can be avoided/ Managed/ Mitigated
	rock disposal, backfilling open pit final void, use of support services, rehabilitation activities.										
SOCIO-ECONOMIC											
Positive economic impact	Construction and initial operational activities, recruitment of contractors and workers, operational activities including open pit mining and sale of product, decommissioning activities, retrenchment of workers at closure.	1,2,3	Construction, operation, decommissioning, closure.	H^+	H	H	H	H^+	N/A	Unlikely	Can be managed/mitigated to acceptable levels
Inward migration				H	H	M	M	H	Partially		
Loss of current land use	Surface infrastructure establishment, open pit mining and concurrent backfilling, crushing, stockpiling, waste rock disposal, backfilling open pit final void, use of support services, rehabilitation	1,2,3	Construction, operation, decommissioning, closure.	H	H	M	H	H	Fully upon closure with proper rehabilitation	Unlikely	Can be managed/mitigated to acceptable levels

Potential impact	**Source of Impact**	**Alternative**	**Project phases**	**Consequence**			**Probability**	**Significance**	**Degree to which impact**		
				Severity	**Duration**	**Spatial scale**			**Can be reversed**	**Causes irreplaceable loss of resources**	**Can be avoided/ Managed/ Mitigated**
	activities.										

7.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The proposed method for the assessment of environmental issues is set out in Table 7-18 below. Part A provides a list of criteria that can be selected in order to rank the severity, duration and spatial scale of an impact. The consequence of the impact is determined by combining the selected criteria ratings allocated for severity, spatial scale and duration in part B. The significance of the impact is determined in Part C whereby the consequence determined in part B is combined with the probability of the impact occurring. The interpretation of the impact significance is given in Part D.

This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated. This assessment method was used to assess impacts associated with all project alternatives.

TABLE 7-18:CRITERIA FOR ASSESSING IMPACTS

PART A: DEFINITION AND CRITERIA*					
Definition of SIGNIFICANCE		**Significance = consequence x probability**			
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**			
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.			
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.			
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.			
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.			
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.			
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term			
	M	Reversible over time. Life of the project. Medium term			
	H	Permanent. Beyond closure. Long term.			
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.			
	M	Fairly widespread – Beyond the site boundary. Local			
	H	Widespread – Far beyond site boundary. Regional/ national			
PART B: DETERMINING CONSEQUENCE					
SEVERITY = L					
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**
SEVERITY = M					
DURATION	Long term	**H**	**Medium**	**High**	**High**

	Medium term	M	Medium	Medium	High
	Short term	L	Low	Medium	Medium
			SEVERITY = H		
DURATION	Long term	H	High	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Medium	Medium	High
			L	M	H
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		
			PART C: DETERMINING SIGNIFICANCE		
PROBABILITY (of exposure to impacts)	Definite/ Continuous	H	Medium	Medium	High
	Possible/ frequent	M	Medium	Medium	High
	Unlikely/ seldom	L	Low	Low	Medium
			L	M	H
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

7.7 POSITIVE AND NEGATIVE IMPACTS IN TERMS OF SITE LAYOUT ALTERNATIVES

With reference to Section 7.1.3, three alternatives positions for the waste rock dump were considered, these arepresented in Figure 7-27. A basic alternative selection matrix was compiled in order to provide a discussion in terms of the advantages and disadvantages of the three WRD position alternatives. Table 7-19 presents the results of the related selection matrix process. The ranking system is a simple three score relative ranking system. For each criterion, a score of one is allocated to the best option and a score of three to the worst. The option with the lowest total score is the preferred option. It is important to note that the discussion around the advantages and disadvantages of the preferred site layout in Table 7-19 below is also informed by the impacts and risks identified for the site layout options as outlined in Table 7-17.

TABLE 7-19: POSITIVE AND NEGATIVE IMPACTS ASSOCIATED WITH SITE LAYOUT ALTERNATIVES

CRITERIA	ADVANTAGES AND DISADVANTAGES			PREFERRED ALTERNATIVE
	WRD ALTERNATIVE 1	WRD ALTERNATIVE 2	WRD ALTERNATIVE 3	
The potential for groundwater pollution	Depth to groundwater ranges between 7-37m and is expected to be the same for all alternatives. No significant geological features that could act as preferential flow paths are known to occur at any alternative at this stage. Therefore no significant difference is expected between alternatives.			n/a
The potential for surface water pollution	Alternative is located more than 100m from watercourse and wetland.	Alternative is located more than 100m from watercourse and wetland.	Alternative is located more than 100m from watercourse and wetland.	n/a
Proximity to people (dust, noise and visual impacts)	No significant difference between alternatives - human settlements lie to the east and north of the study areas, these include the residents of two local farmers, the game farm on Thaakwaneng and the Maremane Community which are more than 5km away from all alternatives. All three alternatives are likely to be visible from the R325. There are abandoned buildings in close proximity to WRD alternative 2, however these do not seem to be inhabited by people currently.			n/a
Soil and land capability	Although no soil study has yet been conducted, no significant difference is expected between alternatives. The soils are expected to have a non-arable or wilderness land capability.			n/a
Biodiversity	No significant difference is expected between alternatives as all three sites lie within least threatened ecosystems, although there is potential for protected tree species to occur. Protected trees have been mapped in a previous biodiversity survey and all three alternatives will not encroach on the trees that have been mapped to date. The property is utilised for grazing, with very little natural biodiversity remaining.			n/a
Heritage resources	Alternative situated relatively close to a low significance heritage resource identified in literature. A heritage survey is needed to verify this resource.	No heritage mapping has been conducted in this area to date therefore it is unknown whether any heritage sites occur here.	Alternative situated in close proximity to two low significance heritage sites identified in literature, however a heritage survey is needed to verify these resources. In addition, these resources should be protected from damage with appropriate fencing.	n/a
Capital development	Capital development is	No significant difference expected between these		2 and 3

CRITERIA	ADVANTAGES AND DISADVANTAGES			PREFERRED ALTERNATIVE
	WRD ALTERNATIVE 1	WRD ALTERNATIVE 2	WRD ALTERNATIVE 3	
	expected to be higher due to the unfavourable topography of this alternative.	alternatives.		
Operating costs	This alternative is situated in close proximity to the open pit however on a slope which could result in increased energy use and haulage costs.	This alternative is situated further away from the open pit on the other side of the Transnet Railway Line linking Beeshoek Mine to Sishen Mine and therefore energy use haulage costs will be significantly higher than the other alternatives.	This alternative is situated in close proximity to the open pit which minimises energy use and haulage costs.	3
Technical feasibility	The topography is unsuitable in this location.	The topography is flat and there is no known reason why this alternative is not technically feasible.	The topography is flat and there is no known reason why this alternative is not technically feasible.	2 and 3

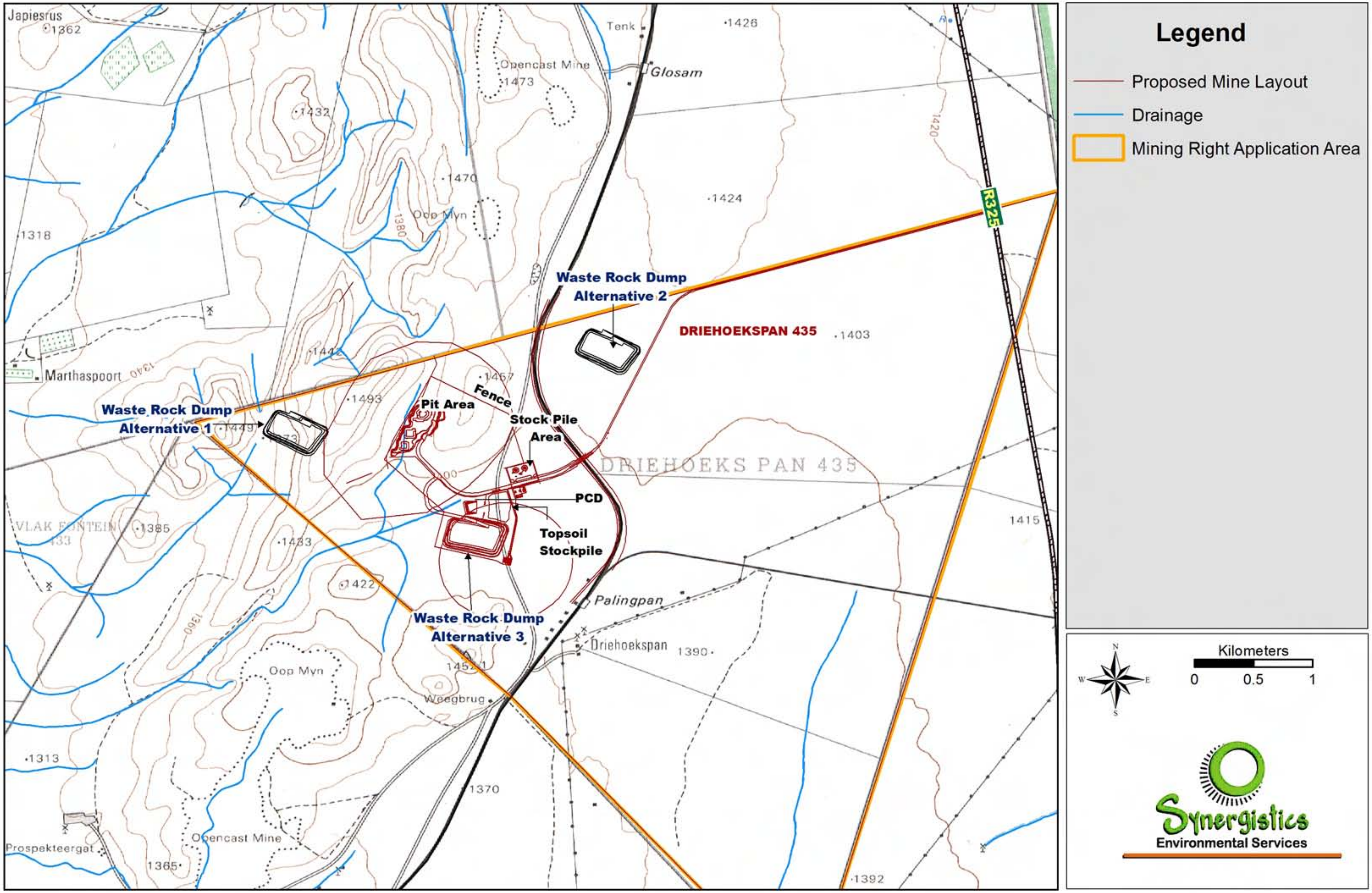


Figure 7-27: Site Layout Alternatives

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO

7.8 POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RESIDUAL RISK

Section 7.3, provides a summary of all issues and concerns raised by IAPs as part of the proposed project. This section outlines possible mitigation measures or alternatives that are available to accommodate or address issues and concerns raised by IAPs where relevant. In addition to this, this section will also provide an assessment of the impact or risks associated with the identified possible mitigation measures or alternatives.

TABLE 7-20:POSSIBLE MITIGATION MEASURES AND ANTICIPATED LEVEL OF RESIDUAL RISK

Issue and concern raised	Possible mitigation measure or alternative to address issue	Impact significance of the possible mitigation measure or alternative before and after mitigation	
		Unmitigated	Mitigated
There are problems related to groundwater and dust due to mining in the area. I am concerned about the potential cumulative impacts of the mining in the area.	Due to the nature of opencast mining projects this may result in a reduction in groundwater quantity and/or quality. The mitigation measures available to manage this impact include: • Conduct groundwater monitoring and implement remedial actions where required. This includes compensation for mine related loss of third party water supply (both in terms of quantity and quality). This monitoring programme will include third party boreholes. Due to the nature of the project, dust related impacts may affect receptors. The mitigation measures to manage this impact include: • Limit clearing of vegetation and handling of materials only to what is absolutely necessary. • Supress dust effectively on unpaved roads and at material transfer points as required. • Monitor dust levels and implement additional mitigation if required. • Maintain vehicles and equipment in good working order. • Undertake a carbon footprint assessment.	Medium High	Low Medium
My objection purely relates to how pollution will affect all the communities around your operations and what remedies are available to alleviate this.	Pollution of soil, surface and groundwater and air will be managed by implementing management measures aimed at: 1. Reducing the source of pollution by control at source and engineering designs where relevant for example supressing dust	M (soil) H (air, surface and groundwater)	M (air) L (soil, surface and groundwater)

Issue and concern raised	Possible mitigation measure or alternative to address issue	Impact significance of the possible mitigation measure or alternative before and after mitigation	
		Unmitigated	Mitigated
	at material transfer points, lining of dirty water dams, containing contaminanted water and reusing it and containing runoff from the overburden stockpiles 2. Monitoring the environment to detect changes caused by pollution and implementing additional corrective action is necessary 3. Cleaning up spills and leaks immediately.		
Will the specialists use labour from nearby communities to assist with their fieldwork?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Will the people from the Maremane Community benefit in terms of employment if the processing will be undertaken elsewhere. I believe processing creates more employment opportunities than mining.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
What will be done for the community once Coza start to mine and they gain profit. The community needs to get an idea of what benefits they will receive from the project.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
The community is fearful that once COZA is granted a mining right, there will be no benefits for the community.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
The community must be consulted when preparing the SLP	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
How will the community benefit from the project in terms of employment?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
How the project will be able to decrease the high unemployment.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
We request that we be kept up to date with the project and how the community will benefit from the project.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
How will the project and mining benefit local communities.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
When projects of this magnitude are undertaken, the locals are generally excluded to participate in the development and wealth of their minerals mined. Lack of access to this wealth creation opportunity is hampered by “red tape” rules and regulations, that make it impossible to participate and once the investors are making their riches, they vanish and left the local residents high & dry.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		

Issue and concern raised	Possible mitigation measure or alternative to address issue	Impact significance of the possible mitigation measure or alternative before and after mitigation	
		Unmitigated	Mitigated
There are people that are not in the area but who at a later stage will be relocated to the land and will be affected by this development. He asked how these people would be accommodated.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
The information of the meeting was not appropriately marketed toward the Maremane Community.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Some of the people from the Maremane Community are from the Kuruman area and this meeting and the project is very far from Kuruman. As such the people will not know what is happening	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Can meetings be held in Kuruman?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Please hold a meeting at the Maremane community as well.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
The Maremane community members from Kuruman are being excluded from the public participation process and problems may arise if people come to Maremane from Kuruman.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I am reluctant to believe independent environmental consultants. The community was previously consulted by independent consultants for the Sedibeng Mine, however we were not notified when the mine started. The community is fearful that the same process would occur with the COZA project.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
The Maremane Community is sceptical that Synergistics will return to meet with the community.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
An information sharing meeting was held on 23 May 2013, however no prior notice was given to Interested and Affected parties. The meeting should have been communicated in the local newspaper (The Ghaap, Diamond Field Advertiser).	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Was the Department of Rural Development and Land Reform (DRDLR) consulted as they were key in the Maremane Community land claim process?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		

Issue and concern raised	Possible mitigation measure or alternative to address issue	Impact significance of the possible mitigation measure or alternative before and after mitigation	
		Unmitigated	Mitigated
Was the municipality was consulted?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Why the application for environmental authorisation to the Northern Department of Environment and Nature Conservation was submitted before consultation with communities?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I would like to register as an IAP.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I would like to register as an IAP.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I would like to register as an IAP.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I would like to request an electronic copy of the report on a CD.	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
I would like to request an organogram for COZA Mining. At what stage is the process currently in?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Referring to a DMR document from 2010, I would like to ask about the prospecting and mining right and why COZA are not mining in all the areas?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
How far will the project be from Portion 3 of the Farm 445?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
What is the possibility for further expansion and is exploration still continuing?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
How much the mine will produce	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Will there be a survey of the resource before mining commences?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
What income was received from prospecting and where was the money spent?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
Does Coza have a mining license?	Not applicable. Refer to Section 4.3 for the full response to comment raised.		
• The BID stated that the affected areas of the proposed open pit iron ore and associated infrastructure will be approximately 25 hectares on the farm Doornpan and 80 ha on farm Driehoekspan. Since vegetation clearance will be required, you may need a Forest Act Licence (from DAFF) and a Flora Permit (from Nature Conservation)	Not applicable. Refer to Section 4.3 for the full response to comment raised.		

Issue and concern raised	Possible mitigation measure or alternative to address issue	Impact significance of the possible mitigation measure or alternative before and after mitigation	
		Unmitigated	Mitigated
• The BID listed the most important environmental legislation applicable to the project. The Northern Cape Nature Conservation Act (Act 9 of 2009) (NCNCA should also be consulted • Kindly supply this office with copies of the relevant documental for comments, especially the specialist biodiversity/ecological assessment and EMPR (once available). Please note that the office cannot download such documentation from the internet and it should be provided on a CD or in hardcopy format Please ensure that the anticipated impacts on protected trees are assessed and try to design the mine in such a manner as to minimise the impact (if any) on such slow growing tree species. Where impacts cannot be avoided, appropriate mitigation may be required.			

7.9 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Not applicable.

7.10 STATEMENT MOTIVATING THE PREFERRED ALTERNATIVE

With reference to Section 7.1 only site layout alternatives were considered and assessed in the EIA phase. The site alternative differed on the position of the WRD. A motivation describing the preferred location of the WRD is provided below.

7.10.1 SITE LAYOUT ALTERNATIVES

Three alternatives for the location of the Waste Rock Dump (WRD) have been considered and assessed in the EIA phase and the advantages and disadvantages of the three alternatives are given in Section 7.7.

With regard to the assessment, alternative 3 is the preferred position for the location of the WRD. This alternative is preferred as it will result in less operational costs, capital development and technical input. This alternative will however be closer to a low significance heritage site. This site can be fenced off to prevent construction, operational and decommissioning activities from impacting on the site.

Alternative 1 and 2 are further from the open pit and will therefore require higher operational cost due to haulage distances. In addition to this, emission of diesel fumes will be greater for these two alternatives as opposed to alternative 3. Based on this, it is motivated that alternative 3 should be implemented for the project.

8 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE THROUGH THE LIFE OF THE ACTIVITY

8.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

Environmental and socio-economic impacts associated with the proposed project were identified through site visits undertaken by SLR and specialists (where relevant), the social scan, consideration of the project description, site layout and specialist studies.

Potential environmental and socio-economic impacts identified were outlined in the background information document that was distributed to IAPs and regulatory authorities (Section 7.2) for consideration. In addition this was described in the Scoping Report which was subjected to public and regulatory authority review. The feedback received from IAPs and regulatory authorities also provided input into the identification of environmental and socio-economic impacts.

8.2 DESCRIPTION OF THE PROCESS UNDERTAKEN TO ASSESS AND RANK THE IMPACTS AND RISKS

A description of the assessment methodology use to assess the severity of identified impacts including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources is provided in Section 7.6. In addition to this, the assessment methodology also assesses the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

8.3 A DESCRIPTION OF THE ENVIRONMENTAL IMPACTS AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL ASSESSMENT PROCESS

This section below (Table 8-1) provides a description of the impacts on environmental and socio-economic aspects in respect of each of the main project actions / activities and processes that will be assessed in Section 9.

TABLE 8-1: LIST OF POTENTIAL IMPACTS AS THEY RELATE TO PROJECT ACTIONS / ACTIVITIES / PROCESSES

Main activity/process	Impacts (unmitigated)
Site preparation	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Pollution from emissions to air Noise pollution

Main activity/process	Impacts (unmitigated)
	Contamination of surface water resources Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Earthworks	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Civil works	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Open pit mining	Loss and sterilization of mineral resources Hazardous excavations, surface subsidence and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Reduction of groundwater levels and availability Pollution from emissions to air Noise pollution Blasting damage Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Crushing	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance

Main activity/process	Impacts (unmitigated)
	Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Offices	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Road disturbance and traffic safety Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Explosive magazine	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Road disturbance and traffic safety Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Transportation and Access Roads	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Road disturbance and traffic safety Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Power supply and use	Hazardous excavations and infrastructure

Main activity/process	Impacts (unmitigated)
	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Water supply and use	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Reduction of groundwater levels Contamination of groundwater Reduction of groundwater levels and availability Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Mineralised waste	Loss and sterilization of mineral resources Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Non-mineralised waste management (general and hazardous)	Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts

Main activity/process	Impacts (unmitigated)
	Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Storage of Dangerous Goods **Workshops and washbays**	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Backfilling of the open pit	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Demolition	Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Alteration of natural drainage patterns Contamination of groundwater Pollution from emissions to air Noise pollution Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Rehabilitation	Loss and sterilization of mineral resources Hazardous excavations, surface subsidence and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity

Main activity/process	Impacts (unmitigated)
	General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Noise pollution negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use
Maintenance and aftercare	Loss and sterilization of mineral resources Hazardous excavations and infrastructure Loss of soil resources and land capability through pollution Loss of soil resources and land capability through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Contamination of surface water resources Contamination of groundwater Pollution from emissions to air Negative visual impacts Loss of heritage/palaeontological resources Positive socio-economic impacts (Economic impact) Negative socio-economic impacts (Inward migration) Change in land use

8.4 ASSESSMENT OF THE SIGNIFICANCE OF EACH IMPACT AND RISK AND AN INDICATION OF THE EXTENT OF TO WHICH THE ISSUE AND RISK CAN BE AVOIDED OR ADDRESSED BY THE ADOPTION OF MITIGATION MEASURES

The assessment of the significance of the impacts identified for the proposed project area included in Appendix F and summarised in Section 9. The section also provides the extent to which the identified impacts can be avoided or addressed by the adoption of mitigation measures.

9 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

A summary of the assessment of the environmental and socio-economic impacts associated with the proposed project is provided in Table 9-1 below. A full description of the assessment is included in Appendix F. All identified impacts are considered in a cumulative manner such that the current baseline conditions on site and in the surrounding area are discussed and assessed together.

TABLE 9-1: ASSESSMENT OF SIGNIFICANT IMPACTS AND RISKS

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Open pit mining Mineralised waste Maintenance and aftercare	Loss and sterilisation of mineral resources	Geology	Construction Operation Decommissioning Closure	High	• Control through mine plan that will ensure minimal sterilisation of resources. • Ensure optimal extraction of resources	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare.	Hazardous excavations infrastructure and surface subsidence	Topography	Construction Operation Decommissioning Closure	High	• Prevention through access control • Remedy through emergency response procedure	Medium	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use	Loss of soil resources and land capability through contamination	Soil and land capability	Construction Operation Decommissioning Closure	Medium	• Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare of rehabilitated areas					spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management • Remedy through emergency response procedure		
Site preparation Earthworks Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation	Loss of soil resources and land capability through physical disturbance		Construction Operation Decommissioning Closure	High	• Prevention by limiting the area of disturbance, effective topsoil stripping and management, and erosion management.	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Maintenance and aftercare of rehabilitated areas							
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Backfilling of the open pit Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	High	• Prevention by limiting the area of disturbance, avoidance of sensitive areas, monitoring and management of invasive species is to be undertaken at the mine, allowing animal movement where feasible • Remedy by rescueing species where possible and obtaining relevant permits to do this as required, re-establishment of key tree species, effective rehabilitation	Medium	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use	General disturbance of biodiversity		Construction Operation Decommissioning Closure	High	• Prevention by training of workers on the value of biodiversity, zero tolerance of the killing or collecting of any biodiversity by anybody working for or on behalf of COZA, banning of domestic animals to be banned from site, taking into account	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare					avifauna in infrastructure designs such as powerlines • Minimisation by limiting lighting, speed control, managing dust and waste effectively, implementation of a stormwater management plan.		
Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare	Alteration of drainage patterns	Surface water	Construction Operation Decommissioning Closure	Hight	• Minimisation by limiting area of disturbance, diverting clean water away form site, implementing a stormwater management plan and rehabilitation including backfilling of the open pit.	Medium Low (closure)	Can be managed/mitigated to acceptable levels
Earthworks Civil works Open pit mining	Contamination of surface water	Surface water	Construction Operation Decommissioning	High	• Prevention through a range of management measures including infrastructure	Low	Can be managed/mitigated to acceptable levels

Activity	**Potential impact**	**Aspects affected**	**Phase**	**Significance (unmitigated)**	**Mitigation type**	**Significance (mitigated)**	**Extent to which the impact can be avoided or addressed through the implementation of management measures**
Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare	resources		Closure		design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management, monitoring of surface water quality and compensation or water supply replacement if needed • Remedy through emergency response procedure.		
Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services	Contamination of groundwater resources	Groundwater	Construction Operation Decommissioning Closure	Medium	• Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management	Low	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare					plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management, monitoring of groundwater quality and compensation or water supply replacement if needed • Remedy through emergency response procedure.		
Water supply and use Dewatering in the open pit	Reduction of groundwater levels and availability		Operation	Medium	• Remedy through the monitoring of third party borehole water levels and compensation or water supply replacement if needed	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site	Air pollution	Air	Construction Operation Decommissioning Closure	High	• Prevention through a range of management measures aimed at limiting the area of disturbance, dust suppression, traffic control measures, enclosing dusty equipment where feasible, monitoring air quality • Remedy through corrective action if third party health impacts occur.	Medium	Can be managed/mitigated to acceptable levels

Activity	**Potential impact**	**Aspects affected**	**Phase**	**Significance (unmitigated)**	**Mitigation type**	**Significance (mitigated)**	**Extent to which the impact can be avoided or addressed through the implementation of management measures**
management Backfilling of the open pit Rehabilitation Maintenance and aftercare							
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Backfilling of the open pit Rehabilitation Maintenance and aftercare	Noise pollution	Noise	Construction Operation Decommissioning	Medium	• Prevention through the use of vibration isolators where feasible, maintenance of equipment and vehicles, monitoring in the event of complaints • Minimise though communication of blast times to local people • Remedy through corrective action if uanneceptable third party impacts occur.	Low	Can be managed/mitigated to acceptable levels
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	Blasting	Operation	High	• Prevention through acess control, appropriate blast design that prevents excessive fly rock, ground vibration and air blast	Medium	Can be managed/mitigated to acceptable levels

Activity	**Potential impact**	**Aspects affected**	**Phase**	**Significance (unmitigated)**	**Mitigation type**	**Significance (mitigated)**	**Extent to which the impact can be avoided or addressed through the implementation of management measures**
					• Minimise though communication of blast times to local people • Remedy through emergency response procedure.		
Transport system	Road disturbance and traffic safety	Traffic	Construction Operation Decommissioning	High	• Prevention through construction of a dedicated mine access road, speed control and training of workers on road safety • Remedy through emergency response procedure.	Medium	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit	Negative visual views	Visual	Construction Operation Decommissioning Closure	High	• Prevention through limiting area of disturbance, • Minimising through dust management, con-current rehabilitation, minimising lighting and effective rehabilitation including backfilling of the open pit.	Medium	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Rehabilitation Maintenance and aftercare of rehabilitated areas							
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of heritage, cultural and palaeontological resources	Heritage/ cultural and palaeontological resources	Construction Operation Decommissioning Closure	High	• Preventing through additional archeological survey, training of workers to recognise heritage sites including stromatolites and not disturbing heritage sites outside of footprint area • Remedy through limiting area of disturbance and destruction of heritage sites, obtaining approval where required for destruction of heritage sites, and chance finds procedure.	Low	Can be managed/mitigated to acceptable levels
Site preparation Earthworks Civil works Crushing Processing plant	Economic impact	Socio-economic	Construction Operation Decommissioning	High positive	• Enhance positive impact through local employment and procurement where feasible, and implementation of Social and Labour Plan projects.	High positive	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas							
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition	Inward migration		Construction Operation Decommissioning Closure	High	• Minimisation through proper communication of opportunities to local communities, implementation of health policy, accommodation of construction staff on site, incentivising permanent employees to live in formal housing with adequate services, working with local government to manage social impacts.	Medium	Can be managed/mitigated to acceptable levels

Activity	Potential impact	Aspects affected	Phase	Significance (unmitigated)	Mitigation type	Significance (mitigated)	Extent to which the impact can be avoided or addressed through the implementation of management measures
Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas							
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas	Land use impact	Land use	Construction Operation Decommissioning Closure	High	• Minimisaton through authorising land use through zoning, rehabilitation including backfilling of the open pit.	Medium Low (closure)	Can be managed/mitigated to acceptable levels

10 SUMMARY OF SPECIALIST REPORT FINDINGS

The relevant specialist studies that were undertaken as part of the proposed project including the recommendations made by the specialist are summarised in Table 10-1 below. A relevant specialist reports have been attached in the appendices to this EIA and EMP report.

TABLE 10-1:SUMMARY OF SPECIALIST REPORTS

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
Groundwater impact assessment	Construction phase: • An appropriate liner is recommended for all water retaining infrastructure • Prevent contact between clean and dirty areas • Recycle and reuse contaminated water as far as possible • All contaminated water will be contained for re-use and evaporation • Minimize the extent of disturbance of the aquifer • Limit degeneration of groundwater quality • No construction of any water management measures will be undertaken with potentially hazardous material, • All dams will be constructed to comply with the relevant DWA requirements in an effort to minimize the seepage of poor quality leachate • Clean surface water will not come into contact with dirty water.	X	Section 28
Groundwater impact assessment	Operations: • An appropriate liner is recommended for all water retaining facilities (dirty water dams) in an effort to minimise poor quality seepage to the groundwater regime • Prevent contact between clean and dirty areas • Recycle and reuse contaminated water as far as possible • Minimize the extent of disturbance of the aquifer • Minimize the impact on groundwater quality • Clean surface water will not come into contact with dirty water or material • Wet facilities will be lined to prevent the seepage of poor quality leachate • Continuous monitoring of groundwater quality • All contaminated surface water runoff from haul road areas will be collected in the dirty water management system, which means that the infiltration of contaminated water will be minimized. • Clean runoff water will be diverted away from the stockpile area,	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	• Quarterly monitoring of boreholes will be implemented to monitor the groundwater quality. If the monitoring programme indicates that nearby groundwater users are affected negatively by mining activities and residue disposal, the users need to be compensated for their loss • The groundwater modelling predictions and estimates must be verified during monitoring through the production phase according to the proposed monitoring programme • The dewatering of the local aquifer system and destruction of its structure cannot be prevented. Quarterly monitoring of boreholes will be implemented to monitor the extent of the dewatering. If the monitoring program indicates that nearby groundwater users are affected negatively by the dewatering, the users need to be compensated for the loss.		
Groundwater impact assessment	Rehabilitation, closure and post-closure: • The groundwater modelling predictions and estimates must be verified during monitoring through the production, closure and post-closure phases according to the proposed monitoring programme. • Management actions will be evaluated to deal with any potential decant predicted by the groundwater investigation at the proposed opencast pit.	X	Section 28
Soils and land capability impact assessment	• Removal of surface vegetation will be restricted to as small a footprint as possible. • Due to wind erosion hazard in the area, wind protection measures should be undertaken wherever possible. • Care should be taken to not disturb any drainage line, where cumulative effects, extending downstream, could occur.	X	Section 28
Fauna impact assessment	Pre-construction and construction: • From the faunal aspect, whilst the relatively low impact significance of this project does not necessitate a biodiversity offset, it may be deemed necessary by the collective conclusions of all the project specialists. If this is case, then the recommendations be that the offset area which is to be left undisturbed, should be at least the same size and habitat as the project footprint so as to allow for natural movement of displaced fauna away from	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	the disturbed areas and project activities • Keeping the areas of disturbance to a minimum • Reducing the amount of soils to be removed from sites • Staying clear of the drainage areas and sensitive areas and maintaining an appropriate buffer zone (at least 30 m) between these areas and the erected structures • Construction of culverts, where necessary, to allow for water flow along drainage lines and suitable erosion barriers • Not disturbing the movements of any animals intending to flee the impacted area by preventing abuse and hunting/chasing of animals by workers and by allowing them passage if they are seen wanting to disperse. This prevents the need for costly trapping and relocation exercises • Monitoring dust pollution if necessary, and applying reasonable and applicable dust-suppression measures • Avoiding initial mining activities during spring/summer as animals reproduce and disperse during this period • Ground water abstraction should be monitored and kept to a minimum • Raptor-proofing all open reservoirs, dams or ponds to allow birds to drink and bathe, preventing drowning, and thus contributing to raptor conservation. This can be done by: o Keeping the reservoir full o Covering the reservoir with shade cloth o Attaching a wooden plank, log, ladder or branch to the wall of the reservoir onto which a drowning bird can grasp and lift itself out of the water. These structures can also serve as a platform from which raptors and other birds can drink. However, wooden structures may need to be replaced every few years o Providing alternative, more natural drinking places on the ground • Bird-unsafe electrical structures must be modified to insulate dangerous live components, and to cut a gap in the earthwire – perch deterrents can also be		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	installed to keep birds away from the dangerous areas on the structure. • Bird collisions on newly constructed electrical features must have anti-collision devices in place • Soil and water contamination from diesel spills, particularly at the storage tanks, must be prevented by ensuring these areas are adequately constructed on barrier foundations • Maintaining the integrity of the natural habitat around the facilities, thereby providing the possibility for animals to flee the affected area and re-settle in the undisturbed areas around the area • Prohibiting the intentional killing of animals through on-site supervision and worksite rules • Educating employees to minimise accidental killings of animals during the pre-construction phase • Relocating slow-moving animals like Tortoises, found during ground-breaking to nearby suitable, undisturbed areas • Where necessary and feasible, the construction of landscaped culverts to a depth of 300 mm to allow free movement for small mammals, reptiles and amphibians under roads or other barriers. These will need to be maintained throughout the operational phase and beyond • Where necessary and feasible, the construction of berms, low walling or fencing guiding animals towards these culverts, thus promoting the use of these passage ways		

Studies undertaken	**Recommendations of specialists**	**Specialist recommendations that have been included in the eia report (mark with an x)**	**Reference to applicable section in this report**
	• Dangerous interactions between personnel and venomous fauna can be reduced through awareness courses, posters, and other forms of education • The importation of unsterilised and unvaccinated domestic animals, in particular cats, on to site must be banned • The establishment of a veld fire action policy in the event of a veld fire to prevent unnecessary loss of fauna and habitat.		
Fauna impact assessment	<u>Operations:</u> • The establishment of a basic monitoring programme which takes into account the key suggestions and concerns of all project specialists, and the familiarisation of terrain staff with these issues so that the area and associated ecosystems can be monitored for significant negative changes and immediate actions taken to rectify these changes • Preventing any further harassment of animals that remain within the project area and enforcement of disciplinary actions on transgressors • If constructed, regular assessment of the effectiveness and maintenance of culverts to allow movement of animals and water • Ensuring dust suppression measures are maintained • Regular inspection of diesel storage facilities and the implementation of a cleanup operation in the event of an accidental spill • The continuance of a veld fire action policy in the event of a veld fire resulting from project activities and personal, or from natural causes to prevent unnecessary loss of fauna and habitat	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	• Interactions between personnel and venomous fauna can be reduced if the presence of humans does not provide food and refuge opportunities for these animals. Rubble, compost heaps, domestic chickens etc are all tremendous attractants to snakes should be avoided • The training of employees to reduce littering • A regular refuge removal regime to discourage baboon-raiding activities • The maintenance of a "no domestic animal" policy. • The need to offset the biodiversity impacts of these mining activities will only be known once all the options and alternatives to prevent, minimise and mitigate the impacts have been identified and evaluated during the environmental impact assessment process and the residual impacts on biodiversity and/or ecosystem services have been found to be of 'medium' to 'high' significance.		
Vegetation impact assessment	<u>Construction and operations:</u> • Locate the infrastructure on transformed areas or areas adjacent to disturbed areas that are partly transformed. • Existing access roads/servitudes must be used as far as possible. • A buffer zone of 50 m is needed from the drainage line on Driehoekspan, in which no development or activities should take place. • Sensitive habitats must be avoided. Where these areas are close to the development area, they should be clearly demarcated as no go areas to avoid accidental impacts.	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	• A storm-water management plan must be compiled, indicating how water velocities will be reduced before storm water enters natural channels and how natural processes for water infiltration of the affected landscape will be accommodated. It would be useful to channel and collect the runoff water into underground water tanks for future use, to reduce consumption of water in a water stressed environment. • Any roads running down a slope must have water diversion structures present. • Powerline pylons must be positioned a minimum of 50 m outside of watercourse boundaries. • Vegetation clearing during construction must be restricted to the mine footprint only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. • Unnecessary impacts on surrounding natural vegetation must be avoided during construction & operation. No construction vehicles should be allowed to drive around the veld. All construction vehicles should remain on properly demarcated roads. • During construction the top soil should be removed and separately stored from sub-soil (in piles not > 2 m high). Stockpiles not used in 3 months after stripping must be seeded to prevent dust and erosion. • Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. Re-seed with locally-sourced seed of		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	indigenous grass species that were recorded on site pre-construction. • The collection, hunting or harvesting of any plants, fuel wood or animals at the site should be strictly forbidden and the staff educated to prevent this from happening. • All hazardous materials should be stored in the appropriate manner to prevent impacts on vegetation. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • Fires should only be allowed within fire-safe demarcated areas. • The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. • Security fencing should be constructed in manner which allows for the passage of small and medium-sized mammals. Steel palisade fencing (with 20 cm gaps) is a good option as it allows most small mammals to move through. Alternatively the lowest strand or bottom of the fence should be elevated to 15 cm above the ground at least at strategic places to allow for fauna to pass under the fence. • Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible. • Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	per Conservation of Agricultural Resources Act and Biodiversity Act) for construction phase. • Do not import soil stockpiles from areas with alien plants. • Rehabilitate disturbed areas as quickly as possible. • Keep disturbance of indigenous vegetation to a minimum. • Continue with ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species during operation phase. • Immediately control any alien plants that become established using registered control methods. • Local labour should be utilised for the removal of alien plants. • All remaining damaged areas shall be rehabilitated upon completion of operations in such a manner as to maintain a good basal vegetation cover. • Maintain the management measures and procedures which were required by employees during the construction and operational phases regarding the preservation of species of special concern. • Dust suppression spraying; prohibiting activities outside of the demarcated mine area and the maintenance of storm water management infrastructure until rehabilitation is considered successful will minimize the impacts on the vegetation. • Prevent contamination of natural habitat from any source of pollution. • Prevent veld fires through safe practice guidelines when using equipment.		

Studies undertaken	**Recommendations of specialists**	**Specialist recommendations that have been included in the eia report (mark with an x)**	**Reference to applicable section in this report**
	• Access is to be established by vehicles passing over the same track on natural ground. Multiple tracks are not permitted.		
Vegetation (Flora) impact assessment	Rehabilitation and closure: • All remaining damaged areas shall be rehabilitated upon completion of operations in such a manner as to maintain a good basal vegetation cover. • Re-vegetation of disturbed surfaces must occur immediately after deconstruction activities are completed. • All natural areas impacted must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. • Ripping of compacted areas (e.g. roads) followed by adequate top soiling, fertilisation, irrigation and correct choice of grasses. • Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. • Maintain the management measures and procedures which were required by employees during the construction and operational phases regarding the preservation of species of special concern. • Dust suppression spraying; prohibiting activities outside of the demarcated mine area and the maintenance of storm water management infrastructure until rehabilitation is considered successful will minimize the impacts on the vegetation. • Prevent contamination of natural habitat from any source of pollution.	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	• Prevent veld fires through safe practice guidelines when using equipment. • Access is to be established by vehicles passing over the same track on natural ground. Multiple tracks are not permitted.		
Surface water impact assessment	• It is recommended that bunding around mine infrastructure (rock dumps, soil stockpiles, workshops etc.) are implemented as part of the stormwater management plan	X	Section 28
Air quality impact assessment	• Recommended measures to reduce emissions from unpaved roads include: o Measures aimed at reducing the extent of unpaved roads, e.g. paving; o Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds; and o Measures aimed at binding the surface material or enhancing moisture retention, such as wet suppression and chemical stabilization • Enclosure of crushing operations with a telescopic chute with water sprays. • Enclosure of storage piles where possible. • It is recommended that a method with at least 75% control efficiency be selected for the crusher plant. • Implementing wind sheltering techniques during stacking and loading operations. • Implementing good operational practices to reduce emissions.	X	Section 28

<table>
<tr><th>Studies undertaken</th><th>Recommendations of specialists</th><th>Specialist recommendations that have been included in the eia report (mark with an x)</th><th>Reference to applicable section in this report</th></tr>
<tr><td></td><td>Regular maintenance and emission testing is recommended on all mobile and stationary diesel combustion sources. Use should also be made of low sulphur fuel.
It is recommended that exhaust emissions testing be done on all mobile and stationary diesel combustion sources as part of equipment maintenance schedules.
It is recommended that water sprays applied at all operational drill rigs.
It is recommended that NAAQS and dustfall regulations be adopted by COZA Iron Ore as receptor-based objectives.
It is recommended that, as a minimum, continuous dustfall, PM10 and PM2.5 sampling be conducted as part of the project's air quality management plan at selected points defined in the Air Quality Impact Assessment.
For dustfall, the NDCR specifies that the method to be used for measuring dustfall and the guideline for locating sampling points shall be ASTM D1739 (1970), or equivalent method approved by any internationally recognized body.
For PM10 and PM2.5 the method as set out by British Standards (BS EN 12341) is recommended.
It is recommended that site inspections and progress reporting be undertaken at regular intervals (at least quarterly), with annual environmental audits being conducted. Annual environmental audits should be continued at least until closure.</td><td></td><td></td></tr>
</table>

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	• it is recommended that stakeholder forum meetings be scheduled and held at least on a bi-annual basis. The budget should provide a clear indication of the capital and annual maintenance costs associated with dust control measures and dust monitoring plans.		
Noise impact assessment	• For general activities, following good engineering practice is recommended: o All diesel powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance. o To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels. o Vibration isolators should be considered to reduce noise and vibration from crushers. o A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed. o Blasting at the surface will be audible over long distances and may cause a startling reaction at receptors in close proximity. This can be mitigated by adhering to blast schedules that have been	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	communicated to the affected parties. • The recommendations described below are considered good practice in reducing traffic related noise. o Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program. o Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration. o Maintain road surface regularly to avoid corrugations, potholes etc. o Avoid unnecessary idling times. o Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. • In the event that noise related complaints are received short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions.		
Traffic impact assessment	• The present access road with its level crossing, over the main Postmasburg rail line, and use of the rail service road will not be acceptable to serve as an access for the Driehoekspan Mine. The heavy ore trucks from the mine	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	would only be allowed to cross the main rail line via a new grade separated bridge. A possible new access road further to the north, and a new bridge over the main rail line would need to be considered. This would need to be further investigated when planning starts for that mine.		
Heritage impact assessment	• It is recommended that further archaeological fieldwork be undertaken on the proposed development footprint area. • The mine Environmental Department must take note of the possible presence of stromatolites. If these structures are present, a qualified palaeontologist must be informed and a representative sample of at least $1m^3$ must be collected for future reference. Photographic recording of the structures must be taken. • Should any heritage features and/or objects not included in the presently identified inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. • In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out in the heritage impact assessment..	X	Section 28
Social Impact Assessment	• Ensure proper planning for in-migration. COZA is to liaise with the Tsantsabane Local Municipality to ensure that their employees are	X	Section 28

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	accommodated appropriately in serviced areas to minimise the unmanaged influx. • In order to minimise uncontrolled influx of persons in search of job opportunities, COZA is to ensure accurate communication of available jobs, skills required and timeframes for employment during their communication with communities. COZA's should appoint a person's (job can be performed by the Environmental Officer) to monitor establishment of squatter settlements in nearby areas that are unoccupied i.e. of Farm Driehoekspan. • During the construction phase, persons will be accommodated in a fully serviced construction village within the mine property. • It is recommended that Coza Mining must ensure that there are open communication lines between members of the Maremane community residing in Lohatla as the directly affected community. This can be done in a form of a forum, this forum is for meeting frequently (quarterly during construction) and once during the operation of the mine. Members of the community are to be notified of the commencement with construction and operation phase. • According the Department of Rural Development and Land Reform, there are two official representative of the Maremane Community Property Association this includes Mr Mastididi and Mr Tswaro. COZA is to ensure that both these members are consulted when discussing access to land. • Establishment of a community communication platform for the dissemination		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	of project information • Distribute project information fact sheets before the start of construction activities • Maintain a transparent recruitment process • COZA is to cooperate fully with the Manica Police to assist where possible in the solving of crimes • At the community level, COZA is to assist with improving capacity of local leadership through improving communication members between the mine and the surrounding communities. • A grievance mechanism is to be put in place for communities to raise complaints against any mine employees suspected to be involved in criminal offences. • To combat HIV/AIDS it is recommended that COZA: o Provide condoms at hot spot areas, this includes local shebeens o Provide HIV/AIDS information pamphlets to major labour sending areas and areas of entertainment within the study area. o Develop a workplace HIV/AIDS policy that encourages testing and awareness on HIV/AIDS. • For employment activities and local procurement it is recommended that COZA: o Provide bursaries for scholars within the community to ensure		

Studies undertaken	Recommendations of specialists	Specialist recommendations that have been included in the eia report (mark with an x)	Reference to applicable section in this report
	employability. Learners can then be asked to work for the mine after studying o Conduct skills audit of the local community to identify potential employees. o Identified potential employees are to be provided with training in order to improve employability at the mine. o Mine employees are to be provided with training (in line with the SLP) to improve their skills. • As part of the COZA closure strategy it is recommended that COZA: o Implement formal training policy and programme that aims to improve skills of employees o Conduct a skills assessment of all unskilled and semi-skilled employees and design a portable skills training program for the mine's employees. Portable skills refer to useful economic skills that an employee could use to augment their livelihoods.		
Closure cost assessment	• Not Applicable	Not applicable	

11 ENVIRONMENTAL IMPACT STATEMENT

11.1 SUMMARY OF KEY FINDINGS OF THE EIA

A summary of the potential impacts (as per Section 9), associated with the chosen alternatives (as per Section 7), in the unmitigated and mitigated scenarios for all project phases is included in Table 11-1 below.

TABLE 11-1:SUMMARY OF POTENTIAL IMPACTS

Section	Potential impact	Significance of the impact (the ratings are negative unless otherwise specified)	
		Unmitigated	Mitigated
Geology	Loss and sterilization of mineral resources	H	L
Topography	Hazardous excavations and infrastructure	H	M
Soils and land capability	Loss of soil resources and land capability through contamination	M	L
	Loss of soil resources and land capability through physical disturbance	H	L
Biodiversity	Physical destruction of biodiversity	H	M
	General disturbance of biodiversity	H	L
Surface Water	Alteration of surface drainage patterns	H	M L (closure)
	Contamination of surface water resources	H	L
Groundwater	Contamination of groundwater resources	M	L
	Reduction of groundwater levels and availability	M	L
Air quality	Air pollution	H	M
Noise	Noise pollution	M	L
Blasting	Blasting impacts	H	M
Traffic	Road disturbance and traffic safety	H	M
Visual	Visual impacts	H	M L (closure)
Heritage, palaeontological and cultural resources	Loss of heritage, palaeontological and cultural resources	H	L
Socio-economic	Economic impact	H^+	H^+
	Inward migration	H	M
Land use	Land use impact	H	M L (closure)

The assessment of the proposed project presents the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments both on the project sites and in the surrounding area. With mitigation these potential impacts can be prevented or reduced to acceptable levels.

The economic impact assessment concluded that the development of the project will have significant positive economic impacts. Moreover, the integrated alternative land use assessment concluded that the proposed project components are the preferred land use alternative.

It follows that provided the EMP is effectively implemented there is no environmental, social or economic reason why the project should not proceed.

11.2 FINAL SITE MAP

The final preferred site layout plan is included in Appendix G.

11.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES

A detailed discussion of the positive and negative implications and risks of the proposed activity and identified alternatives is provided in Section 7.7.

With regard to the assessment, alternative 3 is the preferred position for the location of the WRD. This alternative is preferred as it will result in less operational costs, capital development and technical input. This alternative will however be closer a low significance heritage site. This site can be fenced off to prevent construction, operational and decommissioning activities from impacting on the site.

Alternative 1 and 2 are further from the open pit and will therefore require higher operational cost due to haulage distances. In addition to this, emission of diesel fumes will be greater for these two alternatives as opposed to alternative 3. Based on this, it is motivated that alternative 3 should be implemented for the project.

12 IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the impact assessment and where applicable the recommendations from specialists the proposed management objectives and outcomes for inclusion into the environmental management programme are detailed in this section.

12.1 PROPOSED MANAGEMENT OBJECTIVES AND OUTCOMES FOR ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Specific environmental objectives to control, remedy or stop potential impacts emanating from the proposed project is provided in Table 12-1 below.

TABLE 12-1:ENVIRONMENTAL OBJECTIVES AND OUTCOMES

Aspect	Environmental objective	Outcome
Geology	To prevent unacceptable mineral sterilisation	Avoid mineral sterilisation
Topography	To prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure	To ensure the safety of people and animals
Soil and land capability	To prevent soil pollution and to minimise the loss of soil resources and related land capability through physical disturbance, erosion and compaction	To handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability
Biodiversity	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical destruction and disturbance	To limit the area of disturbance as far as practically possible
Surface water	To prevent pollution of surface water resources and related harm to surface water users (if any)	To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that the reduction of the volume of run-off into the downstream catchment is limited to what is necessary.
Groundwater	To prevent pollution of groundwater resources and related harm to water users and to prevent losses to third party water users.	To ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that groundwater continues to be available to current users.
Air	To prevent air pollution health impacts	To ensure that any pollutants emitted as a result of the proposed project remains with acceptable limits
Noise	To prevent unacceptable noise impacts	To ensure that any noise generated as a result of the proposed project remain within acceptable limits
Visual	To limit negative visual impacts	To ensure visual views that complement the surrounding

Aspect	Environmental objective	Outcome
		environment
Traffic	To reduce the potential for safety and vehicle related impacts on road users	To ensure the mine's use of public roads is done in a responsible manner
Blasting	To minimise the potential for third party damage and/or loss	To protect third party property from proposed project-related activities, where possible Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome To ensure public safety
Heritage and cultural	To prevent unacceptable loss of heritage resources and related information	To protect heritage resources where possible If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements
Socio-economic	To enhance the positive economic impacts and limit the negative economic impacts	To work together with existing structures and organisations To enhance positive economic impacts
Informal settlements	To limit the impacts associated with inward migration	To establish and maintain a good working relationship with surrounding communities, local authorities and land owners
Land uses	To prevent unacceptable impacts on surrounding land uses and their economic activity	To co-exist with existing land uses To minise negative land use impacts for surrounding land users.

12.1.1 IMPACTS THAT REQUIRE MONITORING PROGRAMMES

Outcomes of the environmental objectives are the implementation of monitoring programmes. Impacts that require monitoring include:

- Physical destruction and general disturbance of biodiversity
- Pollution of surface water resources
- Contamination of groundwater
- Depletion of groundwater resources
- Increase in air pollution
- Blasting damage.

12.1.2 ACTIVITIES AND INFRASTRUCTURE

The source activities of potential impacts which require management are detailed in Section 4.1 and listed below.

- Site preparation
- Earthworks
- Water supply, use and management
- Power supply and use

- Civil works
- Open pit mining
- Crushing plant
- Transportation
- Mineralised waste
- Non-mineralised waste
- Supporting services
- General site management
- Demolition
- Rehabilitation, including backfilling of the open pit
- Maintenance and aftercare

12.1.3 MANAGEMENT ACTIONS

Management actions which will be conducted to control the project activities or processes which have the potential to pollute or result in environmental degradation are detailed in Section 28.

12.1.4 ROLES AND RESPONSIBILITIES

The following roles and responsibilities will be ascribed to parties listed below in terms of implementation of monitoring programmes and management activities as identified in the EMPr:

Project Manager:	COZA is to delegate responsibility for adherence with the EMPr to the Project Manager. The project manager is responsible for the design and planning of the COZA Iron Ore Project and the appointment of personnel.
Environmental Manager:	An environmental scientist appointed by the project manager to provide support to the engineering team and who will be responsible for monitoring compliance with the EMPR on a monthly basis. The Environmental Manager is to be appointed prior to the commencement of construction activities.
Community Affairs Manager:	A designated person to deal with public issues. This person is to be appointed during the planning and design phase of the project.
Human Resources Manager	A designated person appointed to deal with recruitment. This person is to be appointed during the planning and design phase of the project.
Contractor	These are companies appointed by COZA Mining to carry-out specific components of the project. Adherence to the EMP must be included as a contractual agreement for all contractors involved in the construction of the mine.
Construction Manager:	Person appointed to manage the construction phase of the

	project. This person is to be appointed prior to the commencement of construction activities.
Mining Manager:	Person appointed to manage and oversee mining activities. This person is to be appointed prior to the commencement of operations.
Engineering Manager:	Engineer appointed to manage and oversee maintenance of the mine. This person is to be appointed prior to the commencement of operations
Procurement Manager:	Responsible for procurement during the operation of the mine.
Safety Manager:	Responsibility for safety issues related to the operational workforce.

13 FINAL PROPOSED ALTERNATIVES

Three alternatives for the location of the Waste Rock Dump (WRD) have been assessed and the location of the alternative is given in Figure 7-27. No significant differences are expected with respect to the waste rock dump alternatives, with the exception of topography and distance to the open pit. **The final proposed alternative for the project is Alternative 3 due to favourable topography and proximity to the open pit.**

14 ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

Management measures including monitoring requirements as outlined in Sections 26 and 30 need to form part of the conditions of the environmental authorisation. With reference to Section 26 of GN.982 of NEMA, additional conditions that need to form part of the environmental authorisation that are not specifically included in the EIA and EMP report include the following:

- COZA must comply with all applicable environmental legislation whether specifically mentioned in this document or not and which may be amended from time to time

15 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Assumptions, uncertainties and limitations associated with the proposed project are included below.

15.1 ENVIRONMENTAL ASSESSMENT LIMIT

The EIA and EMP focused on third parties only and did not assess health and safety impacts on workers because the assumption was made that these aspects are separately regulated by health and safety legislation, policies and standards, and that COZA will adhere to these.

15.2 PREDICTIVE MODELS IN GENERAL

All predictive models are only as accurate as the input data provided to the modellers. If any of the input data is found to be inaccurate or is not applicable because of project design changes that occur over time, then the model predictions will be less accurate.

15.3 SOILS AND LAND CAPABILITY

The assumptions and limitations were made as part of the soils and land capability study include the following:
The following assumptions were made during the assessment and reporting phases:

- A reconnaissance field investigation was done and randomly placed soil observations (41 in total) were made throughout the study area with a hand soil auger to verify the dominant soil forms and soil depth.
- A very broad soil map was compiled.
- The soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991).
- Soil samples were collected and chemically analysed to assist in determining the morphological, chemical and physical properties of the soils.
- With this information, a class of general agricultural potential and land capability could then be established.

15.4 BIODIVERSITY

The following limitations and assumptions are applicable for the floral assessment:

- The report was based on a desk-top study and two field surveys as well as limited datasets. The assumption was made that the databases provide information that is accurate and reliable. There is a paucity of information on and collections of Red Data List species, and being rare these species are very difficult to locate. There is therefore a chance that species not known or expected to occur in the area could have been overlooked.

- Two site visits (wet and dry) seasons were undertaken for the purpose of establishing vegetation on site. Although this may be considered adequate, it should be noted that major potential limitation associated with the survey approach is the narrow temporal window for recording species presence. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant species present are captured.
- The ecological patterns at the site were clear, and although additional species might be recorded at different times of the year, this is highly unlikely to alter the overall pattern which has been formed by the land-use history of the site.
- Rainfall in the periods preceding the site visits was below average and the vegetation at the time of the survey was fairly dry, but the majority of grasses, forbs and shrubs could be identified. This represents a sufficiently conservative and cautious approach which takes account of the study limitations. It is likely that most species of special concern were recorded during the two surveys, however some later summer to autumn flowering plants which were possibly dormant due to the timing and amount of rainfall may have been missed.
- The mapping of the sensitive habitats is not an accurate account of the boundaries of each unit, as it is based on satellite imagery and ground-truthing to within approximately 50 m. Estimates of population sizes of species of special concern and the number of protected trees were based on a rough count.

The following assumptions and limitations exist for the faunal assessment:

- The designation of Red Data species status reflects the viewpoint mainly from a South African perspective and this data should be viewed with caution because national and international lists vary considerably and are also reviewed on a regular basis.
- Red Data List species are, by their nature, usually very rare and difficult to locate. Compiling the list of applicable species that could potentially occur in an area is limited by a paucity of records that make it difficult to predict whether a species may occur in an area or not.
- The methodology used in this assessment is aimed at reducing the risks of omitting any species, as well as including others unexpectedly. However predictions based on experience of these and similar species cannot be expected to hold true under all circumstances, particularly in the instance of highly mobile fauna such as larger mammals, birds and bats. As a result, risk mitigation strategies are generalised to include all fauna unless specific species or taxa have been identified for targeted mitigation.
- The Northern Cape region in general, in particular the area under study, has little long term, verifiable data available on species distribution on a micro-habitat level. Gap analysis data to

identify gaps in conservation lands where significant plant and animal species and their habitat or important ecological features occur is limited, unanalysed or currently unpublished.

- This report was undertaken following a desktop level scoping report and a summer site visit in March 2013. This is considered adequate for assessing the major issues associated with the impacts of the current project activities and those envisaged for the immediate future on the relevant fauna in the area.

15.5 SURFACE WATER

Floodlines

- Design Rainfall Utility developed by Smithers and Schulze (2000), which utilises a regionalised L-moment Algorithm and scale invariance to estimate design rainfall at any 1’ × 1’ grid interval in South Africa, was used to determine design rainfall

- The method adopted for the peak discharge calculations was the Rational Method. The Rational formula has the following assumptions:
  - The rainfall has a uniform spatial distribution across the total contributing catchment;
  - The rainfall has a uniform time distribution for at least a duration equal to the time of concentration;
  - The peak discharge occurs when the total catchment contributes to the flow occurring at the end of the critical storm duration, or time of concentration;
  - C remains constant for the storm duration, or the time of concentration; and
  - The return period of the peak flow, T, is the same as that of the corresponding rainfall intensity

15.6 GROUNDWATER

- With regard to aquifer thickness estimation, the aquifer thickness includes both the shallow weathered zone aquifer and the deeper fractures rock aquifer. This was done as additional drilling data was required to make a clear distinction. Based on the specialist experience, there is no clear layer or formation that separates the shallow and deeper aquifer as the distinction is mainly made based on the degree of primary or secondary porosity of the aquifer based mostly on weathering depth.
- Although limited geophysical surveys were conducted to site monitoring boreholes, detailed surveys will be required to determine if there are any geological structures within the open pit area that could influence the expected groundwater ingress and resuktant cone of depression. The groundwater model should be updated as more detailed information becomes available.

- Due to highly complex system of the fractured rock aquifer and highly complex system coupled with numerous model restrictions, the groundwater impacts can either be over or under estimated. The model results should therefore only be regards as being qualitative rather than quantitative for use in planning of management and mitigation measures. The results need to be verified and updated regularly by means of a comprehensive groundwater monitoring program.
- Groundwater contamination sources were assigned a theoretical concentration of 100%. This was done as expected sources of groundwater contamination cannot be estimated or predicted with a high degree of confidence. Long terms groundwater quality impacts will need to be confirmed through groundwater monitoring during operational and decommissioning phases.

15.7 AIR QUALITY

The assumptions and limitations that were made as part of the air quality impact assessment include the following:

- Although the focus of this assessment is on mining activities at Driehoekspan, the COZA Iron Ore Project includes mining on the farms Doornpan and Driehoekspan. The potential for cumulative impacts as a result of mining activities at their peak on both farm portions were considered.
- The quantification of sources of emission was restricted to proposed operations at Driehoekspan and Doornpan. Although other existing sources of emission within the area were identified, such sources were not quantified.
- The Doornpan emissions inventory compiled by Airshed in 2014 was updated with more recent and more detailed project information. The updated emissions inventory differs mainly from the 2014 inventory in terms of reduced fugitive dust emissions from unpaved haul roads. Newly available project information indicated that watering of roads is included in the mine plan (van Rensburg, 2015).
- All project information required to calculate emissions for proposed operations were provided by SLR and AMSA.
- Routine emissions from mining operations were estimated and modelled.
- In the absence of on-site meteorological data, use was made of data recorded near Postmasburg.
- A minimum of 1 year, and typically 3 to 5 years of meteorological data are generally recommended for use in atmospheric dispersion modelling for air quality impact assessment purposes. Approximately 3 years of meteorological data were available for use in atmospheric dispersion modelling simulations.
- The impact assessment was limited to airborne particulates (including TSP, PM10 and PM2.5) and gaseous pollutants from vehicle exhausts, including CO, DE, NOx, VOCs and SO2.
- Nitrogen monoxide (NO) emissions are rapidly converted in the atmosphere into the much more poisonous nitrogen dioxide (NO2). NO2 impacts where calculated by AERMOD using the ozone

limiting method assuming constant monthly average background ozone concentrations of ranging between 51 and 78 µg/m3 (as obtained from the Postmasburg monitoring station data set) and a NO2/NOx emission ratio of 0.2 (Howard, 1988).

15.8 HERITAGE/ CULTURAL AND PALAEONTOLOGICAL RESOURCES

- Heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. Therefore it is possible that other sites can be uncovered during site excavations
- The findings of the heritage report are based on an intensive walkthrough of the section of the Remainder of Portion 1 of Farm Driehoekspan 435 as provided by the EAP. Should the nature or extent of the proposed mining and related activities change from what is proposed, a heritage specialist must be contacted to assess whether any additional fieldwork or studies would be required.
- The widening and lengthening of the existing gravel access road did not form part of the assessment.

15.9 ECONOMIC LAND USE AND SUSTAINABILITY

Assumptions for the Impact Assessment Calculation:

- In the calculation economic impact values it is assumed that all current agricultural activity will cease within the project boundary once mining commences. Mitigation will be provided if possible
- In order to calculate the impact of all the sectors, the net income per activity is used – this is calculated based on the yield of the activity and the market related price per unit at current, 2014 prices
- Values are kept constant at 2014 values for illustration purposes

15.10 TRAFFIC IMPACT ASSESSMENT

Following assumptions we made with regard to trip generation

- Permanent staff would be accommodated within existing or new residential areas in Postmasburg or Kathu. It is estimated that the mine would require a staff of roughly 90 persons. Two thirds would work during the 9 hour long morning shift, and the remaining third would work during the afternoon shift. This would require 6 bus trips per day, and 20 trips per day with passenger cars and light vehicles. In all 26 trips per day for staff needs.
- Maintenance needs, spares, and deliveries of fuel and materials etc. would require 50 trips per week with light vehicles, and ten heavy vehicle trips. This would amount to sixty trips per week. It is estimated that it would amount to an average of 12 trips per day.
- The delivery of ore would require five trips by 32 ton ore trucks per day to haul the ore to the processing facility outside the mine.

- Allowing for some external trips for personal reasons, training, visitors, and provision is made for an additional ten trips per day.

15.11 CLOSURE COST ESTIMATE

The closure cost estimate for the proposed project was based on the following assumptions (SLR, November 2015):

- No allowance for salvage and recycled/scrap material has been considered.
- All infrastructure will be demolished and no handover of any facilities (for post closure use) has been allowed for.

16 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

16.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

The assessment of the proposed project presents the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments both on the project site and in the surrounding area. With mitigation these potential impacts can be prevented or reduced to acceptable levels. It follows that provided the EMP is effectively implemented there is no environmental, social or economic reason why the project should not proceed.

16.1.1 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

16.1.1.1 Specific conditions for inclusion in the EMPR

Refer to Section 14.

16.1.1.2 Rehabilitation Requirements

The closure objective will be to return the land to as close as practically possible to the pre-mining potential or as agreed with the land owner and the relevant authorities. At a conceptual level, decommissioning is a reverse of the construction phase with infrastructure and activities very similar to those described for the construction phase. The conceptual decommissioning plan is as follows:

- All surface infrastructure will be removed from site
- The open pit will be fully backfilled, however due to bulking, some waste rock may remain on surface
- Areas where infrastructure has been removed will be levelled and topsoil restored
- Remove all waste and contaminated soil and water from the project area and dispose of appropriately.

Mineralised waste facility decommissioning:

- The remaining material on the waste rock dump will be shaped to prevent ponding and to create slopes that allow vegetation to establish on the facility
- Runoff and eroded material from the dump surface will be captured behind a perimeter bund and allowed to evaporate until vegetation has been properly established
- Aftercare and maintenance will be designed and implemented for the post closure phase
- Surface and groundwater quality will be monitored regularly for a period to be agreed upon with the relevant authorities.

The open pit:

- The open pit will be fully backfilled with waste rock or overburden material in order to mimic the natural topography as far as practically possible and prevent ponding of rainfall

- Allow vegetation to re-establish itself.

All other surface components:

- All other surface infrastructure will be broken down and reused or disposed of as waste
- Contaminated soils underlying the structures will be excavated and disposed of appropriately
- The soil and vegetation function of the land will be restored to be free draining as far as practically possible. Hard surface may need to be ripped
- Any residual excavations (excluding the open pit void) will be backfilled and levelled with selected overburden material and covered with between 300 mm and 500 mm of topsoil.

17 PERIOD FOR WHICH AUTHORISATION IS REQUIRED

The life of mine is expected to be approximately 6 years.

18 UNDERTAKING

I, Linda Munro, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- The information provided herein is correct
- The comments and inputs from stakeholders and I&APs has been included
- Inputs and recommendations from the specialist reports have been included where relevant
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.

Signature of EAP	Date
Signature of commissioner of oath	Date

19 FINANCIAL PROVISION

Estimated costs for implementing the technical and management actions identified in Section 28 are included in Table 19-1 below. The costs are either once off costs or an annual cost that have been determined. Please note that the costs included in Table 19-1 are based on conceptual estimates only (using experience in similar projects).

19.1 METHOD TO DERIVE THE AMOUNT TO MANAGE AND REHABILITATE THE ENVIRONMENT

TABLE 19-1: ESTIMATED COSTS FOR IMPLEMENTING TECHNICAL AND MANAGEMENT OPTIONS DURING OPERATIONS

Potential impact	Technical and management options	Estimated costs
Resources	• All options need to be implemented with input from a dedicated environmental management resource at the mine.	• R700 000.00
Auditing and annual review	• Biannual EMP performance assessment (external) • Annual review of closure cost estimate	• R60 000.00 (EMP performance assessment) • R300 000.00 (Closure cost update)
Hazardous structures	• Establish and maintain site security measures • Control site and facility access • Appropriate design of stockpiles with the potential to fail (and by qualified person) • Establish and maintain infrastructure security measures • Undertake third party awareness training	• Approximately 2 million to cover all aspects
Loss of soil resources	• Implement a site-specific soil management plan • Implement a non-mineralised waste management procedure (provide skips for waste sorting and waste removal contractor) • Rehabilitation of contaminated soils (as soon as possible)	• Approximately R1 million to cover all aspects
Biodiversity	• Apply for permit to disturb protected trees • Implement a monitoring programme to remove alien and invasive species	• R30 000.00 (Tree removal permit as and when required) • Approximately R30 000 (Alien invasive species programme)
Alternation of drainage patterns	• Construction of stormwater controls (and by qualified person)	• Approximately R2 700 000.00 (stormwater controls – once off)
Surface water pollution	• Maintain stormwater controls and inspections • Update water balance on an annual basis	• Approximately R30 000.00 (water balance) • Approximately R60 000.00 (maintain stormwater controls and inspections)
Groundwater quality and quantity	• Implement a monitoring programme (quality and quantity). Where surface water resources are present, include these in the programme. • Installation of liners in relevant dams	• Approximately R400 000.00 (monitoring) • Approximately R 2 500 000.00 (liners – once off)

Potential impact	Technical and management options	Estimated costs
Air pollution	• Install dust monitoring buckets and implement monitoring programme • Implement a PM10/PM2.5 sampler and monitoring	• R150 000 (Dust bucket installation and monitoring) • R400 000 (PM10 and PM2.5 sampler and monitoring).
Disturbing noise	• Short term noise monitoring if required in response to a complaint • Maintenance of equipment	• Approximately R80 000.00 (Noise sampling) • Approximately R280 000.00 (maintenance)
Landscape and visual	• Retain natural vegetation as screens • Paint buildings and structures in colours that reflect landscape • Careful use of night lights • Prevent litter	• Approximately R500 000.00
Blast hazards	• Design and implement blast to meet threshold criteria • Monitor blasts and installation of seismographs	• Approximately R200 000.00 (blast design and monitoring)
Traffic	• On-going training of staff • Maintenance of vehicles and of roads	• Approximately R150 000.00 (training) • Approximately R280 000 (maintenance)
Heritage	• Not applicable unless there are chance finds.	• Approximately R300 000 (mitigation)
Socio-economic	• Quarterly stakeholder engagement meetings	• Approximately R20 000.00

The estimated amount to manage and rehabilitate the environment is as presented above. It is however important to note that some of these costs are once-off and will only be required during the construction phase as part of implementing facilities.

19.2 CONFIRM THAT THE AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE

The amount required in order to manage and rehabiliate the environment is provided for in the operating costs.

20 DEVIATIONS FROM SCOPING REPORT AND APPROVED PLAN OF STUDY

20.1 DEVIATION FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

No deviations in terms of the methodology used to determine the significance of potential environmental impacts and risks were made as per the approved plan of study in the scoping report.

20.2 MOTIVATIONS FOR DEVIATION

No deviations in terms of the methodology used to determine the significance of potential environmental impacts and risks were made as per the approved plan of study in the scoping report.

21 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

21.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

The impacts associated with socio-economic conditions are discussed in Appendix F. Management and mitigation measures identified to address any socio-economic impacts are included in Section 28. It is however important to note that no person will be directly affected by the proposed project given that no IAPs currently reside within the proposed project footprint area.

21.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

Not applicable as no national estate will be affected as part of the proposed project.

22 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

No other matters are required in terms of Section 24(4)(A) and (B) of the act.

PART B – ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

23 DETAILS OF THE EAP

It is hereby confirmed that the details of the EAP who undertook the EIA and prepared this EMPr are provided in Part A, Section 1 of the EIA report.

24 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

It is hereby confirmed that the activities covered by this EMPr are fully described in Part A, Section 1 of the EIA report.

25 COMPOSITE MAP

A map indicated all surface infrastructure superimposed on the environmental sensitive areas of the preferred site is included in Appendix G.

26 DESCRIPTION OF THE IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENT

26.1 DETERMINATION OF CLOSURE OBJECTIVES

The closure objectives for the proposed project were determined taking into account the exiting type of environment as described in Section 7.4.1, in order to ensure that the closure objectives strive to achieve a condition approximating its natural state as far as possible. Further information pertaining to the closure objectives identified for the proposed project, refer to Section 29.1.1.

26.2 THE PROCESS FOR MANAGING ENVIRONMENTAL DAMAGE AS A RESULT OF UNDERTAKING THE ACTIVITY

The management measures outlined in Section 28 have been identified in order to manage and reduce impacts associated with the proposed project in order to prevent unnecessary damage to the environment as a result of the proposed project. In the event that incidents occur that may result in environmental damages the emergency response procedure as outlined in Section 31.2 will be implemented to avoid pollution or degradation.

26.3 POTENTIAL RISK OF ACID MINE DRAINAGE

As part of the proposed project a geochemistry analysis was undertaken. The results of the analysis indicate that there is no risk of acid mine drainage.

26.4 STEPS TAKEN TO INVESTIGATE, ASSESS AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO AVOID OR REMEDY ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.6 MEASURES IN PLACE TO REMEDY RESIDUAL OR CUMULATIVE IMPACT FROM ACID MINE DRAINAGE

This section is not applicable as acid mine drainage is not associated with the proposed project.

26.7 VOLUMES AND RATE OF WATER USE FOR MINING

Water for the mine will be sourced from an on site borehole as indicated in Section 4.2. In summary, for year 1 -4 of operation, COZA will be abstracting 2 416 m^3/month which equates to approximately 79 m^3/day. For year 5 and 6, abstraction from boreholes is expected to decrease due to pit ingress. It is expected that 15m^3/day and 20 m^3/day of groundwater will ingress in year 5 and 6 respectively. Borehole abstraction for year 5 and 6 will be 65m^3/day and 60m^3/day respectively.

26.8 HAS A WATER USE LICENCE BEEN APPLIED FOR

A water use license application is required for the proposed project. The water use license application will be submitted to the DWS prio to construction. The DWS has been notified that a water use license application will be submitted as part of the proposed project. In this regard a copy of the notice of intent letter submitted to the DWS in included in Appendix E.

26.9 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES IN ORDER TO REHABILITATE THE ENVIRONMENT AFFECTED

TABLE 26-1:MEASURES TO REHABILITATE THE ENVIRONMENT AFFECTED BY THE LISTED ACTIVITIES

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
GN R 984 Activity 15	Selective site clearance in line with the biodiversity management plan and soil management plan (clearance of the following area: spit, waste rock dump, infrastructure, stockpile, crushing, explosive magazine, pollution control dam) Digging of foundations and trenches	Total area ~100 ha	Construction Operations	Refer to Table 28-1 for mitigation measures to mitigate: • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance.	Comply with permit for removal of protected species.	On-going during relevant phases
GNR 984, activity 17	Mining of iron ore in open pits (requires a mining right in terms of the MPRDA).	Open pit ~9 ha	Operations	Refer to Table 28-1 for mitigation measures to mitigate: • Loss and sterilisation of mineral resources • Hazardous structures and excavation • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution. • Reduction in groundwater availability to third parties • Alteration of surface drainage patterns • Air pollution • Destruction or disturbance of heritage resources	Comply with National Water Act and Regulations, water use licence to be obtained. Comply with the National Heritage Resource Act and Regulations to destroy heritage sites and in the event of any chance finds of heritage resources.	On-going during relevant phases
GNR 984, activity 21	Primary processing of ore: crushing will take place on site. Crushed ore will then be blended prior to transport off-site where it will be further processed.	~6 ha	Operations			On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
				• Noise pollution • Negative visual impacts • Blasting impacts • Traffic and road use impacts • Land use impacts • In-migration • Economic impacts.		
GNR 983, activity 9.	Bulk pipelines for dewatering activities/water reticulation and stormwater. These pipelines are likely to exceed 1 000 metres in length with an internal diameter of 0.36 metres or more with peak throughput of 120 litres per second or more.	Dependent on mine plan	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Hazardous structures and excavations • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution • Destruction or disturbance of heritage resources.	N/A	On-going during relevant phases
GNR 983, activity 10	Bulk pipelines to transport return water/effluent from the sewage treatment facility and waste water from mining activities. These pipelines may exceed 1 000 metres in length with a diameter of 0.36 metres or more or a peak throughput of 120 litres per second or more.	~2 km	Construction Operation Decommissioning		N/A	On-going during relevant phases
GNR 983, activity 12	Construction/development of mine infrastructure (waste rock dump, stockpile area, mine pit, within 32 metres of a watercourse.	~21 ha	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Biodiversity destruction and disturbance • Surface pollution. • Alteration of surface drainage patterns.	N/A	On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
GNR 983, activity 13 GNR 984, activity 16	Construction of pollution control/attenuation dams, water supply tanks for the Driehoekspan mine.	~ 1ha	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Hazardous structures and excavation • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution. • Destruction or disturbance of heritage resources.	Comply with National Water Act and Regulations, water use licence to be obtained. Comply with the National Heritage Resource Act and Regulations to destroy heritage sites and in the event of any chance finds of heritage resources.	On-going during relevant phases
GNR 983, activity 19	Development of the mine pit near the watercourse. The mining activities and the construction of infrastructure will cross watercourses, requiring earthworks (excavation/fill) of more than 5 cubic meters.	~ 9 ha	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Hazardous structures and excavations • Biodiversity destruction and disturbance • Surface pollution.	Comply with National Water Act and Regulations, water use licence to be obtained.	On-going during relevant phases
GNR 984, activity 11	Construction of dewatering pipelines. The pipelines may transfer 50 000 cubic metres of water from the mine pit catchment area to other catchments within the mine property. Pipelines can potentially transfer up to 50 000m^3 of water a day between impoundments/attenuation	To be determined		Refer to Table 28-1 for mitigation measures to mitigate: • Hazardous structures and excavations • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance	N/A	On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
	dams on site during peak flows.			• Surface and groundwater pollution • Destruction or disturbance of heritage resources.		
GNR 984, activity 6.	The storage of water containing waste, i.e. pumped from the pits, wash bays, workshop area and waste rock dumps, requires a water use license in terms of the NWA which governs the release of waste.	~ 1 ha	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Hazardous structures and excavation • Surface and groundwater pollution.	Comply with National Water Act and Regulations, water use licence to be obtained.	On-going during relevant phases
GNR 983, activity 24	Construction of haul roads and access and service roads at the mine. Some of the roads will be wider than 8 metres.	~5 km	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution. • Air pollution • Destruction or disturbance of heritage resources • Noise pollution • Negative visual impacts • Traffic and road use impacts.	Comply with National Water Act and Regulations, water use licence to be obtained. Comply with the National Heritage Resource Act and Regulations to destroy heritage sites and in the event of any chance finds of heritage resources.	On-going during relevant phases
GNR 983, activity 56	The expansion of the district road intersection with the mine access road to accommodate passing lanes. `	To be determined	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Soil and land capability through physical disturbance and contamination	Comply with National Water Act and Regulations, water use licence to be obtained.	On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
				• Biodiversity destruction and disturbance • Surface and groundwater pollution. • Air pollution • Destruction or disturbance of heritage resources • Noise pollution • Negative visual impacts • Traffic and road use impacts.	Comply with the National Heritage Resource Act and Regulations to destroy heritage sites and in the event of any chance finds of heritage resources.	
GNR 983, activity 2	Power generation through the use of backup generators during construction and operations of up to 10 megawatts covering an area greater than 1 hectare.	Approx. 1 ha	Construction Operation	Refer to Table 28-1 for mitigation measures to mitigate: • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface water pollution. • Air pollution • Destruction or disturbance of heritage resources • Noise pollution.	N/A	On-going during relevant phases
GNR 983, activity 2	Storage of fuel	80 m^3	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution. • Air pollution	Comply with National Water Act and Regulations, water use licence to be obtained. Comply with the National Heritage Resource Act and Regulations to destroy	On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
				• Destruction or disturbance of heritage resources • Negative visual impacts • Land use impacts.	heritage sites and in the event of any chance finds of heritage resources. Obtain air emiisisons permit if necessary.	
GNR 921 Category B: activity 7, 10, 11 and	Construction of the waste rock dump	~ 13 ha	Construction Operation Decommissioning	Refer to Table 28-1 for mitigation measures to mitigate: • Loss and sterilisation of mineral resources • Hazardous structures and excavation • Soil and land capability through physical disturbance and contamination • Biodiversity destruction and disturbance • Surface and groundwater pollution. • Alteration of surface drainage patterns • Air pollution • Destruction or disturbance of heritage resources • Negative visual impacts • Land use impacts.	Comply with National Water Act and Regulations, water use licence to be obtained. Comply with the National Heritage Resource Act and Regulations to destroy heritage sites and in the event of any chance finds of heritage resources. Comply with regulations regarding the planning and management of residue stockpiles and deposits from a prospecting, mining, exploration or	On-going during relevant phases

Activity number	Description of activity	Size and scale of disturbance	Phase	Mitigation measures	Compliance with standards	Time period for implementation
					production operation in terms of NEM:WA, Regulation 632.	

27 IMPACT MANAGEMENT OUTCOMES

The section below provides a description of the outcomes and objective of mitigation actions in order to manage, remedy, control or modify potential impacts. The mitigation actions identified to achieve these outcomes and objectives are described in Section 28.

TABLE 27-1:DESCRIPTION OF IMPACT MANAGEMENT OUTCOMES

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Open pit mining Mineralised waste Maintenance and aftercare	Loss and sterilisation of mineral resources	Geology	Construction Operation Decommissioning Closure	• Control through mine plan that will avoid sterilisation of resources. • Ensure optimal extraction of resources	Avoid sterilisation of mineral resources
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare.	Hazardous excavations infrastructure and surface subsidence	Topography	Construction Operation Decommissioning Closure	• Prevention through access control • Remedy through emergency response procedure	To ensure the safety of people and animals in order to prevent physical harm from potentially hazardous excavations and infrastructure
Site preparation Earthworks Civil works Open pit mining	Loss of soil resources and land capability through	Soil and land capability	Construction Operation Decommissioning Closure	• Prevention through a range of management measures including infrastructure design to contain	To ensure that soil resources are handled and managed properly in order to

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare of rehabilitated areas	contamination			contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management • Remedy through emergency response procedure	conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.
Site preparation Earthworks Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and	Loss of soil resources and land capability through physical disturbance		Construction Operation Decommissioning Closure	• Prevention by limiting the area of disturbance, effective topsoil stripping and management, and erosion management.	To ensure that soil resources are handled and managed properly in order to conserve these resources for use as part of rehabilitation which will assist with the restoration of pre-mining land capability as far as possible.

Activity	**Potential impact**	**Aspects affected**	**Phase**	**Mitigation type**	**Standard to be achieved**
aftercare of rehabilitated areas					
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Backfilling of the open pit Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	Biodiversity	Construction Operation Decommissioning Closure	• Prevention by limiting the area of disturbance, avoidance of sensitive areas, monitoring and management of invasive species is to be undertaken at the mine, allowing animal movement where feasible • Remedy by rescueing species where possible and obtaining relevant permits to do this as required, re-establishment of key tree species, effective rehabilitation	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical destruction
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management	General disturbance of biodiversity		Construction Operation Decommissioning Closure	• Prevention by training of workers on the value of biodiversity, zero tolerance of the killing or collecting of any biodiversity by anybody working for or on behalf of COZA, banning of domestic animals to be banned from site, taking into account avifauna in infrastructure designs such as powerlines • Minimisation by limiting lighting, speed control, managing dust and waste effectively, implementation	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical disturbance

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Rehabilitation Maintenance and aftercare				of a stormwater management plan.	
Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare	Alteration of drainage patterns	Surface water	Construction Operation Decommissioning Closure	• Minimisation by limiting area of disturbance, diverting clean water away form site, implementing a stormwater management plan and rehabilitation including backfilling of the open pit.	To ensure that the reduction of the volume of run-off into the downstream catchment is limited to what is necessary and that natural drainage patterns are re-established as part of rehabilitation.
Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management	Contamination of surface water resources	Surface water	Construction Operation Decommissioning Closure	• Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water,	To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Demolition Rehabilitation Backfilling of the open pit Maintenance and aftercare				effective mineralized and non-mineralised waste management, monitoring of surface water quality and compensation or water supply replacement if needed • Remedy through emergency response procedure.	
Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare	Contamination of groundwater resources	Groundwater	Construction Operation Decommissioning Closure	• Prevention through a range of management measures including infrastructure design to contain contaminants, proper handling and management of potentially polluting materials, cleaning up of spills and leaks, education and training of workers, implementation of a stormwater management plan, containment and re-use of contaminated water, effective mineralized and non-mineralised waste management, monitoring of groundwater quality and compensation or water supply replacement if needed • Remedy through emergency response procedure.	To ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes to prevent harm to water users.
Water supply and use Dewatering in the open pit	Reduction of groundwater levels and		Operation	• Remedy through the monitoring of third party borehole water levels and	To avoid or remedy loss of groundwater for third party use.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
	availability			compensation or water supply replacement if needed	
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Backfilling of the open pit Rehabilitation Maintenance and aftercare	Air pollution	Air	Construction Operation Decommissioning Closure	• Prevention through a range of management measures aimed at limiting the area of disturbance, dust suppression, traffic control measures, enclosing dusty equipment where feasible, monitoring air quality • Remedy through corrective action if third party health impacts occur.	To ensure that any pollutants emitted as a result of the proposed project remain with acceptable limits so as to prevent health related impacts.
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services	Noise pollution	Noise	Construction Operation Decommissioning	• Prevention through the use of vibration isolators where feasible, maintenance of equipment and vehicles, monitoring in the event of complaints • Minimise though communication of blast times to local people • Remedy through corrective action if uanneceptable third party impacts occur.	To ensure that any noise generated as a result of the proposed project remains within acceptable limits to avoid the disturbance of third parties.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Demolition General site management Backfilling of the open pit Rehabilitation Maintenance and aftercare					
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	Blasting	Operation	• Prevention through acess control, appropriate blast design that prevents excessive fly rock, ground vibration and air blast • Minimise though communication of blast times to local people • Remedy through emergency response procedure.	To protect third party property from proposed project-related activities, where possible. Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome and to ensure public safety
Transport system	Road disturbance and traffic safety	Traffic	Construction Operation Decommissioning	• Prevention through construction of a dedicated mine access road, speed control and training of workers on road safety • Remedy through emergency response procedure.	To avoid accidents that can harm third party road users
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use	Negative visual views	Visual	Construction Operation Decommissioning Closure	• Prevention through limiting area of disturbance, • Minimising through dust management, con-current rehabilitation, minimising lighting and effective rehabilitation including backfilling of the open pit.	To limit visual impacts and rehabilitate effectively.

Activity	**Potential impact**	**Aspects affected**	**Phase**	**Mitigation type**	**Standard to be achieved**
Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas					
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of heritage, cultural and palaeontological resources	Heritage/ cultural and palaeontological resources	Construction Operation Decommissioning Closure	• Preventing through additional archeological survey, training of workers to recognise heritage sites including stromatolites and not disturbing heritage sites outside of footprint area • Remedy through limiting area of disturbance and destruction of heritage sites, obtaining approval where required for destruction of heritage sites, and chance finds procedure.	To avoid the disturbance of significant heritage resources and remedy impacts on low significance heritage sites where damage cannot be avoided.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Site preparation Earthworks Civil works Crushing Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas	Economic impact	Socio-economic	Construction Operation Decommissioning	• Enhance positive impact through local employment and procurement where feasible, and implementation of Social and Labour Plan projects.	To enhance the positive economic impacts
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management	Inward migration		Construction Operation Decommissioning Closure	• Minimisation through proper communication of opportunities to local communities, implementation of health policy, accommodation of construction staff on site, incentivising permanent employees to live in formal housing with adequate services, working with local government to manage social impacts.	To establish and maintain a good working relationship with surrounding communities, local authorities and land owners in order to limit the impacts associated with inward migration.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas					
Site preparation Earthworks Civil works Open pit mining Crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Backfilling of the open pit Rehabilitation Maintenance and aftercare of rehabilitated areas	Land use impact	Land use	Construction Operation Decommissioning Closure	• Minimisaton through authorising land use through zoning, rehabilitation including backfilling of the open pit.	To prevent unacceptable impacts on surrounding land uses and their economic activity

28 IMPACT MANAGEMENT ACTIONS

The mitigation actions for all phases (construction, operation, decommissioning and closure) to achieve the objectives and outcomes set out in Section 27 are listed in tabular format below. The action plans include the timeframes for implementing the mitigation actions together with a description of how mitigation actions comply with relevant standards. Mitigation actions and recommendations identified by specialists have been summarised and are included into Table 28-1 below.

TABLE 28-1:DESCRIPTION OF IMPACT MANAGEMENT ACTIONS

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Open pit mining Mineralised waste Maintenance and aftercare	Loss and sterilisation of mineral resources	During all mine phases COZA will ensure the following: • Incorporation of cross discipline planning structures for all mining and infrastructure to avoid mineral sterilization. A key component of the cross cutting function is the Mine resource manager • Mine workings will be developed and designed so as not to limit the potential to exploit deeper minerals	Design phase On-going	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous excavations, infrastructure and surface subsidence	• All mineralised waste facilities and water dams will be designed, constructed, operated and closed in a manner to ensure stability and related safety risks to third parties and animals are addressed. It will furthermore be monitored according to a schedule that is deemed relevant to the type of facility by a professional engineer. As part of closure, COZA should ensure that provision is made to address long term and safety risks in the decommissioning and rehabilitation planning. • COZA will survey its mining area and update its mine plan map on a routine basis to ensure that the position and extent of all potential hazardous excavations, hazardous infrastructure and subsidence is known as part of construction, operation and decommissioning. It will further more ensure that appropriate management measures are taken to address the related safety risks to third parties and animals	On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• As part of construction and operation, the safety risks associated with identified hazardous excavations, subsidence and infrastructure will be addressed through one or more of the following: o Fencing, berms, barriers and/or security personnel to prevent unauthorized access o Warning signs in the appropriate languages (s) Warning pictures can be used as an alternative • During decommissioning planning of any part of the mine, provision will be made to address long term safety risks in the decommissioning and rehabilitation phases. • At closure of any part of the mine, the hazardous infrastructure will either have been removed or decommissioned and rehabilitated in a manner that it does not present a long term safety and/or stability risk. • At closure the hazardous excavations and subsidence will have been dealt with as follows: o Complete pit backfilling and rehabilitation o The potential for surface subsidence will have been addressed by providing a bulking factor for the backfilled pit o Monitoring and maintenance will take place to observe whether the relevant long term safety objective have been achieved and to identify the need for additional intervention where the objectives have not been met. • In case of injury or death due to hazardous excavations, the emergency response procedure in Section 31.2.2 will be followed.	On-going As required As required As required As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation	Loss of soil resources and land capability through contamination	• During the construction, operational and decommissioning phases, COZA will ensure that all hazardous chemicals (new and used), dirty water, mineralized wastes and non-mineralised wastes are transported, handled and stored in a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following:	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas		○ Pollution prevention through basic infrastructure design ○ Pollution prevention through maintenance of equipment ○ Maintenance of equipment should be done either on impermeable surfaces or drip trays should be used. ○ Pollution prevention through education and training of workers (temporary and permanent) ○ Pollution prevention through appropriate management of hazardous materials and waste as outlined in Table 28-2. ○ The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resourced will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned ○ Specifications for post rehabilitation audit to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures • In case of major spillage incidents the emergency response procedure in Section 31.2.2 will be followed.	If required	
Site preparation Earthworks Open pit mining Processing plant Transportation Power supply and use	Loss of soil resources and land capability through physical disturbance	• Limit the disturbance of soils and the removal of vegetation to what is absolutely necessary for earthworks on-going activities, infrastructure footprints and use of vehicles during all phases. • Due to wind erosion hazard in the area, wind protection measures should be undertaken wherever possible. • Drainage lines will not be disturbed.	On-going On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas		• All employees (permanent and temporary) should be aware of which areas are identified for infrastructure/activities. In this regard, no activities or infrastructure should be placed on the western section of the proposed project area. • During construction the topsoil should be removed and separately stored from sub-soil (in piles not > 2 m high). Stockpiles not used in 3 months after stripping must be seeded to prevent dust and erosion. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. • Where soils have to be disturbed the soils will be stripping, storage and maintenance and replaced in accordance with the specifications of the soil management principles included in Table 28-3.	On-going On-going On-going	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	Physical destruction of biodiversity	As part of construction, operatio, rehabilitation and closure the following should be undertaken: • Limiting infrastructure, activities and related soil and vegetation disturbance to those specifically identified and described in this report • Vegetation clearing and soil stripping should be phased to limit the area exposed at any point in time • Concurrent rehabilitation of areas no longer being used must take place as soon as possible. These areas must be re-seeded with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. • Conduct preconstruction surveys of the development footprints for species suitable for search and rescue operations. • Prevent the disturbance of sensitive areas so that the species composition and ecosystem functionality remain intact as far as practically possible. In this respect drainage lines will be avoided and a buffer zone of 50 m will be applied to sensitive areas. Where sensitive areas occur close to development areas, the sensitive areas will	On-going On-going On-going On-going On-going On-going	The mitigation action to obtain a tree removal permit from DAFF is in accordance with the National Forests Act (No. 84 of 1998) that stipulates that no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		be clearly demarcated as "no go" areas • Collect pods of *Vachellia erioloba* (Camel Thorn) and *Boscia Albitrunca* (Shepherd's Tree) should be collected in order to aid in the re-establishment of these species • Obtain a tree removal permit prior to removal of protected tree species from DAFF • Avoiding initial mining activities during spring/summer as animals reproduce and disperse during this period if at all possible • A comprehensive monitoring programme of the protected trees within the area will be initiated. This monitoring should be conducted on an individual tree basis as well as monitoring on a community level. • Do not import soil stockpiles from areas with alien plants. • Implementation of an alien invasive species programme. Local labour should be utilised for the removal of alien plants where possible • Security fencing should be constructed in manner which allows for the passage of small and medium-sized mammals. Steel palisade fencing (with 20 cm gaps) is a good option as it allows most small mammals to move through. Alternatively the lowest strand or bottom of the fence should be elevated to 15 cm above the ground at least at strategic places to allow for fauna to pass under the fence. • Regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. All erosion problems observed should be rectified as soon as possible. • Implementation of a biodiversity action plan to ensure that the undeveloped/mined areas within the property are properly conserved and maintained • Ripping of compacted areas (e.g. roads) followed by adequate top soiling, fertilisation, irrigation and correct choice of grasses. • Rehabilitation must be executed in such a manner that	On-going On-going On-going On-going On-going On-going On-going On-going As required	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		surface run-off will not cause erosion of disturbed areas. • As part of con-current rehabilitation during the operational and decommissioning phases, all cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the current natural vegetation. This may be used in conjunction with commercially available mix as this will ensure good vegetation coverage and soil stability. • Closure objective should aim to ensure effective rehabilitation to as close to pre-mining conditions as practically possible. In addition to this closure planning needs to take into consideration the requirements for the establishment of long term species diversity, ecosystem functionality, aftercare and confirmatory monitoring	On-going As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Maintenance and aftercare	General disturbance of biodiversity	During construction, operation, decommissioning and closure the following needs to be adhered to: • The use of light is kept to a minimum, and where it is required, yellow lighting is used where possible • Vertebrates should be kept away from the proposed project area with appropriate fencing • Train workers on the value of biodiversity and the need to conserve the species and systems that occur within the surface use area • There will be zero tolerance of the killing or collecting of any biodiversity by anybody working for or on behalf of COZA • Strict speed control measures will be enforced for any vehicles driving within the surface use area • Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels • Powerline pylons must be positioned a minimum of 50m outside of watercourse boundaries • Pollution and litter prevention measures will be implemented • Prevention and combatting veld fires though establishment and maintaining of fire breaks and through	On-going	The mitigation actions regarding veld fires are in accordance with the National Veld and Forest Fire Act No. 101 of 1998. The purpose of this Act is to prevent and combat veld, fires and places the responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		the education of employees in order to comply with the National Veld and Forest Fire Act No. 101 of 1998. • COZA will form part of existing forums within the area and work together with local farmers to combat, manage and control veld fires • Culverts will be constructed, where necessary, to allow for water flow along drainage lines and suitable erosion barriers. There will be regular assessment of the effectiveness and maintenance of culverts to allow movement of animals and water • The movements of any animals intending to flee the impacted area will not be hindered by preventing abuse and hunting/chasing of animals by workers and by allowing them passage if they are seen wanting to disperse. • Monitoring dust pollution if necessary, and applying reasonable and applicable dust-suppression measures • Groundwater abstraction will be monitored and kept to a minimum • Raptor-proofing all open reservoirs, dams or ponds to allow birds to drink and bathe, preventing drowning, and thus contributing to raptor conservation. This can be done by: o Keeping the reservoir full o Covering the reservoir with shade cloth o Attaching a wooden plank, log, ladder or branch to the wall of the reservoir onto which a drowning bird can grasp and lift itself out of the water. These structures can also serve as a platform from which raptors and other birds can drink. However, wooden structures may need to be replaced every few years o Providing alternative, more natural drinking places on the ground • Bird-unsafe electrical structures must be modified to	As required As required	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		insulate dangerous live components, and to cut a gap in the earthwire. Perch deterrents will be installed to keep birds away from the dangerous areas on the structure. • Soil and water contamination from diesel spills, particularly at the storage tanks, will be prevented by ensuring these areas are adequately constructed on barrier foundations. Diesel storage facilities will be regularly inspected for leaks • The integrity of the natural habitat around the mine infrastructure will be maintained, thereby providing the possibility for animals to flee the affected area and re-settle in the surrounding undisturbed areas • Employees will be educated to minimise accidental killings of animals • Slow-moving animals like Tortoises, found during ground-breaking will be relocated to nearby suitable, undisturbed areas • Where necessary and feasible, landscaped culverts will be constructed to a depth of 300 mm to allow free movement for small mammals, reptiles and amphibians under roads or other barriers. These will be maintained throughout the operational phase and beyond. Where necessary and feasible, berms, low walling or fencing will be constructed guiding animals towards these culverts, thus promoting the use of these passage ways • Dangerous interactions between personnel and venomous fauna will be reduced through awareness courses, posters, and other forms of education • A regular refuse removal regime to discourage baboon-raiding activities • Domestic animals on site will be banned • A storm-water management plan must be compiled, indicating how water velocities will be reduced before storm water enters natural channels and how natural processes for water infiltration of the affected landscape will be accommodated		

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		• Any roads running down a slope will have water diversion structures present if necessary • As part of closure planning, the designs of any permanent and potentially polluting structures (mineralised waste facilities) will take consideration of the requirements for long term pollution prevention and confirmatory monitoring. • In case of a major incident, including veld fire, the emergency response procedure in Section 31.2.2 will be followed.	As required	
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Contamination of surface water resources	• Mine infrastructure, will be constructed and operated so as to comply with the National Water Act (36 of 1998) and Regulation 704 (4 June 1999): ○ Clean water systems are separated from dirty water systems ○ Clean run-off and rainfall water is diverted around dirty areas and back into its normal flow in the environment ○ The size of dirty water areas are minimized and dirty water is contained in systems that allow the reuse and/or recycling of this dirty water ○ Discharges of dirty water may only occur in accordance with authorisations that are issued in terms of the relevant legislation specifications and they must not result in negative health impacts for downstream surface water users. The relevant legislation specifications comprises any applicable authorisation/exemption, the National Water Act (36 of 1998) and Regulation 704, or any future amendment thereto • All hazardous chemicals (new and used), mineralized waste and non-mineralised waste must be handled in a manner that they do not pollute surface water. This will be implemented by means of the following: ○ Pollution prevention through basic infrastructure design	On-going On-going	Comply with Section 21 of the National Water Act No. 36 of 1998 for water uses. Compliance with Government Notice Regulation 704 of the National Water Act No. 36 of 1998 for the design of stormwater facilities and the separation of clean and dirty water systems.

Activity	**Potential impact**	**Mitigation type**	**Time period for implementation**	**Compliance with standards**
		○ Pollution prevention through maintenance of equipment ○ Pollution prevention through education and training of workers (permanent and temporary) ○ Pollution prevention through appropriate management of hazardous, materials and ○ The required steps to enable containment and remediation of pollution incidents • Specifications for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures. • The designs of potentially polluting structures will take account of the requirements for long term surface water pollution prevention. • In case of a discharge incident that may result in the pollution of surface water resources, the emergency response procedure in Section 31.2.2 will be followed.	On-going On-going As required	
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Alteration of natural drainage patterns	• In all phases mine infrastructure will be constructed, operated and maintained so as to comply with the provisions of the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) of any future amendments thereto. These include: ○ Clean water systems are separated from dirty water systems ○ The size of dirty water areas are minimized and clean run-off and rainfall water is diverted around dirty areas and back into the normal flow in the environment ○ The site wide water balance is refined on an on-going basis with the input of actual flow volumes and used as a decision making tool for water management and impact mitigation (Section 30). ○ The location of all activities and infrastructure should be outside of the specified zones and/or floodlines of watercourses. If this is unavoidable the necessary	On-going On-going On-going On-going As required	Comply with Section 21 of the National Water Act No. 36 of 1998 for water uses. Compliance with Government Notice Regulation 704 of the National Water Act No. 36 of 1998 for open cast activities and overburden stockpiles located within 100m of the Ga-Mogara drainage channel.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		exemptions/approvals will be obtained.		
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare	Contamination of groundwater resources	• COZA will comply with both the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) • All hazardous chemicals (new and used), mineralized wastes and non-mineralised waste are handled in a manner that they do not pollute groundwater. This will be implemented by covering the following: o Pollution prevention through basic infrastructure design o Pollution prevention through maintenance of equipment o pollution prevention through education and training of workers (permanent and temporary); o Pollution prevention through appropriate management of hazardous chemicals, materials and non-mineralised waste o Required steps to enable containment and remediation of pollution incidents o Specification for post rehabilitation audit criteria to ascertain whether the remediation has been successful and if not, to recommend and implement further measures • Infrastructure that has the potential to pollute groundwater resources will be designed and implemented in a manner that pollution is addressed in all mine phases. In this regard design of overburden stockpiles need to comply with Section 7 of GN. 632 of NEM:WA. • Existing and planned infrastructure that has the potential to pollute groundwater (overburden stockpiles) will be identified and included into the groundwater pollution management plan which will be implemented and needs to comply with Section 7 of GN. 632. The plan includes: o Identify potential pollution sources o Determine the extent of the pollution plume o Design and implement intervention measures to prevent, eliminate and/or control the pollution plume.	On-going On-going On-going On-going On-going	Comply with the National Environmental Management Waste Act No 59 of 2008 for waste listed activities in terms of Regulation 921 and GN. 632 of NEM:WA for the planning and management of overburden stockpiles. Comply with Section 21 of the National Water Act No. 36 of 1998 for water uses.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		o Limit unauthorized access to overburden stockpile o Monitoring all potential impact zones to track pollution and mitigation impacts o Where monitoring results indicates that third party water supply has been polluted by Impala, Impala will ensure that an alternative equivalent water supply will be provided. o At closure some overburden may remain on surface and this will be rehabilitated as outlined in the decommissioning plan. • Minimize the extent of disturbance of the aquifer • No construction of any water management measures will be undertaken with potentially hazardous material • All dams will be constructed to comply with the relevant DWS requirements in an effort to minimize the seepage of poor quality leachate. Dirty water dams will be appropriately lined • Clean and dirty water will be kept separate through the implementation of a stormwater management plan. Contaminated water will be contained and reused. • COZA will implement the groundwater monitoring programme as outlined in Section 30. If the monitoring programme indicates that nearby groundwater users are affected negatively by mining activities and residue disposal, the users need to be compensated for their loss • The groundwater modelling predictions and estimates must be verified through monitoring • Management actions will be evaluated to deal with any potential decant predicted by the groundwater investigation at the proposed opencast pit. • In case of a major discharge incident that may result in the pollution of groundwater resources the emergency response procedure in Section 31.2.2 will be followed.	On-going On-going As required On-going On-going On-going As reequired	
Water supply and use Open pit mining	Reduction of groundwater levels and	• During the construction and operational and decommissioning phases, COZA will implement the following:	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
	availability	○ All potentially affected third party boreholes will be included in the COZA groundwater monitoring program to ensure that changes in water depths can be identified, where possible. ○ Where COZA's dewatering causes a loss of water supply to third parties an alternative equivalent water supply will be provided by COZA until such time as the dewatering impacts cease ○ COZA will monitor groundwater quantity as per the monitoring programme included in Section 30.		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Air pollution	• During the construction, operation and decommissioning phases, COZA will implement a dynamic air quality management plan that covers: ○ The identification of sources and emissions inventory ○ The implementation of source based controls ○ The use of source and receptor based performance indicators and monitoring strategies ○ The use of source and receptor based mitigation measures ○ The use of internal and external auditing ○ Review and plan adjustment as required. • During the construction, operation and decommissioning phases, the following specific mitigation measures will be implemented for the main emission sources: roads, crushing. The recommended methods include: ○ Limit the disturbance of land to what is absolutely necessary and in accordance with the mine infrastructure layout ○ For the control of vehicle entrained dust chemical suppressant or surface wetting will be applied to main haul roads and traffic control measures be will be implemented ○ Enclosure of crushing operations to achieve 75% control efficiency ○ Enclosure of storage piles where possible.	On-going On-going	National Atmospheric Emission Reporting Regulations in terms of the National Environmental Management: Air Quality Act 39 of 2004 requires that holders of mining rights register on the National Atmospheric Emissions Inventory System (NAEIS).

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		o In minimizing windblown dust from stockpile areas, water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the area. o Regular maintenance and emission testing will be conducted on all mobile and stationary diesel combustion sources. Use will also be made of low sulphur fuel. o Water sprays will be applied at all operational drill rigs. o The NAAQS and dustfall regulations will be adopted by COZA Iron Ore as receptor-based objectives. o In the transportation of ore and products, trucks should be well covered in order to avoid spillages. This will reduce the release of PM and consequently o Equipment suppliers or contractors will be required to ensure compliance with appropriate emission standards for mining fleets. o Rehabilitation and re-vegetation of all decommissioned areas o Maintenance of all vehicles to achieve optimal exhaust emissions. • COZA will implement the monitoring programme as included in Section 30. • It is recommended that site inspections and progress reporting be undertaken at regular intervals (at least quarterly), with annual environmental audits being conducted. Annual environmental audits should be continued at least until closure. • Stakeholder forum meetings will be scheduled and held at least on a bi-annual basis and report on air quality. • The mine budget will provide a clear indication of the capital and annual maintenance costs associated with dust control measures and dust monitoring plans.	On-going On-going On-going As required On-going On-going On-going As required	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare	Noise pollution	• During the construction, operation and decommissioning phases the following good engineering practice should be applied: o All diesel powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. o Vendors will be required to guarantee optimised equipment design noise levels. o Vibration isolators will be considered to reduce noise and vibration from crushers. • During the construction, operation and decommissioning phases measures to manage transport related noise, specifically from trucks, include o Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program. o Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration. o Maintain road surface regularly to avoid corrugations, potholes etc. o Avoid unnecessary idling times. o Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm could be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage	On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		to those sites 'with low ambient noise level. o Blasting at the surface will be audible over long distances and may cause a startling reaction at receptors in close proximity. This can be mitigated by adhering to blast schedules that have been communicated to the affected parties. o A noise complaints register will be kept on site • In the event that COZA receives noise related complaints during either construction or operation, monitoring measures outlined in Section 30 should be implemented.	As required	
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	• Implementation of a blast management programme during the operational phase which has the following principles: o Pre mining structure and crack survey of structures within the potential impact zone o Design of blasts to prevent injury to people and livestock and to prevent damage to structures. As a minimum the blast design will achieve: o A fly rock zone limit of less than 500 m o A peak velocity limit of less than 12 mm/s at third party structures that are built according to building industry standards and that is further reduced at third party structures that are not built according to building industry standards o An air blast limit of less than 125 dB at third party structures o Communication of the planned blast programme to interested and affected parties including mine personnel o Pre-blast warning and evacuation to clear people, traffic, moveable property and livestock from the potential impact zone o Blast monitoring to verify the effectiveness of the blast design and blast execution o Audit and review to adjust the blast design where necessary to achieve the stated objectives	On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		o Formal documented investigation and response for all third party blast related complaints o Remediation of all impacts caused by blasting. • No blasting will take place within 500 m of any third party structures. Where COZA would like to blast in areas within this 500 m distance, a project specific risk assessment will be completed and project specific mitigation measures will be implemented, subject to approval by the relevant authority(ies) • Blasting activities is limited to day time hours • In case of a person or animal being injured by blasting activities the emergency response procedure in Section 31.2.2 will be followed.	On-going On-going As required	
Transport system	Road disturbance and traffic safety	• A new access road will be constructed from the mine to the R325. The access road will be gravel, 4 km long and will be more than 6 metres wide in order to accommodate two lanes of traffic. A bridge will need to be constructed over the railway line. In addition to this, the district road will need to be widened to accommodate passing lanes and possibly become controlled intersections for safety reasons. • COZA will implement a transport safety programme to achieve the mitigation objectives during the construction, operational and decommissioning phases. Key components of the programme include: o Education and awareness training o Maintenance of the transport system o Use of dedicated loading and off-loading areas on site • Mine vehicles are to always have their lights on when accessing the site via the R325 • COZA needs to ensure that proper road markings, reflective road studs (LED), road signs, overhead lighting and proper pedestrian crossings should be provided and maintained at the entrance to the mine • In case of a person or animal being injured by transport activities the emergency response procedure in Section	On-going On-going On-going On-going	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		31.2.2 will be followed.	As required	
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Negative visual views	• During construction and operation phases, COZA will ensure the following: o Limit the clearing of vegetation o Limit the emission of visual air emission plumes (dust emissions) o Use of lighting will be limited to project requirements and measures will be implemented to limit light pollution impacts on surrounding areas o On-going vegetation establishment on rehabilitated areas o Painting infrastructure with colours that blend in with the surrounding environment where possible • During the decommissioning phase, COZA must develop a closure plan which involves the removal of infrastructure, and the rehabilitation and re-vegetation of cleared areas. • During closure final rehabilitated areas will be managed through a care and maintenance programme to limit and/or enhance the long term post closure visual impacts	On-going As required As required	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation	Loss of heritage, cultural and palaeontological resources	• Obtain approval to destroy the following heritage sites of low significance: DRHP5, 6, 7 and 11. • Further archaeological fieldwork must be undertaken on the proposed development footprint area prior to construction. This is because of the possible prescence of archeological resources such as stromatolites. • The mine Environmental Department must take note of the possible presence of stromatolites. If these structures are found, a qualified palaeontologist must be informed and a representative sample of at least 1m^3 must be collected for future reference. Photographic recording of the structures must be taken. • If there are any chance finds of heritage and/or cultural sites, COZA will follow the emergency response procedure (Section 31.2.2).	On-going On-going On-going As required	Not applicable.

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Maintenance and aftercare of rehabilitated areas				
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Economic impact (positive impact)	• During all mine phases, COZA will ensure the following: ○ COZA (and its contractors) will hire local people from the closest communities where possible ○ COZA will extend its formal bursary and skills development programmes to the closest communities to increase the number of local skilled people and thereby increase the potential local employee base ○ COZA will ensure it procures local goods and services from the closest communities where possible ○ COZA will implement a procurement mentorship programme which provides support to local businesses from the enquiry to project delivery stages ○ COZA will ensure that it incorporates economic considerations into its closure planning from the outset ○ Closure planning considerations cover the skilling of employees for the downscaling, early closure and long term closure scenarios ○ COZA will identify and develop sustainable business opportunities and skills, independent form mining for members of the local communities to ensure continued economic prosperity beyond the life of mine.	On-going	Not applicable
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste	Inward migration	• During the construction phase, all workers will be accommodated in a fully serviced construction village within the mine property. • Project information sheets will be distributed prior to construction and distributed in the local communities. • In terms of recruitment, procurement and training during all mine phases COZA will ensure the following: ○ Good communication with all job and procurement opportunity seekers will be maintained throughout the recruitment process. The process must be seen and understood to be fair and impartial by all involved.	On-going On-going On-going	Not applicable

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas		The personnel in charge of resolving recruitment and procurement concerns must be clearly identified and accessible to potential applicants o The precise number of new job opportunities (permanent and temporary) and procurement opportunities will be made public together with the required skills and qualifications. The duration of temporary work will be clearly indicated and the relevant employees/contractors provided with regular reminders and revisions throughout the temporary period o Recruitment and procurement, by COZA and its contractors, will be preferentially provided to people in the communities where possible, that are closest to COZA. In order to be in a position to achieve this a skills register of people within the closest communities will be maintained. COZA will also preferentially provide bursaries and training to people that reside in these closest communities o There will be no recruitment or procurement at the gates of the mine. All recruitment will take place off at designated locations. All procurement will be through existing, established procurement and tendering processes that will include mechanisms for empowering service providers from the closest communities • During all mine phases, COZA will ensure the following: o COZA will work with neighbouring mines, local authorities and law enforcement officials to monitor and prevent the development of informal settlements near the mine and to assist where possible with crime prevention within the proposed projet area o COZA will implement a health policy on HIV/AIDS and tuberculosis. This policy will promote education, awareness and disease management both in the workplace and in the home so that the initiatives of the workplace have a positive impact on the	On-going	

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		communities from which employees are recruited. Partnerships will be formed with local and provincial authorities to maximize the off-site benefits of the policy. o COZA will work closely with the local and regional authorities and other mine/industries in the areas to be part of the problem solving process that needs to address social service constraints. In this respect COZA will ensure that their employees are housed in formal housing with adequate services by including this as a contractual requirement when using service providers and by incentives to permanent employees such as housing allowance which can only be claimed when proof of formal residence is produced. o COZA will implement a stakeholder communication, information sharing and grievance mechanism to enable all stakeholders to engage with COZA on both socio-economic and environmental issues. Communication will additionally focus on the Maremane community residing in Lohatla as the directly affected community. According the Department of Rural Development and Land Reform, there are two official representative of the Maremane Community Property Association this includes Mr Mastididi and Mr Tswaro. COZA will ensure that both these members are consulted when discussing access to land.		
		• To combat HIV/AIDS it COZA will: o Provide condoms at hot spot areas, this includes local shebeens o Provide HIV/AIDS information pamphlets to major labour sending areas and areas of entertainment used by mine workers. o Develop a workplace HIV/AIDS policy that encourages testing and awareness on HIV/AIDS.	On-going	
		• As part of the COZA closure strategy COZA will: o Implement formal training policy and programme that		

Activity	Potential impact	Mitigation type	Time period for implementation	Compliance with standards
		aims to improve skills of employees o Conduct a skills assessment of all unskilled and semi-skilled employees and design a portable skills training program for the mine's employees. Portable skills refer to useful economic skills that an employee could use to augment their livelihoods.		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Land use impact	• Prior to construction, COZA will apply to the local municipality to change the land zoning from agriculture to mining. • During construction, operation and decommissioning COZA will implement the EMP commitments with a view not only to prevent and/or mitigate the various environmental and social impacts, but also to prevent negative impacts on surrounding land uses. • During closure planning COZA will incorporate measures to achieve the future land use plans for the land within the proposed project area	On-going As required	Not applicable

The waste management and soil conservation procedures applicable to the proposed project are included in Table 28-2 and Table 28-3 below.

TABLE 28-2:WASTE MANAGEMENT PROCEDURES FOR GENERAL AND HAZARDOUS WASTE

Items to be considered		Intentions
General	**Specific**	
Classification and record keeping	General	The waste management procedure for the mine will cover the storage, handling and transportation of waste to and from the mine. The mine will ensure that the contractor's responsible are made aware of these procedures.
	Waste opportunity analysis	COZA will assess each waste type to see whether there are alternative uses for the material. This will be done as a priority before the disposal option.
	Classification	Wastes (except those listed in Annexure 1 of the new Waste Regulations) will be classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation. Waste will be re-classified every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors.
	Safety data sheets	The mine will maintain, where required in terms of the Regulations, the safety data sheets for hazardous waste (prepared in accordance with SANS 10234).
	Inventory of wastes produced	The mine will keep an accurate and up to date record of the management of the waste they generate, which records must reflect: • The classification of the wastes • The quantity of each waste generated, expressed in tons or cubic metres per month • The quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of • By whom the waste was managed.
	Labelling and inventory of waste produced	Any container or storage impoundment holding waste must be labelled, or where labelling is not possible, records must be kept, reflecting: • The date on which waste was first placed in the container • The date on which waste was placed in the container for the last time when the container was filled, closed, sealed or covered • The dates when, and quantities of, waste added and waste removed from containers or storage impoundments, if relevant • The specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations, 2012 • The classification of the waste in terms of Regulation 4 once it has been completed (if required).
	Disposal record	Written evidence of safe disposal of waste will be kept.
	Record keeping	Records will be retained for a period of at least 5 years and will be made available to the Department on request.
Waste management	Collection points	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity and that these are serviced frequently.
	Laydown/ salvage areas	During decommissioning and closure, lay down areas for re-usable non-hazardous materials will be established.
	General waste	Will be stored in designated skips and removed by an approved contractor for disposal at a licensed facility.

Items to be considered		Intentions
General	**Specific**	
	Scrap metal and building rubble	Care will be taken to ensure that scrap metal and building rubble does not become polluted or mixed with any other waste. The scrap metal will be collected in a designated area for scrap metal. It will be sold to scrap dealers.
	Hazardous wastes	Hazardous waste will be temporarily stored in sealed containers in a bunded store before removal by an approved waste contractor and disposal in a licenced facility.
	Oil and grease	Oil and grease will be collected in suitable containers at designated collection points. The collection points will be bunded and underlain by impervious materials to ensure that any spills are contained. Notices will be erected at each waste oil point giving instructions on the procedure for waste oil discharge and collection. An approved subcontractor will remove oil from site.
	Diesel tanks	Bunds should be established around the diesel tanks
	Any soil polluted by a spill	If remediation of the soil *in situ* is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.
	Mixing of wastes	Waste will not be mixed or treated where this would reduce the potential for re-use, recycling or recovery; or result in treatment that is not controlled and not permanent.
Disposal	Off site waste disposal facilities	Waste will be disposed of at appropriate permitted waste disposal facilities.
		Unless collected by the municipality, the mine must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Waste Act prior to the disposal of the waste to landfill.
		Unless collected by the municipality, the mine must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Waste Act.
Waste transport	Contractor	A qualified waste management subcontractor will undertake the waste transport. The contractor will provide an inventory of each load collected and of proof of disposal at a licensed facility.
Banned practices	Long-term stockpiling of waste	Stockpiling of waste is a temporary measure. Waste stockpiling sites must have an impervious floor, be bunded and have a drainage system for collection and containment of water on the site.
	Burying of waste	No wastes will be buried on site.
	Burning of waste	Waste may only be burned in legally approved incinerators.

TABLE 28-3:SOIL MANAGEMENT PRINCIPLES

Steps	Factors to consider	Detail
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities and infrastructure that are described in the EIR and EMPr report, and where a clearly defined end rehabilitation use for the stripped soil has been identified. Soil stripping should be conducted a suitable period ahead of mining.
Stripping	Topsoil	A minimum of 400 mm topsoil will be stripped unless a soils expert advises otherwise.
Delineation of stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.
	Designation of the areas	Soil stockpiles will be clearly identifiable in terms of soil type and the intended areas of rehabilitation. All topsoil will be stockpiled in areas clearly demarcated on the infrastructure layout and should be defined as no-go areas.

Steps	Factors to consider	Detail
Stockpile management	Vegetation establishment and erosion control	Rapid growth of vegetation on the topsoil stockpiles will be promoted (e.g. by means of watering or fertilisation). The purpose of this exercise will be to encourage vegetation growth on soil stockpiles and to combat erosion by water and wind.
	Storm water controls	Stockpiles will be established with storm water diversion berms to prevent run off erosion.
	Height and slope	Soil stockpile height will be controlled to avoid compaction and damage to the underlying soils. In this regard, topsoil stockpiles should be limited to a maximum height of 2m.The stockpile side slopes should be flat enough to promote vegetation growth and reduce run-off related erosion. In addition to this, the topsoil stockpiles need to be established on a gradual slope if possible.
	Waste	No waste material will be placed on the soil stockpiles.
	Vehicles	Equipment movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
Rehabilitation of disturbed land: restoration of land capability	Placement of soil	Once the site has been cleared on infrastructure, the area to be rehabilitated should be ripped in order to reduce soil compaction. A minimum layer of 400 mm of topsoil will be replaced unless a soils expert advises otherwise. Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to restore disturbed areas to beneficial uses as quickly as possible.
	Fertilisation	Samples of stripped soils will be analysed to determine the nutrient status of the soil before rehabilitation commences. As a minimum, the following elements will be tested for cation exchange capacity, pH and phosphate. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed away and that erosion gulley's do not develop prior to vegetation establishment. If erosion is evident on the topsoil stockpiles, the side slopes can be stabilised through re-vegetation with indigenous species.
	Restore land function and capability	Apply landscape function analysis and restoration interventions to areas where soil has been replaced as part of rehabilitation, but the land function and capability has not been effectively restored.

29 FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

29.1.1 DESCRIPTION OF THE CLOSURE OBJECTIVES AND THE ALIGNMENT WITH THE BASELINE ENVIRONMENT

The closure objective will be to return the land to as close as practically possible to the pre-mining potential or as agreed with the land owner and the relevant authorities. At a conceptual level, decommissioning is a reverse of the construction phase with infrastructure and activities very similar to those described for the construction phase. The conceptual decommissioning plan is as follows:

- All surface infrastructure will be removed from site
- The open pit will be fully backfilled, however due to bulking, some waste rock may remain on surface
- Areas where infrastructure has been removed will be levelled and topsoil restored
- All waste and contaminated soil and water from the project area will be removed and disposed of appropriately.
- The social impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised.
- Mine closure is achieved efficiently, cost effectively and in compliance with the law.

Mineralised waste facility decommissioning:

- The remaining material on the waste rock dump will be shaped to prevent ponding and to create slopes that allow vegetation to establish on the facility
- Runoff and eroded material from the dump surface will be captured behind a perimeter bund and allowed to evaporate until vegetation has been properly established
- Aftercare and maintenance will be designed and implemented for the post closure phase
- Surface and groundwater quality will be monitored regularly for a period to be agreed upon with the relevant authorities.

The open pit:

- The open pit will be fully backfilled with waste rock or overburden material in order to mimic the natural topography as far as practically possible and prevent ponding of rainfall
- Allow vegetation to re-establish itself.

All other surface components:

- All other surface infrastructure will be broken down and reused or disposed of as waste
- Contaminated soils underlying the structures will be excavated and disposed of appropriately
- The soil and vegetation function of the land will be restored to be free draining as far as practically possible. Hard surface may need to be ripped

- Any residual excavations (excluding the open pit void) will be backfilled and levelled with selected overburden material and covered with between 300 mm and 500 mm of topsoil.

29.1.2 CONFIRMATION THAT THE CLOSURE OBJECTIVES HAVE BEEN CONSULTED WITH LANDOWNERS AND IAPS

The closure objectives were outlined in the scoping report which was made available to IAPs, including landowners for review and comment (Section 7.2). Further to this, IAPs including landowners will be given a further opportunity to review the closure objectives associated with the proposed project as part of the review of this EIA and EMPr report (Section 7.2).

To date no comments regarding the closure objectives associated with the proposed project have been received from IAPs including landowners.

29.1.3 REHABILITATION PLAN

The plan showing the location and aerial extent of the entire operation at the time of closure is illustrated in Figure 4-1.

29.1.4 COMPATIBILITY OF THE REHABILIATION PLAN WITH THE CLOSURE OBJECTIVES

It can be confirmed that the rehabilitation palnt is compatible with the closure objectives given that the closure objectives were taken into account during the determination of the financial provision.

29.1.5 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION

The information in this section was sourced from the closure cost calculation study completed by SLR (SLR, November 2015) and is included in Appendix Q. The closure cost assessment was undertaken in accordance to the DMR Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine.

The financial closure liability associated with the proposed COZA Iron Ore Project : Driehoekspan Section (as at approximately November 2015), life of mine is R 10 786.265 (including VAT). The annual forecasted financial provision for the 6 years of the proposed project is provided in Table 29-1 below. There is no decrease or increase in the financial closure liability over the life of mine since there is no additional infrastructure constructed during the life of mine, and the open pit area remains unchanged after the end of the first year (i.e. pit only gets deeper). Further details regarding the closure cost calculation is included in the closure cost assessment (SLR, September 2015) and is included in Appendix Q.

TABLE 29-1:FINANCIAL PROVISION (SLR, SEPTEMBER 2015)

Timeframe	Date	Financial Liability Calculations based on the following activities	Financial Liability incurred during the year (incl VAT)	Progressive Financail Liability (incl VAT)	Progressive Liability as a % of LOM liability
End of year 1	Dec 2017	Pre-stripping at open pit complete and mine production started	R 10, 786, 265	R 10, 786, 265	100%
End of Year 2	Dec 2018	Ongoing mine production and open pit development	R 0	R 10, 786, 265	100%
End of Year 3	Dec 2019	Ongoing mine production and open pit development	R 0	R 10, 786, 265	100%
End of Year 4	Dec 2020	Ongoing mine production and open pit development	R 0	R 10, 786, 265	100%
End of Year 5	Dec 2021	Ongoing mine production and open pit development	R 0	R 10, 786, 265	100%
End of Year 6	Dec 2022	LOM, end of mine opearations	R 0	R 10, 786, 265	100%

29.1.6 CONFIRMATION THAT THE FINANCIAL PROVISION WILL BE PROVIDED

The financial provision will be provided in the form of a bank guarantee.

30 MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE AGAINST THE EMP

Environmental impacts requiring monitoring are listed in Table 30-1 below.

TABLE 30-1:MONITORING OF COMPLIANCE AND PERFORMANCE IN TERMS OF EMPR

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare	Hazardous infrastructure	All mineralised waste facilities and water dams will be monitored to ensure stability, safety and prevention of environmental impacts. The findings will be documented for record-keeping and auditing purposes and addressed where relevant to achieve the stated objectives.	Qualified engineer	The frequency of the monitoring and the qualification of the monitoring personnel will be determined on an infrastructure specific basis. Monitoring will be undertaken for the duration of the mine.
Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Alteration of natural drainage patterns	An operational water balance for the mine needs to be developed from recorded flow measurements and production figures. This is done by an appropriately qualified person. The water balance is used to check on an on-going basis that the capacity of the dirty water holding facilities is adequate.	Environmental site officer	Updated on a monthly basis for the duration of the mine.

<table>
<tr><th>Activity</th><th>Impacts requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>Demolition
Maintenance and aftercare</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Earthworks
Civil works
Open pit mining
Processing plant
Transportation
Power supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition
Maintenance and aftercare</td><td>Contamination of groundwater resources</td><td>As part of the proposed project, COZA will implement a groundwater monitoring programme. As part of the monitoring plan, water samples will be taken around the Driehoekspan area and in the dam constructed for the purposes of dirty water management on a quarterly basis. A total of four source monitoring boreholes have been recommended and their position is indicated in Figure 30-2. Samples are to be analysed for chemical and physical constituents normally associated with iron ore mining which are tabulated below:
<table>
<tr><td>pH</td><td>Potassium</td></tr>
<tr><td>Electrical conductivity</td><td>Magnesium</td></tr>
<tr><td>Total dissolved solids</td><td>Sodium</td></tr>
<tr><td>Total hardness</td><td>Calcium</td></tr>
<tr><td>Total alkalinity as $CaCO_3$</td><td>Iron</td></tr>
<tr><td>Calcium</td><td>Manganese</td></tr>
<tr><td>Sulphate as SO_4</td><td>Turbidity</td></tr>
<tr><td>Nitrate as N</td><td></td></tr>
<tr><td>Aluminium</td><td></td></tr>
</table>
Monitoring boreholes will be capped and locked at all times
Borehole depths will be measures quarterly and the boreholes will be blown out with compressed air, if required.</td><td>Environmental site officer</td><td>Groundwater quality should be monitored bi-annually for the duration of the mine and for at least ten years after closure.

Groundwater quantity should be monitored on a quarterly basis for the duration of the mine and for at least ten years after closure.

The monitoring programme should be implemented at least one year prior to mining.

Groundwater monitoring reports need to be submitted to the DWS as per the conditions of the WUL.</td></tr>
<tr><td>Site preparation
Earthworks
Civil works
Open pit mining
Processing plant
Transportation</td><td>Air pollution</td><td>Continuous dustfall, PM10 and PM2.5 sampling will be conducted as part of the project’s air quality management plan. Sampling locations are indicated in Figure 30-1. Details of parameters to be sampled is given in table below.
<table>
<tr><th>No.</th><th>Description</th><th>Parameter to be</th><th>Reasoning</th></tr>
</table></td><td>Environmental site officer</td><td>Dust fallout monitoring must be undertaken on a monthly basis. Monitoring will be undertaken for the duration of the mine.

Dust fallout, PM10,</td></tr>
</table>

<table>
<tr><th>Activity</th><th>Impacts requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>Power supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition
Maintenance and aftercare</td><td></td><td>
<table>
<tr><th></th><th></th><th>Sampled</th><th></th></tr>
<tr><td>1</td><td>South western farm boundary location</td><td>Dustfall, PM_{10} and $PM_{2.5}$</td><td>Downwind of operations in area of simulated maximum impact near the most affected AQSR</td></tr>
<tr><td>2</td><td>SW operational location</td><td>Dustfall</td><td>On SW operational fence line, downwind of activities</td></tr>
<tr><td>3</td><td>NW operational location</td><td>Dustfall</td><td>On NW operational fence line</td></tr>
<tr><td>4</td><td>NE operational location</td><td>Dustfall</td><td>On NE operational fence line</td></tr>
<tr><td>5</td><td>SE operational location</td><td>Dustfall</td><td>On SE operational fence line, near topsoil storage area</td></tr>
<tr><td>7</td><td>Access road location</td><td>Dustfall</td><td>Along access road on farm boundary</td></tr>
</table>

Exhaust emissions testing be done on all mobile and stationary diesel combustion sources as part of equipment maintenance schedules.

Together with the monitoring, the following activities are to form part of the air quality monitoring programme:
• Development of an air quality monitoring database that will be updated on a monthly basis or as information becomes available. This information will be used in understanding the mine's air quality impacts and updating the dispersion model.
• Development of a monitoring response protocol after completion of the construction phase, this protocol is to</td><td></td><td>PM2.5 element monitoring should take place on a monthly basis.

Monitoring reports need to be uploaded onto the National Emissions Inventory System on annual basis.</td></tr>
</table>

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		describe procedures to be followed in event that air quality monitoring reveals that action must be undertaken. • Compilation of an annual compliance report presenting results of the monitoring and submission to authorities. • Maintenance of sampling equipment to ensure its effective functioning		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Demolition	Noise pollution	In the event that COZA receives noise related complaints during either construction or operation, COZA should conduct a short term (24-hour) ambient noise measurements as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The following procedure should be adopted for all noise surveys if required: • Any surveys should be designed and conducted by a trained specialist. • Sampling should be carried out using a Type 1 sound level meter (SLM) that meets all appropriate International Electrotechnical Commission (IEC) standards and is subject to annual calibration by an accredited laboratory. • The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session. • Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic climate should be taken. • The following acoustic indices should be recoded and reported: o LAeq (T) o Statistical noise level LA90 o LAmin and LAmax o Octave band or 3rd octave band frequency spectra. • The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.	Environmental site officer	Noise monitoring should be done for a month in the event of a noise releted complaint.

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		• Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet. • A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic climate of each site.		
Site preparation Earthworks Civil works Open pit mining Processing plant Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Demolition Maintenance and aftercare	Physical destruction and general disturbance of biodiversity	COZA will implement an alien/invasive /weed management programme to control the spread of these plants onto and form disturbed areas. This will be achieved by active eradication and the establishment of natural species and through on-going monitoring and assessment. The use of herbicides will be limited and focussed and will only be used under strict controls. Herbicides will be selected to ensure least residual harm. Herbicides will be administered by suitably qualified people. Continued monitoring will be undertaken to ensure that the alien invasive species have been eradicated and are controlled for both controlled sites as well as rehabilitated areas. A comprehensive monitoring programme of the protected trees within the area will be initiated. This monitoring should be conducted on an individual tree basis as well as monitoring on a community level. For each area requiring rehabilitation specific landscape functionality objectives will be set with expert input and the associated targets and monitoring programme will follow accordingly.	Environmental safety officer	The alien/invasive/weed management programme should be undertaken for the duration of the mine. After closure, repeat surveys should be carried out annually for at least the first three years post-rehabilitation.
Open pit mining	Blasting impacts (fly rock, air blasts and ground vibrations)	Monitoring of each surface blast will take as part of the proposed project. Points for off-site vibration and airblast monitoring will be identified in consultation with surrounding landowners and a blast monitoring specialist. The monitoring results will be documented and	Environmental safety officer	Blast monitoring will take place for the duration of blasting activities.

Activity	**Impacts requiring monitoring**	**Functional requirements for monitoring**	**Roles and responsibilities**	**Monitoring and reporting frequency and time period for management actions**
		maintained for record-keeping and auditing purposes.		

30.1 FREQUENCY OF PERFORMANCE ASSESSMENT REPORT

The environmental department manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy of the EMP report relative to the on-site activities will be assessed in the performance assessment. In addition, in accordance to Section 34 of GNR. 982 of NEMA, the holder of a mining right needs to submit an environmental audit report, prepared by an independent person, to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMP.

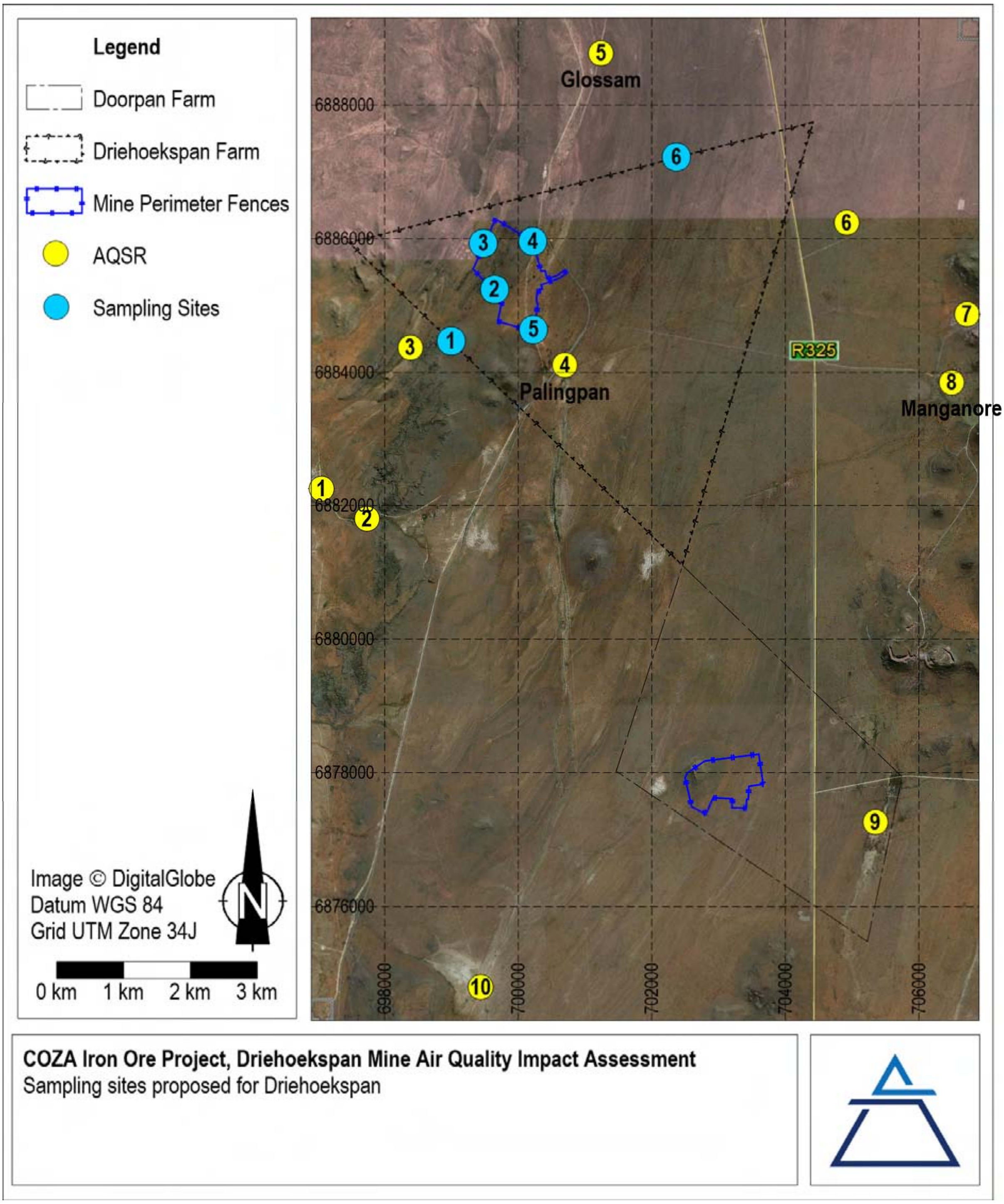


FIGURE 30-1: AIR QUALITY MONITORING POINTS (AIRSHED, 2015)

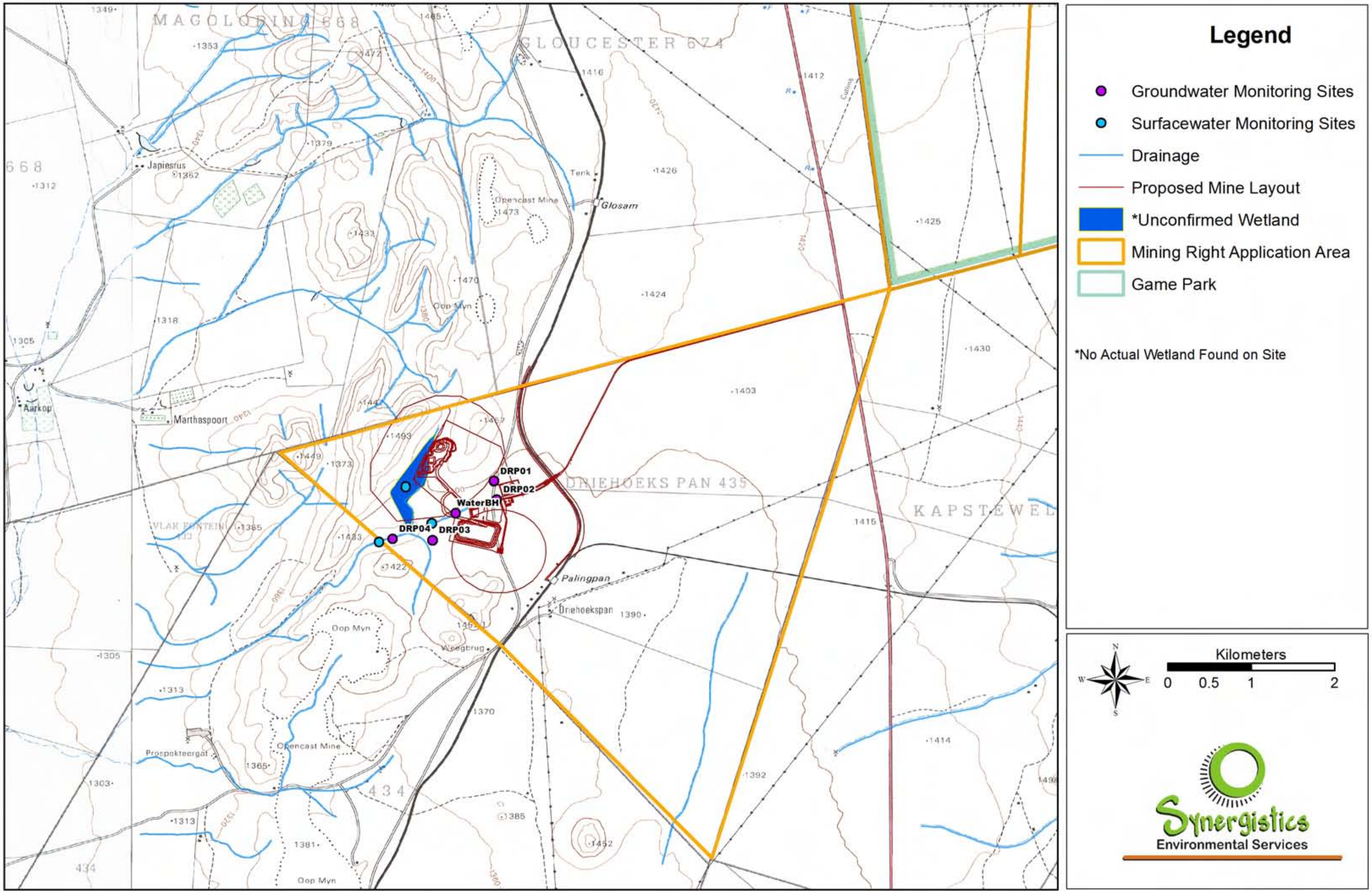


Figure 30-2: Surface and Groundwater Monitoring Sites

SO707

Coordinate System DMS	
Spheroid WGS84	Central Meridian LO

31 ENVIRONMENTAL AWARENESS PLAN

31.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

31.1.1 ENVIRONMENTAL INDUCTION TRAINING

The purpose of the induction training is to promote a general awareness of the sensitivity of the environment, the legal commitments and the aspirations of COZA Mining in terms of environmental management and the environmental consequences of individual actions. Induction is applicable to all employees, contractors and service providers that will be working within the mining area.

31.1.2 ENVIRONMENTAL INDUCTION FOR EMPLOYEES AND SERVICE PROVIDERS

The induction training for employees, contractors and service providers is to take the form of a presentation including:

- A description of environmental sensitivities in the COZA Iron Ore Project environment.
- A description of environmental legal requirements and COZA's commitment to comply with these requirements;
- A description of broad-based objectives of environmental management at the COZA Iron Ore Mine;
- A discussion of how individual actions can impact on the environment;
- A discussion of how individual actions can assist in the successful implementation of the environmental management programme (EMPR);
- The Code of Conduct.

All employees are to sign that they have understood and will comply with the Code of Conduct. Employees are to be re-inducted on an annual basis (after returning from their annual leave).

Requirements

- Environmental induction material (posters, power point presentations etc.);
- Code of Conduct;
- Register of inducted employees, service providers and contractors.

31.1.3 GENERAL ENVIRONMENTAL AWARENESS PROGRAMME

The purpose of the general environmental awareness programme is to promote ongoing environmental awareness amongst the workforce. It will focus on addressing particular environmental issues which have been identified as problematic through the Performance Assessment Programme and EMPR compliance monitoring. All members of the workforce and contractors at COZA's Iron Ore Mine at Driehoekspan are to be incorporated into the general environmental awareness programme.

31.1.4 MONTHLY ENVIRONMENTAL TOPICS

A monthly environmental awareness topic is to be chosen by management based on the outcomes of internal audits as well as topics of general environmental interest. The topic is to be communicated to the workforce through:

- Discussions at all SHE meetings (to be itemised on the agenda).
- Posters on notice boards.

Monthly environmental topics could include:

- What is the environment;
- The COZA environment;
- You and the environment;
- The Code of Conduct;
- Reporting environmental incidents;
- Environmental risks;
- Environmental emergency training;
- Preventing and cleaning up spills;
- Reduce, reuse and recycle;
- General versus hazardous waste;
- Alien vegetation control;
- Saving water;
- Saving energy;
- Historical sites.

Requirements

- Environmental topics to be included on the agenda of relevant meetings;
- Environmental awareness material to be produced and posted.

31.1.5 JOB SPECIFIC ENVIRONMENTAL AWARENESS TRAINING

The purpose of the job specific environmental awareness training is to ensure that employees within the specific management units are equipped to implement the actions committed to in the EMPr. All members of the COZA Iron Ore Mine's workforce are to be subject to job specific environmental training. This training is to undertaken by the managers of each of the management units. Supervisors will be trained to assist with the implementation and training of the work force.

31.1.6 ENVIRONMENTAL RISK IDENTIFICATION

The environmental risks associated with each management area are to be identified by the manager and supervisors together with the technical services manager. The risks are to be documented and actions to reduce these risks should be developed. The actions are to ensure overall compliance with the commitments of the EMPR. The findings of the performance assessment audits and EMPR compliance monitoring will assist in identifying risks.

31.1.7 TRAINING

All members of the workforce (mining, plant workers, administration etc.) are to be subject to job specific training. This may include but not be limited to:

- Preventing pollution
- Spill prevention and clean-up procedures
- The location and purpose of material safety data sheets (MSDSs)
- Managing waste
- No-go areas
- Incident reporting.

The aspects to be covered however are dependent on the findings of the individual risk assessments. This is to be undertaken for each management area initially. Thereafter all new members of the workforce are to undergo environmental training as part of the training required to do their particular job.

31.1.8 CORRECTIVE ACTION

- Any actions undertaken by a worker that pose a risk to the environment are to be stopped immediately.
- The worker is to be instructed in how to correct the action.
- Non-compliance is to be incorporated into the standard disciplinary procedure applicable to COZA.

Requirements

- Risk assessment and action plan for each area at the COZA Iron Ore Mine at Driehoekspan.
- Training of the workforce within each management area.
- Training of new members of the workforce.
- Records of appropriate training conducted.

31.1.9 COMMUNITY COMMUNICATION AND AWARENESS

The purpose of the external communication and awareness programme is to:

- Inform neighbouring and nearby landowners and land users of the environmental risks associated with operations at the COZA Iron Ore Mine.
- Inform and update interested and affected parties regarding environmental issues and monitoring undertaken.
- Provide a forum for communication of issues.

External communication is to include residents and land users on neighbouring and nearby farms, registered interested and affected parties, and interested authorities.

31.1.10 COMPLAINTS REGISTER

A complaints register is to be kept at the office within each section for the registration of internal complaints by employees and contractors. External persons will be able to officially register their complaints in a register kept at a readily accessible point (e.g. the main office at Coza Mine). Complaints are to be followed up by the appropriate manager and the person is to be notified (preferably in writing) of how the complaint has been addressed. Complaints can also be received by facsimile, mail or e-mail and all registered interested and affected parties will be notified of the contact details (see below).

31.1.11 NOTIFICATION OF INTERESTED & AFFECTED PARTIES

Registered interested and affected parties are to be provided with contact details for the mine and encouraged to direct their queries through this preferred channel of communication.

Requirements

- Register of interested and affected parties.
- Internal complaints registers at each section.
- External complaints register at the main office.

31.2 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

31.2.1 ON-GOING MONITORING AND MANAGEMENT MEASURES

The monitoring programme as described in Section 30 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

31.2.2 PROCEDURES IN CASE OF ENVIRONMENTAL EMERGENCIES

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). Procedures to be followed in case of environmental emergencies are described in Table 31-1 below.

31.2.2.1 General emergency procedure

The general procedure that should be followed in the event of all emergency situations is as follows.

- Applicable incident controller defined in emergency plans must be notified of an incident upon discovery
- Area to be cordoned off to prevent unauthorised access and tampering of evidence
- Undertake actions defined in emergency plant to limit/contain the impact of the emergency
- If residue facilities/dams, stormwater diversions, etc., are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Operations Engineer on shift must be notified
- Take photographs and samples as necessary to assist in investigation
- Report the incident immediately to the environmental department for emergencies involving environmental impacts or to the safely department in the case of injury
- The Environment department must comply with Section 30 of the National Environmental Management Act (107 of 1998) such that:
  - The Environment department must immediately notify the Director-General (DWS and DMR and Inspectorate of Mines as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of DMR, the head of the local municipality, the head of the regional DWS office and any persons whose health may be affected of:
    - The nature of the incident
    - Any risks posed to public health, safety and property
    - The toxicity of the substances or by-products released by the incident
    - Any steps taken to avoid or minimise the effects of the incident on public health and the environment.
- The Environment department must as soon as is practical after the incident:
    - Take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
    - Undertake clean up procedures;
    - Remedy the effects of the incident; and
    - Assess the immediate and long term effects of the incident (environment and public health);
  - Within 14 days the Environment department must report to the Director-General DWS and DEA, the provincial head of DMR, the regional manager of the DMR, the head of the local and district municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
    - The nature of the incident
    - The substances involved and an estimation of the quantity released
    - The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects)
    - Initial measures taken to minimise the impacts

- Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure
- Measures taken to avoid a recurrence of the incident.

31.2.2.2 Identification of Emergency Situations

The site wide emergency situations that have been identified together with specific emergency response procedures are outlined in Table 31-1.

31.2.2.3 Technical, management and financial options

Technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a mine of this scale and nature.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and mitigation measures as included in this EMPr report.
- The mine has an environmental management system in place where all operation identify, report, investigate, address and close out environmental incidents.
- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations.
- Where required, the mine will seek input from appropriately qualified people.

TABLE 31-1:EMERGENCY RESPONSE PROCEDURES

Item	Emergency situation	Response in addition to general procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that contamination will contaminate the land (leading to a loss of resource), surface water and/or groundwater, COZA will: • Notify residents/users downstream of the pollution incident. • Identify and provide alternative resources should contamination impact adversely on the existing environment. • Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. refuelling bays) and the infrastructure 'made safe'. • Contain the spill (e.g. construct temporary earth bund around source such as road tanker). • Pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal. • Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	Discharge of dirty water to the environment	Apply the principals listed for Item 1 above. To stop spillage from the dirty water system the mine will: • Redirect excess water to other dirty water facilities where possible • Pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system • Carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. • Apply for emergency discharge as a last resort.
3	Pollution of surface water (where relevant)	Personnel discovering the incident must inform the Environment department of the location and contaminant source. Apply the principals listed for Item 1 above. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. Contamination entering the surface water drainage system should be redirected into the dirty water system. The Environment department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.
4	Groundwater contamination	Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). Investigate the source of contamination and implement control/mitigation measures.
5	Burst water pipes (loss of resource and erosion)	Notify authority responsible for the pipeline (if not mine responsibility). Shut off the water flowing through the damaged area and repair the damage. Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.

Item	Emergency situation	Response in addition to general procedures
6	Flooding from failure of surface water control infrastructure	Evacuate the area downstream of the failure. Using the emergency response team, rescue/recover and medically treat any injured personnel. Temporarily reinstate/repair stormwater diversions during the storm event (e.g. emergency supply of sandbags). Close the roads affected by localised flooding or where a stormwater surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of animals and or people as relevant. Ensure medical assistance is available to recovered individual.
8	Veld fire	Evacuate mine employees from areas at risk. Notify downwind residents and industries of the danger. Assist those in imminent danger/less able individuals to evacuate until danger has passed. Provide emergency fire fighting assistance with available trained mine personnel and equipment.
9	Falling into hazardous excavations	Personnel discovering the fallen individual or animal must mobilise the emergency response team to the location of the incident and provide a general appraisal of the situation (e.g. human or animal, conscious or unconscious, etc.). The injured party should be recovered by trained professionals such as the mine emergency response team. A doctor (or appropriate medical practitioner)/ambulance should be present at the scene to provide first aid and transport individual to hospital.
10	Road traffic accidents (on site)	The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. Access to the area should be restricted and access roads cleared for the emergency response team. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). Casualties will be moved to safety by trained professionals and provided with medical assistance. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected. A nearby vet should be consulted in the case of animal injury
11	Development of informal settlements	The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24hrs.
12	Injury from fly rock	The person discovering the incident will contact the mine emergency response personnel to recover the injured person or animal and provide medical assistance. Whilst awaiting arrival of the emergency response personnel, first aid should be administered to the injured person by a qualified first aider if it is safe to do so.

Item	Emergency situation	Response in addition to general procedures
13	Uncovering of graves and sites	Personnel discovering the grave or site must inform the Environment department immediately. Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves must be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. The exhumation process must comply with the requirements of the relevant Ordinance on Exhumations, and the Human Tissues Act, 65 of 1983.
14	Uncovering of fossils	Personnel discovering the fossil or potential site must inform the Environment department immediately. Should any fossils be uncovered during the development of the site, a palaeontologist will be consulted to identify the possibility for research.

32 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The following documents will be submitted to the DMR from the start of construction until mine closure:

- In accordance to Section 34 of GNR. 982 of NEMA, the holder of a mining right needs to submit an environmental audit report, prepared by an independent person, to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMPr.
- The financial provision will be updated on an annual basis and submitted to the DMR

33 UNDERTAKING

I, Linda Munro, the Environmental Assessment Practitioner responsible for compiling this EMPR hereby confirm:

- The correctness of the information provided in the report
- The inclusion of comments and inputs form stakeholders and IAPs
- The inclusion of inputs and recommendations from the specialist reports where relevant
- The acceptability of the project in relation to the finding of the assessment and the level of mitigation proposed.

_________________________ Date: ____________________

Signature of the EAP

34 REFERENCES

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APPENDIX A: PROOF OF EAP QUALIFICATIONS

APPENDIX B: CURRICULUM VITAE OF EAP

APPENDIX C: LOCAL AND REGIONAL SETTING

If more Figures are required than included in report

APPENDIX D: SITE LAYOUT

Initial

Alternatives

If more Figures are required than included in report

APPENDIX E: STAKEHOLDER ENGAGEMENT DOCUMENTS

- NEMA/NEMWA application form
- Database
- Notice of intent letter submitted to the DWS
- DMR acceptance letter of relevant applications
- Background information document in English and Afrikaans
- Site notices in English and Afrikaans and photos of the site notices
- Advertisements placed in the Kalahari Bulletin and Kathu Gazette
- Formal invitations sent to IAPs to notify them of the public meeting
- Formal invitations sent to Regulatory authorities to notify them of the authorities meeting
- Minutes of the public meeting including the attendance register
- Minutes of the regulatory authorities meeting including the attendance register
- Correspondence from the land claims commissioner
- Summary documents of the scoping report submitted to IAPs and regulatory authorities in English and Afrikaans
- Proof of distribution of the scoping report and summaries to IAPs and regulatory authorities for review and comment
- Comments received during the review of the scoping report by IAPs and regulatory authorities

APPENDIX F: IMPACT ASSESSMENT AND RATING FOR EACH POTENTIAL IMPACT

The impact rating for each potential impact is provided in the section below. The criteria used to rate each impact is outlined in Section 7.6. The potential impacts are rated with the assumption that no mitigation measures are applied and then again with mitigation. An indication of the phases in which the impact will occur including the activity associated with each impact is provided below. A summary of the impact assessment is provided in Section 9.

Environmental impacts that will be assessed in this section include the following:

- Loss and sterilization of a mineral resource
- Hazardous excavations, infrastructure and surface subsidence
- Loss of soil resources and land capability through contamination
- Loss of soil resources and land capability through physical disturbance
- Physical destruction of biodiversity
- General disturbance of biodiversity
- Contamination of surface water resources
- Alteration of natural drainage patterns
- Contamination of groundwater resources
- Reduction of groundwater levels and availability
- Air pollution
- Noise pollution
- Blasting impacts
- Road disturbance and traffic safety
- Visual impacts
- Loss of heritage, cultural and palaeontological resources
- Economic impact
- Inward migration impact
- Land use impact

GEOLOGY

ISSUE: LOSS AND STERILIZATION OF MINERAL RESOURCE

Information in this section was sourced from the project team.

Introduction

Mineral resources can be sterilised and/or lost through the placement of infrastructure and activities in close proximity to mineral resources, by preventing access to potential mining areas, and through the disposal of mineral resources onto mineralised waste facilities (overburden stockpile) or as backfill in the open pit.

By the nature of mining projects the geology is exploited for the target minerals therefore the impact on the geology will be high in all project phases without mitigation.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Open pit mining Mineralised waste	Open pit mining Mineralised waste	Open pit mining Mineralised waste	Maintenance and aftercare of rehabilitated areas Final landforms i.e. remaining mineralised waste

Rating of impact

Severity / nature

The severity of sterilising mineral resources is considered to be high because of the associated potential economic value that is lost when sterilisation occurs.

In the unmitigated scenario, minerals can be deposited onto the overburden stockpiles or as backfill in the open pit and minerals can be sterilised because of the requirement of leaving a safety barrier between open pit workings and potential underground workings.

In the mitigated scenario, planning and co-ordination between the project team can help to prevent the unacceptable sterilisation of resources, without compromising safety requirements. The mitigated severity reduces to low.

Duration

If sterilisation of resources occurs it is likely that the related impact will extend beyond the life of mine. This is a long term duration.

Spatial scale / extent

In the first place, the spatial extent of the physical impact is linked to the spatial extent of the proposed project area. This is a localised spatial extent. If one however considers the economic nature of the impact, it will extend beyond the site into the broader economy.

Consequence

The unmitigated consequence is high. The mitigated consequence is medium.

Probability

Without mitigation the probability is high. With the implementation of mitigation measures, planning structures will be in place to avoid infrastructure and development related sterilisation. Further to this, with mitigation the probability associated with the open pit operations also reduces to low because if there is a need for safety barriers, care will be taken to leave only those barriers that are specifically required which is a safety reality that would face any future mining operation.

Significance

The unmitigated significance is high. In the mitigated scenario the significance is low.

Summary of the rated loss and sterilisation of mineral resources impact per phase of the project

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	L	H	M	M	L	L

TOPOGRAPHY

The topography (as described in Section 7.4.1.2) will be changed by the proposed infrastructure and excavations associated with proposed mine. The following related issues have been identified and are discussed further in the sections emphasised by brackets:

- Hazardous excavations and infrastructure, surface subsidence and the dangers they present to animals and humans (This section)
- Changes to surface water flow and related impacts (Under surface water in this Appendix)
- Visual impacts (Under visual impacts in this Appendix).

ISSUE: HAZARDOUS EXCAVATIONS AND INFRASTRUCTURE

Information in this section was sourced from the project team.

Introduction

Hazardous excavations and infrastructure include all structures into or off which third parties and animals can fall and be harmed. Included in this category is surface subsidence associated with mining areas. Hazardous excavations and infrastructure occur in all mine phases from construction through operation to decommissioning and closure. In the construction and decommissioning phases these hazardous excavations and infrastructure are usually temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term hazardous excavations and infrastructure and the closure phase will present final land forms that are considered hazardous. Included in this category are structes that could fail.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works Foundations Trenches Stockpiles Scaffolding Cranes Use of support services and amenities	Open pit mining and concurrent backfilling Primary crushing Mineralised waste facilities Water dams/reservoirs Voids Trenches Buildings and equipment Pipelines Use of support services and amenities	Open pit void Mineralised waste facilities Water dams/reservoirs Trenches Scaffolding Cranes Piles of rubble Piles of scrap Demolition Rehabilitation Use of support services and amenities	Remaining mineralised waste Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity/ nature

In the unmitigated scenario, in all project phases, most of the identified hazardous structures and excavations present a potential risk of injury and/or death to both people and animals for all the proposed project. This is a potential high severity.

In the mitigated scenario the severity reduces to moderate with the implementation of management measures focused on access control and the design of the open pit concurrent rehabilitation components through roll-over mining to prevent and/or mitigate impacts.

Duration

In the context of this assessment, death or permanent injury is considered a long term, permanent impact. This cannot be reduced with mitigation.

Spatial scale/ extent

Direct impacts associated with hazardous infrastructure and excavations will be located within the site boundary in all project phases, with or without mitigation. The potential indirect impacts for the proposed project will extend beyond the site boundary to the communities to which the injured people and/or animals belong. This cannot be reduced with mitigation.

Consequence

The consequence is high in both the unmitigated and mitigated scenarios.

Probability

In the unmitigated scenario, without design and management interventions the impact probability is expected to be medium. The mitigation measures will focus on infrastructure safety design and implementation as well as on limiting access to third parties and animals which reduces the probability of the impact occurring.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance of this potential impact is medium because there will be a reduction in probability that the impact occurs.

Summary of the rated hazardous excavations and infrastructure impact per phase of the project

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H
Mitigated	M	H	M	H	L	M

SOIL AND LAND CAPABILITY

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH CONTAMINATION

Information in this section was sourced from the Soils and Agrictultural Potential specialist report compiled by ARC Institute for Soil, Climate and Water (2013) and included in Appendix I.

Introduction

Soil is a valuable resource that supports a variety of ecological functions. The proposed project has the potential to damage soil resources through physical disturbance and/or contamination. Contamination of soils also has the potential to impact both surface and groundwater resources. Surface and groundwater contamination impacts are discussed under their respective headings in this Appendix. The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. This section therefore focuses directly on the potential for disturbance and contamination of the soil resources and the effect this has on land capability.

There are a number of sources in all phases that have the potential to pollute soil resources. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although the sources are temporary in nature, the potential related pollution can have long term effects. The operational phase will present more long term potential sources and the closure phase will present final land forms that may have the potential to contaminate soils through long term seepage and/or run-off.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works General construction activities Cement mixing Management of dirty water Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (non-mineralised) Equipment servicing Use of vehicles and equipment that may leak lubricants and fuel Use of support services and amenities	Servicing equipment Management of dirty process water/effluent Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (mineralised and non-mineralised) Open pit mining and concurrent backfilling Primary crushing Use of support services and amenities	General building activities Management of dirty water Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (mineralised and non-mineralised) Equipment servicing Use of vehicles and equipment that may leak lubricants and fuel Demolition Rehabilitation Backfilling of the final open pit void Use of support services and amenities	Seepage and run-off from final landforms i.e. remaining mineralised waste Maintenance and aftercare of rehabilitated areas

Rating of impacts

Severity/nature

In the unmitigated scenario, pollution of soils from numerous incidents can result in a loss of land capability as an ecological driver because it can create a toxic environment for vegetation and ecosystems that rely on the soil. It could also negatively impact on the chemistry of the soils such that current growth conditions are impaired. While it is noted that the land capability in the area is generally low, the proposed infrastructure will be located in areas with deeper soils and slightly better soil potential. This is a medium severity in the unmitigated scenario.

In the mitigated scenario the number of pollution events should be significantly less which reduces the potential severity to medium.

Duration

In the unmitigated scenario, most pollution impacts and associated loss in land capability will remain long after closure. In the mitigated scenario most of these potential impacts should either be avoided or be remedied within the life of the project, which reduces the duration to low. This will be achieved by the effective reaction time of the clean-up team and the chosen remediation methods.

Spatial scale/extent

In both the unmitigated and mitigated scenarios for all phases, the potential loss of soil resources and associated land capability will be restricted to within the site boundary.

Consequence

In the unmitigated scenario the consequence is medium. In the mitigated scenario the consequence is reduced to low as the severity and duration of the impact is reduced.

Probability

Without any mitigation the probability of impacting on soils and land capability through pollution events is high. With mitigation, the probability will be significantly reduced because emphasis will be placed on preventing pollution events and on quick and effective remediation if pollution events do occur.

Significance

In the unmitigated scenario, the significance of this potential impact is medium. In the mitigated scenario, the significance reduces to low because with mitigation the severity, duration and probability associated with the potential the impact all reduce.

Summary of the rated loss of soil resources and land capability through contamination impact per phase of the project

Mitigation	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	M	H	M
Mitigated	L	L	L	L	L	L

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Information in this section was sourced from the Soils and Agrictultural Potential specialist report compiled by ARC Institute for Soil, Climate and Water (May, 2013) and included in Appendix I..

Introduction

Soil is the key to re-establishing post closure land capability. There are a number of activities/infrastructure in all phases that have the potential to disturb soils and related land capability through removal, compaction and/or erosion. Decommissioning related activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term activities. During the closure phase, even though activities that cause physical disturbance of soil and associated land capability will not occur during the closure phase, final rehabilitated areas may be susceptible to erosion.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Soil stripping Cleaning and grubbing	Open pit mining and concurrent backfilling	Soil stripping Cleaning and grubbing	Erosion of final land forms i.e. remaining mineralised waste

Construction	Operational	Decommissioning	Closure
Earthworks Civil works Preparation of the foundations Compacting bases Opening trenches General building activities Slope stabilization Building roads Vehicle movement Developing open pit Use of support services and amenities	Primary crushing Vehicle movement Stockpile development Mineralised waste facility development Use of support services and amenities	Material movement General decommissioning activities Slope stabilization Vehicle movement Demolition Rehabilitation Backfilling of the final open pit void Use of support services and amenities	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity/nature

In the unmitigated scenario, physical soil disturbance can result in a loss of soil functionality as an ecological driver. In the case of erosion, the soils will be lost to the area of disturbance, and in the case of compaction the soils functionality will firstly be compromised through a lack of rooting ability and aeration, and secondly the compacted soils are likely to erode because with less inherent functionality there will be little chance for the establishment of vegetation and other matter that naturally protects the soils from erosion. While it is noted that the land capability in the area is generally low, the proposed infrastructure will be located in areas with deeper soils and slightly better soil potential. This amounts to a high severity.

In the mitigated scenario, the soils can be conserved and reused which reduces the high unmitigated severity to medium.

Duration

In the unmitigated scenario the loss of soil and related functionality is long term and will continue after the life of the mine. In the mitigated scenario, the soil is conserved, replaced and the functionality restored which reduces the duration of the impact to medium.

Spatial scale/extent

In both the unmitigated and mitigated scenarios for all phases of the project, the potential loss of soil and land capability through physical disturbance will be restricted to within the site boundary.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium as the severity and duration of the impact is reduced.

Probability

Without any mitigation the probability of losing soil and related land capability is definite. With mitigation, the probability will be reduced because emphasis will be placed on soil conservation and re-establishment.

Significance

In the unmitigated scenario the impact is high. In the mitigated scenario the significance of this impact is reduced to low as the severity, duration and probability are reduced.

Summary of the rated loss of soil resources and land capability through physical disturbance impact per phase of the project

Management	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmanaged	**H**	**H**	**L**	**H**	**H**	**H**
Managed	**M**	**M**	**L**	**M**	**L**	**L**

BIODIVERSITY

ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY

Information in this section was sourced from the specialist flora study underaken by ecologist Tania Anderson (January, 2014) and the specialist fauna study undertaken by zoolist and field biologist Beryl Wilson (January, 2014). Copies of the specialist studies are included in Appendix J and Appendix K respectively.

Introduction

There are a number of activities/infrastructure in all phases that have the potential to destroy biodiversity in the broadest sense. In this regard, the discussion relates to the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Soil stripping Cleaning and grubbing Earth works Civil works Preparation of the foundations Compacting bases Infrastructure establishment Slope stabilization Building internal linear infrastructure	Soil stripping Opn pit mining and concurrent backfilling Dewatering Primary crushing Vehicle movement Waste management (mineralised and non-mineralised) Stockpile development Exploration	Material movement General building activities Slope stabilization Vehicle movement Water management (mineralised and non-mineralised) Demolition Rehabilitation Backfilling of open pit final void	Final landforms i.e. remaining mineralised waste Maintenance and aftercare of rehabilitated areas

Construction	Operational	Decommissioning	Closure
Vehicle movement Initial open pit development Stockpile development Waste management (non-mineralised) Use of support services and amenities	Water management Open pit mining Use of support services and amenities	Use of support services and amenities	

Rating of impact

Severity/nature

Areas of high ecological sensitivity are functioning biodiversity areas with species diversity and associated intrinsic value. In addition, some of these areas host protected species. The linking areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas which is a key function for the broader ecosystem. The transformation of land for any purpose, including mining and associated activities, increases the destruction of the site specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance.

An area of high terrestrial ecological sensitivity for the project in the dry watercourse ecological unit. It should be noted that no infrastructure will be placed within this area of high sensitivity and as far as possible, infrastructure will be limited to areas of medium and low sensitivity. The open pit will be located in an area of medium-high sensitivity. The proposed project will require the removal of protected tree species *Vachellia erioloba* (Camel Thorn) and *Boscia Albitrunca* (Shepherd's Tree) and removal permits from DAFF and DENC will need to be obtained before removal.

Dewatering activities could impact on a keystone species, *Vachellia erioloba* (Camel Thorn) because it is sensitive to groundwater level changes. This species can have very deep roots (30 – 60 m) and groundwater between 10 – 60 m supports these species. The expected cone of depression caused by dewatering in the immediate vicinity of the open pit is therefore likely to impact on these species. This impact cannot be mitigated.

When considering the above cumulatively in the context of existing mining operations in the broader area, this impact exacerbates the potential risk of losing ecosystem functionality in the broader area which amounts to a high severity when unmitigated. With the correct mitigation measures being put in place, the physical disturbance of floral species can be limited somewhat; however by the very nature of opencast mining, the proposed activities will still be invasive. If the correct mitigation measures are put in place, some of the destruction could be avoided entirely and where such destruction has occurred, rehabilitation could establish a functional ecosystem. This amounts to a mitigated severity of medium.

Duration

In the unmitigated scenario the loss of biodiversity and related functionality is long term and will continue after the life of the mine. With mitigation, biodiversity and related functionality may be partially restored during the operational, decommissioning and closure phases. The duration can therefore reduce to medium in the mitigated scenario.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of impacts will extend beyond this boundary in both the mitigated and unmitigated scenario. Key related issues are the migration of species and the flow of nutrients.

Consequence

In the unmitigated the consequence is high and reduces to moderate with mitigation.

Probability

Without mitigation the probability is definite. With mitigation, the probability may be reduced to medium with correct management measures and concurrent rehabilitation.

Significance

The significance of this impact is high without mitigation, reducing to medium with the correct mitigation measures.

Summary of the cumulatively rated loss of biodiversity through physical destruction impact per phase of the project

Management	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmanaged	**H**	**H**	**H**	**H**	**H**	**H**
Managed	**M**	**M**	**M**	**M**	**M**	**M**

ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Information in this section was sourced from the specialist flora study underaken by ecologist Tania Anderson (January, 2014) and the specialist fauna study undertaken by zoolist and field biologist Beryl Wilson (January, 2014). Copies of the specialist studies are included in Appendix J and Appendix K respectively.

Introduction

There are a number of activities/infrastructure that have the potential to directly disturb vegetation, vertebrates and invertebrates in all project phases, particularly in the unmitigated scenario. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term occurrences that may have pollution potential through long term seepage and/or run-off.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Soil stripping Cleaning and grubbing Earthworks Civil works Preparation of the foundations Compacting bases Infrastructure establishment Slope stabilization Building internal linear infrastructure Vehicle movement Initial open pit development Stockpile development Waste management (non-mineralised) Use of support services and amenities	Soil stripping Open pit mining and concurrent backfilling Dewatering Primary crushing Vehicle movement Waste management (mineralised and non-mineralised) Stockpile development Exploration Water management Underground mining Open pit mining Use of support services and amenities	Material movement General building activities Slope stabilization Vehicle movement Water management (mineralised and non-mineralised) Demolition Rehabilitation Backfilling of open pit final void Use of support services and amenities	Final landforms i.e. remaining mineralised waste Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

In the unmitigated scenario, biodiversity may be disturbed in the following ways:

- Lighting can attract large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances
- Powerlines can lead to bird kills
- People may kill or harvest various types of fauna and flora species for food, for sport, for fire wood etc.
- Excessive dust fallout from various dust sources (the stockpiles and crusher) may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation
- Noise and vibration pollution (from the open pit activities, vehicle movement, materials handling etc.) may scare off vertebrates and invertebrates. In some instances the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities
- The increased presence of vehicles in the area can cause road kills especially if drivers speed
- Blasting could harm species in the fly rock zone
- The presence of mine water impoundments may lead to drowning of fauna

- Contamination of water and soil and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

Taken together, the disturbances will have a high severity in the unmitigated scenario. In the mitigated scenario, many of these disturbances can be prevented or mitigated to acceptable levels, which reduces the severity to low.

Duration

In the unmitigated scenario, the impact is long term because where biodiversity is compromised, killed or removed from the area this impact is likely to exist beyond the life of the project. With mitigation, most of these disturbances will cease upon closure; however, any imbalances caused by disturbances will take some time to restore.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of general disturbances will extend beyond the site boundary in the unmitigated and mitigated scenario. Key related issues are the migration of species and linkages between biodiversity areas. This is a medium spatial scale.

Consequence

In the unmitigated scenario, the consequence of this potential impact is high. With mitigation, this reduces to low because the severity and duration reduce.

Probability

Without any mitigation, the probability of negatively impacting on biodiversity through multiple disturbance events is high. With mitigation, the probability can be reduced to low because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures.

Significance

In the unmitigated scenario, the significance of this potential impact is high reducing to low with mitigation.

Summary of the cumulatively rated general disturbance of biodiversity impact per phase of the project

Management	Severity	Duration	Spatial Scale	Consequence	Probability of Occurrence	Significance
All phases						
Unmanaged	**H**	**H**	**M**	**H**	**H**	**H**
Managed	**L**	**M**	**M**	**L**	**L**	**L**

SURFACE WATER

ISSUE: ALTERATION OF NATURAL DRAINAGE PATTERNS

Information in this section was sourced from the surface water study (Jeffares and Green, December 2013) included in Appendix L.

Introduction

There are a number of activities/ infrastructures which could alter drainage patterns and result in the reduction of surface runoff in the catchment to downstream water users throughout all phases of the project. There are no surface water resources within the mining infrastucture. Rainfall and surface water run-off will be collected in all areas that have been designed with water containment infrastructure as required by legislation. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. During the construction, operational and decommissioning phase, these activities will continue until such time as project infrastructure can be removed and/or the project areas are rehabilitated. During the closure phase rehabilitation will allow for the restoration of drainage patterns.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities	Earthworks Civil works Site management Transport systems Non-mineralised waste management Mineralised waste management Open pit mining and concurrent backfilling Use of support services and amenities	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Mineralised waste management Backfilling final open pit void Use of support services and amenities Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impacts

Severity/nature

According to the 1:50 000 topographical map, a drainage line occurs to the south-east of the proposed open pit. However, as discussed in the baseline section (Section 7.4.1.6), no defined drainage lines as indicated in the 1: 50 000 topo map have been found on site. From a delineation exercise, three ephemeral drainage lines traversing Farm Driehoekspan were identified. Runoff within the mining area is largely undefined surface sheetflow.

According to the NFEPA database, there is a wetland in the project area. However, as discussed in the baseline section (Section 7.4.1.7), based on site assessment there were no hydromorphic plants, signs of surface wetness and topographical charecteristics suggesting the presence of a wetland or pan. Therefore there are no wetlands within the project area.

There are drainage lines west of the mining area that may be altered by mining activities through the reduction MAR due to containment at the mine. During the construction, operation, decommissioning, and to a lesser extent, the closure phases, rainfall and surface water run-off will be collected in all areas that have been designed as “dirty areas” with water containment infrastructure. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns.

The project area is located in quaternary catchment D73A of the Lower Vaal Management Area. This catchment is defined as an endoheic system and has MAR equal to 0. This is due to the fact that any surface flow in the catchment only leaves as evaporation or seepage. Based on this, impact on MAR in the catchment area is considered low.

Duration

In the unmitigated scenario, the alteration of drainage patterns will extend beyond closure. In the mitigated scenario, the duration of the alterations will mostly be restricted to the phases before closure.

Spatial scale / extent

In the mitigated and unmitigated scenario the physical alteration of drainage patterns will extend beyond the site boundary as flow reduction impacts could extend further downstream.

Consequence

In the unmitigated scenario the consequence is high. In the mitigated scenario the consequence is medium prior to closure and low thereafter because of reductions in duration and severity.

Probability

The probability of the alteration of drainage patterns is definite, but the magnitude of the reduced flows is unlikely to result in substantial deterioration and related flow impacts downstream therefore probability is medium until closure when it is expected to reduce to low.

Significance

The significance is high in all phases without mitigation. With mitigation this reduces to medium prior to closure and to low thereafter.

Summary of the rated alteration of natural drainage patterns impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Unmitigated	**M**	**H**	**M**	**H**	**M**	**H**
Mitigated	**M**	**M**	**M**	**M**	**M**	**M**
Closure						
Unmitigated	**M**	**H**	**M**	**H**	**M**	**H**
Mitigated	**L**	**L**	**M**	**L**	**L**	**L**

ISSUE: CONTAMINATION OF SURFACE WATER RESOURCES

Information in this section was sourced from the surface water study (Jeffares and Green, December 2013) included in Appendix L and through observations by the SLR team.

Introduction

There are a number of pollution sources in all project phases of the proposed project that have the potential to pollute surface water, particularly in the unmitigated scenario. In the construction, decommissioning and closure phases these potential pollution sources are temporary and diffuse in nature. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long term potential sources. After closure remaining landforms such as residue facilities present long term potential sources.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works Site management Transport systems Non-mineralised waste management Support services and amenities	Earthworks Civil works Site management Transport systems Non-mineralised waste management Mineralised waste management Open pit mining and concurrent backfilling Use of support services and amenities	Demolition Earthworks Civil works Site management Transport systems Non-mineralised waste management Mineralised waste management Backfilling final open pit void Use of support services and amenities Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impacts

Severity/nature

In the unmitigated scenario, surface water may collect contaminants (hydrocarbons, salts, and metals) from numerous sources. Potential construction and decommissioning phase pollution sources include:

- Sedimentation from erosion
- Spillage from portable toilets, spillage of construction fuel, lubricants, cement or leaks from vehicles and equipment.

Potential operational phase pollution sources include:

- Spills of potentially polluting materials such as chemicals, fuel and lubricant
- Contaminated discharges from the dirty water systems including: sewage treatment and conveyance infrastructure, dirty water containment facilities, stockpile areas, dirty water pipelines, workshops etc.
- Contaminated runoff and seepage from waste rock dump (from initial boxcut development)
- Sedimentation from erosion.

At elevated concentrations these contaminants can exceed the relevant limits imposed by DWS and can be harmful to humans and livestock if ingested directly and possibly even indirectly through contaminated vegetation, vertebrates and invertebrates. The related unmitigated severity is high.

In the mitigated scenario, clean water will be diverted away from the project areas and contaminated run-off and process water will be contained and re-used in the normal course. This includes groundwater ingress in the open pit. No discharge to planned. The severity can therefore be reduced to medium.

Duration

In the unmitigated scenario, the potential health impacts are long-term, occurring for periods longer than the life of proposed project. With mitigation, pollution can be prevented and/or most of the health impacts can be reversed or mitigated within the life of proposed project.

Spatial scale / extent

In the mitigated and unmitigated scenarios the spatial scale is likely to extend beyond the proposed project area because contamination is mobile once it reaches flowing watercourses. This will be more of an issue in the rainy season because most of the watercourses in the broader area are non-perennial.

Consequence

In the unmitigated scenario the consequence is high and in the mitigated scenario it is medium.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach surface water resources?
- Will people and livestock utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the surface water resources within the proposed project area. Due to the proximity of the proposed project to an ephemeral drainage line, contaminants could reach surface water resources, although it should be noted that this drainage line does not flow regularly and contaminants might only reach this preferential flowpath once in flow.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. There is a limited possibility that this will occur given that there is no reliance on surface water resources in the area, for domestic use or livestock watering.

The third element is that it is likely that only some contaminants will be at a level which is harmful to humans and livestock. This is influenced both by the quality of any discharged water and by the diluting effect of any rainwater particularly in the rainy season.

As a combination, when considering the nature and location of the proposed infrastructure in proximity to the ephemeral drainage line, the unmitigated probability is medium, reducing to low with mitigation.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance is reduced to low because of the reduction in severity, duration and probability.

Summary of the rated pollution of water resources impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	**H**	**H**	**M**	**H**	**M**	**H**
Mitigated	**M**	**M**	**M**	**M**	**L**	**L**

GROUNDWATER

ISSUE: REDUCTION OF GROUNDWATER LEVELS AND AVAILABILITY

Information in this section was sourced from the groundwater study undertaken by Groundwater Complete (January 2014) included in Appendix H.

Introduction

The dewatering of seepage water from the open pit associated with the proposed open pit mining activities as well as abstraction of water from proposed project boreholes has the potential to cause dewatering in the operational phase. Lowering of groundwater levels through dewatering and abstraction may cause a loss in water supply to surrounding borehole users.

Activities and infrastructure - link to mine phases

Construction	Operation	Decommissioning	Closure

Construction	Operation	Decommissioning	Closure
Water supply and use	Open pit mining and dewatering Water supply and use	Recovery of water levels Water supply and use	Recovery of water levels

Rating of impact

Severity / nature

Water for use in the mining activities and as potable water will be sourced from a single borehole. It is expected that approximately 2 416 m^3/month will be pumped from this borehole for year 1-4 and 1 961m^3/day for year 5 and 1 809 m^3/day for year 6. An area of approximately 4.1 km^2 was estimated to be affected by the planned groundwater abstraction at the end of year 6. The predicted cone of depression is shown in Figure 34-1 and shows that one third party borehole, Drie02 is located within the cone of depression. The drop in water level is predicted to be up to two metres at this borehole. It should be noted that this borehole was not in use at the time of the hydrocensus.

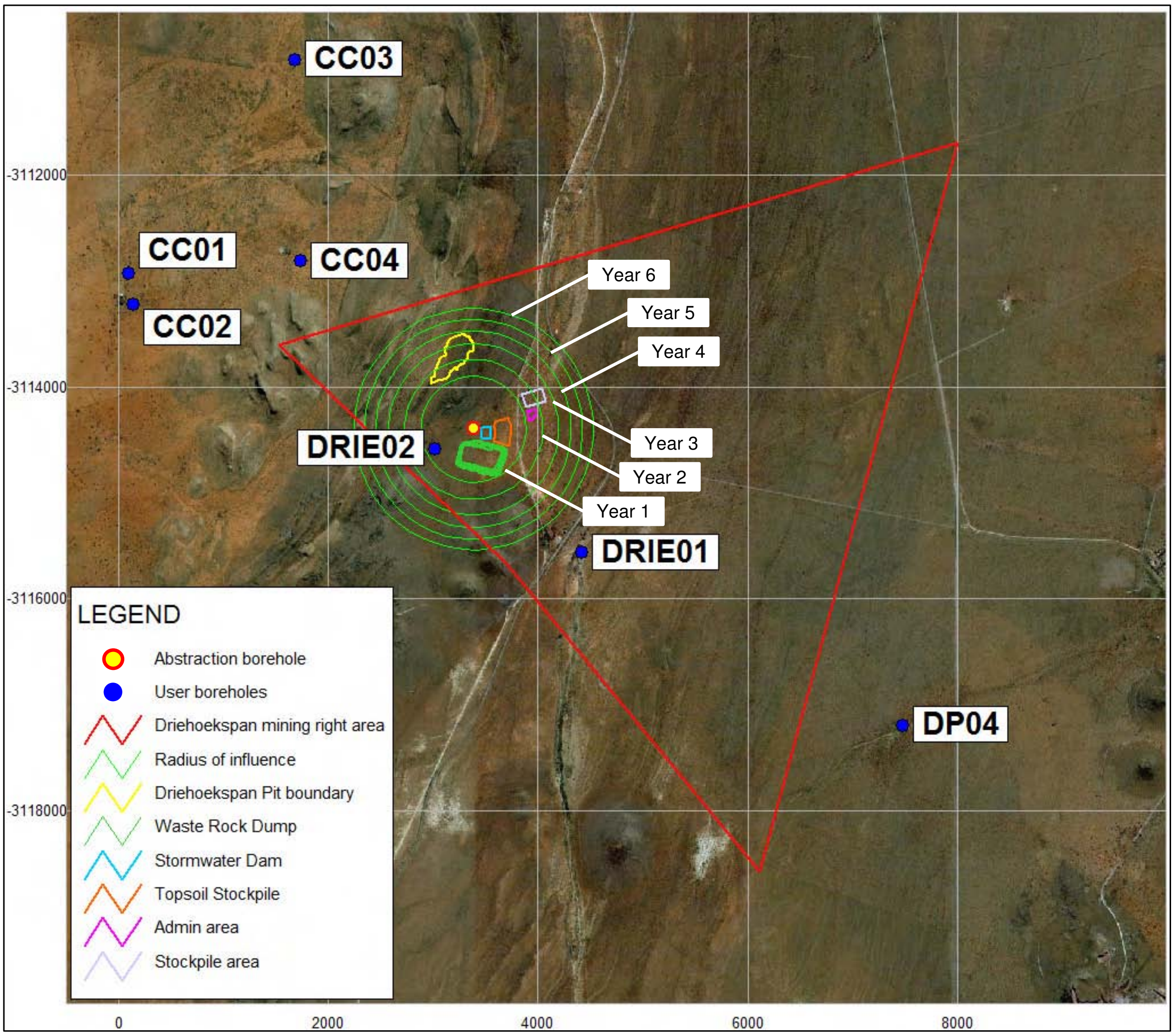

FIGURE 34-1: CONE OF DEPRESSION MODELLED FOR GROUNDWATER ABSTRACTION (GROUNDWATER COMPLETE, 2015B)

Based on the results of the groundwater modelling, mining will only reach the groundwater table in year 5. An ingress or inflow of 10 - 20 m^3/day is expected in the open pit in year 6, when the pit will reach maximum depth. A maximum groundwater level drawdown of approximately six metres was simulated for the fifth year and a drawdown of approximately 11 metres was simulated for the sixth year of mining. The cone of depression was simulated not to exceed the pit boundary by more than 100 metres for both year 5 and year 6 – refer to Figure 34-4. No third party boreholes have been found within the cone of depression. It should be noted that this cone of depression was simulated without any transmissive geological structures such as dykes. It is possible that such structures occur within the pit area which could increase the ingress expected, however detailed geophysical surveys will be required to determine this.

The construction of surface infrastructure is expected to cause a small reduction in aquifer recharge due to compaction. Similarly any leakage from water dams could increase the recharge slightly. These impacts are however not considered to be significant.

Although no impacts on surrounding groundwater users are exected to occur, the aquifer structure will be altered wherever it is intersected by the open pit. This will lead to permanently altered aquifer conditions where material was removed and replaced as part of the mining operations. The transmissivity and storativity of the backfilled open pit will be higher than the pre-mining aquifers. Because the sedimentary rocks surrounding the iron ore body have relatively low transmissivity values, impacts on the natural flow pattern in the mining area are expected to be noticeable but limited to the pit area. The extent of impact however depends on the transmissivity of geological structures and discontinuities that may or may not intersect the open pit. Dedicated and detailed geophysical surveys would be needed to identify and define such structures and determine the extent of this potential impact.

It is estimated that groundwater levels will take in the order of 140 years to recover after active mining and dewatering has ceased. Decant is not expected because evaporation is expected to far exceed recharge within the backfilled open pit.

Based on the above discussions, the severity of reduction of groundwater levels is considered to be moderate, and can be reduced to low with mitigation.

<u>Duration</u>

The duration of the impacts is linked to the duration of the dewatering and the recharge time thereafter. It is expected that the duration of dewatering activities will not extend beyond closure, however water levels will not recover until well after closure in both the mitigated and unmitigated scenarios. This is a high duration.

Spatial scale / extent

The spatial scale of the known dewatering cones will extend beyond the site boundary which is a medium spatial scale in both the unmitigated and mitigated scenarios.

Consequence

In the unmitigated scenario the consequence is high. With mitigation it reduces to medium.

Probability

In the unmitigated scenario it is possible that dewatering activities at the mine will impact third party boreholes and result in a decrease in water supply. In the mitigated scenario it is unlikely that the drawdown will impact third party boreholes which reduces the probability to low.

Significance

In the unmitigated scenario the significance is medium. This reduces to low with mitigation.

Summary of the rated dewatering impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operations, decommissioning and closure						
Unmitigated	**M**	**H**	**M**	**H**	**M**	**M**
Mitigated	**L**	**H**	**M**	**M**	**L**	**L**

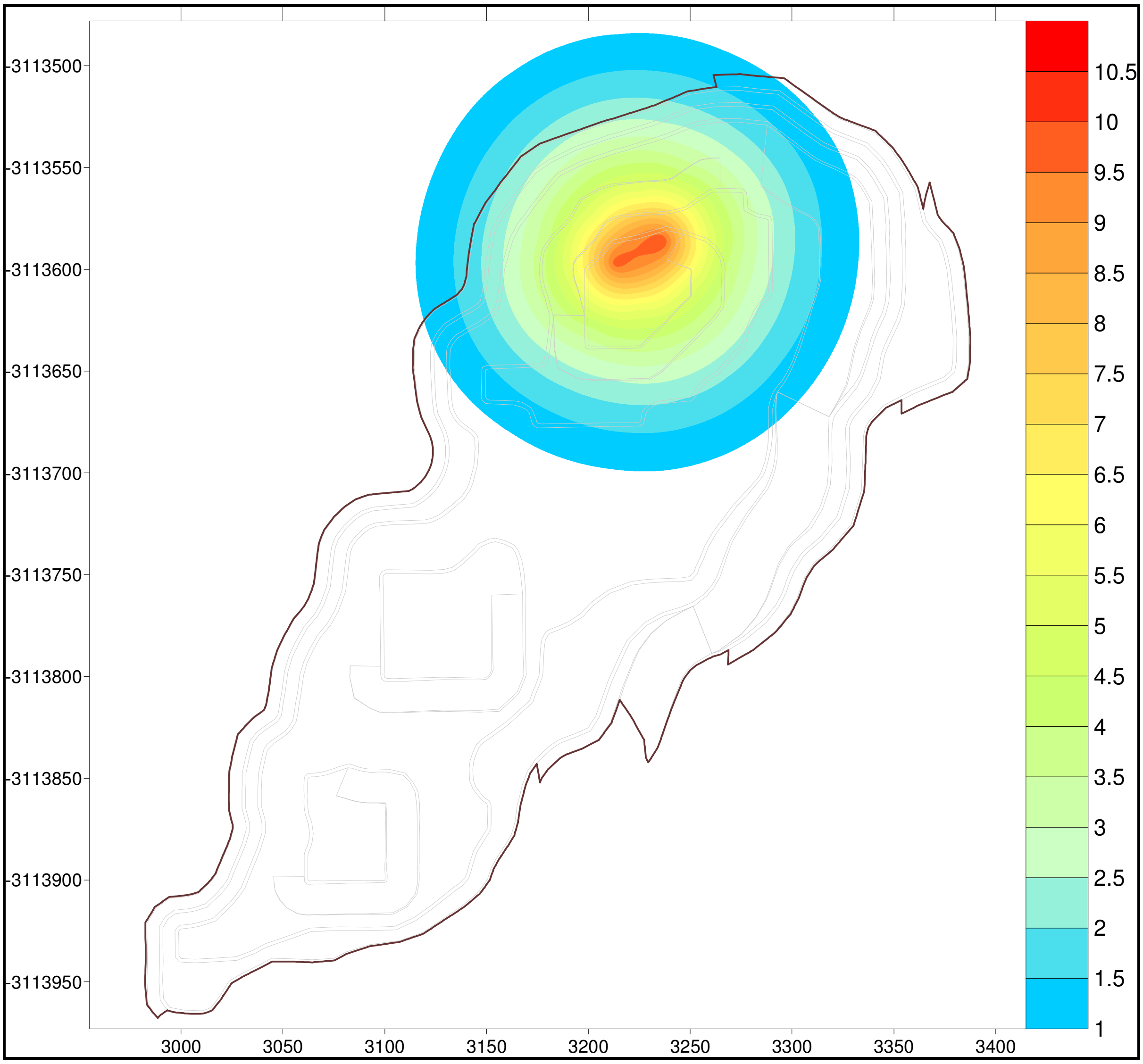

FIGURE 34-2: CONE OF DEPRESSION FOR YEAR 6 (GROUNDWATER COMPLETE, 2016)

ISSUE: CONTAMINATION OF GROUNDWATER RESOURCES

Information in this section was sourced from the groundwater study undertaken by Groundwater Complete (January 2014) included in Appendix H.

Introduction

There are a number of sources in all mine phases that have the potential to pollute groundwater. In the construction, decommissioning and closure phases some of these potential pollution sources are temporary and diffuse in nature. Even though the sources are temporary in nature, related potential pollution can be long term. The operational phase will present more long term potential sources. Any remaining landforms such as residue facilities will present residual pollution sources after closure.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (non-mineralised) Sanitation Servicing equipment Use of support services and amenities	Open pit mining and concurrent backfilling Primary crushing Servicing equipment Dirty water management and related facilities Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (mineralised and non-mineralised) Stockpile development Sanitation Pipelines Use of support services and amenities Underground mining	Servicing equipment Storage and handling of new and used materials and chemicals (including hydrocarbons) Waste management (mineralised and non-mineralised) Sanitation Dirty water management and related facilities Backfilling of open pit final void Use of support services and amenities Demolition Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impacts

<u>Severity / nature</u>

There is some potential for accidental spills and leaks on surface during all project phases to reach groundwater where the groundwater level is very shallow. Groundwater could become contaminated through the incorrect stockpiling of potentially polluting waste materials during the construction and decommissioning of infrastructure. Possible sources of groundwater contamination during the operational phase include leaks from dirty water holding facilities, seepage from blasting residues and exposure of groundwater to exposed rock, as well as seepage from the overburden rock and other stockpiles. During operation, decommissioning and after closure there is also a potential for groundwater resources to be contaminated from backfilling the open pit with overburden rock, as well as from any mineralised waste that may be left on surface due to bulking.

With reference to Section 7.4.1.3, the overburden material associated with the proposed project is not exepcted to generate acid. However there may be potential for elevated aluminium concentrations in leachate from overburden and ore. In addition, it is possible that blast residue related nitrates can be associated with overburden. If this material is stockpiled or used for backfill, it presents a potential pollution risk for both surface and groundwater in both the short and long term.

The groundwater contaminant transport model was prepared which focussed on determining the contamination plume of the open pit, waste rock dump, waste storage facility, stockpiles, workshops and fuel depot (included in the administrative block) and storm water management dam was conducted by Groundwater Complete (2014). It should be noted that although waste rock will be concurrently backfilled into the open pit, some waste rock may remain on surface after the final void is filled due to bulking. The groundwater modelling included the full extent of the waste rock dump as a precautionary approach.

The exact concentrations of contaminants in groundwater pollution plumes cannot be estimated to a high degree of accuracy therefore the modelling assigns a concentration of 100 % to all sources and shows the expected percentage of the plumes emanating from these pollution sources. The modelling considered no mitigation measures such as liner systems. The results of the modelling show that (Groundwater Complete, 2014):

- No significant groundwater quality impacts are expected over the life of mine – refer to Figure 34-3. This is due to:
    - Low groundwater recharge percentage
    - Low transmissivity of host rock
    - Dilution with fresh groundwater and contaminant dispersion
    - During active opencast mining and until a new groundwater equilibrium has been reached (expected >50 years post mining), the mine void will act as groundwater sink and groundwater will move radially inwards towards the void. This means that during this period any pollution generated by the mining activities is more likely to move towards the mine void and cannot drain towards the immediate surroundings.
- Groundwater quality within the backfilled open pit will gradually improve due to recharge. Contamination emanating from the backfilled open pit and remaining waste rock dump will be slow due to the overall low transmissivity of the fractured rock aquifer which will greatly restrict the rate of contamination movement away from the open pit. The pollution plumes were simulated not to exceed a maximum distance of approximately 100 meters in the down gradient direction at a time of 50 years post closure at a concentration less than 10 % of the pollution source – refer to Figure 34-4. No third party boreholes have been found within the modelled plume.

Taking the above into consideration the severity in the unmitigated scenario is moderate and can be reduced to low with mitigation.

<u>Duration</u>

Groundwater contamination and the potential related health impacts on third parties are long term in nature, occurring for periods longer than the life of project.

<u>Spatial scale / extent</u>

Groudnwater modelling showed that pollution will not exceed the project boundary during the operational phase or 50 years after active mining has ceased. This is therefore a low spatial extent in both the unmitigated and mitigated scenarios.

Consequence

The unmitigated consequence is moderate.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach groundwater resources?
- Will people and animals utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the groundwater resources underneath or adjacent to the proposed project area. Due to the proximity of the sources to groundwater in the shallow aquifer, contaminants could reach groundwater resources over time.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. No third party boreholes are located within the contamination plume zone,.

The third element is whether contamination is at concentrations which are harmful to users. Given that existing groundwater qualities are moderate to poor, with elevated Manganese, iron, selenium, sodium, chloride, EC, zinc, aluminium and fluoride it is not a certainty that mine related contamination will worsen the water quality, particularly in the mitigated scenario.

As a combination, the unmitigated impact probability is moderate and low in the mitigated scenario.

Significance

The unmitigated significance is moderate and the mitigated significance is low.

Summary of the rated contamination of groundwater impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operations, decommissioning and closure						
Unmitigated	**M**	**H**	**L**	**M**	**M**	**M**
Mitigated	**L**	**H**	**L**	**M**	**L**	**L**

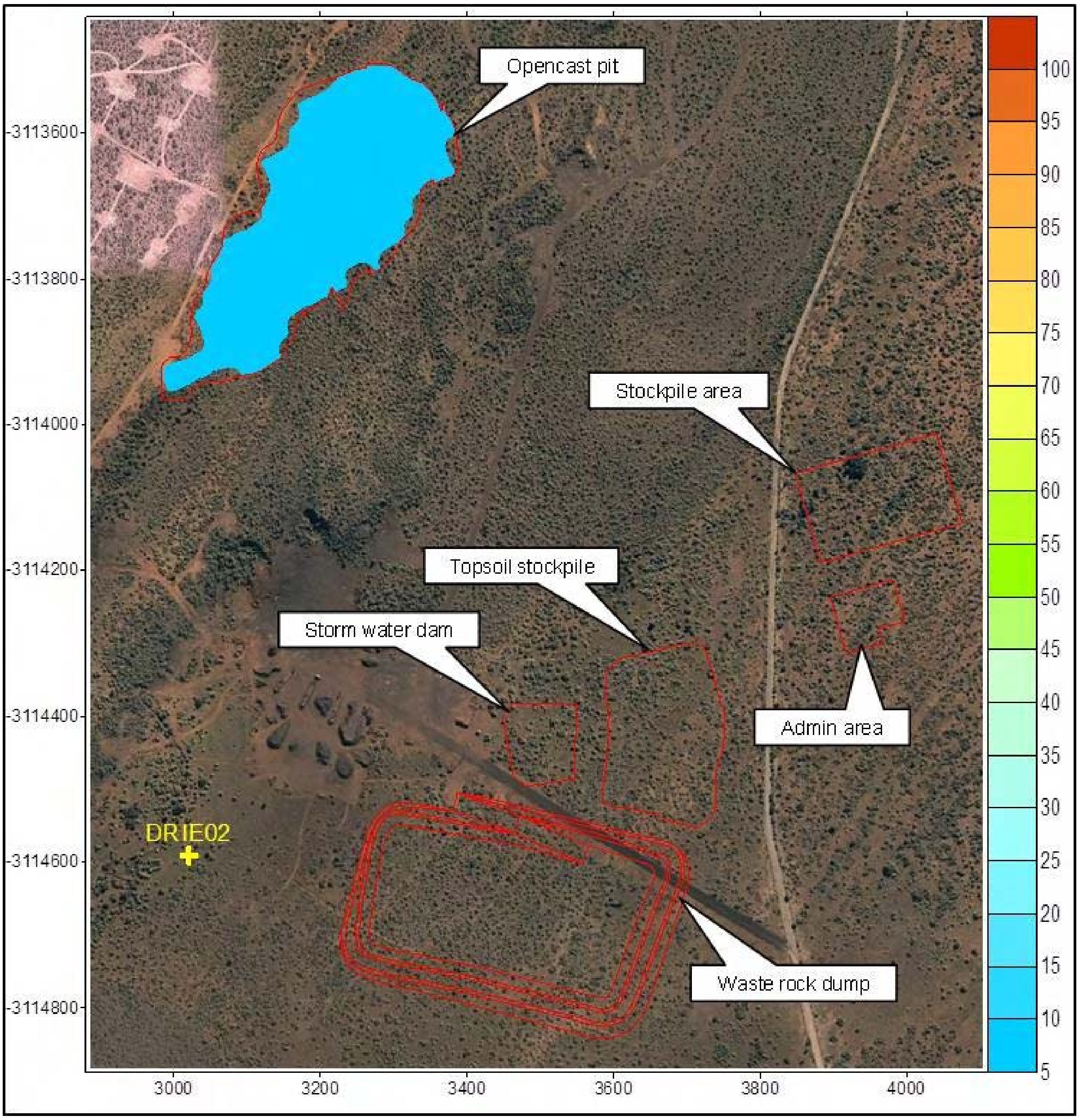

FIGURE 34-3: SIMULATED POLLUTION PLUMES AT MINE CLOSURE (GROUNDWATER COMPLETE, 2014)

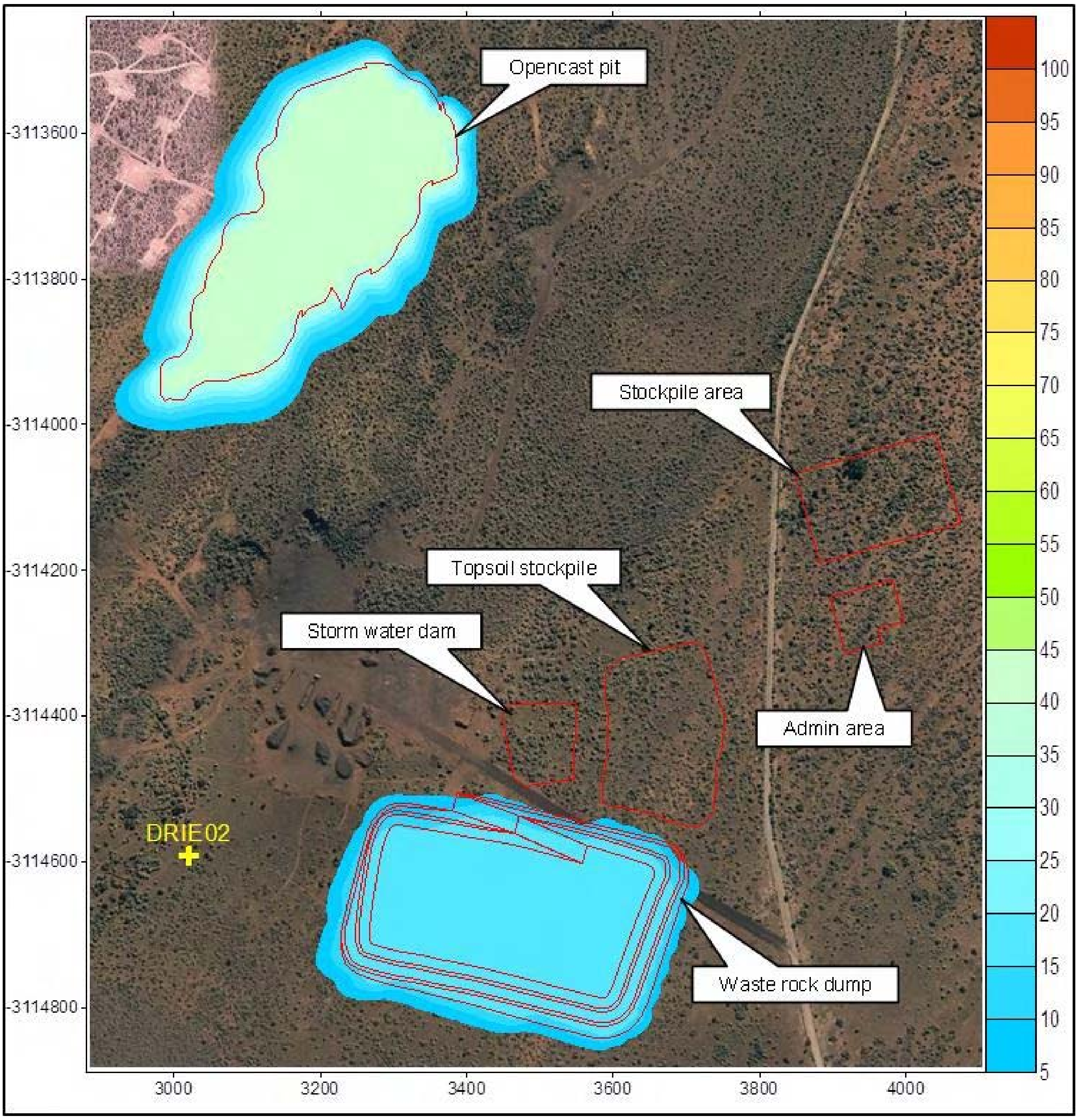

FIGURE 34-4: SIMULATED POLLUTION PLUMES 50 YEARS AFTER CLOSURE (GROUNDWATER COMPLETE, 2014)

AIR QUALITY

ISSUE: AIR POLLUTION

Information in this section was sourced from the air quality assessment report undertaken by Airshed Planning Professionals (APP) (May 2016) and included in Appendix M.

Introduction

There are a number of activities/infrastructure in the operation and decommissioning phases that have the potential to pollute the air. In the decommissioning phase these activities are temporary in nature. The operational phase will present more long term pollution sources. The closure phase will present final rehabilitated areas that may have the potential to pollute the air through long term wind erosion.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Soil stripping Cleaning and grubbing Earthworks Civil works Preparation of the foundations Compacting bases General building activities Slope stabilization Building internal linear infrastructure Vehicle movement	Soil stripping Overburden removal Drilling and blasting Open pit mining and backfilling Primary crushing Vehicle movement and exhaust fumes Soil management activities Mineralised waste management Stockpile development General materials handling	Removal of infrastructure Vehicle movement General material handling Soil management activities Mineralised waste management Slope stabilization Backfilling the final void of the open pit Demolition Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impact

Severity / nature

An assessment of the project impacts on air quality due to the above listed sources was undertaken. The assessment focused on the operational phase as the construction and decommissioning phase are not considered to produce significantly higher impacts as opposed to the operational phase.

The purpose of the assessment was to determine impacts on human health and the environment through simulation of concentration of pollutants of concern for the project. The main contaminants associated with the proposed activities include: inhalable particulate matter less than 2.5 and 10 microns in size (PM2.5 and PM10), larger total suspended particulates (TSP) that relate to dust fallout, and vehicle exhaust emissions including carbon monoxide (CO), nitrogen oxides (NO_x), sulpur dioxide (SO_2) and volatile organic compounds (VOC). To determine impacts to human health and the environment, the following air quality standards/applications were used:

- National Ambient Air Quality Standards (NAAQS) published on 13 March 2009
- National Dust Control Regulations (NDCR) published on 1st November 2013

The potential for health impacts associated with non-criteria pollutants emitted from mobile and stationary diesel combustion sources are assessed according to guidelines published by the following institutions:

- Inhalation RfCs and URFs published by the US EPA IRIS

- Reference Exposure Levels (RELs) and Cancer Potency Values (CPV) published by the California Environmental Protection Agency (CAL EPA)
- The Texas Commission on Environmental Quality (TCEQ).

Sensitive air quality receptors were identified for the project and are presented in Section 7.4.1.8 of the main report.

An emissions inventory list was prepared for the proposed mine during the operation phase and the main emissions sources include (Airshed, 2015A):

- Fugitive dust emissions:
  - Blasting – $PM_{2.5}$, PM_{10} and TSP
  - Crushing – $PM_{2.5}$, PM_{10} and TSP
  - Drilling – $PM_{2.5}$, PM_{10} and TSP
  - Handling of ore and waste rock – $PM_{2.5}$, PM_{10} and TSP
  - Transport of ore and waste rock, vehicle entrained dust from road surfaces (paved and unpaved) – $PM_{2.5}$, PM_{10} and TSP
  - Windblown dust – $PM_{2.5}$, PM_{10} and TSP.
- Vehicle exhaust emissions - CO, DE, NOx, PM2.5, PM10, SO2 and VOC

It should be noted that the density and particle size of the ore being mined makes windblown dust from the mining and waste rock dump unlikely. Therefore only windblown dust from topsoil storage was considered in this assessment.

The following points should be noted with regard to the emiissions inventory (Airshed, 2015A):
- Vehicle entrained dust from unpaves roads, primary crushing and materials handling will contribute most notably to TSP, PM10 and PM2.5 during operations
- Annual PM emmissions can be reduced significantly (55 tp 65 %) through the application of the most basic mitigation i.e. waster sprays and chemical suppressants or binding agents.

Table 34-1 below provides estimated annual emissions from Driehoekspan per source group. Due to the close proximity of the proposed COZA Iron Ore: Doornpan Mine to the Driehoekspan Section, the Doornpan emissions were also considered in the assessment undertaken by Airshed to produce cumulative impacts for the project.

TABLE 34-1: ESTIMATED ANNUAL EMISSION RATES FROM DRIEHOEKSPAN PER SOURCE GROUP (APP, 2015B)

Source Group	Annual emission rates (t/a)								Annual emission rates (t/a) with additional mitigation		
Driehoekspan:	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**DE (diesel exhaust)**	**NO_x**	**SO_2**	**VOC**	**TSP**	**PM_{10}**	**$PM_{2.5}$**
Blasting	1.28	0.663	0.0384						1.28	0.663	0.0384
Crushing	210	60	17.1						105	30	8.57
Drilling	14.1	7.4	3.89						4.23	2.22	1.17
Materials Handling	134	63.3	9.58						100	47.4	7.18
Paved Roads	13.7	2.63	0.635						13.7	2.63	0.635
Unpaved Roads	786	224	22.4						196	56	5.6
Vehicle Exhaust	6.01	6.01	5.52	30.6	6.01	73.6	0.198	6.71	6.01	6.01	5.52
Windblown Dust	12.1	6.06	3.03						6.06	3.03	1.52
Total (Driehoekspan)	**1180**	**370**	**52.2**	**30.6**	**6.01**	**73.6**	**0.198**	**6.71**	**433**	**148**	**30.2**
Total (Doornpan)	**567**	**176**	**35.6**	**30.3**	**5.45**	**72.8**	**0.196**	**6.64**	**231**	**80.1**	**19.6**

Airshed simulated impacts on sensitive receptors as a result of mining operations. The following air quality impacts are predicted (APP, 2016A):

- Diesel Exhaust (DE): excess lifetime cancer risk at most air quality receptors is considered low with the exception of receptor 3 which has a moderate risk and receptor 5 which has a low/moderate risk. When considering the cumulative impact of Doornpan and Driehoekspan, the same receptors have low/moderate risk. Sensitive receptor 3 is an empty building associated with the nearby railway line.
- NO2 concentrations are very low with no exceedances of the NAAQS of 40 µg/m3 off-site. The 1-hour NAAQS (88 hours of exceedance of 200 µg/m3) was however exceeded along the access road to Driehoekspan and the south-western mine rights boundary of Doornpan when considered cumulatively. However this exceedance was not sumulated to occur at any sensitive receptors.
- PM2.5 concentrations were very low with some exceedances of the NAAQS of 20 µg/m3 south west of the mine boundary. The 24 hour (4 days of exceedance of 40 µg/m3) was exceeded at receptors 3 and 4. However with mitigation these exceedances can be eliminated.
- PM10 concentration exceeded the NAAQS of 40 µg/m3 off-site to the south-west of Driehoekspan and at AQSR 3. The 24 hour standards (4 days of exceedance of 75 µg/m3) is also exceeded at off-site and at several AQSRs. Mitigaiton can reduce the concentration to levels that exceed only the 24-hour NAAQS off-site.
- Dustfall rates are in exceedance of 600 mg/m2-day, the limit for residential areas, only in very close proximity to areas of disturbance and not in any of the sensitive receptors identified.

Based on the abovementioned impacts, the severity of air quality pollution linked to impacts on human health and is considered high in the unmitigated scenario. In the mitigated scenario the impact is reduced to medium.

Duration

Without mitigation, the duration of health related impacts could extend beyond closure. With mitigation, the duration of impacts will be limited to the life of the project.

Spatial scale / extent

The spatial scale of the potential impact could beyond the site boundary in both the mitigated and unmitigated scenarios.

Consequence

Without mitigation the consequence of air pollution is high and with mitigation it is reduced to medium.

Probability

The health impact probability is linked to the probability of ambient concentrations exceeding the evaluation criteria in relation to sensitive receptors. As concertation have been predicted to exceed at receptor 3 for various pollutants and is exceeded at all receptors for PM10, the probability is therefore high in the unmitigated scenario. The probability should reduce with mitigation.

Significance

The significance of this impact is high in the unmitigated scenario and can be reduced to medium with mitigation.

Summary of the cumulatively rated air pollution impact

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, oerations and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M

NOISE

ISSUE: NOISE POLLUTION

Information in this section was sourced from the noise specialist study undertaken by Airshed Planning Professionals (APP, January 2016) for the proposed project (refer to Appendix Q).

Introduction

Two types of noise are distinguished: noise disturbance and noise nuisance. The former is noise that can be registered as a discernible reading on a sound level meter and the latter, although it may not register as a discernible reading on a sound level meter, may cause nuisance because of its tonal character (e.g. distant humming noises).

Proposed activities/infrastructure present the possibility of generating both noise disturbances and noise nuisance in the project phases prior to closure. Refer to the biodiversity section in this appendix for the potential noise impacts on biodiversity. This section will only focus on the potential human related noise impacts.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Use of generators Site preparation Earthworks Civil works	Open pit mining Drilling Blasting Earth moving equipment	Open pit mining Vehicle movement Earth moving equipment Backfilling the final void of	

Construction	Operational	Decommissioning	Closure
Vehicle movement Earth moving equipment General building activities Drilling and blasting if needed for foundations and terracing	Material tipping Vehicle movement Open pit mining and backfilling Use of generators Primary crushing Transportation Mineralised waste management	the open pit Material tipping Stripping of buildings and equipment Use of generators Demolition Rehabilitation	

Rating of impact

Severity / nature

Sensitive noise receptors have been identified in Section 7.4.1.10. Noise impacts were simulated for the operational phase for the following sources (APP, 2015B):

- Diesel mobile equipment
- Ore processing through crushing
- Transport of ore and waste
- Personnel transport.

The South African National Standard (SANS) 10103 provides a standard of 55 dBA during the day and 45 dBA during the night for urban districts. The International Finance Corporation (IFC) provides the same guidelines for urban districts and furthermore states that that noise impacts should not increase by more than 3 dBA.

The noise modelling showed the following:

- During the day, noise levels remain within the South African National Standard (SANS) 10103 day-time guideline of 55 dBA. The highest day-time impact is expected to occur at receptor 4 (Palingpan) with an increase of 2 dBA, which is well below the IFC guidelines.
- At night, the guideline of 45 dBA will be exceeded at the same receptor 4 with a noise increase modelled to be 6.3 dBA. This is well above the IFC guideline of 3 dBA increase.

Taking the above into consideration, the impact is rates as having a high severity in the unmitigated scenario. This can be reduced to low with mitigation.

Duration

In both the unmitigated and mitigated scenarios the noise pollution impacts will generally occur until the closure phase of the mine when the noise generating activities are stopped. This is a medium duration.

Spatial scale / extent

In both the unmitigated and mitigated scenarios the noise impacts will extend beyond the site boundary. This is a medium spatial scale.

Consequence

The unmitigated consequence is medium and the mitigated consequence is low.

Probability

The unmitigated probability of the predicted noise increases causing a noise related disturbance at the nearest sensitive receptors is considered to be high without mitigation. With mitigation the probability reduces to low.

Significance

The unmitigated significance is medium and can be reduced to low with mitigation given that the severity and probability of the impact are reduced.

Summary of the rated noise pollution impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	M	M	M	H	M
Mitigated	L	M	M	L	L	L

BLASTING

ISSUE: BLASTING DAMAGE

Introduction

The main activity that has the potential to cause blasting hazard is mining of the pit. This activity will occur during the operational phase only. Some blasting may occur during the construction phase, for foundation establishment, but this will be limited (if needed). Blasting activities have the potential to impact on people, animals and structures located in the vicinity of the proposed project area. Air quality impacts and biodiversity impacts are discussed under their respective headings in this Appendix and as such will not be re-assessed in this section.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
-	Open pit mining	-	-

Rating of impact

Severity / nature

Blasting hazards include ground vibration, air blast and fly rock which can cause damage to buildings and/or harm people and animals.

Fly rock generation is related to the energy or mass of explosives and the containment of the energy on all sides of the blast area. In general, larger blastholes tend both to throw larger rocks over greater distances. Containment of fly rock is important because it has the potential to cause injury and death to people and animals. It can also damage structures. In unmitigated scenarios fly rock can extend more than 1000 m from the blast site. In the mitigated scenario, this can be kept within a range of less than 500 m. Death or injury to a third party is considered a high severity impact in both the unmitigated and mitigated scenarios.

Ground vibrations from blasting travel directly through the ground. The related impact on structures (such as buildings and reservoirs) depends on velocity and frequency of vibrations and the integrity of the built structures. The United States Bureau of Mines (USBM) standard of 12mm/s peak particle velocity is applied as a general guideline for blast management in South Africa as a “safe” limit for brick and mortar structures in the usual range of blasting vibration frequencies (4 – 12 Hz). In the unmitigated scenario, third party structures, depending on their location in relation to the mining activities, could be at risk where peak particle velocities greater than 12 mm/s are generated by blasting. In the mitigated scenario, assuming that the blast design will consistently result in a peak particle velocity of 12 mm/s or below at all third party structures, these should not be damaged. As a result, the blast design must be specific to manage impacts on surrounding structures.

Airblast is an air pressure pulse that has both a high frequency audible sound and a low frequency inaudible concussion. If the pressure is great enough damage can be caused to structures. If the airblast is contained to 130 dB or less, then damage should not be caused to surrounding structures. In the unmitigated scenario, third party structures, depending on their location in relation to the mining activities, could be at risk outside where airblast greater than 130 dB is generated by blasting. In the mitigated scenario, assuming that the blast design will consistently result in airblast of 130 dB or below, third party structures should not be damaged. As a result, the blast design must be specific to manage impacts on surrounding structures.

It is noted that some or all of the above issues could have greater severity if blasting takes place at the same time as neighbouring mines, and/or when climatic conditions such as low cloud cover, temperature inversions, and unfavourable wind direction occur at the time of blasting.

The severity is therefore high in the unmitigated scenario. In the mitigated scenario, this severity reduces to medium because measures can be taken to control blasts and associated impacts.

Duration

While damage to infrastructure can be repaired in the short term, injury or death is considered to be long term in nature. Therefore the unmitigated and mitigated impact duration is high.

Spatial scale / extent

The spatial scale may extend beyond the mine fenced areas in the unmitigated scenario; however this should be reduced to within 500m of the blast sites in the mitigated scenario.

Consequence

The consequence is high in both the unmitigated and mitigated scenarios.

Probability

Due to the fact that blasting on surface will only take place when required, the likelihood of this impact occurring is seldom and as such the probability is medium in the unmitigated scenario, reducing to low with mitigation.

Significance

The significance has been rated as high in the unmitigated scenario. This can be mitigated to medium.

Summary of the rated blasting impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	**H**	**H**	**M**	**H**	**M**	**H**
Mitigated	**M**	**H**	**M**	**H**	**L**	**M**

TRAFFIC

ISSUE: ROAD DISTURBANCE AND TRAFFIC SAFETY

Information was sourced from the traffic specialist study undertaken by Traffic and Transportation Technology Africa (2014) included in Appendix N.

Introduction

Traffic impacts are expected from construction through to the end of the decommissioning phases when trucks, buses, and private vehicles make use of the private and public transport network in and adjacent to the proposed project area. The key potential traffic related impacts are on road capacity and public safety.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Transport system	Transport system	Transport system	

Rating of impact

Severity / nature

Existing traffic volumes comprising public traffic and traffic from nearby mines that utilise the R325 are associated with an acceptable level of service in the context of the existing public and private road infrastructure. The proposed project will generate higher volumes of traffic along the R325 as a result of the transportation of ore. In addition to this, the job opportunities that will be created as part of the proposed project will result in additional use of the R325 by private vehicles, buses and taxis transporting mine employees and contractors to and from site. The following safety risks apply when additional traffic associated with the proposed project is added to the transport network (R325):

- Pedestrian accidents
- Vehicle accidents.

The proposed project will also require an additional access road to be built linking the R325 to the site, and it is proposed that the intersection of the R325 and the proposed new access road be upgraded to cater for increased traffic volumes. The routing of the proposed access route is illustrated in Figure 4-1. TTTA concluded that the intersection of the access road with the main R325 intersection would operate well due to the relatively low peak volumes and low operational traffic. It shows that there will be a maximum delay of 9 seconds per vehicle resulting in Level of Service (LOS) A which is an acceptable LOS.

With regard to safety considerations at the R325 access, a good and clear distance of at least 300 m is required to ensure that cars can safely turn into and out of the roadway. Trucks require longer times of 13 seconds or more to pull away. This clear access exists and a stop controlled access will be required therefore making accidents at the intersections very low. There is however a risk of accidents due to skidding as a result of the gravel from access road being spilled onto the main road.

Based on the above, in the unmitigated scenario this can result in safety issues particularly if the design and implementation of the intersection upgrade are not undertaken with appropriate safety protection measures. In the unmitigated scenario the severity is high. In the mitigated scenario the severity reduces to medium because the frequency of potential accidents is expected to reduce.

Duration

Any serious injury or death is a long term impact in both the unmitigated and mitigated scenarios.

Spatial scale / extent

Possible accident sites could be located within or outside the proposed project given that both private and public roads are and will continue to be used for the transport of ore, materials and personnel. Any indirect impacts associated with any injuries or fatalities will extend to the communities to which the injured people/animals belong. This is a medium spatial scale both with and without mitigation.

Consequence

The consequence is high in both the unmitigated and mitigated scenario.

Probability

In the unmitigated scenario, the probability of accidents occurring as a result of the proposed project is medium because although there is a possibility that traffic accidents could occur these are not expected to occur on a continuous basis. With mitigation this reduces to low.

Significance

Without mitigation, the significance is high. With mitigation, this reduces to medium.

Summary of the cumulatively rated road disturbance and traffic safety impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	H	M	H	M	H
Mitigated	M	H	M	H	L	M

VISUAL

ISSUE: NEGATIVE VISUAL IMPACTS

Information in this section was sourced from on-site observations and through the review of satellite imagery.

Introduction

Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. The more significant visual impacts relate to the larger infrastructure components (such as the open pit mining, processing facilities and stockpiles). After closure the infrastructure should be removed and the site rehabilitated.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earth works Foundations Trenches Stockpiles Scaffolding Cranes Roads Power lines Pipelines Lights	Open pit Stockpiles Mineralised waste facility Water dams Buildings and equipment Pipelines Power lines Lights	Backfilling of final open pit void Stockpiles Mineralised waste facility Water dams Trenches Scaffolding Cranes Piles of rubble Piles of scrap Pipelines Power lines Lights Demolition activities Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impacts

<u>Severity / nature</u>

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of mine related infrastructure and activities.

The visual landscape is determined by considering: landscape character, sense of place, scenic quality, sensitivity of the visual resource and sensitive views. In this regard, the proposed project area lies in a flat, open area characterised by semi-arid vegetation and ephemeral drainage lines. Livestock and game farms and associated isolated farmsteads are typical of the region. The Transnet freight railway line linking Beeshoek Mine to Sishen Mine and ultimately to the Sishen Saldanha export line passes through the farm Driehoekspan. There are a number of abandoned buildings associated with the railway line on Farm Driehoekspan. Potential receptors include two local farm houses approximately 5 km north west of Driehoekspan and a homestead on the Farm Driehoekspan. A viewshed analysis was undertaken by Synergistics and indications are that the waste rock dump will be visible to the homestead on Farm Driehoekspan and will not be visible to the two farmsteads due to topography.

It should however be noted that the night glow from the mine is likely to be visible for a distance of up to 20 km from the mine, which may affect a number of other receptors. The occurrence of nightglow for an extended distance will impact on the sense of place within the rural setting. However, given that there is already such infrastructure in the region, the cumulative impact of the project will probably be low. The impact will also be experienced by a limited number of receptors due to the low population in the area.

Based on the above, the severity of visual impacts is considered high for the homestead on Farm Driehoekspan in the unmitigated scenario and remains high in the mitigated scenario.

Duration

In the unmitigated scenario the duration is high as it will last over life of mine and in the mitigated scenario its low.

Spatial scale / extent

In all phases visual impacts are likely to extend beyond the proposed project area. This is a medium spatial scale.

Consequence

The unmitigated consequence is high. With mitigation, prior to closure, this impact reduces to medium. After closure the consequence reduces to low.

Probability

In the unmitigated scenario the probability is high. In the mitigated scenario, the probability of visual impacts occurring as a result of the proposed project is medium because of the nature of the existing landscape. At closure when the site has been rehabilitated, the probability will be reduced to low.

Significance

The unmitigated significance is high. The mitigated significance reduces to medium before closure and low at closure.

Summary of the rated visual impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	L	L	M	L	L	L

HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

ISSUE: LOSS OF HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

Information in this section was sourced from the Phase 1 Heritage Impact Assessment undertaken by PGS Heritage and Grave Relocation Consultants (Appendix O).

As part of the heritage/cultural and palaeontological studies information was sourced from the review of available literature and through on-site observations.

Introduction

There are a number of activities/infrastructure in all phases prior to closure that have the potential to damage heritage and cultural resources, either directly or indirectly, and result in the loss of the resource for future generations. Heritage and cultural resources include sites of archaeological, cultural or historical importance.

No palaeontological resources were found on site, however there is a low possibility that the dolomite sequences underlying the project area can contain good examples of stromatolite structures that are of medium palaeontological significance. The potential impact on palaeontological resources is therefore not assessed further however the mitigation measures cover the steps to be taken should there be any chance finds.

Project phase and link to activities/infrastructure

Construction	**Operational**	**Decommissioning**	**Closure**
Infrastructure establishment Soil stripping Cleaning and grubbing Preparation of the foundations Compacting bases Slope stabilization Vehicle movement Earthworks Civil works	Open pit mining and backfilling Primary crushing Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management	Backfilling of final open pit Removal of infrastructure Vehicle movement Material movement Slope stabilization Demolition Rehabilitation	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impact

Severity / nature

As part of the proposed project a total of 11 heritage sites were identified within the proposed project area as illustrated in Figure 7-20. As indicated in Figure 7-20, the following heritage sites of low heritage significance will be destroyed as a result of the project:

- DRHP 5 - Low density surface scatter of predominantly MSA lithics
- DRHP 6 - Low density surface scatter of MSA / LSA lithics
- DRHP 7 - Low density surface scatter of predominantly MSA lithics
- DRHP 11 - Low density surface scatter of MSA / LSA lithics
- DRHP 12 - Low density surface scatter of historic material

There is also some risk that heritage resources close to the proposed surface infratsucture could be disturbed. In the unmitigated scenario where activities are uncontrolled, damage to heritage sites will occur. With mitigation, these site could be protected and will remain undisturbed. Some mitigation is possible with respect to DRHP5, 6, 7, 11 and 12 to reduce the severity to moderate.

Duration

If the heritage resources are removed, damaged or destroyed the impact duration is long term. In the mitigated scenario the duration reduces to less than the project life.

Spatial scale / extent

The spatial scale is low both with or without mitigation.

Consequence

The unmitigated scenario the consequence is high. In the mitigated scenario the consequence reduces to low as the spatial scale, duration and severity is reduced.

Probability

The unmitigated probability is high reducing to low with mitigation.

Significance

The unmitigated significance is high and the mitigated significance is low.

Summary of the cumulatively rated heritage resources impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	**H**	**H**	**L**	**H**	**H**	**H**
Mitigated	**M**	**L**	**L**	**L**	**L**	**L**

SOCIO-ECONOMIC

In the broadest sense the activities associated with the proposed mine will have socio-economic impacts in all phases. Some of these are considered to be positive impacts and others are considered to be negative impacts. The separate groups of impacts are discussed below and must be read in the context of the baseline information included in section 7.4.1.12.

ISSUE: INWARD MIGRATION IMPACT

Introduction

Mining projects tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. This section focuses on the potential for the inward migration and associated social issues.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Construction and initial operational activities Recruitment of contractors and workers	Operational activities Recruitment of contractors and workers	Decommissioning activities Recruitment of contractors and workers	Retrenchment of contractors and workers Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impact

Severity / nature

The effects of inward migration can be significant. These effects could include, but not be limited to:

- Potential establishment or expansion of informal settlements
- Increased pressure on housing, water supply infrastructure, sanitation and waste management systems and infrastructure, health care and community services and infrastructure
- Potential for increased pressure on natural resources such as water, fauna, flora and soils
- Increase in crime
- Spread of disease, most notably HIV/Aids and tuberculosis
- Disruption of social cohesion.

It is not possible to predict how significant the inward migration may be, however this impact severity has been rated as high in line with the precautionary approach. It may be possible to mitigate this impact by managing expectations with regard to employment.

Duration

In the normal course, social impacts associated with each phase of the project will occur for the life of the project, but negative social issues associated with inward migration can continue beyond the closure of the mine, particularly in the unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impacts of inward migration could extend beyond the proposed project area and into surrounding communities.

Consequence

In the unmitigated scenario the consequence associated with inward migration is high. In the mitigated scenario, the consequence is reduced to medium.

Probability

In the unmitigated scenario the impact is considered to be possible because although this type of pressure has been experienced in the communities around other mining operations, no informal settlements have been observed in the immediate vicinity of mines neighbouring the proposed project site. With mitigation, probability reduces to low.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation this may reduce to medium.

Summary of the rated inward migration impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	H	M	H	M	H
Mitigated	M	H	M	H	L	M

ISSUE: ECONOMIC IMPACT

Information in this section was sourced from the economic study undertaken by Demacon Market Studies (Demacon, 2014) and included in Appendix P.

Introduction

In the broadest sense, all activities associated with the mine contribute towards a positive and negative economic impact in operation, decommissioning and closure phase.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Construction and initial operational activities Recruitment of contractors and workers	Operational activities Recruitment of contractors and workers	Decommissioning activities Recruitment of contractors and workers	Retrenchment of contractors and workers Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Rating of impact

Severity / nature

The mine has a positive economic impact on the national, local and regional economy. Direct benefits are derived from wages, taxes and profits. Indirect benefits are derived through the procurement of goods and services, and the increased spending power of employees.

Demacon conducted economic modelling and determined that (Demacon, 2014):

- The total economic gain of the Doornpan and Driehoekspan sections together to be R5.5 billion over ten years, and R 557 million on an annual basis.
- The multiplier effect (this refers to an increase in the final income arising form an injection of new demand) for every R1 million in final demand from iron ore mining in the Northn Cape will result in (Demacon, 2014:
  - R1.37 downstream variation in output or sales across the entire economy
  - Labour renumeration gains R321,000
  - Two employment opportunities in the formal and informal sectors.
- The total capital investment of R49.1 million for the project should result in the following positive impacts on the wider regional economy:
  - R67.1 additional sales or outputs
  - R45.8 million gross geographic product
  - 100 new employment opportunities.
- During the operational phase the project should result in the following positive impacts of the wider regional economy over the life of mine:
  - R12.0 billion additional sales or outputs
  - R8.2 billion million gross geographic product
  - 18 000 new employment opportunities.

Very limited agriculture currently takes place at Driehoekspan and this economic loss is not consiederd to be significant.

In both unmitigated and mitigated scenarios the severity is highly positive, although the limited life span of the mine is a factor to consider.

Duration

In the normal course, the direct positive and negative economic impacts associated with the proposed mine will occur for the life of mine. Post closure, in the unmitigated scenario, the scale of the impacts will be reduced. Furthermore, the proposed mine would have contributed to income creation, and a better skilled workforce is expected to continue beyond the life of mine. Quantitatively assessing the post closure impacts is not possible because there are a number of important unknown factors such as the general state of the future economy (local, national and world wide) and the future state of the mining sector in particular. There may also still be some negative impacts if the site is not properly rehabilitated.

Spatial scale / extent

In both the mitigated and unmitigated scenarios, the spatial scale of the impact is high because it will extend far beyond the proposed project area on a regional and national scale.

Consequence

In both the unmitigated and mitigated scenarios the consequence is high and positive.

Probability

In the normal course of economic activity the net positive impacts will definitely occur.

Significance

In the unmitigated scenario, the significance of this potential impact is high positive. In the mitigated scenario, the significance is further increased.

Summary of the rated economic impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H+	H	H	H+	H	H+
Mitigated	H+	H	H	H+	H	H+

ISSUE: LOSS OF CURRENT LAND USE

Information in this section was sourced from on-site observations and the project team.

Introduction

There are project related activities and infrastructure that may have an impact on other land uses in the proposed project areas in all mine phases.

Project phase and link to activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Open pit mining and backfilling Primary crushing Transportation Power supply and use Water supply and use Mineralised waste	Backfilling of final open pit void Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste	Maintenance and aftercare of final land forms (remaining minreralised waste) and rehabilitated areas

Construction	Operational	Decommissioning	Closure
	Non-mineralised waste Support services General site management Rehabilitation	Support services General site management Demolition Rehabilitation	

Rating of impact

Severity / nature

The project area is currently zoned for agricultural use, with the dominant land uses in the area immediately surrounding the project area comprising mining, linear infrastructure, livestock farming and other community activites (housing, although limited). Due to the arid climate, intensive commercial agriculture is not possible. It should be noted that the Transnet line which links Beeshoek Mine to Sishen Mine traverses the Driehoekspan farm as does the R325 to Kathu. In addition to this there is also a powerline which traverses the farm Driehoekspan. It follows that although no on-site third party land use will be physically impacted (according to current project planning), the current zoning requires amendment.

These land uses within and surrounding the proposed project area may be affected by one or more of the following environmental and social impacts during the construction, operations and decommissioning phases:

- Hazardous infrastructure and excavations
- Land clearing (vegetation and soil) for infrastructure and activities
- Surface and groundwater quality and quantity
- Dust generation
- Noise pollution
- Air pollution
- Traffic related safety impacts
- Visual
- Inward migration.

After closure surface infrastructure will be removed, the open pit will be backfilled and the land rehabilitated to be suitable for the end land use (limited grazing and residential use). Only some mineralised waste will remain on surface and be unsuitable for the end lan use, however this areas is expected to be limited because most of the waste rock will be returned to the open pit.

In the unmitigated scenario the severity is high and can be reduced to medium/low with mitigation that is focussed on prevention and/or controls for each environmental and social impact type.

Duration

In the unmitigated scenario the impact on land use will extend beyond mine closure. With mitigation the majority of the land use impacts are expected to be limited to the phases prior to mine closure.

Spatial scale / extent

The spatial scale extends beyond the proposed project area in both the mitigated and unmitigated scenario.

Consequence

The unmitigated consequence is high in all project phases. The mitigated consequence is low.

Probability

In the unmitigated scenario, where environmental and social impacts are uncontrolled, the probability that land uses will be impacted by mining is definite. With mitigation, the probability reduces to medium prior to closure and low post closure.

Significance

The unmitigated significance is high in all project phases. With mitigation this reduces to medium prior to closure and to low post closure.

Summary of the rated land use impact per phase of the project

Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M-L	M	M	L	M	M
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	M-L	L	M	L	L	L

APPENDIX G: COMPOSITE MAP

APPENDIX H: GROUNDWATER IMPACT ASSESSMENT REPORT

APPENDIX I: SOILS AND LAND CAPABILITY IMPACT ASSESSMENT REPORT

APPENDIX J: FLORAL ASSESSMENT

APPENDIX K: FAUNAL ASSESSMENT

APPENDIX L: HYDROLOGY REPORTS

APPENDIX M: AIR QUALITY IMPACT ASSESSMENT REPORT

APPENDIX N: TRAFFIC IMPACT ASSESSMENT REPORT

APPENDIX O: HERITAGE/CULTURAL AND PALEONTOLOGICAL IMPACT ASSESSMENT REPORT

APPENDIX P: SOCIAL AND ECONOMIC ASSESSMENT

APPENDIX Q: NOISE SPECIALIST STUDY

APPENDIX R: CLOSURE COST ASSESSMENT

RECORD OF REPORT DISTRIBUTION

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