DESKTOP ECOLOGICAL ASSESSMENT AND SITE SENSITIVITY REPORT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR **MINING ACTIVITIES ON THE FARMS WESSEL 227 AND** DIBIAGHOMO, NORTH OF BLACK ROCK, NORTHERN **CAPE PROVINCE**

Prepared for

SLR Consulting (Fourways Office)

October 2016

Prepared by: Report author : Report reviewers:

Report Reference: Date:

Scientific Aquatic Services S. Swanepoel E. van der Westhuizen S. van Staden SAS 216185 October 2016

> Scientific Aquatic Services CC CC Reg No 2003/078943/23 Vat Reg. No. 4020235273 PO Box 751779 Gardenview 2047 Tel: 011 616 7893 Fax: 086 724 3132



E-mail: admin@sasenvironmental.co.za

EXECUTIVE SUMMARY

Based on the findings of the desktop biodiversity assessment, it is the opinion of the specialist that the proposed mining activities be considered favourably, provided that no surface mining infrastructure or surface impacts occur within the Mining Right Area (MRA), and that all mitigation measures stipulated in this report be adhered to by the applicant, if surface impacts should take place within the MRA. It is however essential that should any surface mining activities occur within the MRA a full ecological assessment must be undertaken to obtain complete inventories of faunal and floral species occurring within the MRA and determine the possible impacts that the mining activities will have on the biodiversity of the area.

Scientific Aquatic Services (SAS) was appointed to conduct a desktop ecological assessment focusing on sensitive habitat such as wetlands or habitat that may support faunal and floral Species of Conservation Concern (SCC), as part of the environmental assessment and authorisation process for mining activities on the farms Wessels 227 and Dibiaghomo 226, north of Black Rock, within the Northern Cape Province. Ntsimbintle Mining (Pty) Ltd and Lehating have formed a joint mining venture for the proposed project, namely Khwara Manganese (Pty) Ltd, hereinafter referred to as the proposed Mining Right Area (MRA).

The proposed resource to be mined will be accessed and mined from the Lehating underground mine, adjacent to the proposed MRA. Mining will take place underneath the Kuruman River, of which the Ga-Mogara is a tributary. It is understood that the already approved surface infrastructure on Lehating will be adequate to support the mining of the proposed MRA and that no additional infrastructure will be required as part of the Khwara Manganese (Pty) Ltd mining right application project.

The Kuruman River traverses the northern portion of the MRA. According to the NFEPA Database the Kuruman River is considered to be in a largely natural condition (River Condition and PES Class B)

The points below summarise the findings of the study:

- According to the National Freshwater Ecosystem Priority Area (NFEPA) database the MRA falls within an area listed as a Freshwater Ecosystem Priority Area (FEPA), indicating that there are river systems within the catchment that are considered to be in a good condition (A/ B ecological category);
- The NFEPA database indicates that there are two natural wetland features present within the MRA, where the wetland feature situated in the northern portion of the MRA is considered to be in a good condition, and is associated with the Kuruman River;
- The Kuruman River traverses the northern portion of the MRA, which is considered to be in a largely natural condition;
- According to the Northern Cape Provincial Spatial Development Framework (NPSDF, 2012) the MRA is situated within the Gamagara Corridor and the Griqualand West Centre of Endemism. Please refer to Appendix C for further detail.
- The MRA is located within two biomes namely Savanna and Azonal vegetation. The MRA is situated within three bioregions namely: Eastern Kalahari Bushveld, Inland Saline Vegetation and Kalahari Duneveld, and therefore comprises three vegetation types, the Kathu Bushveld, Southern Kalahari Mekgacha and Gordonia Duneveld. The vegetation types are considered to be least threatened;
- The northern portion of the MRA is situated within a moderately protected area, according to the National; Biodiversity Assessment (NBA, 2011);
- The MRA is not situated within or in the vicinity of a protected area according to the South African Protected Area Database (SAPAD) and National Protected Areas Expansion Strategy (NPAES);
- According to the Mining and Biodiversity Guidelines, the northern portion of the MRA is situated within an area considered to be of Highest Biodiversity Importance. Refer to section 3 for more detail;



- According to PRECIS there are no floral species of conservational concern (SCC) expected to occur within the MRA. However, should any floral SCC be encountered within the MRA, care should be taken to not disturb, affect or remove these species. If it is not possible to avoid all individual species, a permit application to remove or relocate the protected species must be submitted and approval should be granted prior to any activities taking place; and
- Several faunal SCC such as Neotis Iudwigii (Ludwig's Bustard) are expected to occur within the Northern Cape Province, therefore should any mining activities take place, care should be taken to minimise habitat disturbance and avoid collision with these species, if they are encountered within the MRA. Hunting and trapping of faunal species (common and SCC) are prohibited and if any faunal species are encountered within the MRA, they should be rescued and relocated to similar suitable habitat within the vicinity of the MRA if deemed feasible.

Impact Assessment:

Based on the above impact assessment, it is evident that there are possible impacts on the floral and faunal ecology within the MRA. The table below summarises the findings, indicating the significance of the impacts before management takes place and the likely impact if management and mitigation takes place.

From the table, it is evident that the proposed mining activities are likely to have a low impact on the faunal and floral ecology prior to mitigation, however, should no additional infrastructure be constructed and no indiscriminate driving occurs within the MRA, as understood, and mitigation measures are implemented, the impact on floral and faunal ecology can be reduced to very significance.

A summary of the results obtained from the assessment of watercourse, floral and faunal ecological impacts arising from mining activities.

Impact	Unmanaged	Managed
1: Impact of floral species of conservational concern	Low	Very Low
2: Impact of faunal species of conservational concern	Low	Very Low



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GLOSSARY OF TERMS

Alien vegetation	Plants that do not occur naturally within the area but have			
	been introduced either intentionally or unintentionally			
Biome	A broad ecological unit representing major life zones of large			
	natural areas - defined mainly by vegetation structure and			
	climate			
Ecoregion	An ecoregion is a "recurring pattern of ecosystems			
	associated with characteristic combinations of soil and			
	landform that characterise that region			
Endangered	Organisms in danger of extinction if causal factors continue			
	to operate			
Indigenous vegetation	Vegetation occurring naturally within a defined area			
RDL species	Organisms that fall into the Extinct in the Wild (EW), Critically			
	Endangered (CR), Endangered (EN), Vulnerable (VU), Near			
	Threatened (NT) and Rare categories of ecological status			
Species of Conservation Concern	The term SCC in the context of this report refers to all RDL			
	(Red Data) and IUCN (International Union for the			
	Conservation of Nature) listed species as well as protected			
	species of relevance to the project.			



ACRONYMS

BGIS	Biodiversity Geographical Information System
CSIR	Council of Scientific and Industrial Research
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water Affairs and Sanitation
EAP	Environmental Assessment Practitioner
EC	Ecological Class
EI	Ecological Importance
EIA	Environmental Impact Assessment
ES	Ecological Sensitivity
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information System
GN	General Notice
GWC	Griqualand West Centre of Endemism
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature and Natural Resources
MAP	Mean Annual Precipitation
MAPE	Mean annual potential evaporation
MASMS	Mean annual soil moisture stress
MBSP	Municipal Biodiversity Summary Project
МАТ	Mean Annual Temperature
MRA	Mining Right Area
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Area Expansion Strategy
NWA	National Water Act (Act 36 of 1998)



PES	Present Ecological State
PRECIS	Pretoria Computer Information Systems
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data List
REC	Recommend Ecological Category
SAPAD	South African Protected Area Database
SABAP	South African Bird Atlas Project
SAIAB	South African Institute of Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SAS	Scientific Aquatic Services
SCC	Species of Conservation Concern
SQ	Sub-quaternary
SQR	Sub-quaternary Reach
TOPS	Threatened or Protected Species
TSP	Threatened species programme
WMA	Water Management Area
WRC	Water Research Commission



1 INTRODUCTION

1.1 Background

Scientific Aquatic Services (SAS) was appointed to conduct a desktop ecological assessment focusing on sensitive habitat such as wetlands or habitat that may support faunal and floral Species of Conservation Concern (SCC), as part of the environmental assessment and authorisation process for mining activities on the farms Wessels 227 and Dibiaghomo 226, north of Black Rock, within the Northern Cape Province. Ntsimbintle Mining (Pty) Ltd and Lehating have formed a joint mining venture for the proposed project, namely Khwara Manganese (Pty) Ltd, hereinafter referred to as the proposed Mining Right Area (MRA). The proposed MRA is situated approximately 11,2 km north of Hotazel and 66 km north of the town of Kathu. The R380 traverses the western portion of the study area and Santoy is situated approximately 4.7 km south of the MRA (Figure 1 &2).

The proposed resource to be mined will be accessed and mined from the Lehating underground mine, neighbouring the proposed MRA. Mining will take place underneath the Kuruman River, of which the Ga-Mogara is a tributary. It is understood that the already approved surface infrastructure on Lehating will be adequate to support the mining of the proposed MRA and that no additional infrastructure will be required as part of the Khwara Manganese (Pty) Ltd mining right application project.

This report, after consideration and description of the ecological integrity of the study area, must guide the Environmental Assessment Practitioner (EAP) and authorities, by means of recommendations, as to the viability of the proposed mining activities.







Figure 1: Location of the proposed MRA depicted on a 1:50 000 topographical map in relation to surrounding area.





Figure 2: Digital satellite image depicting the location of the proposed MRA in relation to surrounding areas.



1.2 Legislative requirements

1.2.1 National Environmental Management Act, 1998

The National Environmental Management Act (NEMA) (Act 107 of 1998) as amended and the associated Regulations (Listing No R. 982, No R. 983 and R. 984), states that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment (EIA) process depending on the nature of the activity and scale of the impact.

1.2.2 Minerals and Petroleum Resource Development Act (MPRDA) (Act 28 of 2002)

The primary environmental objective of the Minerals and Petroleum Resource Development Act (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that "any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations".

1.2.3 National Water Act (NWA; Act 36 of 1998)

The NWA; Act 36 of 1998 recognises that the entire ecosystem and not just the water itself in any given water resource, constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS¹).

Any area within a wetland or riparian zone is therefore excluded from development, unless authorisation is obtained from DWS in terms of Section 21 of the NWA.

¹ ¹ The Department of Water and Sanitation (DWS) was previously known as the Department of Water Affairs (DWA) and the Department of Water Affairs and Forestry (DWAF). For referencing purposes, the name of the Department under which documentation was published, is used.



1.2.4 GN 704 – Regulations on use of water for mining and related activities aimed at the protection of water resources, 1999

These Regulations, forming part of the National Water Act, were put in place in order to prevent the pollution of water resources and protect water resources in areas where mining activity is taking place from impacts generally associated with mining.

It is recommended that the proposed project complies with Regulation GN 704 of the NWA, 1998 (act no. 36 of 1998) which contains regulations on use of water for mining and related activities aimed at the protection of water resources. GN 704 states that:

No person in control of a mine or activity may:

a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on waterlogged ground, or on ground likely to become waterlogged, undermined, unstable or cracked.

According to the above, the activity footprint must fall outside of the 1:100 year flood line of a watercourse or 100m from the edge of the feature, whichever distance is the greatest.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this assessment:

- The desktop ecological assessment is confined to the proposed MRA and does not include the full extent of the neighbouring and adjacent properties.
- This study was undertaken as a desktop assessment only and as such, the information gathered must be considered with caution, as inaccuracies and data capturing errors are often present within these databases. Due to the low impact nature of the proposed mining activities, this desktop assessment is considered to provide adequate information for informed decision making to take place; and
- The freshwater resource desktop delineation will only take place once results have been obtained from the hydrologist pertaining to any possible impact on the Kuruman River situated within the northern portion of the study area.



2 METHOD OF ASSESSMENT

A desktop study was compiled with all relevant information as presented by SANBI's Biodiversity Geographic Information Systems (BGIS) website (<u>http://bgis.sanbi.org</u>). Biodiversity specific information resources taken into consideration during the desktop assessment of the MRA included:

- Important Bird Areas, 2015, in conjunction with the South African Bird Atlas Project (SABAP2);
- > National Freshwater Ecosystem Priority Areas (NFEPAs, 2011)
 - NFEPA water management area (WMA)
 - NFEPA wetlands/National wetlands map
 - Wetland and estuary FEPA
 - FEPA (sub)WMA % area
 - Sub water catchment area FEPAs
 - Water management area FEPAs
 - Fish sanctuaries
 - Wetland ecosystem types
- > Threatened Terrestrial Ecosystems of South Africa, 2011
- National Biodiversity Assessment, 2011;
- > NPAES Focus Areas for Protected Area Expansion, 2009
 - Formally and Informally protected Areas
- Mucina and Rutherford for information on the biomes, bioregions and vegetation types within which the MRA is situated in, 2006;
- Mining and Biodiversity Guidelines, 2012;
- > Northern Cape Provincial Spatial Development Framework (NPSDF, 2012)
- South African National Biodiversity Institute (SANBI) [Threatened species programme (TSP)], Pretoria Computer Information System (PRECIS),
- National Environmental Management Biodiversity Act (NEMBA) Threatened or Protected Species (TOPS);
- > International Union of Conservation of Nature (IUCN); and
- South African Protected Areas Database (SAPAD), 2016.

A brief description of the databases used, as well as the methodologies used for the floral and faunal Species of Conservation Concern (SCC), and impact assessment are provided in Appendix A and B.



3 RESULTS OF THE DESKTOP ANALYSIS OF CONSERVATION DATABASES

The following section contains data accessed as part of the desktop assessment and are presented as a "dashboard" report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation is provided, and information that was considered to be of particular importance was emboldened.

It is important to note that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the MRA's actual site characteristics at the scale required to inform the Environmental Impact Assessment (EIA) process. However, this information is considered to be useful as background information to the study and sufficient decision making can take place with regards to mining activities based on the desktop results.



Table 1: Desktop data relating to the character of freshwater resources within the MRA and surrounding	region.
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Aquatic ecoregion and sub-regions in which the MRA is located		Detail of the study area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database (Figure 4 & 5)					
Ecoregion (Figure 3)	Southern Kalahari		The MRA falls within an area listed as a FEPA. River Freshwater Ecosystem Priority Area (FEPA) achieves biodiversity targets for river ecosystems and threatened fab analysis, and ware identified in river that are surroutly in a				
Catchment	Orange						
Quaternary Catchment	D41M	FEPACODE	acod condition (A or B ec	plogical category) Although th	he FEPA status applies		
WMA	Lower Vaal		to the actual river reach, s	hading of the whole sub-quat	ernary catchment reach		
subWMA	МоІоро		indicate that that the surrounding land and smaller stream network need to l				
Dominant characteristics of the (Kle	e Southern Kalahari Ecoregion Level 2 (29.01) ynhans et al., 2007)		 managed in a way that ma Two natural wetland 	nanaged in a way that maintains the good condition of the river reach. Two natural wetland features are present within the northern and			
Dominant primary morphology terrain Plains: Moderate relief, Closed Hills, Mountains: Moderate and high relief. Hills, Hills and Lowlands, Extremely Irregular Plains (Almost Hilly), Lowlands and hills, Slightly irregular Plains and Pans		NFEPA Wetlands	 southern portion of the MRA; The wetland features are classified by NFEPA to be a floodplain wetla (north) and a flat (south); The wetland feature in the northern portion of the MRA is considered NFEPA to be in an AB wetland condition, hence it is in a good condition and the wetland feature in the south is heavily modified (Class Z1); 		be a floodplain wetland MRA is considered by t is in a good condition, idified (Class Z1);		
Dominant primary vegetation types	Karroid Kalahari Bushveld, Kalahari Mountain Bushveld, Kalahari Plateau Bushveld	Wetland vegetation Type Eastern Kalahari Bushveld Group 1 vegetation type (Least Threatened)			east Threatened)		
Altitude (m a.m.s.l)	700-1500	NFEPA Rivers	The Kuruman River traverses the northern portion of the MRA. According to the NFEPA Database the Kuruman River is considered to be in a largely natural condition (River Condition and PES Class B)				
MAP (mm)	0 to 500						
Coefficient of Variation (% of MAP)	30 to 40	Detail of the study area in terms of the I	Kgalagadi District Municipali	ty Biodiversity Summary Proj	ect (MBSP, 2010).		
Rainfall concentration index	60 to >65						
Rainfall seasonality	Late summer		The database indicates two wetland features within the MRA, which corresponds with the NFEPA database.				
Mean annual temp. (°C)	16 to 22	Ecological Status of the most proximal sub-qu	aternary reach (DWS, 2014)			
Winter temperature (July)	0 to 22 °C	Sub-quaternary reach	D41M-01756 (Kuruman)	D41L-02042 (Kuruman)	D41K-02068 (Ga- Mogara)		
Summer temperature (Feb)	16 – >32 °C	Assessed by expert?	Y	Y	Y		
Median annual simulated runoff (mm)	<5 to 40	Mean Ecological Importance (EI) Class	Moderate	Moderate	Moderate		
Northern Cape Provincial Spa	tial Development Framework (NPSDF, 2012)	Mean Ecological Sensitivity (ES) Class	Very Low	Moderate	Very Low		
• The proposed MRA is situated within the Gamagara Corridor. The corridor		Stream Order	4	3	3		
 tocuses on the mining of iron and manganese (Figure 6); and The proposed MRA is situated within the Griqualand West Centre of Endemism (Figure 7). Please refer to Appendix C for further detail 		Default Ecological Class (based on median PES and highest El or ES mean)	С	С	С		



Ν Legend Proposed MRA Orange Catchment Inland Water Area **ECOREGION** Southern Kalahari **D41M** D41L AQUATIC **ECOREGION AND** QUATERNARY CATCHMENTS **D41K** Scientific Aquatic Services CC CK (Eg. No 203/079543/23 Val Reg. No. 4002035273 PO BCX 751/75 <u>Sardenview</u> 2047 Tel: (011) 615 7855 Fax: (021) 65 5420/ 086 724 3132 Project No: SAS 216185 Date: AUGUST 2016 Projection: LATLONG Datum: WGS84 www.sasenvironmental.co.za 2 4 km 0

Figure 3: The Aquatic Ecoregion and quaternary catchments associated with the study area.

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Figure 4: Natural and artificial wetlands associated with the study area according to NFEPA (2011).





Figure 5: The Kuruman River traversing the northern portion of the MRA according to the NFEPA database (2011).





Figure 6: Centers of endemism of the Northern Cape Province: the MRA indicated by a yellow circle (Northern Cape Provincial Spatial Development Framework, 2012).





Figure 7: Development regions and corridors of the Northern Cape: the MRA indicated by the yellow circle (NPSDF, 2012).



Table 2: Summary of the conservation characteristics for the MRA.

Details of the MRA in terms of Mucina & Rutherford (2006) Description of the vegetation type(s)			e vegetation type(s) relevant to the	MRA (Mucina & Rutherford 2006)	
Biome (Figure 8)	The majority of the MRA is situated within the Savanna Biome and the northern portion falls within the Azonal vegetation	Vegetation Type	Kathu Bushveld	Southern Kalahari Mekgacha	Gordonia Duneveld
Bioregion (Figure 9)	The southern portion of the MRA is situated within the Eastern Kalahari Bushveld Bioregion , the northern portion in the Kalahari Duneveld Bioregion and a small area in the east falls within the Inland Saline Vegetation .	Climate	Summer and autumn rainfall with very dry winters	Summer rainfall region, with major peak towards late summer	Summer and autumn rainfall with very dry winters
Vegetation Type (Figure 10)	The southern portion of the MRA is situated within the Kathu Bushveld , whereas the northern portion is within the Southern Kalahari Mekgacha and a small area in the east is within the Gordonia Duneveld .	Altitude (m)	960-1300	850-1500	800-1200
Conservation details pertaining to the MRA (Various databases)		MAP* (mm)	300	239	182
NBA (2011) (Figure 11)	The northern portion of the MRA falls within a moderately protected area, whereas the southern portion falls within an area that is currently not protected	MAT* (°C)	18.5	19.0	18,6
National Threatened Ecosystems (2011)	The MRA falls within an area that is least threatened.	MFD* (Days)	27	21	21
NPAES (2009) & SAPAD (2016)	The MRA is not located within or near any protected area within a 5km radius	MAPE* (mm)	2883	2945	2912
IBA (2015)	Not located within or near an IBA	MASMS* (%)	85	NA	86
	An area in the northern portion of the MRA is considered to be of Highest Biodiversity Importance	Distribution	Northern Cape Province	Northern Cape and North-West Provinces.	Northern Cape Province
Mining & Biodiversity guidelines (2013) (Figure 12)	Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to the potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning), mining projects will be significantly	Geology & Soils	Aeolian red sand and surface calcrete, deep sandy soils of Hutton and Clovelly soil forms.	River channels embedded with prevalently sandy Kalahari sediments covering the Precambrian metamorphic crust. The substrate is silty, sandy and rocky, poorly drained and rich in nutrients.	Aeolian sand underlain by silcretes and calcretes, of the Cenozoic Kalahari Group. Fixed parallel sand dunes, with Af land type.



Details of the MRA in terms of Mucina & Rutherford (2006)		Description of the vegetation type(s) relevant to the MRA (Mucina & Rutherford 2006)				
constrained or may not receive necessary authorisations. This highest biodiversity importance area corresponds with the NFEPA Database indicating a WETFEPA feature within this area.		Conservation	Least Threatened (LT) (Target 16%). None statutorily conserved. >1% of the area is transformed: iron ore mining. Erosion is very low.	LT. Target 24%. 18% is statutorily conserved. About 2% has been transformed by road building. Mekgacha under strong utilisation pressure from wildlife and domestic animals.	Least Threatened. (Target 16%). 14% statutorily conserved. Very little transformed. Generally low erosion, some area spectacular destabilisation of normally vegetated dunes.	
National Land Cover (2015) (Figure 13)		Low shrubland (Approximately 70% of MRA)	Vegetation & Me landscape mo features Bos (Dominant pro Floral Taxa in ger Appendix D) A. / and	getation &Medium-tall tree layer with Acacia erioloba in places, but mostly open and including Boscia albitrunca as the	t Sparse patchy grassland, sedgelands and low herblands dominated by C4 grasses on the bottom of the dry riverbads Low	Parallel dunes about 3-8m above plains. Open shrubland with ridges
	Land	Grassland (8% of study area)				of grassland dominated by Stipagrostis amabilis on the dune
	(2013)	Thicket/ Dense Bush (1% of study area)		(Dominant	prominent trees. Shrub layer is shrublands in places with patches	crests and Acacia haemotoxylon on
		Woodland/ Open Bush (20% of study area)		A. mellifera, Diospyros lycioides riv	of taller shrubland on banks of the	slopes and Rhigozum trichotomum
		Mines (2% of study area)			rivers.	in the interdune straiten.

NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SAPAD = South African Protected Areas Database; IBA = Important Bird Area; MRA = Mining Right Area; M&R = Mucina & Rutherford; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).





Figure 8: The Biomes associated with the MRA (Mucina and Rutherford, 2006).





Figure 9: The bioregions associated with the MRA (Mucina and Rutherford, 2006).





Figure 10: The vegetation types associated with the MRA (Mucina and Rutherford, 2006).





Figure 11: Level of ecosystem protection according to the National Biodiversity Assessment (2011).





Figure 12: Importance of the MRA according to the Mining and Biodiversity Guidelines (2013).





Figure 13: Land uses associated with the MRA (National Land Cover, 2015).



4 FLORAL AND FAUNAL SPECIES OF CONSERVATIONAL CONCERN (SCC)

4.1 Floral SCC

The Pretoria Computer Information Systems (PRECIS) was utilised to tabulate the floral species that are expected to occur within the study area (QDS 2722BB), which was acquired from SANBI.

According to PRECIS there are no floral SCC within the QDS 2722BB, thus it is expected that no floral SCC will occur within the MRA. However, based on the floral list provided by TOPS (NEMBA, 2015) several SCC are expected to occur within the larger provincial region (Table 3).

Family	Scientific Name	Habitat	Growth Form	Threat Status
		Gravels and shale derived from metamorphic		
Aizoaceae Cheiridopsis peculiaris ro		rocks of the Namaqualand Complex	Succulent	CR
	Conophytum herreanthus			
Aizoaceae	subsp. Herreanthus	Quartz patches	Succulent	CR
		Succulent Karoo shrubland on dry, rocky	Succulent,	
Asphodelaceae	Aloidendron pillansii	dolomite and gneiss hillsides.	Tree	EN
		Namaqualand Klipkoppe Shrubland or		
Amaryllidaceae	Haemanthus granitcus	Namaqualand Granite Renosterveld.	Geophyte	EN
Aizoaceae	Lithops dorotheae	Fine-grained, sheared, feldspathic quartzite	Succulent	EN
Asphodelaceae	Aloidendron dichotomum	On north-facing rocky slopes (particularly dolomite) in the south of its range. Any slopes and sandy flats in the central and northern parts of range.	Succulent, Tree	VU
Amaryllidaceae	Brunsvigia herrei	Succulent Karoo Shrubland, granitic soils on flats and sometimes in deposits of fairly large stopes	Geophyte	VII
Airoaceae	Cononhytum bachelorum	Bocky outcrops	Succulent	VU
Aizoaccac			Oucculent	
Alzoaceae	Conophylum ralum	Spongy quartz soll.	Succulent	VU
Amaryllidaceae	Gethyllis grandiflora	sandy and or stony soils in arid karrold shrubland.	Geophyte	VU
Amaryllidaceae	Gethyllis namaquensis	Coastal dunes and gravelly mountain slopes in succulent karoo shrubland.	Geophyte	VU
Amaryllidaceae	Brunsvigia josephinae	Heavy clay soils.	Geophyte	VU
Asphodelaceae	Aloe krapohliana	Occurs in the extremely arid northern regions of the Succulent Karoo, on clay, stony (mostly quarzitic) and sandy soils on flats and slopes.	Herb, Succulent	Р
	· · ·	Deeply shaded rock ledges on south-facing		
Amaryllidaceae	Cyrtanthus herrei	rocky slopes.	Bulb	Р
Aizoaceae	Sceletium tortuosum	Quartz patches and is usually found growing under shrubs in partial shade.	Succulent	Р
	Harpagophytum	Well drained sandy habitats in open savanna		
Pedaliaceae	procumbens	and woodlands.	Herb	Р

Table 3: TOPS	plant list for the floral s	pecies expected to occ	ur within the Northern Cape.

CR= Critically Endangered, EN= Endangered, VU= Vulnerable, P= Protected.



Should any of the species listed in Table 3 be encountered within the MRA, care should be taken to not disturb, affect or remove these species. If it is not possible to avoid all individual species, a permit application to remove or relocate the protected species must be submitted and approval should be granted prior to any activities taking place. Prior to any activities taking place, the proposed MRA footprint must be investigated for the above floral SCC by a suitably qualified specialist. If it is not possible to avoid all individuals, the species should be rescued and relocated to suitable offset areas, with the process overseen by a suitably qualified specialist after the necessary permits have been obtained.

4.2 Faunal SCC

The table below indicate the faunal SCC that are expected to occur within the Northern Cape Province as a whole, based on NEMBA (2013). A complete list of avifaunal species occurring within the QDS 2722BB is provided in Appendix B.

Scientific Name	Common Name	Threat Status
Chrysoritis thysbe schloszae	Schlosz's Opal Butterfly	CR
Trimenia malagrida	Scarce Mountain Copper Butterfly	CR
Trimenia wallengrenii	Wallengren's Silver-spotted Copper Butterfly	CR
Bitis schneideri	Namaqua Dwarf Adder	Р
Bitis xeropaga	Desert Mountain Adder	Р
Bitis caudalis	Horned Adder	Р
Lamprophis fiski	Fisk's House Snake	Р
Neophron percnopterus	Egyptian Vulture	CR
Neotis ludwigii	Ludwig's Bustard	EN
Ardeotis kori	Kori Bustard	Р
Bunolagus monticularis	Riverine Rabbit	CR
Pelea capreolus	Grey Rhebok	Р

Table 4: TOPS list of faunal species expected to occur within the Northern Cape.

CR= Critically Endangered, EN=Endangered, P=Protected

Several faunal SCC are expected to occur within the greater region, however faunal specialist studies will need to be conducted within the MRA to determine whether these faunal SCC will inhabit and utilise the area. Should any mining activities take place within the MRA, care should be taken to avoid collision with these faunal SCC, should they be encountered. Hunting and trapping of faunal species (common and SCC) are prohibited and if any faunal species are encountered within the MRA, a suitably qualified specialist should be consulted to determine a suitable way forward.



5 IMPACT ASSESSMENT

The proposed resource to be mined will be accessed and mined from the Lehating underground mine, neighbouring the proposed MRA. Mining will take place underneath the Kuruman River, of which the Ga-Mogara is a tributary. It is understood that the already approved surface infrastructure on Lehating will be adequate to support the mining of the proposed MRA and that no additional infrastructure will be required within the MRA as part of the Khwara Manganese (Pty) Ltd mining right application project. However, for the purpose of the impact assessment it is assumed at 'worst case scenario' that some surface infrastructure construction and indiscriminate driving within the proposed MRA will take place.

The tables below serve to summarise the significance of potential impacts on terrestrial and habitat that may result due to mining related activities. In addition, it also indicates the required mitigatory and management measures required to minimise potential ecological impacts and presents an assessment of the significance of the impacts taking into consideration the available mitigatory measures, assuming that they are fully implemented.

The following essential mitigation measures are considered to be standard best practice measures applicable to activities of this nature, in conjunction with those stipulated in the individual tables in the following sections, which define the mitigatory measures specific to the minimisation of impacts on natural resources within the MRA.

Mining footprint

- As far as possible, all mining related activities and infrastructure should be excluded from all sensitive areas such as freshwater resources and associated zones of regulation, with special mention if the Kuruman River traversing the northern portion of the MRA, and rocky outcrops, if applicable;
- It is highly recommended that mining activities within sensitive habitat units (freshwater resources) be minimised as far as possible as they are regarded to be of ecological importance, since the habitat unit provides suitable habitat for a diversity of faunal and floral species. Edge effects from any activities occurring in areas surrounding these habitat units must be effectively mitigated in order to prevent impacts on the areas;
- All footprint areas should remain as small as possible and should not encroach onto surrounding areas beyond the MRA. It must be ensured that the freshwater resources, if any, beyond the MRA are off-limits to vehicles and personnel;



- The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled if the project is to proceed;
- Planning of temporary roads and access routes should avoid natural areas and especially freshwater resources and be restricted to existing gravel roads where possible;
- Appropriate sanitary facilities must be provided for the life of the proposed mining activities and all waste removed to an appropriate waste facility; and
- > No fires should be permitted in or near the mining area.

Alien floral species

- Alien and invasive vegetation control should take place throughout the duration of the mining activities;
- Proliferation of alien and invasive species are expected within any disturbed area. These species should be eradicated and controlled to prevent their spread beyond the footprint area. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled; and
- Removal of the alien and weed species encountered within the footprint area must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998).

SCC and Protected floral and faunal species

- A walkdown/active search for floral and faunal SCC must be conducted in areas where mining activities are planned prior to such activities taking place. The anticipated footprint area along with all access roads and the immediate vicinity must be investigated;
- The existing integrity of flora surrounding the MRA should be upheld and no activities should occur outside the footprint area;
- > Prohibit the collection of plant material for firewood or medicinal uses;
- Should any SCC or other protected floral and faunal species be encountered within the MRA, the following should be ensured:
 - If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas;
 - Permit applications should be obtained from the relevant authorities where applicable; and



- A suitably qualified specialist should oversee all rescue and relocation plans.
- > No trapping or hunting of fauna is to take place.

Vehicle access

- Existing roads should be utilised wherever possible to provide access to mining areas, and no new roads should be created within watercourse areas, in order to minimise loss of habitat;
- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- > All spills should be immediately cleaned up and treated accordingly.

5.1 Impact 1: Impact on Floral Species of Conservation Concern

Based on digital satellite imagery the national land cover data (2015), the list obtained from PRECIS and the vegetation types, it is unlikely that floral SCC will be encountered within the MRA during a field investigation. Should any floral SCC be affected by any surface activities within the MRA, they must be rescued and relocated to suitable habitat if deemed feasible and after obtaining the relevant permits.

Unmanaged								
Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance	
3	3	2	2	3	6	7	42 (Low)	
			Mana	aged				
Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance	
1	3	1	1	2	4	4	16 (Very-Low)	

5.2 Impact 2: Impact on Faunal Species of Conservation Concern

Based on the faunal SCC list provided by NEMBA (2013), faunal SCC are expected to occur within the provincial boundaries, however should any surface infrastructure or mining activities take place within the MRA, a suitably qualified specialist must be consulted to undertake a field assessment to determine if any faunal SCC will be present within the MRA.



Once the field assessment has taken place the qualified specialist will have to advise on a suitable and feasible way forward.



Unmanaged								
Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance	
3	3	2	2	3	6	7	42 (Low)	
			Manag	ed				
Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance	
1	3	1	2	2	4	5	25 (Very-Low)	

5.3 Impact Assessment Conclusion

Based on the above impact assessment, it is evident that there are possible impacts on the floral and faunal ecology within the MRA. The table below summarises the findings, indicating the significance of the impacts before management takes place and the likely impact if management and mitigation takes place.

 Table 5: A summary of the results obtained from the assessment of floral and faunal ecological impacts arising from mining activities.

Impact	Unmanaged	Managed
1: Impact of floral species of conservational concern	Low	Very Low
2: Impact of faunal species of conservational concern	Low	Very Low

From the table, it is evident that the proposed mining activities are likely to have a low impact on the faunal and floral ecology prior to mitigation, however, should no additional infrastructure be constructed and no indiscriminate driving occurs within the MRA, as understood, and mitigation measures are implemented, the impact on floral and faunal ecology can be reduced to very significance.



6 CONCLUSION

Scientific Aquatic Services (SAS) was appointed to conduct a desktop ecological assessment focusing on sensitive habitat such as wetlands or habitat that may support faunal and floral Species of Conservation Concern (SCC), as part of the environmental assessment and authorisation process for mining activities on the farms Wessels 227 and Dibiaghomo 226, north of Black Rock, within the Northern Cape Province. Ntsimbintle Mining (Pty) Ltd and Lehating have formed a joint mining venture for the proposed project, namely Khwara Manganese (Pty) Ltd, hereinafter referred to as the proposed Mining Right Area (MRA).

Based on the findings of the desktop biodiversity assessment, it is the opinion of the specialist that the proposed mining activities be considered favourably, provided that no additional surface mining infrastructure or related activities occur within the MRA, as expected, and that all mitigation measures stipulated in this report are adhered to by the applicant. It is however essential that should any surface impacts occur within the MRA, a full ecological assessment must be undertaken to obtain complete inventories of faunal and floral species occurring within the MRA and determine the possible impacts that the mining activities will have on the biodiversity of the area.



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APPENDIX A – Desktop Database Description

National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland features present within the study area.

Threatened Terrestrial Ecosystems for South Africa (2011)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. 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 (SANBI, BGIS).

National Biodiversity Assessment (NBA, 2011)

The NBA (2011) provides an assessment of South Africa's biodiversity and ecosystems, including headline indicators and national maps for the terrestrial, freshwater, estuarine and marine environments. The NBA 2011 was led by the South African National Biodiversity Institute (SANBI) in partnership with a range of organisations. It follows on from the National Spatial Biodiversity Assessment of 2004, broadening the scope of the assessment to include key thematic issues as well as a spatial assessment. The NBA 2011 includes a summary of spatial biodiversity priority areas that have been identified through systematic biodiversity plans at national, provincial and local levels (SANBI BGIS).

The ecosystem protection level indicate whether an ecosystem is adequately protected or underprotected. Ecosystem types are categorised as well protected, moderately protected, poorly protected, or currently not protected based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Moderately protected, poorly protected and unprotected ecosystem types are collectively referred to as under-protected ecosystems (Driver et al., 2011).

National Protected Area Expansion Strategy (NPAES, 2009)

The goal of the National Protected Area Expansion Strategy (NPAES) is 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. It deals with land-based and marine protected areas across all of South Africa's territory (SANBI BGIS).



Mining and Biodiversity Guideline (2012)

The Mining Biodiversity Guideline (2012) 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 Legally Protected Areas, Highest Biodiversity Importance, High Biodiversity Importance and Moderate Biodiversity Importance (SANBI, BGIS).

Floral and faunal Species of Conservational Concern (SCC)

All relevant databases were utilised to record the floral and faunal SCC that are expected to occur within the study area. Should the proponent require complete inventories of faunal and floral species that would occur within the study area, a field assessment must take place.



APPENDIX B – Impact Method of Assessment

Impact Assessment

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructures that are possessed by an organisation.

An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'². The interaction of an aspect with the environment may result in an impact.

Environmental risks/impacts are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.

Resources include components of the biophysical environment.

Frequency of activity refers to how often the proposed activity will take place.

Frequency of impact refers to the frequency with which a stressor (aspect) will impact on the receptor.

Severity refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

Spatial extent refers to the geographical scale of the impact.

Duration refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the table below. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine whether mitigation is necessary3.

The assessment of significance is undertaken twice. Initial, significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts. Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.



⁶ The definition has been aligned with that used in the ISO 14001 Standard.

³ Some risks/impacts that have low significance will however still require mitigation

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act (No. 108 of 1997) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

LIKELIHOOD DESCRIPTORS

Table B1: Criteria for assessing significance of impacts

Probability of impact	RATING
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	RATING
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	RATING
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	RATING
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear features affected < 1000m	2
Local area/ within 1 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	3
Regional within 5 km of the site boundary / < 5000ha impacted / Linear features affected < 10 000m	4
Entire habitat unit / Entire system/ > 5000ha impacted / Linear features affected > 10 000m	5
Duration of impact	RATING
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



	CONSEQUENCE (Severity + Spatial Scope + Duration)														
-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
vity .	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
acti ct)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
cy of	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
uen , of i	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
Freq	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
oD (7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
울	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
IKEI	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table B2: Significance Rating Matrix.

Table B3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management RecommendationPositive Impact Management Recommendation			
Very high	126- 150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management		
High	101- 125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management		
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management		
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement		
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement		
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement		

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the project's area of influence encompassing:
 - Primary project site and related facilities that the client and its contractors develop or controls;
 - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
 - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- > Risks/Impacts were assessed for mining activities and decommissioning and rehabilitation;
- > If applicable, transboundary or global effects were assessed;
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.
- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.



Mitigation measure development

The following points present the key concepts considered in the development of mitigation measures for the proposed development.

- Mitigation and performance improvement measures and actions that address the risks and impacts⁴ are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation.
- Desired outcomes are defined, and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation.

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed development. These recommendations also include general management measures which apply to the proposed development as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the operation from planning, through mining, and closure through to after care and maintenance, where applicable.



⁴ Mitigation measures should address both positive and negative impacts

APPENDIX C – Northern Cape Provincial Spatial Development Framework (NPSDF, 2012)

The proposed MRA falls within the Griqualand West Centre of Endemism (GWC). According to van Wyk and Smith (2001), the GWC coincides with the surface outcrops of the Ghaap Group (previously Griqualand West Sequence) and Olifantshoek Supergroup (previously Sequence). However, in floristic terms the outer boundaries of the centre are rather diffuse, as several of the GWC floristic elements spill over onto related substrates, especially alkaline substrates rich in calcium.

The Kalahari Mountain Bushveld covers the mountainous western parts of the GWC, and, both endemic to the centre, covers the eastern plateau area. *Tarchonanthus camphorates* is a particularly common woody species in these two bushveld types. Typical mountain species include *Searsia tridactyla* (formally known as *Rhus tridactyla*), *Croton gratissimus* and *Buddleja saligna*. Pockets of Karoo-type vegetation increase towards the south and west, especially in heavily overgrazed areas.

The vegetation of the GWC is still intact, although extremely poorly conserved. Apparently, the Kalahari Plateau Bushveld is the only Savanna Biome vegetation type, which is not represented in any sizable nature reserve. Bush encroachment by e.g. the indigenous *Senegalia mellifera* (formally known as *Acacia mellifera*), which is due to inappropriate veld management practices (mainly overgrazing by domestic livestock), is a major problem in many parts of the region.

All vegetation within the study area has been disturbed to some degree and would therefore not add to the conservation of intact GWC vegetation.



APPENDIX D – Vegetation Type

Kathu Bushveld

Dominant Floral Taxa

The table below presents the key indicator species of this vegetation type:

Table	D1:	Key	indicator	floral	species	associated	with	the	Kathu	Bushveld	Vegetation	type
		(Muc	ina and R	utherf	ord, 2006	5).						

Grass species	Herb species	Tree/Shrub species
Aristida meridionalis (d) Brachiaria nigropedata (d) Centropodia glauca (d) Eragrostis lehmanniana (d) Schmidtia pappophoroides (d) Stipagrostis ciliate (d) Aristida congesta Eragrostis biflora E. Chloromelas E. heteromera E. pallens Melinis repens Schmidtia kalahariensis Stipagrostis uniplumis Tragus berteronianus	Acrotome inflata Erlangea misera Gisekia Africana Heliotropium ciliatum Hermbstaedtia fleckii H. odorata Limeum fenestratum L. viscosum Lotononis platycarpa Senna italic subsp. arachoides Tribulus terrestris	Tall trees: Acacia erioloba (d) Small trees: Acacia mellifera subsp. detinens (d) Boscia albitrunca (d) Terminalia sericea Tall shrubs: Diospyros lycioides subsp lycioides (d) Dichrostachys cinerea Grewia flava Gymnosporia buxifolia Rhigozum brevispinosum Low shrubs: Aptosimum decumbens Grewia retinervis Nolletia arenosa Sida cordifolia Tracia dinica

*d= dominant species



Southern Kalahari Mekgacha

Dominant Floral Taxa

The table below presents the key indicator species of this vegetation type:

Table D2: Key indicator floral species associated with the Southern Kalahari Mekgachavegetation type (Mucina and Rutherford, 2010).

Dry River Bottoms								
Grass species	Herb species	Tree/Shrub species						
Cenchrus ciliaris (d) Chloris vergata (d) Anthephora pubescens (d) Aristida congesta (d) Chloris virgata (d) Enneapogon desvauxii (d) Eragrostis annulata (d) E. bicolor (d) Odyssea paucinervis (d) Pancium coloratum (d) Eragrostis porosa Panicum impeditum Sporobolus nervosus	Amaranthus dinteri subsp. dinteri A. praetermissus A. schinzianus Boerhavia repens Chamaesyce inaequilatera Cucumis africanus Geigeria ornativa G. pectidea Heliotrpoium lineare Indigofera alternans I. argyroides Kohautia cynanchica Lotononis platycarpa Osteospermum muricatum Platycarpha carlinoides Radyera urens Stachys spathulata Tribulus terrstris	Tall trees: Lebeckia linearifolia (d) Sisyndite spartea (d) Deverra denudate subsp. aphylla						
	Succulent Herb:							
	Zygophyllum simplex (d)							
	Rocky Slopes of River canals							
Graminoids: Setaria verticillata (d) Enneapogon scaber Oropetium capense Stipagrostis uniplumis Tragus racemosus	Low Shrubs: Aptosimum lineare Pechuel-Loeschea leubnitziae	Tall Trees:Acacia erioloba (d)Herb Species:Dicoma capensis						

*d= dominant species



Gordonia Duneveld

Dominant Floral Taxa

The table below presents the key indicator species of this vegetation type:

Table D3: Key indicator floral species associated with the Gordonia Duneveld vegetation type
(Mucina and Rutherford, 2006).

Grass species	Herb species	Tree/Shrub species
Graminoids:	Hermbstaedtia fleckii (d) Acanthosicyos naudinianus	Small Trees:
Schmidtia kalahariensis (d)	Hermannia tomentosa	Acacia mellifera subsp. detinens (d)
Brachiaria glomerata Bulbostylis hispidula	Limeum arenicolum L. argute-carinatum	Tall shrubs:
Centropodia glauca	Oxygonum dregeanum subsp.	Grewia flava (d)
Eragrostis lehmanniana Stipagrostis ciliate	canescens var. canescens Sericorema remotiflora	Rhigozum trichotomum
S. obtusa S. uniplumis	Sesamum triphyllum Tribulus zeyheri	Low Shrubs:
		Aptosimum albomarginatum
		Monechma incanum
		Requienia spnaerosperma
		Succulent shrubs:
		Lycium bosciifolium
		L. pumilum
		Talinum caffrum

*d= dominant species



APPENDIX E – Faunal Species List

Table E1: Mammal SCC that occur in the Free State Province (Free State Nature Conservation Bill, 2007)

Common name	Species	IUCN Status	Provincial Status
Aardvark	Orycteropus afer	LC	Protected
Aardwolf	Proteles cristatus	LC	Protected
African elephant	Loxodonta Africana	VU	Protected
African rock python	Python sebae natalensis		Protected
African wildcat	Felis libyca		Protected
All species of house snake	Genus Lamprophis		Protected
All species of otter	Family Mustelidae		Protected
All species of terrestrial tortoise	Family Tesrudinidae		Protected
All species of girdled lizard	Family Cordylidae		Protected
All species of chameleon	Family Chamaeleonidae		Protected
All species of monitor	Family Varanidae		Protected
Bat-eared fox	Otocyon megalotis	LC	Protected
Black-footed cat	Felis nigripes	VU	Protected
Black rhinoceros	Diceros bicomis	CR	Protected
Brown hyaena	Hyaena brunnea	NT	Protected
Cape hunting dog	Lycaon pictus	EN	Protected
Cheetah	Acinonyx jubatus	VU	Protected
Civet	Civettictis civetta	LC	Protected
Hedgehog	Erinaceus frontalis	LC	Protected
Hippopotamus	Hippopotamus amphibius	VU	Protected
Honey badger	Mellivora capensis	LC	Protected
Klipspringer	Oreotragus oreotragus	LC	Protected
Leopard	Panthera pardus	NT	Protected
Lion	Panthera leo	VU	Protected
Oribi	Ourebia ourebi	LC	Protected
Roan antelope	Hippotragus equinus	LC	Protected
Sable antelope	Hippotragus niger	LC	Protected
Scaly anteater	Manis temminckii	VU	Protected
Serval	Leptailurus serval	LC	Protected
Smith's red rock rabbit	Pronolagus rupestris	LC	Protected
Suricate	Suricata suricata	LC	Protected
Tsessebe	Damaliscus lunatus	LC	Protected
Vaal rhebok	Pelea capreolus	LC	Protected
White rhinoceros	Ceratotherium simum	NT	Protected

LC = Least Concern

VU = Vulnerable

NT = Near Threatened

CR = Critical Endangered

EN = Endangered



Common name	Species	IUCN Status	Provincial Status
All bulbuls	Family Pycnonotidae	LC	Ordinary game
All crows	Family Corvidae	LC	Ordinary game
All mousebirds	Family Colidae	LC	Ordinary game
Cape Turtle Dove	Streptopelia capicola	LC	Ordinary game
Common Quail	Coturnix coturnix	LC	Ordinary game
Egyptian Goose	Alopochen aegyptiacus	LC	Ordinary game
Grey-winged Francolin	Scleroptila africanus	LC	Ordinary game
Helmeted Guinea-fowl	Numida meleagris	LC	Ordinary game
Laughing Dove	Streptopelia senegalensis	LC	Ordinary game
Orange River Francolin	Scleroptila levaillantoides	LC	Ordinary game
Red-knobbed Coot	Fulica cristata	LC	Ordinary game
Red-billed Teal	Anas erythrorhyncha	LC	Ordinary game
Red-eyed Dove	Streptopelia semitorquata	LC	Ordinary game
Red-winged Francolin	Francolinus levaillanti	LC	Ordinary game
Red-winged Starling	Onychognathus morio	LC	Ordinary game
Reed Cormorant	Phalacrocorax africanus	LC	Ordinary game
Rock Pigeon	Columba guinea	LC	Ordinary game
South African Shelduck	Tadorna cana	LC	Ordinary game
Spur-winged Goose	Plectropterus gambensis	LC	Ordinary game
Swainson's Spurfowl	Pternistis swainsonii	LC	Ordinary game
White-breasted Cormorant	Phalacrocorax lucidus	LC	Ordinary game
White-faced Duck	Dendrocygna viduata	LC	Ordinary game
Yellow-billed Duck	Anas undulata	LC	Ordinary game

Table E2: Avifaunal SCC that occur in the Free State Province (Free State Nature Conservation Bill, 2007)

Table E3: Arachnid SCC that occur in the Free State Province (Free State Nature Conservation Bill, 2007)

Common name	Species	IUCN Status	Provincial Status
Baboon spider	Family Theraphosidae		Protected
Trapdoor spider	Family Ctenizidae, Nemesiidae and Cyrtancheniidae		Protected



Common name	Species	IUCN Status	Provincial Status
Breyer's plated-lizard	Tetradactylus breyeri	VU	Protected
Karoo flat gecko	Genus Afroedura		Protected
Mountain flat gecko	Afroedura nivaria	LC	Protected
Striped harlequin snake	Homoroselaps dorsalis	NT	Protected
LC = Least Concern			
VU = Vulnerable			

Table E4: Reptile SCC that occur in the Free State Province (Free State Nature Conservation Bill, 2007)

NT = Near

Threatened



APPENDIX F – Avifaunal Species List

Avifaunal Species for QDS 2726BD

http://sabap2.adu.org.za/pentad_info.php?pentad=2705_2250#menu_top http://sabap2.adu.org.za/pentad_info.php?pentad=2700_2250#menu_top



APPENDIX G – DECLARATION AND SPECIALISTS CV'S

Declaration

Declaration that the specialist is independent in a form as may be specified by the competent authority

I, Emile van der Westhuizen, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



Signature of the Specialist





SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF EMILE BASSON VAN DER WESTHUIZEN

PERSONAL DETAILS

Position in Company	Ecologist, Botanist
Date of Birth	30 May 1984
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2008

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Council for Natural Scientific Professions (SACNASP) (Reg. Number 100008/15).

EDUCATION

Qualifications	
BSc (Hons) Plant Science (University of Pretoria)	2012
B.Sc. Botany and Environmental Management (University of South Africa)	2010
Short Courses	
Grass Identification – Africa Land Use Training	2009
Wild Flower Identification – Africa Land Use Training	2009

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Free State, Eastern Cape.

Mozambique (Tete, Sofala and Manica Provinces)

Democratic Republic of the Congo (Katanga and Kivu Provinces)

Ghana (Western and Greater Accra Provinces)

SELECTED PROJECT EXAMPLES

Floral Assessments

- Floral assessment for the proposed Modikwa Platinum Mine South 2 Shaft Project, Burgersfort, Limpopo Province.
- Floral assessment for the proposed New Clydesdale Colliery Stoping Project, Vandyksdrift, Mpumalanga Province.
- Floral assessment as part of the EIA process for the proposed Harriet's Wish PGM Project, Limpopo Province.
- Floral assessment as part of the environmental authorisation process for the proposed Shanduka Coal Argent Colliery in the vicinity of Argent, Mpumalanga.
- Floral assessment for the Auroch Resources Manica Gold Mining Project, Manica, Mozambique.
- Floral assessment for the Namoya Gold Mine project in Namoya, Democratic Republic of Congo.
- High-level floral risk assessment and alternatives analysis for the proposed new Tete Airport, Tete, Mozambique.
- Floral assessment for the proposed Richards bay Harbour Compactor Slab development, Richards bay, Kwa-Zulu-Natal



Province.

- Site walkdown and floral ecological input prior to the construction of the proposed 180km Mfolozi-Mbewu powerline, Richards bay, Kwa-Zulu-Natal Province.
- Floral assessment as part of the EIA process for the proposed Peerboom Colliery, Lephalale, Limpopo Province.
- Floral assessment as part of the EIA process for the proposed Overvaal Underground Coal Mine Project, Ermelo, Mpumalanga Province.
- Floral assessment as part of the EIA process for the proposed King's City Takoradi 3000-hectare development, Takoradi, Ghana
- Floral assessment as part of the EIA process for the proposed Aquarius Platinum Fairway Platinum Mine, Steelpoort, Mpumalanga Province.
- Floral assessment as part of the EIA process for the proposed Geniland Lubumbashi City 4000-hectare development, Likasi, Katanga Province, Democratic Republic of Congo.
- Floral, faunal, aquatic and wetland assessment as part of the EIA process for the proposed Appollonia City Accra 3000-hectare development, Accra, Ghana.
- Floral assessment as part of the EIA process for the proposed Leeuw Colliery, Utrecht, Kwa-Zulu Natal Province.
- Floral assessment as part of the EIA process for the proposed Lubembe Coppermine Project, Lubumbashi, Katanga Province, Democratic Republic of Congo.
- Floral assessment as part of the EIA process for the proposed Kinsenda Coppermine Project, Lubumbashi, Katanga Province, Democratic Republic of Congo.
- Floral assessment as part of the EIA process for the proposed Lonshi Coppermine Project, Lubumbashi, Katanga Province, Democratic Republic of Congo.
- Floral assessment as part of the EIA process for the proposed Jozini Shopping Mall, Jozini, Kwa-Zulu Natal Province.
- Floral assessment as part of the Biodiversity Action Plan for the Assmang Chrome Dwarsrivier Mine, Steelpoort, Mpumalanga Province.





SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION CURRICULUM VITAE OF SANJA SWANEPOEL

PERSONAL DETAILS

Position in Company	Ecologist, GIS Technician, Faunal Specialist
Date of Birth	8 April 1991
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2014

EDUCATION

Qualifications	
BSc Zoology	2013

COUNTRIES OF WORK EXPERIENCE

uth Africa – Gauteng, Mpumalanga, North West, KwaZulu-Natal

SELECTED PROJECT EXAMPLES

GIS Assessments

- Completed GIS mapping and GIS analysis for a significant number of ecological projects;
- Desktop assessment of 45 wetland and river crossings identified along the proposed Fibreco Fibre Optic Cable Route changes between Cape Town to George, George to Port Elizabeth and from Port Elizabeth to Durban;
- High level desktop ecological study and site sensitivity report as part of the site selection process for the possible Rapid Rail Extension to the Gauteng Rapid Rail Network;
- Ecological scan and site sensitivity report as part of the environmental authorisation process prior to prospecting activities for two prospecting areas in Newcastle, Kwazulu-Natal;
- High level desktop study and site sensitivity report as part of the environmental authorisation process prior to prospecting activities on Portion 4 of the Farm Kapstewel no 436, Administrative District of Hay, Northern Cape

• Cumulative Sensitivity Analyses using GIS Techniques for the Fuleni Anthracite Project, KwaZulu Natal.

Wetland Assessments

- Wetland and aquatic ecological assessment for the proposed N3 De Beers Pass Route.
- Wetland assessment as part of the environmental authorisation process for the proposed Sappi Enstra Mill Wastewater Pipeline in Springs
- Wetland Verification and Rehabilitation Criteria for Aspen Hills Estate
- Wetland Ecological Assessment for development in Shoshanguve, adjacent to Tshwane University of Technology
- Wetland assessment as part of the environmental authorisation process for the proposed Braakfontein Coal Mine near Newcastle, Kwazulu-Natal Province

Faunal Assessments

- Faunal assessment as part of the environmental authorisation process for the proposed New Belfast Mine Railway Siding, Mpumalanga
- Terrestrial ecological scan as part of the environmental authorisation process for the proposed construction of a sewer system in the Ekangala Township, Gauteng Province
- Faunal assessment as part of the environmental authorisation process for the Ledig Water Project near Pilanesberg National Park, North West Province
- Faunal assessment as part of the ecological assessment for the Op Goedenhoop Section 102 Coal Project, Mpumalanga



	Province
Rehabili	tation Plan
•	Wetland Rehabilitation and Management Plan for proposed mixed land use development (Kosmosdal extension 92) on the
	remainder of portion 2 of the farm Olievenhoutbosch 389 jr, Gauteng Province
•	Wetland rehabilitation plan for Dorothy Road, Midrand, Gauteng Province
	Debeliktetion and Management Dire for the Each water Decourses within the Decoursed Divisionlass Form No. 4400

Rehabilitation and Management Plan for the Freshwater Resources within the Proposed Rivierplaas Farm No 1486
Residential Development, Western Cape Province

Risk Assessment

Motivation for General Authorisation for the development of a pipeline at Sappi in Springs, Gauteng Province

Ecological Scan

- Terrestrial Ecological Site Sensitivity Scan as part of the Environmental Assessment and Authorisation Process for a proposed development on Holding 76 Monavoni A.H., Pretoria, Gauteng;
- Terrestrial Ecological Site Sensitivity Scan as part of the Environmental Assessment and Authorisation Process for the proposed development of Portion 79 of the Farm Rietfontein 189 IQ, Gauteng
- Wetland Assessment and Terrestrial Ecological Scan as part of the Environmental Assessment and Authorisation Process for the proposed construction of a sewer system in the Ekangala Township, Gauteng Province

Water Use Licence Application

- Assisting in the public participation for an Integrated Water Use Licence for the proposed sewer pipeline and upgrade of the Refengkgotso Waste Water Treatment Works (WWTW);
- Writing an emergency response plan for the proposed sewer pipeline and Refengkgotso WWTW

