mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT SCOPING REPORT

MORGENSON MINING

MORGENSON MINING

DMR REFERENCE: NC 30/5/1/1/2/12320 PR

ABBREVIATIONS AND ACRYNOMS

COMMUNAL PROPERTY ASSOCIATION: CPA
AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BH: Borehole
CAPEX: Capital Expenditure
CMA: Catchment Management Agency
CMAs: Catchment Management Agencies
CRM: Cultural Resources Management
DEA: Department of Environmental Affairs
DFA: Diamond Fields Advertiser
DMR: Department of Mineral Resources
DMS: Dense Medium Separation
DWA: Department: Water Affairs
DWS: Department of Water Affairs and Sanitation
EC: Electrical Conductivity
EIA: Environmental Impact Assessment
ELWU: Existing Lawful Water Use
EMPR: Environmental Management Programme Report
ESA: Early Stone Age
GA: General Authorisation
GN: Government Notice
GPS: Global Positioning System
HIA: Heritage Impact Assessment
HIR: Heritage Impact Report
HSR: Heritage Scoping Report
I&AP: Interested & Affected Party
IBA: Important Bird Area
LIA: Late Iron Age
LSA: Later Stone Age
MAE :Mean Annual Evaporation
mamsl: metres above mean sea level
MAP: Mean Annual Precipitation
MAR: Mean Annual Runoff
MCM: Million cubic metres
MIA: Middle Iron Age
MPRDA: Minerals and Petroleum Resources Development Act, 2002
MSA: Middle Stone Age
NEM:WA: National Environmental Management: Waste Amendment Act, 2008
NEMA: National Environmental Management Act, Act, 1998(Act 107 of1998) (as amended)
NGDB: National Groundwater Database
NHRA: National Heritage Resources Act
NWA: National Water Act, 1998 (as amended)
OPEX: Operational Expenditure
PASA: Petroleum Agency South Africa
PHRA: Provincial Heritage Resources Authority
PSSA: Palaeontological Society of South Africa
RoD: Record of Decision
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency
SWL: Static Water Level
TMM: Trackless Mobile Machinery
TDS: Total Dissolved Solids
WMA: Water Management Area
WUL: Water Use Licence

1. NAME OF APPLICANT: HARMONY CONSTRUCTION CIVILS (PTY) LTD

DETAILS OF THE APPLICANT

Project applicant:	Morgenson Mining (PTY) LTD		
Registration no (if any):	2018/527013/07		
Responsible Person, (e.g. Director, CEO, etc).:	Director		
Contact person:	Jacobus Smit		
Physical address:	17 Godley Street, Kimberley		
Postal address:	P. O. Box 754 Schweizer-Reneke 2780		
Postal code:	2780	Cell:	0832904913
Telephone:	053-963 2008	Fax:	johan@tri-starmeat.co.za
E-mail:	johan@tri-starmeat.co.za		

2. (i) ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) INFORMATION

EAP:	M A Goliath		
Contact person (if different from EAP):	M A Goliath		
Company:	BNL NNAKE TRADINGS		
Physical address:	23 Goedehoop Avenue, Royldene, Kimberley		
Postal address:	23 Goedehoop Avenue, Royldene, Kimberley		
Postal code:	8301	Cell:	0824523693
Telephone:	0824523693	Fax:	goliathmalcolm@yahoo.com
E-mail:	goliathmalcolm@yahoo.com		

(ii)

EXPERTISE OF THE EAP
CURRICULUM VITAE
M A GOLIATH

PERSONAL DETAILS

Surname	**GOLIATH**
Full Names	**MALCOLM ANGUS**
Nationality ***Identity Number***	**SOUTH AFRICAN** **6412145037082**
Home Address:	**23 GOEDEHOOP AVENUE, ROYLDENE, KIMBERLEY, 8301**
CONTACT DETAILS: **CELLPHONE:** **E-MAIL:**	 **0824523693** **goliathmalcolm@yahoo.com**

Qualifications

QUALIFICATION	*INSTITUTION*	*YEAR*
GRADE 12	**WILLIAM PESCOD HIGH SCHOOL**	**1981**
TRADE TEST:	**BLASTING TICKETS**	
COLLEGE/ DIPLOMA:		
UNIVERSITY:LSTD(SCIENCE)		**1984**
TECHNIKON	**UNIVERSITY OF THE WESTERN CAPE**	
NATIONAL DIP (METAL MINING)		**1994**
NATIONAL HIGHER DIP (METAL MINING)	**WITWATERSRAND TECHNIKON**	

Professional Qualifications

MINE MANAGERS CERTIFICATE OF COMPETENCY

EXPERIENCE RELATING TO THIS APPLICATION

COMPANY NAME	***BNL Nnake Tradings***
EMPLOYMENT DATES	***2015 to Date***
POSITION HELD	***Consultant –Environmental Assessment Practitioner***

RESPONSIBILITIES:
Consult on:
Mining: Health and Safety, Develop Business Plans

Mining Permit, Prospecting Right and Mining Right Applications (DMR)

- ***Lodge Environmental Authorisations***
- ***Compile Scoping, Environmental Impact Assessment Reports and Environmental Management Programme Reports***

Environmental Impact Assessment Reports and Environmental Management Programme Reports Compiled :

Mynplaas 1120 Prospecting Right (Free State)
Bucklands Mining Right (Northern Cape)
Goodrock Hotazell Mining Right (Northern Cape)
Tswelelang Mining Right (Northern Cape)
Ventersvilla Prospecting Right (Northern Cape)
Wynandsfontein Prospecting Right (Free State)
Di Blesbokkantoor Prospecting Right (Free State)
Longlands Prospecting Right Application x 2 (Northern Cape)
Ormabex Prospecting Right (Northern Cape)
Rietfontein 11 Prospecting Right (Northern Cape)
Dorstfontein 10 Mining Permit (Northern Cape)
Erf 42 Windsorton Mining Permit (Northern Cape)
Erf 99 Windsorton Mining Permit (Northern Cape)
Bethel Project Prospecting Right (Free State)
Alexanderfontein Project prospecting Right (Northern Cape)
Blaauwkrantz Groenwater Prospecting Right (Northern Cape)
Caravan Park Mining Permit (Northern Cape)
Drakenstein Manganese Project Prospecting Right (Northern Cape)
Doornpan Manganese Project Prospecting Right (Northern Cape)
Nek 106 Manganese Prospecting Right (Northern Cape)
Rorichshoop Prospecting Right (Free State)
Koegas Prospecting Right (Northern Cape)
Fonteintjie1 Mining Permit (Northern Cape)
Fonteintjie2 Mining Permit (Northern Cape)

(b) (i) and (ii) LOCATION

Farm Name:	(1)Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11) 1880.9443 ha and; (2) Remainder of Portion 4 Rietfontein 11 -1563.1109 ha
Application area (Ha)	3444.0552 ha
Magisterial district:	Prieska
Distance and direction from nearest town	60km NW of Prieska

(iii)CO-ORDINATES OF THE APPLICATION AREA

CO-ORDINATES		
	LONGITUDE	**LATITUDE**
A	**29.357820**	**22.368720**
B	**29.387320**	**22.341540**
C	**29.369400**	**22.319920**
D	**29.370120**	**22.284900**
E	**29.339020**	**22.287680**
F	**29.336440**	**22.287180**

(1) LOCALITY MAP

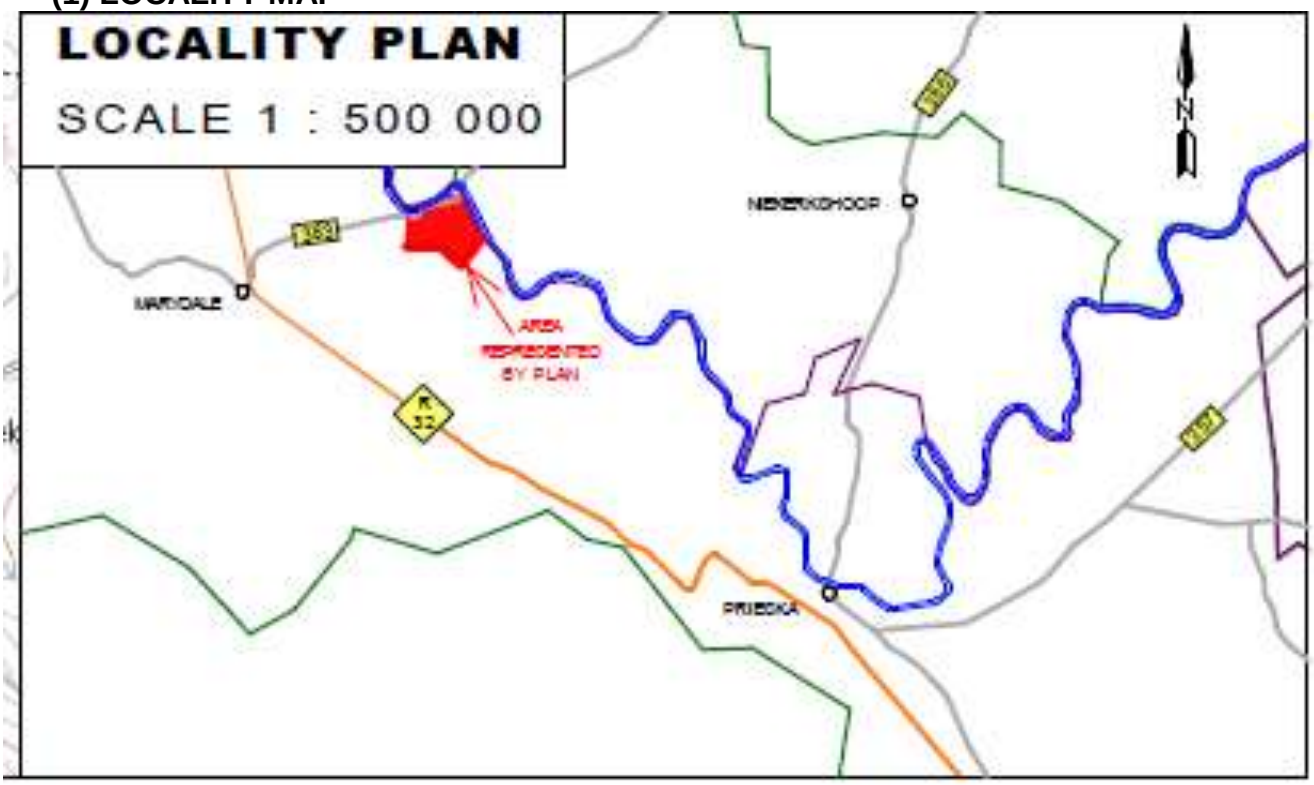
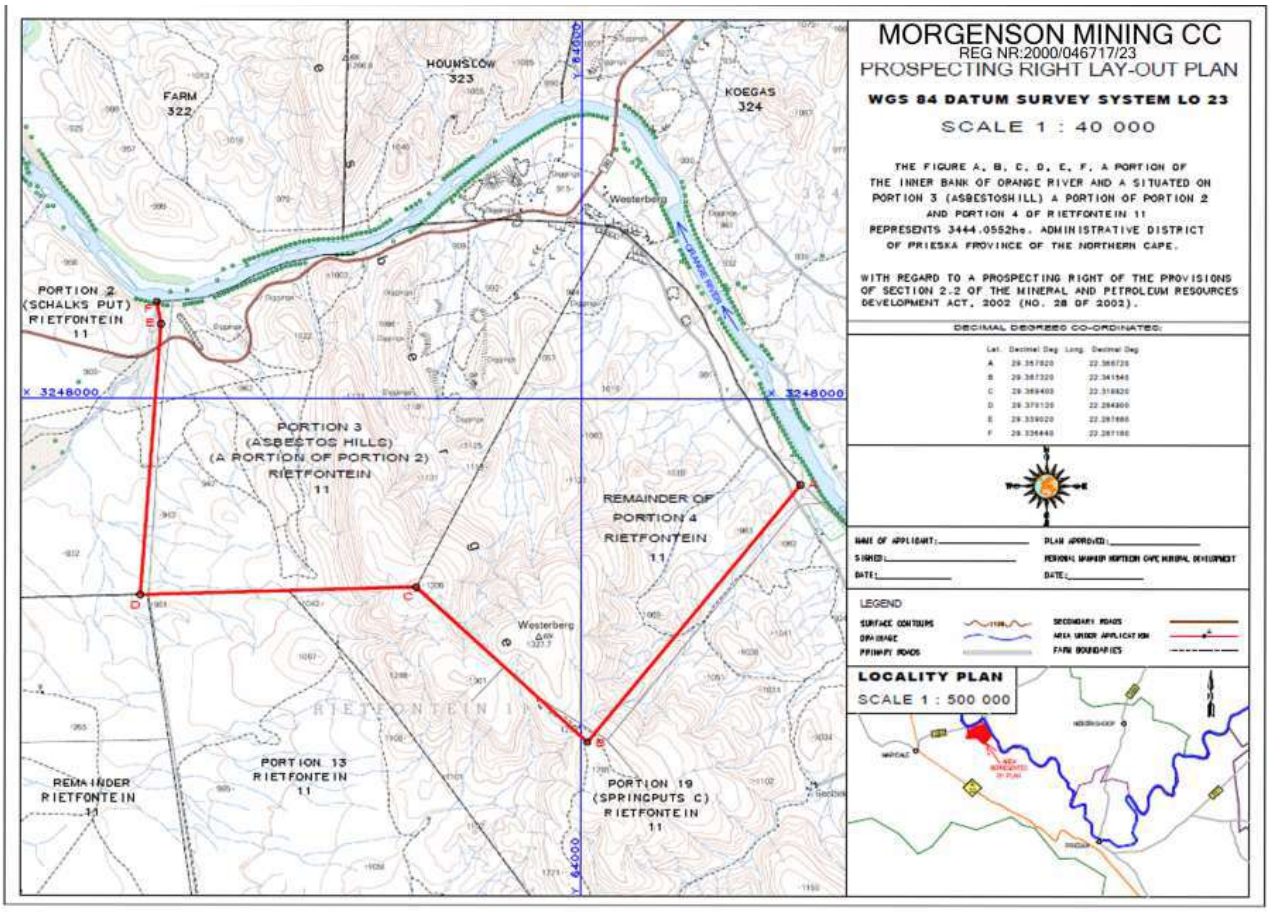


FIGURE 1: ***LOCALITY MAP***



APPLICATION MAP

Plant 2 600m², Waste Stockpiles 1000m2, Topsoil Stockpiles 500m², , Production Stockpiles 500m², Ablution Facilities 25m², Tailings Dam 400m², Site office 40m², Workshop 300m² , Clear Water Reservoir 160m³, Roads 720m² , Domestic Waste Facility 24m2, Diesel Bay with Bund wall 32m², Chemical Storage 25m², Excavations 16 000m²

(d) (i) and (ii) SCOPE OF THE PROPOSED ACTIVITY

Farm Name:	(1) Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11) 1880.9443 ha and; (2) Remainder of Portion 4 Rietfontein 11 -1563.1109 ha
Application area (Ha)	3444.0552 ha
Magisterial district:	Prieska
Distance and direction from nearest town	60km NW of Prieska
21 digit Surveyor General Code for each farm portion	Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11) SG CODE: C06000000000001100000; Remainder of Portion 4 Rietfontein 11 -1563.1109 ha SG CODE: C06000000000001100000

Description of the overall activity. **(Indicate Mining Right, Mining Permit, Prospecting right, Bulk Sampling, Production Right, Exploration Right, Reconnaisance permit, Technical co-operation permit, Additional listed activity)**	**Prospecting Right with Bulk Sampling** **DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:** (i) Desktop Study (1 month) A first phase of geological investigations comprises of collecting various geological literature relating to the area of interest. This literature may be obtained from relevant books and journals. Information can also be inquired from companies which have previously mined in the area. Satellite images as well as geological maps will be used to identify possible prospecting target areas. (ii) Geological Mapping with aid of UAV (1month) To more accurately identify prospecting target areas, an Unmanned Aerial Vehicle (UAV) or commonly known as a drone will be employed. It has different sensors integrated into the drone, making this more productive and environmentally friendly (no contact with the ground). It is an automated system, with a programmed flight plan, allowing for large areas to be covered in a short period of time. The intention is also to reduce drilling needed (and hence costs). The system also provides a cost effective way to make mineral exploration in new, unexplored areas. The flight is controlled by an autopilot. The autopilot records flight data including GPS time and position (latitude and longitude), the orientation (roll, pitch and yaw), and barometric pressure. The real-time flight is controlled by PC software via a telemetry (radio) link. The nominal accuracy of the GPS position is about ±1.5 m. The magnetic field is measured using a digital 3-component flux-gate magnetometer. The magnetometer data (X, Y, Z components and total field), are recorded by the company's own data logger. The GPS time and position are synchronized with the autopilot. A base station located near the mobile telemetry/control station measures the time variation of the total magnetic field using a proton precession magnetometer. This allows for more cost effective (i.e faster and more versatile (e.g. swamps or rivers are no obstacles for drones) and environmentally friendlier (no impact on the ground) exploration. Challenges remaining are the limited payload (requiring survey equipment to be modified light weight), the limited flight time (requiring comprehensive planning for larger survey areas), weather (i.e. wind) and different aviation policy requirements in different countries. *IMPACT ON THE MINING VALUE CHAIN* • EXPLORATION (incl. permitting) EXPLORATION • safe and fast remote exploration • reduced environmental impact The data so obtained would be incorporated into a drilling plan and the final bulk sampling positions. Thorough filed mapping of the surface geology will be done in order to narrow down target areas for determining the location of the ore body. Field mapping and satellite images makes it possible to eliminate certain areas and focus on the possible ore deposits. Geological Report (months 44-60) This written report comprises of all prospecting results as well as recommendations for future activities. When the prospecting period is done decisions will be made regarding the necessity of future prospecting or application for a mining right

	DESCRIPTION OF PLANNED INVASIVE ACTIVITIES: Bulk Sampling(month 3-43) Bulk sampling is done through opencast pitting by using machinery as well as labour. Excavators are used to remove the overburden as well as ore. The dimensions of the excavations is 20m X10m in a checkered pattern. The deviation to this bulk sampling program could be when a particular line of interest is encountered and the prospecting be done along a channel. The ore is then transported to the plant by means of Dump Trucks. The alluvial ore is introduced to the Plant Receiving Bin by means of a Load Haul Dumper.The oversize material (+100mm) is used as backfill in the opened-up excavation areas. The overburden is placed on site where it is later backfilled into the pit, i.e. formations will be placed back in the same sequence it was extracted. The topsoil is then introduced to complete the rehabilitation process. Rehabilitation is thus continous. The ore is treated in a processing plant (Fig4) that consists of 3 x 16 feet rotary pans. These pans operate on the principle of density of which the medium is puddle. The concentrate will report to a recovery house, and the diamonds recovered through grease tables. Production Tonnage Calculation 80 Pits with Dimensions 20mx10mx average depth 12m Average Density Ore 1.8 TONNAGE ORE: 345 600 Overburden Tonnage Calculation 80 Pits with Dimensions 20mx10mx average depth 1.6m Average Density Overburden: 2.2 TONNAGE OVERBURDEN INCLUSIVE OF TOPSOIL: 56 320 TOTAL TONNAGE: 401 920 AERIAL DISTURBANCE OF PITTING: 16 000m^2 : 1.6 ha

LISTED ACTIVITIES DESCRIPTION OF ACTIVITIES AND INFRASTRUCTURE

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. for mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**Aerial extent of the Activity** **Ha or m²**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** (***GNR 544, GNR 545 or GNR 546)***	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). **(Mark with an X)**
Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Development Act, 2002 (Act No.28 of 2002), including- (a) associated infrastructure, structures and earthworks directly related to the extraction of a mineral resource: or	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR 327 Ln 1, Activity 20	

(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing: but exclude the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies (Activity 20 of Listing Notice 1				
The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including- (a) associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource: or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing: but exclude the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies (Activity 19 of Listing Notice 2)	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR 325 Listed 2,Activity 19	
Activity 27 of GNR 983 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.	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR327 LN 1 Activity 27	
Activity 25: “The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.”	Chemical toilets and wash bays for the site.	**X**	NEMA: LN1 (GNR 327)	
Activity 9: “The development of infrastructure exceeding 1000 metres in length for the bulk	Water distribution pipelines	**X**	NEMA: LN1 (GNR 327)	

transportation of water or storm water- (vii) with an internal diameter of 0.36 metres or more; or (viii) with a peak throughput of 120 litres per second or more				
Activity 12 : "The development of- (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; Regulation GNR 704, published on 4 June 1999 in terms of the National Water Act (use of water for mining and related activities)	Clean and dirty water systems on the site. It is anticipated that the operations will establish storm water control berms and trenches to separate clean and dirty water on the prospecting site	**X**	NEMA: LN1 (GNR 327)	
Activity 27(iv): "the development of – (iv) a road catering for more than one lane of traffic in both directions,'' (both access and haulage road on the prospecting site):	Estimated at 4180m. To be confirmed	**X**	NEMA : LN2 (GNR325)	
Pipelines for the bulk transportation of water with diameter of <0.36m and a peak throughput of <120l/s Pipelines for the bulk transportation of slimes with diameter of <0.36m and a peak throughput of <120l/s Pipelines for the bulk transportation of return water with diameter of <0.36m and a peak throughput of <120l/s	To be confirmed			
DEVELOPMENT FOOTPRINT				
Plant Processing Area (Screen and Crush)	2600m^2			
Waste Stockpiles	1000m^2			
Topsoil Stockpiles	500m^2			
Production Treatment Stockpiles	500m^2			
Portable Ablution Facilities	25m^2			
Tailings and Discard Dam	400m^2			
Clear Process Water Facilities (JOJO)	160m^3			
Workshop	300**m^2**			
Site Office	40**m^2**			
Diesel Bay with Bund wall	32m^2			
Mine Roads (6m width)	720m^2			
Excavations	16 000m^2			
Domestic Waste Facility	4m^2			
Chemical Storage	25m^2			

DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:

(i) Desktop Study (1 month)
A first phase of geological investigations comprises of collecting various geological literature relating to the area of interest. This literature may be obtained from relevant books and journals. Information can also be inquired from companies which have previously mined in the area. Satellite images as well as geological maps will be used to identify possible prospecting target areas.

(ii) Geological Mapping with aid of UAV (1month)
To more accurately identify prospecting target areas, an Unmanned Aerial Vehicle (UAV) or commonly known as a drone will be employed. It has different sensors integrated into the drone, making this more productive and environmentally friendly (no contact with the ground). It is an automated system, with a programmed flight plan, allowing for large areas to be covered in a short period of time. The intention is also to reduce drilling needed (and hence costs).
The system also provides a cost effective way to make mineral exploration in new, unexplored areas.
The flight is controlled by an autopilot. The autopilot records flight data including GPS time and position (latitude and longitude), the orientation (roll, pitch and yaw), and barometric pressure. The real-time flight is controlled by PC software via a telemetry (radio) link. The nominal accuracy of the GPS position is about ±1.5 m.
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A base station located near the mobile telemetry/control station measures the time variation of the total magnetic field using a proton precession magnetometer.
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IMPACT ON THE MINING VALUE CHAIN

- EXPLORATION (incl. permitting)

EXPLORATION

- safe and fast remote exploration
- reduced environmental impact

The data so obtained would be incorporated into a drilling plan and the final bulk sampling positions. Thorough filed mapping of the surface geology will be done in order to narrow down target areas for determining the location of the ore body. Field mapping and satellite images makes it possible to eliminate certain areas and focus on the possible ore deposits.

Geological Report (months 44-60)
This written report comprises of all prospecting results as well as recommendations for future activities. When the prospecting period is done decisions will be made regarding the necessity of future prospecting or application for a mining right

DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:

Bulk Sampling(month 3-43)
Bulk sampling is done through opencast pitting by using machinery as well as labour. Excavators are used to remove the overburden as well as ore. The dimensions of the excavations is 20m X10m in a checkered pattern. The deviation to this bulk sampling program could be when a particular line of interest is encountered and the prospecting be done along a channel. The ore is then transported to the plant by means of Dump Trucks. The alluvial ore is introduced to the Plant Receiving Bin by means of a Load Haul

Dumper.The oversize material (+100mm) is used as backfill in the opened-up excavation areas. The overburden is placed on site where it is later backfilled into the pit, i.e. formations will be placed back in the same sequence it was extracted. The topsoil is then introduced to complete the rehabilitation process. Rehabilitation is thus continous.

The ore is treated in a processing plant (Fig4) that consists of 3 x 16 feet rotary pans. These pans operate on the principle of density of which the medium is puddle. The concentrate will report to a recovery house, and the diamonds recovered through grease tables.

Production Tonnage Calculation
80 Pits with Dimensions 20mx10mx average depth 12m
Average Density Ore 1.8
TONNAGE ORE: 345 600

Overburden Tonnage Calculation
80 Pits with Dimensions 20mx10mx average depth 1.6m
Average Density Overburden: 2.2
TONNAGE OVERBURDEN INCLUSIVE OF TOPSOIL: 56 320
TOTAL TONNAGE: 401 920
AERIAL DISTURBANCE OF PITTING: 16 000m^2 : 1.6 ha

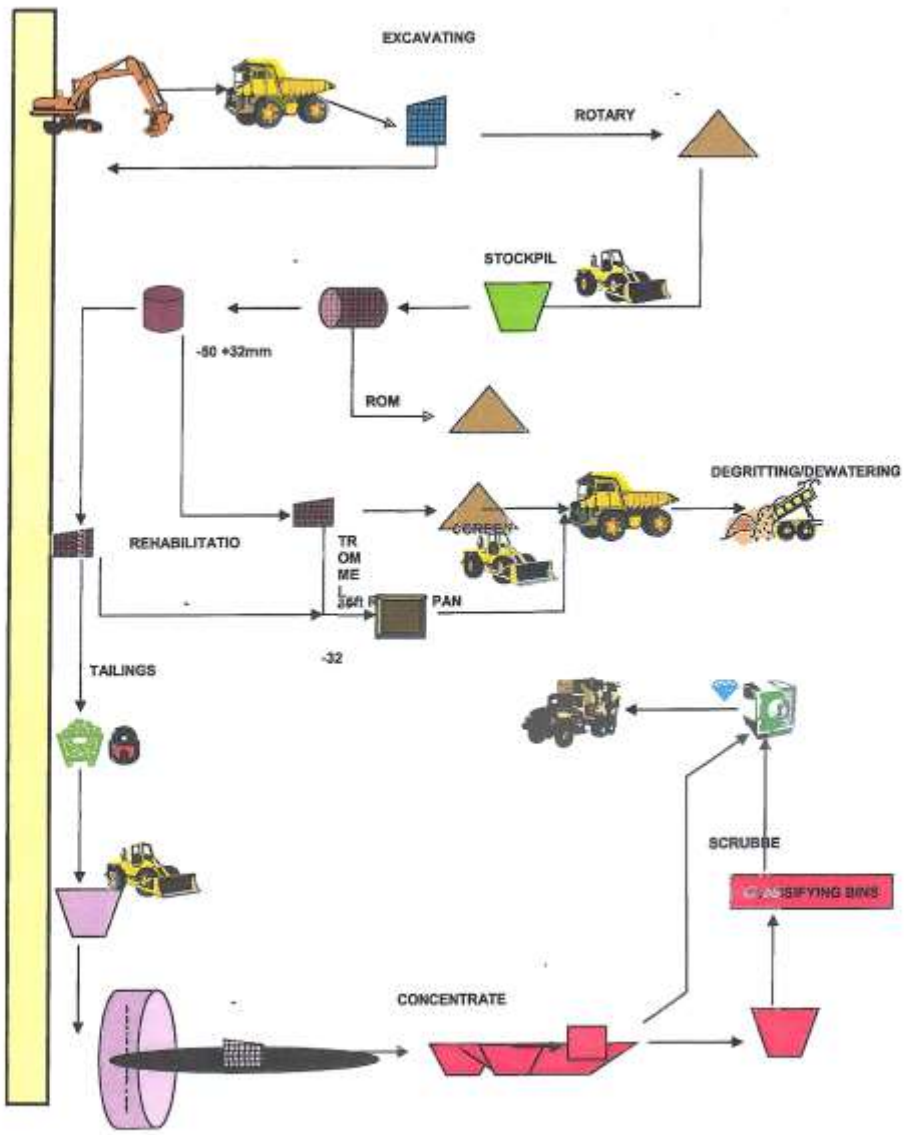


Figure 4: Schematic representation of the planned processing flow

BULK SAMPLING EXCAVATIONS

One block of 20m x10 m is proposed for optimal prospecting. The positions and exact extent is not known at this point. This would be guided by the actual results of the excavations.

The technology used in this activity will be an Excavator to make the excavation and a Front End Loader that will load the material onto Dump Trucks for transportation to the treatment plant which is situated on the prospecting area..

Diamondiferous gravel is excavated for mining purposes. The topsoil and overburden is removed where necessary and stored near the excavation for easier rehabilitation activities. The gravel is excavated, screened and transported to the plant site for mineral processing and diamond recovery.

This activity is the most critical part of the proposed prospecting activities and therefore the option of not implementing the activity cannot be considered.

PLANT SITE

The processing plant site (approximately 2600m^2 in footprint) shall not be formally demarcated but demarcated with berms to indicate the allowed area for movement. Equipment used within this site will be installed in an almost inline manner for sufficient and effective mineral processing operations.

The technology used for the mineral processing area:

The stock material is loaded into a feeder bin crushed and screened into the different size fractions where it will be stockpiled for supply to the consumers.
The option of not implementing this activity is regarded as a no-go as this activity is the core processes in the diamond treatment operation.

PRODUCTION STOCKPILES 500m^2

The production stockpiles would be the dedicated area for the delivery of kimberlitic material and the stockpile facilities for the treated fissure.

The option of not implementing this activity is regarded as a no-go as this activity is the intermediate between the processing and selling of the ore. No profit or income can be generated if this activity is not implemented.

WASTE STOCKPILE 1000 m^2

The plant will have a rejection fraction around 18%. This material need to be placed on a stockpile, landscaped and rehabilitate with the natural vegetation.

If this stockpile cannot be proceeded with, the project cannot proceed as no alternative is available.

TOPSOIL STOCKPILE 500m^2

The topsoil would be removed and kept on a topsoil stockpile (500m^2 footprint) for final rehabilitation of the excavated areas. No specific technology is used other than ensuring no contamination of the topsoil. If this activity is not implemented the project activities cannot continue fluently affecting the cost effectiveness of the operation. The option of not implementing the activity cannot be considered.

ABLUTION FACILITY WITH CHANGE HOUSE 25m^2

The ablution (with a total footprint of approximately 25m^2), is installed before the project operations start, and will be active till the decommissioning of the project.

Contractual agreements will be made and basic flushing chemical toilets installed during the construction phase.
These facilities are to support the sanitation protocol of the operation.

It is a requirement that all employees engage with risk work be afforded facilities to enable them to wash before leaving their place of work.

The implementation of this structure and related activities is absolutely compulsive and enforced by the Basic Conditions of Employment Amendment Act, 2013 (Act 20 of 2013) in conjunction with the Basic Conditions of Employment Act, 1997 (Act 75 of 1997), Basic Conditions of Employment Amendment Act, 2002 (Act 68 of 2002) and Basic Conditions of Employment Amendment Act, 2003 (Act 52 of 2003)

During the operational phase permanent facilities would be erected.

SITE OFFICE 40m^2

The office block will be installed and have an approximate footprint of 25 m^2. This site office will house the operational staff.

The office site will be fitted with relevant equipment/furniture for its specific task.

All administrative activities, storing of files, Project financials and discussions will be occurring within this facility.

The best option is to keep the offices within the project premises for proper managing, activity regulation, accident and damage control as well as optimizing productivity. Some appointments are mandatory and a legal requirement. An alternative was opted for the Occupational Hygienist, Environmentalist and Medical Practitioner to be appointed Part time.

WORKSHOP AND VEHICLE STORAGE AREA

Workshop and Vehicle Storage Area: Footprint 300m^2

The parking area is designed to house designated vehicle parking, concrete constructed wash-bay, vehicle maintenance workshop and an auto parts storage facility .

Drip pans will also be readily available for vehicles during off-time. No other technologies will be used during this activity

The parking area will be sectioned and demarcated for the various activities. All vehicles inclusive of visitors' vehicles, employee vehicles and heavy vehicles will be parked in this area within their different sections. All vehicles will however be required to adhere to the reversed parking policy for the safety of all vehicles in the case of an emergency.

Should this activity not be implemented pollution and chemical spill control cannot be optimally managed as well as the informal parking of other normal vehicles can lead to difficult driving environment for heavy vehicles. For this reason and legislative requirements this activity cannot be excluded as a prospecting related activity and thus planned to be implemented during the construction phase of the prospecting activities.

DIESEL STORAGE

The diesel storage facility (32m^2) will be active for the duration of the project. This footprint will house the diesel bay, containing the tank volume plus 10%, and a re-fueling slab (10 m²).

The technology used shall be of the highest standards provided by the contracting diesel/fuel agency. The actual volume of the tank is currently unknown, but it is compulsive that the operation is supplied with a diesel tank already equipped with a leak-proof bay to prevent any ground contamination should the tank be leaking by fault or bursting.

Diesel will be kept within these containers for re-fueling purposes during the project activities. The contracting agency will be refilling these tanks on a regular basis and only then will the tank be inspected and maintenance procedures carried out.
Machinery will be parked on a cement slap next to the tank for re-fuelling activities. This cement slap shall be contracted at a gradient with a run-off channel leading to a sump for impact prevention should any accidental spillage occur. The sump will also be cleaned and maintained on a regular basis by the contracting agency.
Taking the proximity of the town into consideration the option on not implementing the activity was considered but after careful consideration regarded as a no-go option.

ROADS
Footprint 720m^2. The project would mainly use the current farm roads infrastructure for travel between the plant, excavations and stockpile area. No alternative can be considered for this activity.

CHEMICAL STORAGE 25M^2
The facility should be a well ventilated construction with the ability to be locked.

Ventilation in this facility will be ensured through adequate roof ventilation systems. The structure itself will also be in the form of a mobile container.

This facility's main function is for the storing and controlling of legislative regulated and/or non-legislative regulated chemicals (1 000 liter). The different types of chemicals must be stored separately as well as a differentiation between used and un-used chemicals should be made. Containers can also be place within this storage facility for the storage of used mechanical parts till the removal thereof.
Once the use chemical containers are approximately 80% full the relevant agencies will be contacted for handling and correct removal of such chemicals.
The option of not implementing the activity is legislatively ruled out by specific regulations within the Mineral and Petroleum Resources Development Act and National Environmental Management Act regarding the storing of environmental hazardous chemicals.

WASTE DISPOSAL SITE 24M^2
The operation will establish a dedicated fenced waste disposal site equiped with a concrete floor and bud wall to dispose of the following types of waste:

- Domestic Waste
- Industrial Waste
- Low level hazardous waste in suitable receptacles

(e)LEGISLATIVE AND POLICY CONTEXT

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	**REFERENCE WHERE APPLIED** **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT** **(E.g In terms of the National Water Act:-Water Use Liscence has/has not been applied for).**
Constitution of South Africa (Act 108 of 1996)	Section 24: Environmental Right Section 25: Rights in Property Section 27: Water and sanitation Right	Consultations with interested and affected parties as within the Environmental Management Programme
Mineral and Petroleum Resource Development Act; 2002 (Act No.28 of 2002)(As Amended)	A Prospecting Right application	A Prospecting Right has been applied for to DMR Northern Cape Province
Conservation of Agricultural Resources Act (Act 43 of 1983) and Regulations	Section 5: Implementation of control measures for alien and invasive plant species; Section 6: Control measures	Part of Environmental Management Programme

	Regulation GNR1048, published on 25 may 1984, in terms of CARA	
Environmental Conservation Act (Act 73 of 1989) and Regulations	Sections 21, 22,25,26 and 28: EIA Regulations, including listed activities Section 28A: Exemptions	Part of Environmental Authorisation and Environmental Management Programme.
Mine Health and Safety Act (Act 29 of 1996) and the Regulations Promulgated thereunder	Entire Act	Part of Environmental Management Programme
Hazardous Substances Act (Act 15 of 1973) and Regulations read together with NEMA and NEMWA	Definition, classification, use, operation, modification, disposal or dumping of hazardous substances	Part of Environmental Management Programme
National Environmental Management Act, 1998(Act 107 of1998) (as Amended)NEMA	Section 2: Strategic environmental management principles, goals and objectives Section 24: Foundation for Environmental Management frameworks. Section 28: require duty of care where reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment. Section 29: addresses the protection of workers refusing to do environmentally hazardous work. Section 30: addresses procedure to be followed in the event of emergency incident which may impact on the environment. Section 31: Access to environmental information and protection of whistle blowers.	Part of Environmental Management Programme
National Environmental Management: Air quality Act (Act 39 of 2004)	Section 32: Control of dust Section 34: control of noise Section 35: control of offensive odours Regulation GNR551, published on June 2015 (amended Categories 1to 5 of GN 983) in terms of NEM:AQA (Atmospheric emission which have a significant detrimental effect on the environment) Regulation GN R283, published on 2 April 2015 in terms of NEM:AQA (National Atmospheric Emissions reporting Regulations) (Group C-Mines)	Section 32
National Environmental Management Act: Biodiversity Act, 2004 (Act 10 of 2004)	Section 52 of the National Environmental Management Act: Biodiversity Act (NEMBA) Act 10 of 2004) states that the ME/Minister is to list ecosystems that are threatened and in need of protection Section 53 states that the Minister may identify any process or activity in such a listed ecosystem as a threatening process. A list of threatened and protected species has been published in terms of section 56(1) GG 29657 GNR 151 and GNR 152, Threatened or Protected Species Regulation.	To take note of
National Environmental Management: waste management Act (Act 59 of 2008)	Chapter 4: Waste management activities Regulation GN R 634 published on 23 August 2013 in terms of NEM:WA (Waste Classification and Management Regulations) Regulations GN R921 published on 29 November 2013 in terms of NEM:WA (Categories A to C-Listed activities) National Norms and Standards for the remediation of contaminated land and Soil Quality published on 2 May 2014 in terms of NEM:WA (Contaminated land regulations)	
National Environmental Management Act: Protected Areas act (NEMPAA) Act 57 of 2003) provides for the protection of ecologically viable areas that are	Chapter 2 lists all protected areas.	Take note of

representative of South Africa's natural biodiversity and its landscapes and seascapes.		
National Water Act, 1998(Act 36 of 1998)	In terms of the definitions contained in Section 1 of the National Water Act, Act No.36of 1998, a 'water resource' includes a watercourse, surface water, estuary or aquifer. "Aquifer" means a geological formation which has structures or textures that hold water or permit appreciable water movement though them. "Watercourse" means a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks. The Minister of Water and Environmental Affairs is allowed to regulate activities which have a detrimental impact on water recourse by declaring them to be controlled activities. No person may undertake a controlled activity unless such person is authorised to do so by or under the Act. Duty of Care to prevent and remedy the effects of pollution to water recourse is addressed in Section 19.Section 20 address the procedure to be followed, as well as control of emergency incidents which may impact on a water resource. Recognised water uses are addressed in terms of section 21 and the requirements for registration of water uses are stipulated in Section 26 and 34.	Application will be lodged with the Department Water and Sanitation on approval of the EMPr
Nature Conservation Ordinance (Ord 19 of 1974)	Chapters 2,3,4 and 6: nature reserves, miscellaneous conservation measure, protection of wild animals other than fish, protection of Flora	Take note of
In terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)	In terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), any person who intends to undertake "any development or other activity which change the character of a site – exceeding 5000m3 in extent" and the "construction of a ….. Linear development or barrier exceeding 300m in length" must at the very earliest stages of initiating the development, notify the responsible heritage resources authority, viz, the South African Heritage Resources Agency and /or Department of Environment.	Consult SAHRA
Conservation of Agricultural Resources Act, Act No 43 of 1983	Section 5 of the Conservation of Agricultural Resources Act, Act No 43 of 1983, prohibits the spreading off weeds and Section 6 and Regulation 15 and 15E of GNR 1048 address the implementation of control measures for alien and invasive plant species. This aspect has been addressed in the Environmental Management Programme. This Act also makes provision for the conservation of agricultural land.	Part of Environmental Management Programme
National Forest Act, 190 (Act No. 84 of 1998)	National Forest Act, 190 (Act No. 84 of 1998) and Regulations, Section 7: No person may cut, disturb, damage or destroy any indigenous , living tree in a natural forest, except in terms of a licence issued under Section 7(4) or Section 23: or an exemption from the provisions of this subsection published by the Minister in the Gazette. Sections 12 – 16 deal with protected trees, with the Minister having the power to declare a particular tree, a group of trees, a particular woodland, or trees belonging to a certain species, to be a protected tree, group of trees, woodlands or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.	Take note
Subdivision of Agricultural Land Act, Act 70 of 1970	Control the subdivision, and in connection therewith, the use of agricultural land. It also control long term	Take note

	leases over agricultural land. The applicant needs to apply for consent from the Department of Agriculture for these leases.	
Section 17 of the Fencing Act, Act No.31 of 1983	States that any person erecting a boundary fence may clean any bush along the line of the fence up to 1,5m on each side therefore and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.	Take note
Section 8 of the Atmospheric Pollution Prevention Act, Act No.45 of 1965	Section 8 of the Atmospheric Pollution Prevention Act, Act No.45 of 1965 regulating controlled areas, as well as section 27, with regard to dust control is still applicable.	Comply
The Occupational Health and Safety Act, Act 85 of 1993 GNR 22810f 1987-10-16	Environmental Regulations for Workplaces are applicable.	Comply
The South African Civil Aviation Regulation Act, Act 13 of 2009.	Controls marking of structures that may influence aviation through the Civil Aviation Technical Standards, SA-CATS-AH 139.01.33 Obstacle Limitations and Markings outside Aerodrome or Heliports. It states that any structure exceeding 45m above ground level, or structures exceeds 150m above the MEAN ground level, like on top of a hill, the mean ground level considered to be the lowest point in a 3km radius around such structure. Structures lower than 45m, which are considered as a danger or a potential danger to aviation, shall be marked as such when specified. Overhead wires, cables, etc., crossing a river, valley or major roads shall be marked and in addition, their supporting towers marked and lighted if an aeronautical study indicate that it constitute a hazard to aircraft.	Take note
Basic Conditions of Employment Act (Act 3 of 1997) as amended	Entire Act	Comply
Land Survey Act (Act 8 of 1997) and Regulations	To control land surveying, beacons etc.	Take note
Traditional Leadership and Governance Framework Amendment (Act of 2003) and Council of Traditional Leaders (Act of 1997)	These two acts provide for the recognition and establishment of traditional communities and councils, and provide a framework for traditional leadership and the roles and responsibilities of this leadership.	The project is not located on land under tribal control, the role of the tribal authorities will be particularly important during the stakeholder engagement participation process that will be undertaken.
National Development Plan (NDP)	Development in South Africa is guided by the NDP, which presents a shared long-term strategic framework within which more detailed development planning can take place to advance the long-term goals adopted in the NDP (National Planning Commission, 2011). The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and the reduction of inequality. The NDP 2030 sets a target of creating approximately 11 million new jobs and achieving an annual average economic growth rate of 5.4% by 2030.	The project will create approximately 20 jobs during the course of prospecting and emphasis placed on the employment of women.
National Infrastructure Plan	The South African Government adopted a National Infrastructure Plan in 2012. The primary objective of the Plan is to transform the country's economic landscape, while simultaneously creating significant numbers of new jobs, strengthen the delivery of basic services, and promoting integration with other African economies.	The project will result in the development of support infrastructure such as roads and pipelines. The local community and authorities will have access and use of these infrastructure.

(f) NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

The study area has alluvial diamond gravel sources. This prospecting program seeks to quantify these sources through bulk sampling and prove it to be economically viable. The prospecting operation would provide much needed employment to the local community of the Prieska area, especially (KOEGAS).

Desirability of the Project:

- Creation of employment opportunities to the Koegas community in the mining sector
- The availability of bursaries, internships and training programs that would impact on the employment opportunities of the youth if proceeded with the mining right application with reference to the Social and Labour Plan.
- BEE suppliers of consumables to the projects
- Engagement of women in mining
- Ensure the optimal use of mining resources
- Improve the lack of entrepreneurship
- Underutilization of the regions natural resources and economic opportunities
- Lack of investment in the region

Positive impact of the prospecting activities include:

- ✓ Employment through the life of mine;
- ✓ Skills transfer of employees through training which will be used after the end of lifespan of the prospecting programme and if proceeded the mine; and
- ✓ Poverty Eradication through income

The preferred site on the farm will have the least disturbance and risk to the environment, minimal impact to adjacent farmers and taking into account all biological, and possible archaeological and water sources destruction and contamination.

PERIOD FOR ENVIRONMENTAL AUTHORISATION
5 Years

(g) DESCRIPTION OF PROCESS TO REACH THE PROPOSED PREFERRED ACTIVITY, SITE AND LOCATION .

The decision on the activity is based on the fact that the study area has alluvial diamond bearing gravels which could be economically exploited. Indications of previous mining activity exists on the farm. The reason for this prospecting program is to quantify the diamond resource and establish the quality thereof.

The diamond gravel sources is site specific and no alternative to its location exists.

The following factors were considered for the infrastructure location on-site

Weighing Factors	Impact	Preferred Site	Any Alternative
Proximity of neighbouring farms	Noise and Dust, Visibility.	✓	✓
Rehabilitation	The most effective and efficient rehabilitation program	✓	
Definition of the infrastructure in relation to the prospecting resource	Destruction of Fauna and Flora when developing mine and access roads and plant with	✓	

	other complimentary infrastructure.		
Fauna and Flora	Destruction	✓	
Water supply infrastructure	Any boreholes	✓	
Noise	Noise pollution	✓	✓
Orange River	Contamination	✓	✓
Dust (Wind Regime)	Air Quality	✓	✓
Visibility	Poor view from distance		
Landowner input	Land capability after mining	✓	
Koegas Community (Residential area-currently redundant)	Socio-Economic and Cultural impact	✓	
Topography	Erosion factors	✓	
Geology	Sterilization of mining resource	✓	
Soil	Contamination and erosion	✓	✓
Surface Water	Contamination	✓	
Ground Water	Contamination	Not Known	Not Known
Sensitive Landscape	Destruction	✓	✓
Land Capability	Pre and Post land use	✓	✓
Old Asbestos workings, plant and rehabilitated areas.	Disturbance to rehabilitated area	✓	✓
Roads	Dust and Noise pollution. Visual aspect from R383.	✓	✓

(i) ALTERNATIVES CONSIDERED

THE PROPERTY
The application area is over the farms:
(1) Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11) 1880.9443 ha and;

(2) Remainder of Portion 4 Rietfontein 11 -1563.1109 ha

ALTERNATIVES CONSIDERED:

The applicant considered applying for and include the farms Koegas 324 and Hounslow 325 which is situated directly north of the current application area. Those farms are currently under application by Autumn Skies Trading.

ACTIVITY
LAND USE
There is currently no economic activity conducted on the study area. The land has potential for livestock farming and limited agricultural use. The prospecting activity can be considered as an alternative to the land use.

PROJECT INFRASTRUCTURE

SITE SELECTION

ROADS- the site roads must be developed taking into consideration destruction to fauna and flora, future use thereof, relation and definition to the other prospecting activities with particular reference to the bulk sampling programme (Pitting).

The site selection also has to incorporate and take into account the following factors:
Old Asbestos Plant and Workings (Although Rehabilitated), Location of Graveyard, Current Infrastructure, Ground and Surface water contamination, Closure Objectives, Fauna and Flora destruction.

ALTERNATIVE CONSIDERED:
The alternative for the site selection will have the detrimental effect of requiring an additional 1.8 ha clearance of vegetation to develop project roads and unable to respond to the factors mention above .

TECHNOLOGY
PROCESSING PLANT-The alternative to the Rotary Pan Processing unit considered was a Heavy Medium Separation Plant which uses Ferrosilicon in its process. The Rotary Pan arrangement was selected as it is the most economical and the separation medium (puddle) will have no negative environmental impact.

DIAMOND RECOVERY UNIT
The applicant weight the has however decided to use the alternative to a Grease Table Recovery Unit which is a Sortex recovery unit due to the increase in efficiency and security factors.

(ii) DETAILS OF THE PUBLIC PARTICIPATION PROCESS

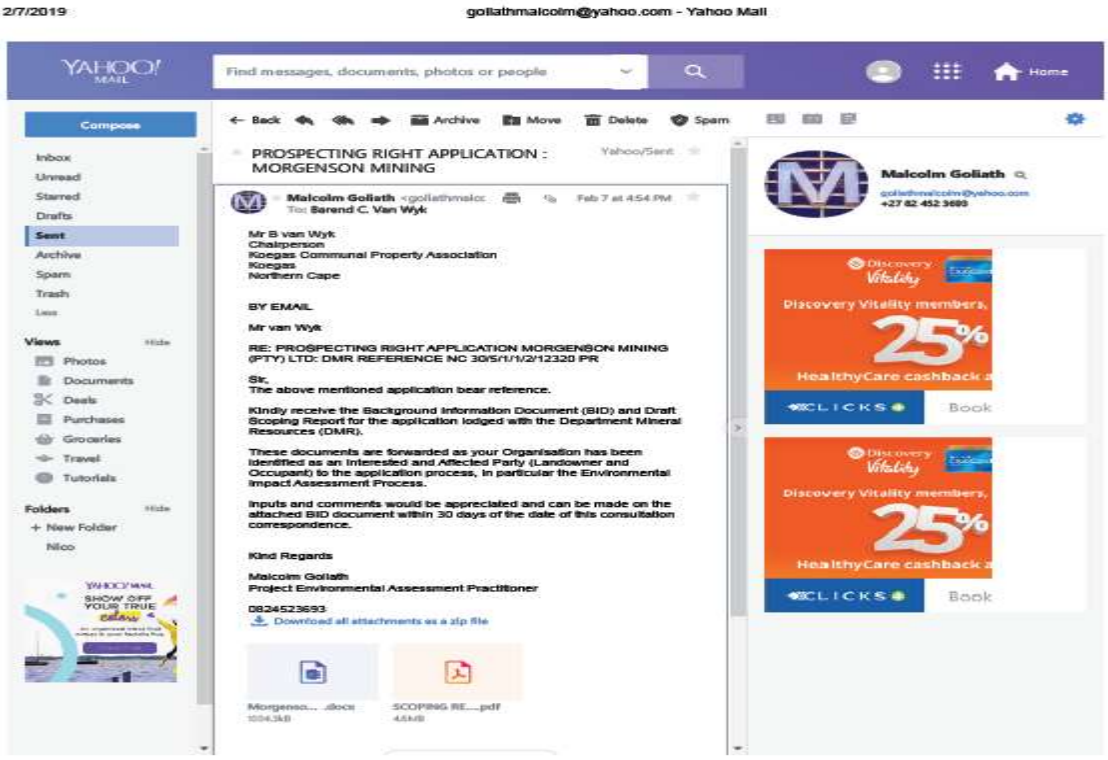
The following process for public participation was undertaken:

(1) ADVERTISEMENT

An advert was placed in a local newspaper, Noordkaap as invitation to Interested and Affected parties to register on the application database and partake in the Scoping phase and EIA process. The advertisement will be placed on the 17th January 2019 and a tear page attached as APPENDIX A.

(2) KOEGAS COMMUNAL PROPERTY ASSOCIATION

Consultation with the Koegas Communal Property Association (Title holder) is on-going as the CPA members don't reside on the property.
Herewith email forwarded to the Koegas CPA Chairperson Mr Barend van Wyk

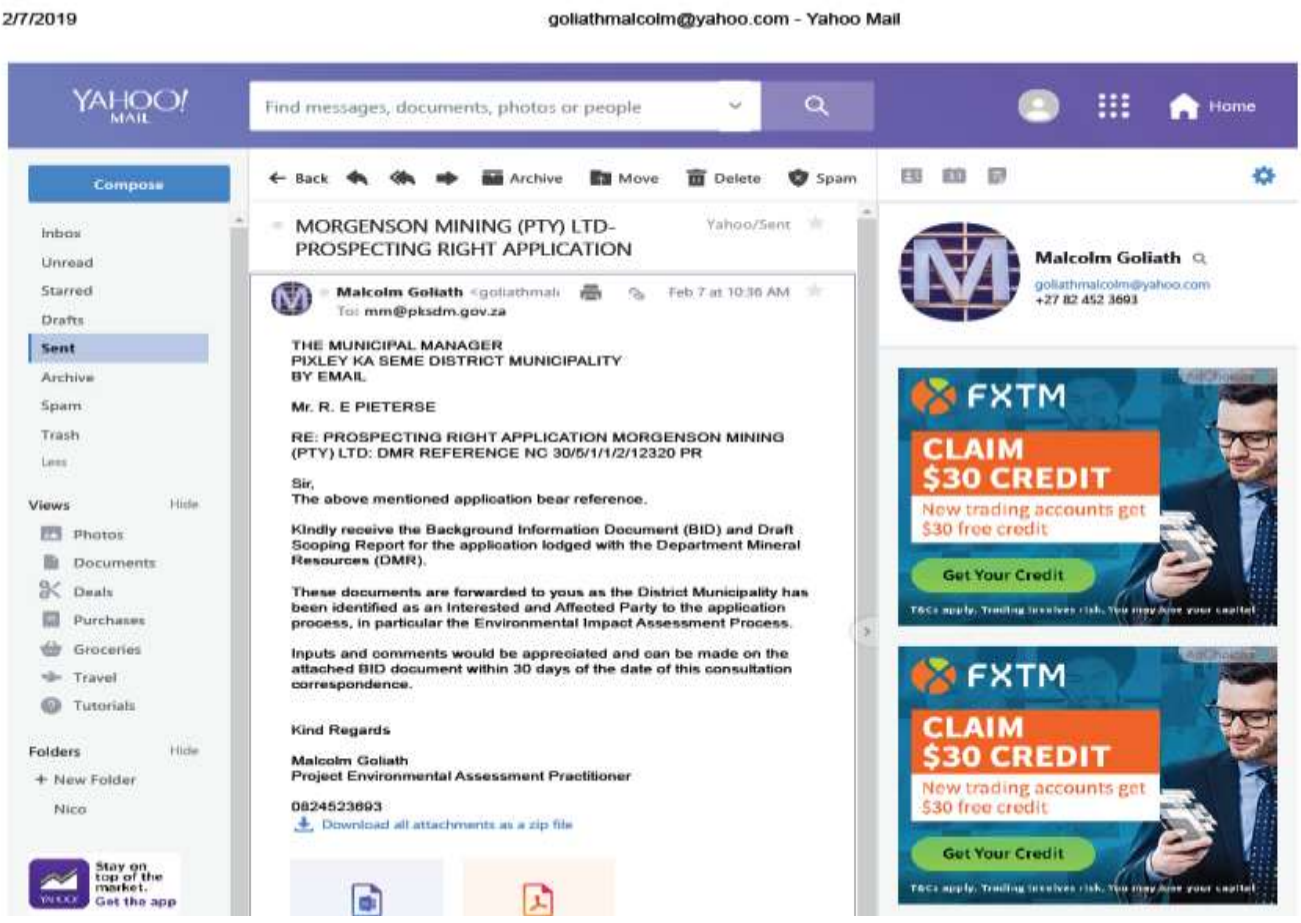


(3) PUBLIC NOTICE BOARD

A Board of dimensions 60cm x 42cm was placed on the farm gate at the entry to the Westerberg Clubhouse. Board was placed on 1st February 2018.

(4) PIXLEY KA SEME DISTRICT MUNICIPALITY

Find attached an email to the Municipal Manager of the Pixley Ka Seme District Municipality for input and participation. Email forwarded on the 7th February 2019.



2/7/2019 goliathmalcolm@yahoo.com - Yahoo Mail

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Groceries
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Folders Hide
+ New Folder
Nico

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MORGENSON MINING (PTY) LTD- PROSPECTING RIGHT APPLICATION

Yahoo/Sent

Malcolm Goliath <goliathmalc
To: mm@pksdm.gov.za
Feb 7 at 10:36 AM

THE MUNICIPAL MANAGER
PIXLEY KA SEME DISTRICT MUNICIPALITY
BY EMAIL

Mr. R. E PIETERSE

RE: PROSPECTING RIGHT APPLICATION MORGENSON MINING (PTY) LTD: DMR REFERENCE NC 30/5/1/1/2/12320 PR

Sir,
The above mentioned application bear reference.

KIndly receive the Background Information Document (BID) and Draft Scoping Report for the application lodged with the Department Mineral Resources (DMR).

These documents are forwarded to yous as the District Municipality has been identified as an Interested and Affected Party to the application process, in particular the Environmental Impact Assessment Process.

Inputs and comments would be appreciated and can be made on the attached BID document within 30 days of the date of this consultation correspondence.

Kind Regards

Malcolm Goliath
Project Environmental Assessment Practitioner

0824523693

Download all attachments as a zip file

Malcolm Goliath
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+27 82 452 3693

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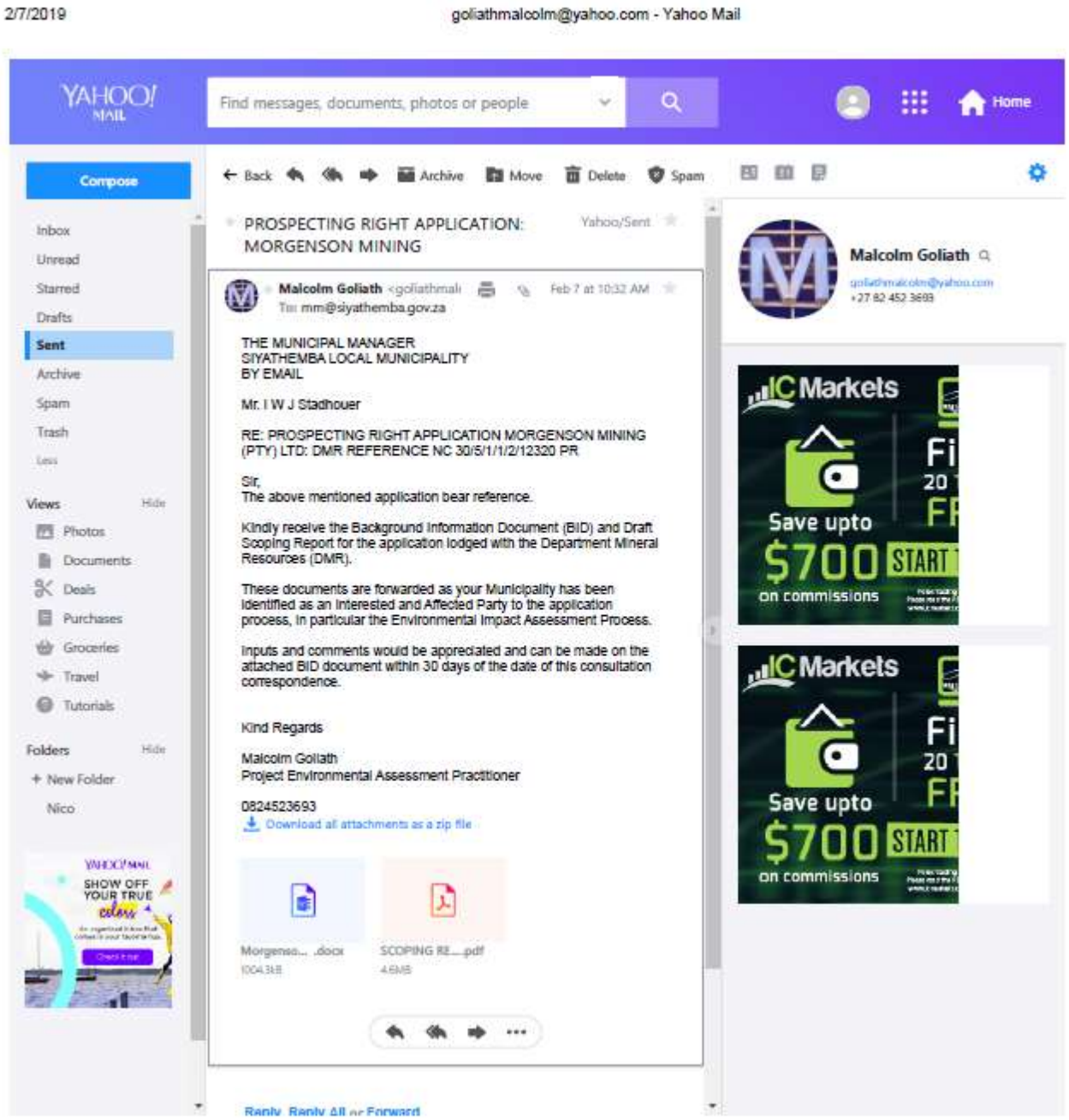
T&Cs apply. Trading involves risk. You may lose your capital

(5) SIYATHEMBA LOCAL MUNICIPALITY

Find attached an email to the Municipal Manager of the Siyathemba Municipality for input and participation. Email forwarded on the 7th February 2019.



(6) GOVERNMENT DEPARTMENTS

BID Document (APPENDIX B) and Scoping Report hand delivered to the following Government Departments for their input and comment.

Department Mineral Resources-Northern Cape Region
BY SAMRAD

Department Environment and Nature Conservation
Appendix C

Department Agriculture, Land Reform and Rural Development
Appendix D

Department Water and Sanitation
Appendix E

Northern Cape Department of Public Works
BID Document (APPENDIX F) and Scoping Report send by email on the .

(7) OTHER INSTITUTIONS

ESKOM
BID Document and Scoping Report emailed to Ms D Harding (APPEMDIX G Inclusive of Response)
Land Development Manager
Northern Cape Operating Unit
Northern Cape

Orange Vaal River Users Association
BID Document forwarded as APPENDIX H

The Land Claims Commissions:
The Restitution of Land Rights Act, 1994 (Act No. 22 of 1994) allows individuals or groups to claim land, from which they were previously dispossessed after 19 June 1913 under the apartheid regime. Claimants were given until 31 December 1998 to register a claim in terms of the Restitution of Land Rights Act. During this period approximately 80 000 claims were lodged throughout South Africa.
The Regional Land Claims Commissioner is responsible to verify the rightful claimant, validity of the claim, identify the beneficiaries and determine the extent of the land claim. This is the research stage of the claim. Once this has been completed, the claim is gazetted and therefore development on the land is at risk the claim is settled. This therefore has development implications for existing land owners and surface or mineral rights holders as further development on land, which has a land claim is a risk.

This is a successful land claim by the Koegas Communal Property Association

SAHRA
A Heritage Impact Assessment Report for the proposed Prospecting Right on the farms: Portion 3 (Asbestos Hills) and Portion 2 and 4 (Rietfontein 11) Prieska, Northern Cape was conducted by David Morris and Abenicia Henderson, from the Mc Gregor Museum during April 2018. The Report is attached as Appendix I.

(iii) SUMMARY OF ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

None received at date of the Draft Scoping Report

(iv) ENVIRONMENTAL ATTRIBUTES
GEOGRAPHY, HISTORY AND ECONOMY
Area: 14725km²
Description: The Siyathemba Local Municipality is a Category B municipality situated within the Pixley Ka Seme District of the Northern Cape Province. It is one of the eight municipalities in the district. The municipality was established as a result of the Local Government Municipal Structures Act of 1998 on 22 September 2000.
Initially it was established as ‘Primanday', which was a combination of the names Prieska, Marydale and Niekerkshoop. However, this was not an acceptable solution and on the 25th June 2001, as a result of a Council decision and Provincial Government notice 22/2001, became Siyathemba. The meaning of Siyathemba is ‘we hope'.

Prieska was originally named Prieschap, a Koranna word meaning ‘place of the lost she-goat', and used to be a fording place for travellers over the Orange River. Known to the locals as ‘the gem of the Northern Cape', Prieska is the seat of the municipality and is located on the hills of the Doring Mountains on the southern banks of the Orange River.
Prieska's infrastructure is impressive – it has Eskom power; an abundant water supply from the Orange River, with the Gariep and the Vanderkloof Dams on the upstream side of the river; easy access to the main railway line to Namibia; good tarred road linkage with Kimberley, Upington and De Aar; two landing strips for light aircraft; and complete and reasonably inexpensive industrial stands, with or without siding facilities. Industrial activities include: grain silos; a cotton mill; a bakery; manufacture of furniture, built-in cupboards; cattle fodder pellets; and a tiger’s eye processing plant.
Niekerkshoop is attractively placed between hills, and large trees shade the streets. There is no domestic water supply but irrigation water is supplied by a spring to the north of the town. On the north-west side of Marydale is a rich underground water source, and the main means of water supply is by borehole and wind pumps. It depends mainly onsheep farming.
Cities/Towns: Copperton, Marydale, Niekerkshoop, Prieska
Main Economic Sectors: Government services (28.9%), financial services (23.8%), agriculture (16.4%)

GEOLOGY

In Griqualand West the succession can be broadly subdivided into a basal, chemical sedimentary unit, referred to as the Ghaap Group, which is overlain by a mixed volcanic-clastic-chemical sequence, known as the Postmasburg Group (Table 1). The Ghaap and Postmasburg Groups represent two separate, major unconformity-bounded sequences (Cheney and Winter, 1995).
According to Beukes (1983 and 1987), deposition of the Transvaal sequence in Griqualand West took place on a continental margin or trailing edge and was controlled by three tectonic-sedimentary elements:

- A shallow water platform on the Kaapvaal Craton.
- A platform edge (shelf margin) located parallel to the Griquatown fault zone (A growth fault across which there are a number of facies changes).
- A deep basin along the western margin of the Kaapvaal Craton (Fig2).

SUPER-GROUP	GROUP	SUB-GROUP	FORMATION		MAJOR LITHOLOGY	APPROX. THICKNESS in m.
TRANSVAAL	OLIFANTS-HOEK	VOLOP	VERWATER		Grey quartzite	3500
			GLEN LYON — ELLIES RUS		Brown quartzite Grey quartzite	
			FULLER		Brown quartzite	
			HARTLEY		Andesitic lava	700
			LUCKNOW		Purple and white quartzite	450
			MAPEDI		Shale, quartzite, lava Basal iron-rich conglomerate	10–1500
	POSTMASBURG	VOËLWATER	MOOIDRAAI	Laterally into BEAUMONT	Dolomite, chert,	250
			HOTAZEL		Iron-formation manganese, lava	
			ONGELUK		Andesitic lava	900
			MAKGANYENE		Diamictite	50–150
	GHAAP	KOEGAS	ROOINEKKE & NELANI		Iron-formation, shale	300
	OLIFANTSHOEK		GAMAGARA (Correlative of Mapedi)		Quartzite and shale, basal iron-rich conglomerate	290
TRANSVAAL	GHAAP		MANGANORE* Correlative of Asbesheuwels		Iron-formation and iron ore	0–200
			WOLHAARKOP* Solution collapse breccia		Siliceous chert breccia	
		KOEGAS	ROOINEKKE		Iron-formation	100
			NARAGAS		Quartz wacke, shale	240–600
			KWAKWAS		Riebeckitic slate	
			DORADALE		Iron-formation	
			PANNETJIE		Quartz wacke, shale	
		ASBESHEUWELS	GRIQUATOWN		Clastic-textured iron-formation	200–300
			KURUMAN* * On Maremane dome Manganore and Wolhaarkop		Microbanded iron-formation	150–750
		CAMPBELLRAND	GAMOHAAN	Laterally into NAUTE and NARAGAS	Sparry limestone, shale	1500–1700
			KOGELBEEN		Dolomite, limestone	
			KLIPPAN		Cherty dolomite	
			PAPKUIL		Dolomite	
			KLIPFONTEINHEUWEL		Cherty dolomite	
			FAIRFIELD		Sparry dolomite	
			REIVILO		Micritic dolomite	
			MONTEVILLE		Dolomite, limestone, shale	
		SCHMIDTSDRIF	LOKAMMONA		Shale	10–250
			BOOMPLAAS		Dolomite, limestone, shale	
			VRYBURG		Quartzite, shale, lava	

Table 1: TRANSVAAL SUPER GROUP STRATIGRAPHY (after Beukes and Smit, 1987a, as amended by Hälbich et al.,1993)

2. *THE GHAAP GROUP*

The Ghaap Group is subdivided, from the base upward, into the Schmidtsdrif Subgroup (interbedded siliclastics and carbonates), The Campbellrand Subgroup (carbonates), the Asbesheuwel Subgroup (iron formation) and the Koegas Subgroup (interbedded siliclastics and iron formations) (Table1 and Fig. 1).

Carbonates from the Schmidtsdrif Subgroup have been dated at 2557 ± 49 Ma by Pb-Pb method (Jahn et al, 1990). The lower Asbesheuwel Subgroup (Kuruman Iron Formation) has been dated at 2432 ± 31 Ma using single zircons from ash beds (Trendall et al, 1990).

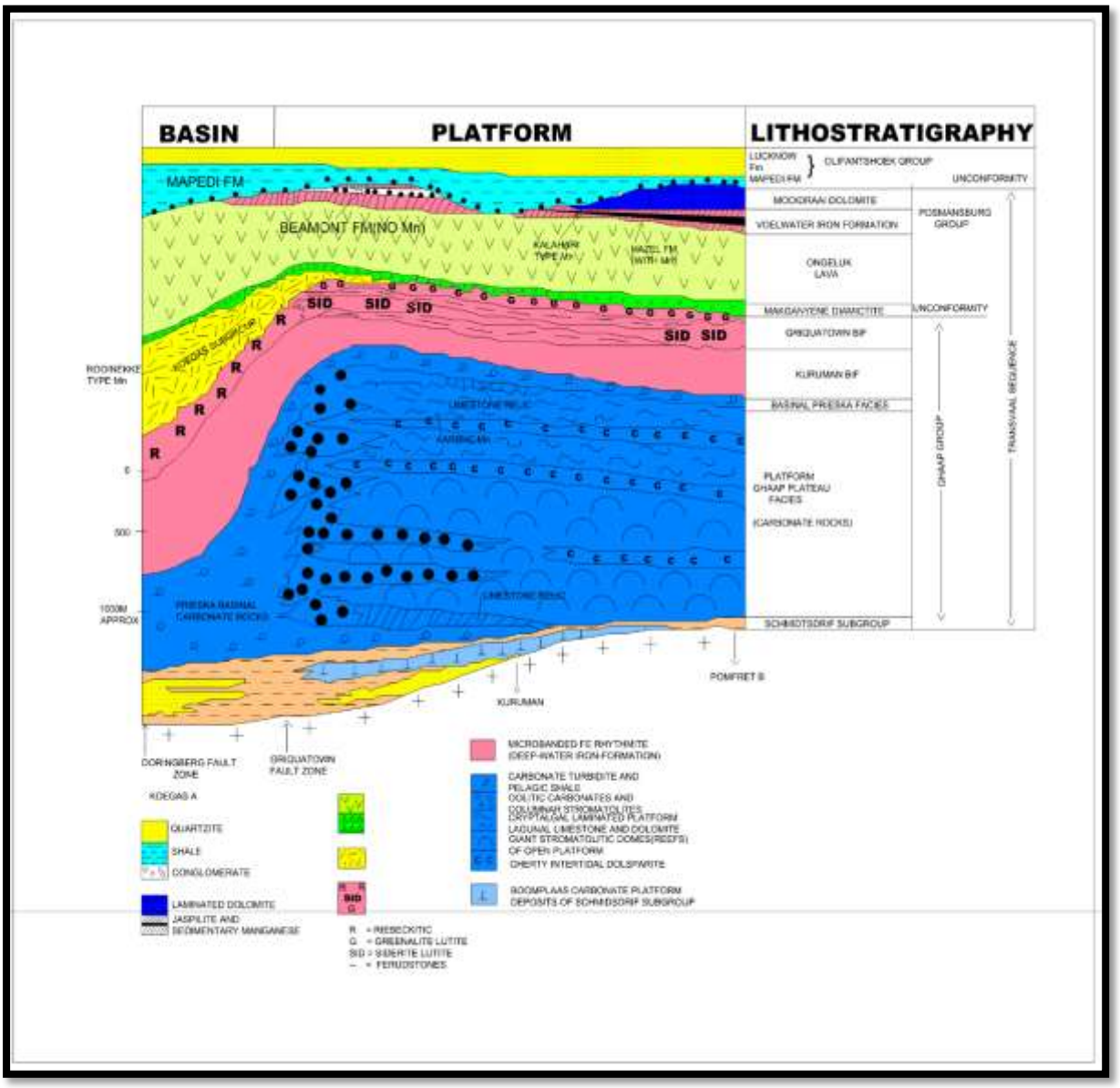


Fig.2 North-south section illustrating the relationships of the stratigraphic and sedimentological facies in the Transvaal Supergroup of Griqualand West.

2.1 The Schmidtsdrif Subgroup

The basal Schmidtsdrif Subgroup comprises fluvially deposited feldspatic quartz arenites, shallow marine and intertidal quartz arenites as well as a plat formal carbonate sequence (Beukes, 1979).

2.2 The Campbellrand Subgroup

The Campbellrand Subgroup consists of stromaolitic dolomite and limestone platform facies, which interfingers down slope with carbonate turbidites (Fig. 4). The turbidites have been ankerized and silicified to form banded ferruginous chert. Toward the south the turbidites interfinger with carbonaceous shale (Prieska facies), which, according to Beukes, relates to deposition within an euxinic basin, in front of the carbonate platform.

2.3 The Asbesheuwel Subgroup

Shallow water carbonate deposition was terminated during a major transgression, which drowned the shelf, resulting in a fairly sudden transition from carbonates through cherts and into the banded iron formation of the Asbesheuwel Subgroup (Fig. 2).

Beukes, 1978 subdivided the Asbesheuwel Subgroup into the Kuruman Iron Formation at the base followed by the Griquatown Iron Formation at the top (Table 1). According to Beukes the Kuruman Iron Formation was deposited within a deep shelf setting over the entire Kaapvaal Craton. It comprises an upward-shallowing sequence consisting of carbonaceous shale deposited in an euxinic basin, ankerite-banded chert, representing distal carbonate turbidites which was deposited in a transition zone, between the euxinic basin and the open shelf. Magnetite-hematite-chert micro banded rhythmite macrocycles containing interbedded stilpnomelane band- lutites, were deposited on the deep open shelf, while greenalite-siderite rhythmites mark the toe-of-slope and slope areas of a shallow water platform. The Ouplaas Member, which marks the top of the Kuruman Iron Formation, represents a clastic-textured shallow-water platform deposit (Beukes, 1983 and 1984).

The Griquatown Iron Formation overlies the Kuruman Iron Formation and consists of upward coarsening megacycles, deposited in environments that vary from low energy, subtidal to high energy, intertidal and lagoonal settings.

2.4 The Koegas Subgroup

The Koegas Subgroup was only deposited down slope and within the deeper part of the basin toward the south (Prieska area) and is absent toward the north (Sishen) (Fig. 4). The Koegas Subgroup was deposited during a transgressional phase and comprises a quartz-chlorite-mudstone unit at the base followed upward by iron formations with interbedded quartz-wackes, with more iron formations, containing interbedded carbonates toward the top. The Koegas Subgroup was subdivided by Beukes; (1978), from the base upward into the following formations :

- Pannetjie Formation: Quartz-chloritic mudstone.
- Dorasdale Formation: Iron-lutites.
- Kwakwas Formation: Greenalite-lutites and interbedded quartz-wackes.
- Naragas Formation: Mudstones and carbonates.
- Rooinekke Formation: Iron band-lutites.
- Nelani Formation: Mudstones with interbedded limestone, chert and grit beds.

3. STRUCTURAL GEOLOGY

Deposition of the early Proterozoic sequence in Griqualand West took place along the western margin of the Kaapvaal Craton.Alterman and Halbich (1990 and 1991) recognized an early phase of thrusting within the Asbesheuwel Formation, pre-dating the deposition of the Makganyene Diamictite. This D_1 thrust is between 2500 and 2240 Ma in age and possibly initiated N-S trending F_1 folds in its hanging-wall, extending from Kuruman to Prieska. (Figs. 9 and 9A). The eastward convex shape of these F_1 axial traces around the Maremane double plunging anticline, is seen as part of this deformational phase (Alterman and Halbich 1990 and 1991).

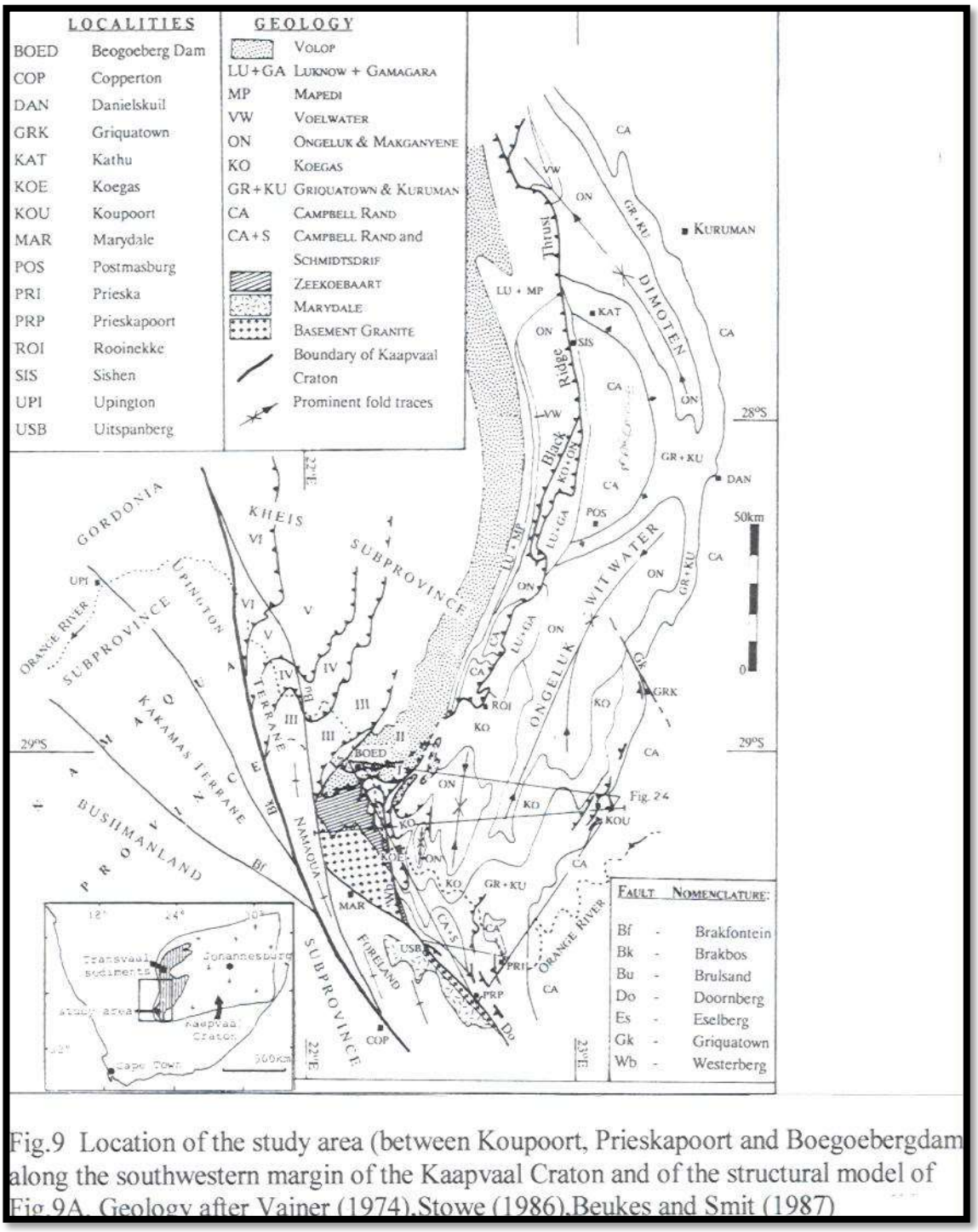
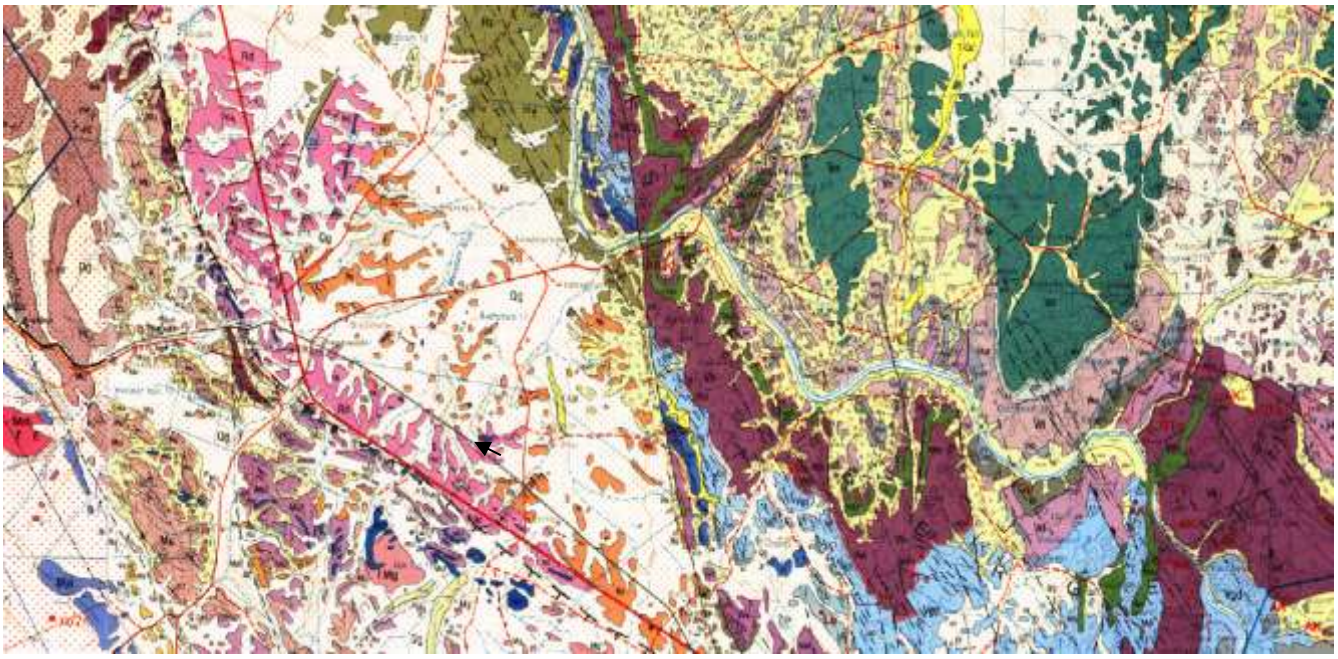


Fig.9 Location of the study area (between Koupoort, Prieskapoort and Boegoebergdam along the southwestern margin of the Kaapvaal Craton and of the structural model of Fig.9A. Geology after Vainer (1974),Stowe (1986),Beukes and Smit (1987)

Diamonds were laid down during the Tertiary Epoch (dd 60 million years), together with unconsolidated fragmental matter of rocks carried downstream by the river flow. These deposits or alluvial fans may overlay any of the formations of the Ghaap Group and Ongeluk lavas. The gravels my also consist of disentegrated rock material which was moved from its original site and are foreign to the area.

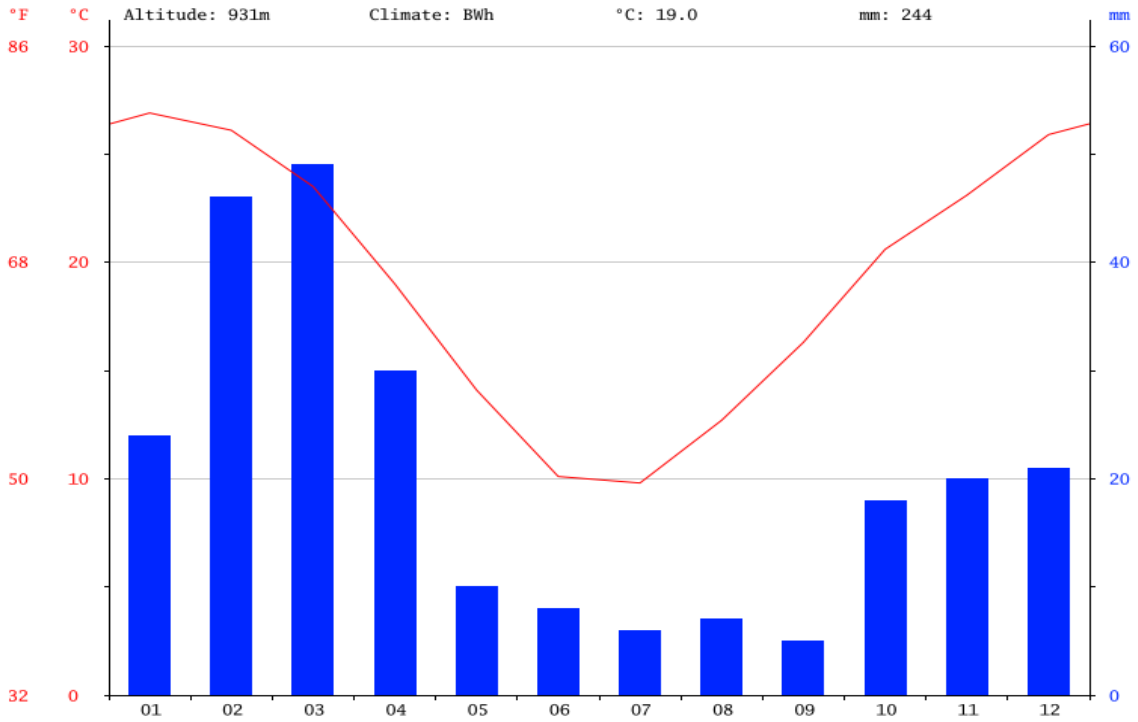
The locality of these fans will very much depend on the migration of divide, palaeo and current erosion cycles and the density of the rock material transported by water.

GEOLOGICAL MAP



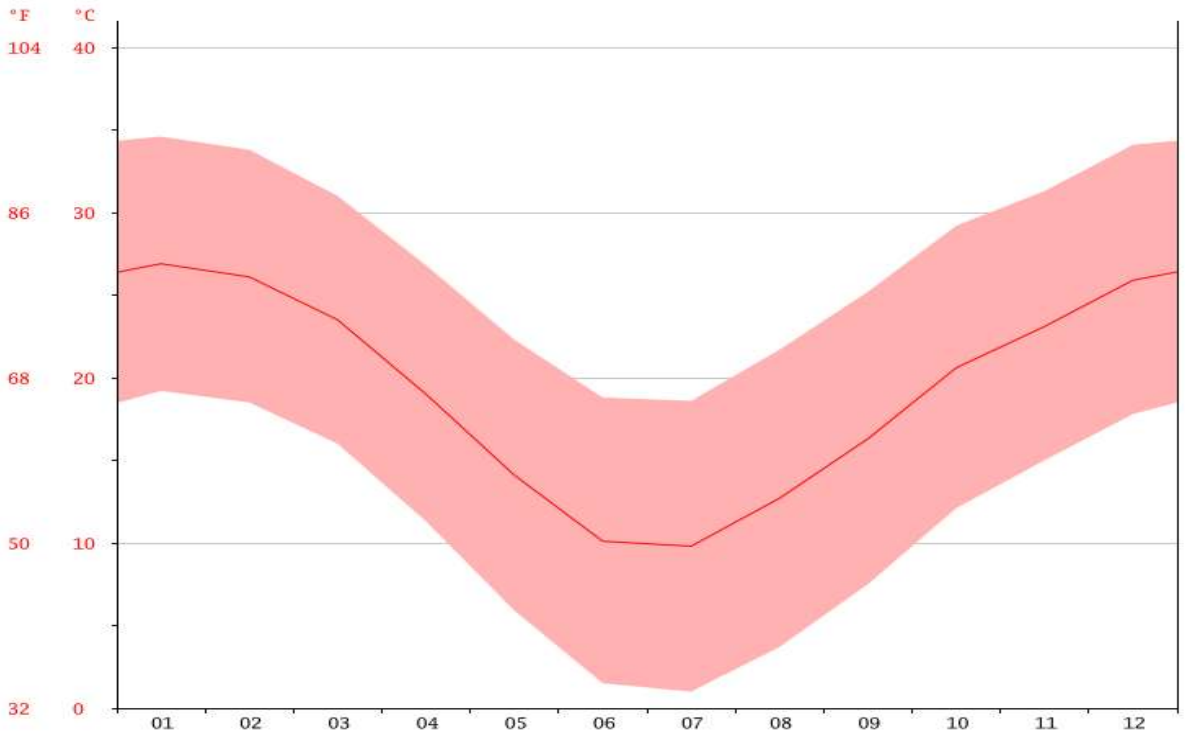
DESCRIPTION OF THE RECEIVING ENVIRONMENT
REGIONAL CLIMATE

(1) CLIMATE GRAPH PRIESKA



The least amount of rainfall occurs in September. The average in this month is 5 mm. In March, the precipitation reaches its peak, with an average of 49 mm.

TEMPERATURE GRAPH PRIESKA



The temperatures are highest on average in January, at around 26.9 °C. At 9.8 °C on average, July is the coldest month of the year.

PRIESKA CLIMATE TABLE/ HISTORICAL WEATHER DATA

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	26.9	26.1	23.5	19	14.1	10.1	9.8	12.7	16.3	20.6	23.1	25.9
Min. Temperature (°C)	19.2	18.5	16	11.3	5.9	1.5	1	3.7	7.5	12.1	15	17.8
Max. Temperature (°C)	34.6	33.8	31	26.8	22.3	18.8	18.6	21.7	25.2	29.2	31.3	34.1
Avg. Temperature (°F)	80.4	79.0	74.3	66.2	57.4	50.2	49.6	54.9	61.3	69.1	73.6	78.6
Min. Temperature (°F)	66.6	65.3	60.8	52.3	42.6	34.7	33.8	38.7	45.5	53.8	59.0	64.0
Max. Temperature (°F)	94.3	92.8	87.8	80.2	72.1	65.8	65.5	71.1	77.4	84.6	88.3	93.4
Precipitation / Rainfall (mm)	24	46	49	30	10	8	6	7	5	18	20	21

The variation in the precipitation between the driest and wettest months is 44 mm. The variation in annual temperature is around 17.1 °C.

(2) TOPOGRAPHY

The southern side of the study area has rocky hills with elevations of up to 1320 mamsl and becoming relative flat towards the northern side in proximity of the Orange River at 901 mamsl.

(3) SOILS

SOIL CONDITIONS

The top of the rocky and hills areas are caved sandstone with a shallow covering of loose sandy soil. The flatter slopes and undulating territory have a deeper layer of loose sandy top soil underlain either by decomposed shales and mudstones or by sandstones. The shales decompose to clays. In many instances, especially where underground drainage is bad, the clay is decomposed to montmorillirite clay mineral. The sandstones usually decompose to a dense clayey sand. In low laying areas transported soils (usually clay) are found. Because of bad drainage the clays are expansive. The so-called escort soils which are clays with an excess of sodium cations have dispersive properties. The dispersive properties usually lead to rapid erosion in rain water (i.e. water with a low dissolved solids content). The latter clay also require special engineering treatment when they are to be used in down walls or roads embankments. The study area composes of variable composition of soil due to variation in rock types. Soil type available at the proposed study area include calcrete and aeolin sands. The depth of top soil is 600 mm.

SOIL DEPTH

Vary from 10mm to 600mm.

4. VEGETATION

South African environmentalists identify six biomes on land in South Africa. A biome can, in general terms, be described as a broad ecological unit, representing a large natural area with a relatively uniform plant and animal life, closely determined by environmental conditions and, especially, climate. The six biomes of South Africa are:

- Grassveld Biome;
- Succulent Karoo Biome;
- Forest Biome;
- Savannah Biome; and
- Fynbos Biome.

Flora

The study area falls within Nama-Karoo biome locate in the NKu3 Northern Upper Karoo (from the STRELITZIA (2006) and the Bushmanland Arid Grassland and Lower Gariep Broken Veld.

Nama-Karoo is a complex of extensive plains, dominated by low (dwarf) shrubs that are generally taller than 1m intermixed with grasses, succulents, annual forbs as well as geophytes.

Along the drainage lines on the study area small trees occur or on the hills and rocky outcrops. Plant life associated with the Nama-Karoo include annuals, geophytes, C3 and C4 grasses, succulents, deciduouu and evergreen chamaephytes and coexisting ephemerals. ress

The following species were found on the study area:

Important Taxa Small Trees:

Black thorn (*Acacia mellifera subsp, de-tines*), Rhino thorn (*Ziziphus micrionates*), Boscia albitrunca.

Tall Shrubs:

L. horridum, L.. oxycarpum, Rhigozum trichotomum.

Low Shrubs:
Pteronia glauca, Plinthus karooicus, Zygoophyllum lichtensteinianum, Salsola calluna, Chrysocoma cillata (d), Berkheya annectens, Erlocephalus ericoides subsp.erlcoides, Felicia muricata, Barleria rigida, Microloma armatum, Osteospermum leptolobum, Phyllanthus madeaspatensis, Asparugus glaucus, Amphiglossa triflora, Pentzia calcarea (d), P. sordida, S. saxatillis, S. tuberculate, E. glnulosus, E. spinescens, Europs asparagoides, Rosenia humilis.

Succulent Shrubs:
Salsola calluna, Zygophyllum flexuosum, S. tuberculate, S. glabrescens, Hertai pallens, semiparasitic Shrub: Thesium hystrix(d)

Herbs:
Radyaera urens, Tribulus terrestris, Vahila capensis, Hermannia comosa, gazaniarebslana, Charmaesyce inaequilatera, Dicoma ca-pensis, Sesamum capensis, Psilocaulon coriarium, Lessertia pauciflora, Indigofera alternans

Succulent Herbs:
Psilocaulon coriarium. Geophytic Herb: Themeda triandra, E. porosa, Themeda triandra, Eragrostis bicolor, A.congesta (d), A.diffusa (d), Enneapogon desvauxii (d), E.obtusa (d), E.truncata (d), Fingertuthia Africana, Heteropogon contortus, Tragus berteronianus, T. racemosus, T. koeleriodes.

Alien Species
Prosopis Juliflora
Opuntia Ficus-indica (Prickley Pear)

FAUNA

Natural Mammals
The following mammals were observed during the site visit. Meercats (*Suricata suricata*), Striped Field Mouse (*Rhabolomys pumillo*), Cape Hare (*Lepus capensis*), Springhare (*Pedeyes capensis*),Porcupine (*Hystrix africaeustralis*), Aardvark (*Oryceteropus afer*), Warthog (*Phacocoerus aethiopicus*), Kudu (*Tragelophus strepsiceros*), Common Duiker (*Sylvicapra grimmia*), African Wild Cat (*Felis lybica*) and Ground Squirrel (*Funisciurus congicus*), Pouched Mouse (Saccostomus capestris), Large-eared Mouse (Malacothrix typical), Pygmy Mouse (Mus minutoides), Domestic Rat (Rattus rattus), Common Mole rat (Cryptomys hottentotus), Slender Mongoose (Galerella sanguinea), Cape Hedgehog (Atelerix frontalis), Bushveld Gerbil ((Tatera lencogaster), Least Dwarf Shrew (Suncus infinitesimus), Chacma Baboon (Papio ursinus)

Endangered Species
The fauna listed below are endangered species that are likely to occur in the area according to the Red Data Book-Mammals (Smithers 1989 & Branch 1988).

Scientific Name	Common Name
Aanyx capensis	Cape Clawless Otter
Felis nigripes nigripes	Small Spotted cat
Proteles cristatus	Aardwolf
Felis lybica cafra	African Wild Cat
Manis temminckii	Cape Pangolin

Bird Life Spotted

An extensive bird life was spotted on the study area and the surroundings

Engish Name	Scientific Name
Laughing Dove	*Streptopelia semitorquata*

Redeyed Dove	*Streptopelia semitorquata*
Namaqua Dove	*Oena capensis*
Redchested Cuckoo	*Cuculus solitaries*
Barn Owl	*Tyto alba*
Pearlspotted Owl	*Glaucidiumperiatum*
Cape Turtledove	*Streptopelia capicola*
European Swallow	*Hirundo rustica*
Hoopoo	*Upupa epops*
Secretary Bird	*Sagittarius serpentarus*
Purple Roller	*Coracias naevia*
Pied Barbet	*Tricholaema leucomelas*
Clapper Lark	*Mirafta apiata*
Black Crow	*Corvus capensis*
Pied Crow	*Corvus album*
Cape Robin	*Cossypha caffta*
Melba Finch	*Amdina erythrocephala*
Blackthroated Canary	*Serinus atrogularis*
Cattle Egret	*Bululcus ibis*
Crested Barbet	*Trachyphouns vaillanti*
Little Swift	*Apus affinis*
Whiterumped Swift	*Apus caffer*
Rufousnaped Lark	*Mirafta Africana*
Ashy Tit	*Parus cinerascens*
Familiar Chat	*Cercomelafamiliaris*
Fantailed Cisticola	*Cisticolajuncididis*
Cape Wagtail	*Motacilla capensis*
Grassveld Pip	*Anthus cinnamomeus*
Whitewinged Black Korhaan	*Eupodotis aftaoides*
Fiscal Shrike	*Lanius collaris*
Dusky Sunbird	*Nectarina fusca*
Yellow Canary	*Serinusflaviventris*
Whitebrowed Sparrowweaver	*Plocepasser mahali*
Hammerkop	*Scopus umretta*
Common Quail	*Coturnix coturnix*
Pintailed Whydah	*Vidua macroura*
Brownhooded Kingfisher	*Halcyon albiventris*
Forktailed Drongo	*Dicrurus adsimilis*
Groundscraper Thrush	*Turdus litstsirupa*
Anteating Chat	*Myrmecocichlaformicivora*
Stonechat	*Saxicolaporquata*
Doublebanded Courser	*Smutsornus africanus*
Burhell's Sandgro	*Ptercoles burchilli*
Spotted Dikkop	*Birhinus capensis*
Orange River Francolin	*Francolinus levaillantoides*
Blacksmith Plover	*Vanellus coronatus*
Crowned Plover	*Vanellus armatus*
Steppe Buzzard	*Buteo buteo*
Helmeted Guineafowl	*Numida meleagris*

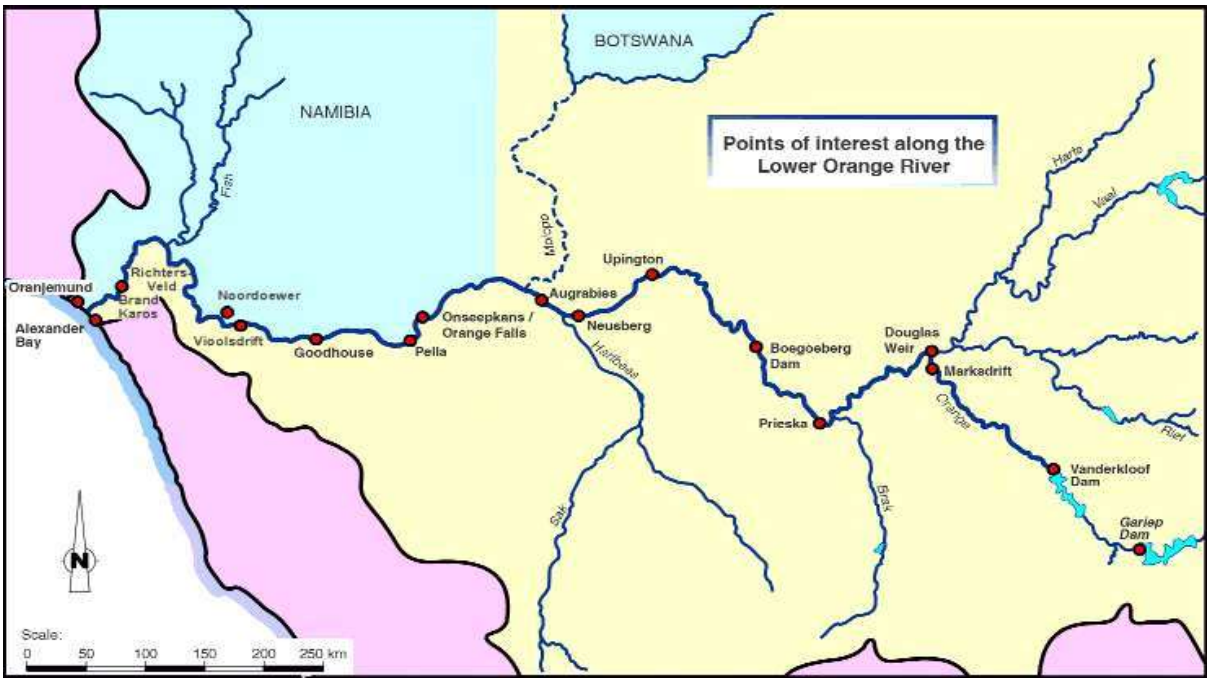
Endangered Species

The fauna listed below are endangered species that are likely to occur in the area according to the Red Data Book-Birds (Barnes, Keith N, 2000).

Scientific Name	**Common Name**
Ardeotis kori	Kori Bustard
Neotis ludwigii	Ludwig's Bastard

Gyps coprotheres	*Cape Vulture*
Gyps africanus	African Whitebacked Vulture

WATERY



OVERVIEW OF WATER QUALITY STATUS OF ORANGE RIVER BASIN

A brief overview of the water quality status in the main stem of the Vaal and Orange Rivers was undertaken. The approach used was to collect water quality data at key stations on the Vaal, Caledon, Fish (Namibia) and the Orange Rivers. The water quality data was accessed from the South African Department of Water Affairs and Forestry, Windhoek Consulting Engineers and the Lesotho government databases and the details of the stations used in the analysis are listed in the Table below.

Table : Details of stations used in the water quality status overview

Station number	Station name	Lat	Long	Beg Date	End Date
DIH003Q01	Allwal North	-30.679722	26.7125	29/01/1972	18/08/2004
D2H036Q01	Caledon	-30.279167	26.654167	12/05/1993	14/07/2004
D3R002Q01	Gariep Dam	-30.623056	25.507222	08/01/1971	12/10/2004
D3R003Q01	Vanderkloof Dam	-29.991111	24.731667	24/07/1971	29/10/2004
D7H002Q01	Prieska	-29.651389	22.746389	28/09/1965	08/05/2001
D7H005Q01	Upington	-28.460833	21.248889	01/11/1965	23/08/2004
D8H003Q01	Vloolsdrift	-28.760833	17.730278	11/11/1965	10/10/2004
C1R002Q01	Grootdraai Dam	-26.918056	29.295	18/11/1982	20/10/2004
C1H017Q01	Inflow Vaal	-27.0225	28.594444	16/11/1975	28/10/2004
C2R008Q01	Vaal Barrage	-26.853611	29.326111	06/06/1980	19/01/2005
C9H021Q01	Bloemhof Dam	-27.669167	25.618056	23/11/1972	19/10/2005
C9R003Q01	Douglas Barrage	-29.043333	23.836944	03.10/1977	26/10/2005
-	Naute Dam on Fish River (Purification plant raw water)	-	-	01/02/1997	01/09/2005
	South Phuthiatsana River	-	-	20/10/1997	12/10/2002

The data covering the period 1994 to 2004 was analysed. The following water quality variables were analysed to give an overview of the water quality status of the basin:

- Electrical conductivity which gives an indication of the salinity or TDS of the river system. The EC was compared to the South African water quality guidelines for

agriculture (most sensitive crops) and domestic. (Class 0, Class 1 and Class 2) water uses to give an indication of the fitness for use of the water as far as salinity is concerned.

- Sulphate which gives an indication of the extent of mining pollution. The sulphate concentrations have been compared to the Class 0, Class 1 and Class 2 water quality guidelines for domestic use.
- Ortho-phosphate (as P) which gives an indication of the nutrient levels and the potential for eutrophication of the river system. The South African Water Quality guidelines give the trophic status associated with different concentrations of inorganic phosphorus

The concentrations associated with the different categories used in the water quality status assessment are summarised in Table below.

Table : Concentrations associated with the different categories used in water quality status assessment

Water Quality variables	Ideal	Acceptable	Tolerable	Unacceptable
EC (mS/m)	<40 (irrigation)	40-70 (Class O)	70-150 (Class I)	>150 (Class II)
SO4 (mg/)	<200 (Class O)	200-400 (Class I)	400-600 (Class II)	>600 (Class III)
PO4 (mg/)	<0.005 (Oligotrophic)	0.005-0.025 (Mesotrophic)	0.025-0.25 (Eutrophic)	>0.25 (Hypertrophic)

The results of the analysis have been represented as pie charts on a map of the Orange River Basin. The sectors of the pies represent the fraction of the total samples that fall in the different concentration ranges used to assess the water quality. The results are given in, Figure 1, Figure 2 and Figure 3 for EC, sulphate and ortho-phosphate respectively.
The results of the analysis can be summarised as follows:
The upper reaches of the Vaal River upstream of Vaal Dam has good quality water as far as salinity is concerned. The EC and sulphate concentrations meet Class 0 domestic water quality guideline. The general consensus as far as users are concerned is that the salinity aspects of the water quality meet their requirements but should not deteriorate any further.

- The salinity deteriorates along the stretch of the river from Vaal Dam to the Douglas weir. There is a significant deterioration in water quality from the Vaal Dam to the Vaal Barrage. This is due to the contributions from the Suikerbosrand, Rietspruit and Klip River catchments. This is largely driven by mine water sewage and industrial discharges as well as runoff from urban areas.
- The salinity in the Orange River from Lesotho to the confluence with the Vaal River is of good quality.
- The salinity deteriorates downstream of the confluence of the Vaal and Orange Rivers but still remains good. There is an increase in EC from the Prieska station to Vioolsdrift along the reaches of the lower Orange River. This is due to irrigation return flows and evaporative losses along the river.
- The measured EC data at Naute Dam on the Fish River (Namibia) showed that 93% of the EC reading met the Class 0 domestic water use guideline.
- The analysis of the water quality in the South Phuthiatsana River showed that the EC of the river is low with a maximum value of 25mSm. However, the orthophosphate concentrations are high with 43% exceeding 0.25 mg/l i.e. falling in the hyperthrophic range. The source of the ortho-phosphate is from the runoff from the settlements scattered throughout the Lesotho lowlands catchment.
- The ortho-phosphate pie charts show that the ortho-phosphate concentrations are indicating potential for eutrophic conditions throughout the catchment and a possibility of hypertrophic conditions in the Vaal Barrage. There are a number of factors however that determine the extent of algal growth. These include the availability of other nutrients such as nitrogen, adequate sunlight and suitable temperatures. The turbid waters experienced in the catchment is limiting sunlight penetration and limiting algal growth. The pie charts shown in Figure 3 can only be considered indicative. However the indications are supported by observations and reports of algal blooms in impoundments, the Vaal Barrage and along the lower reaches of the Orange River downstream of the confluence of the Orange and Vaal Rivers.

ISSUES AND GAPS

The issues and knowledge gaps identified during this desk top overview of the water quality in the Orange River Basin are discussed in Table 5 below. Measures to address the gaps identified are also proposed for inclusion in the future phases of the development of the IWRMP for the Orange River Basin.

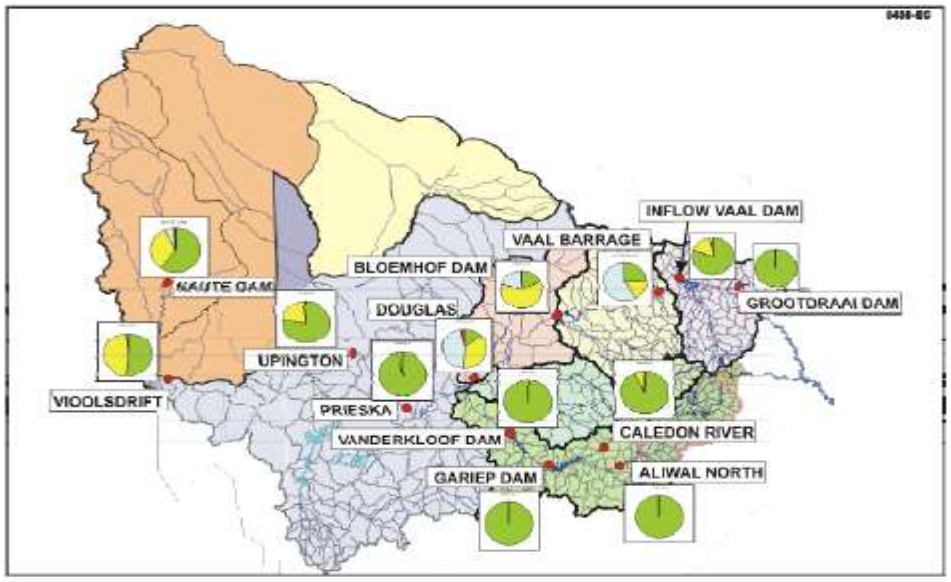


Figure 1: Pie charts showing water quality status for EC in the Orange River Basin

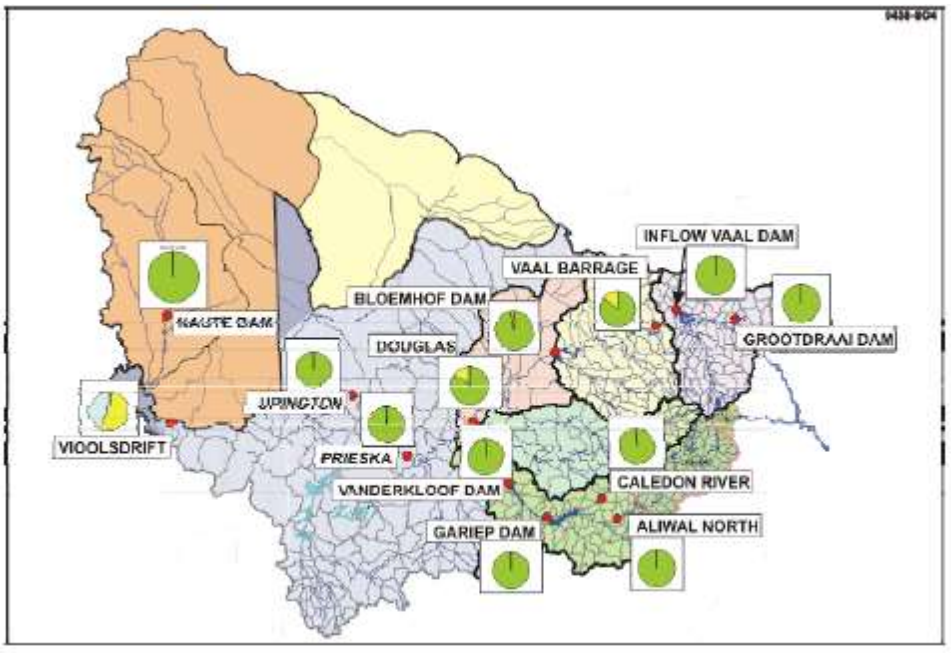


Figure 2: Pie charts showing water quality status for sulphate in the Orange River Basin

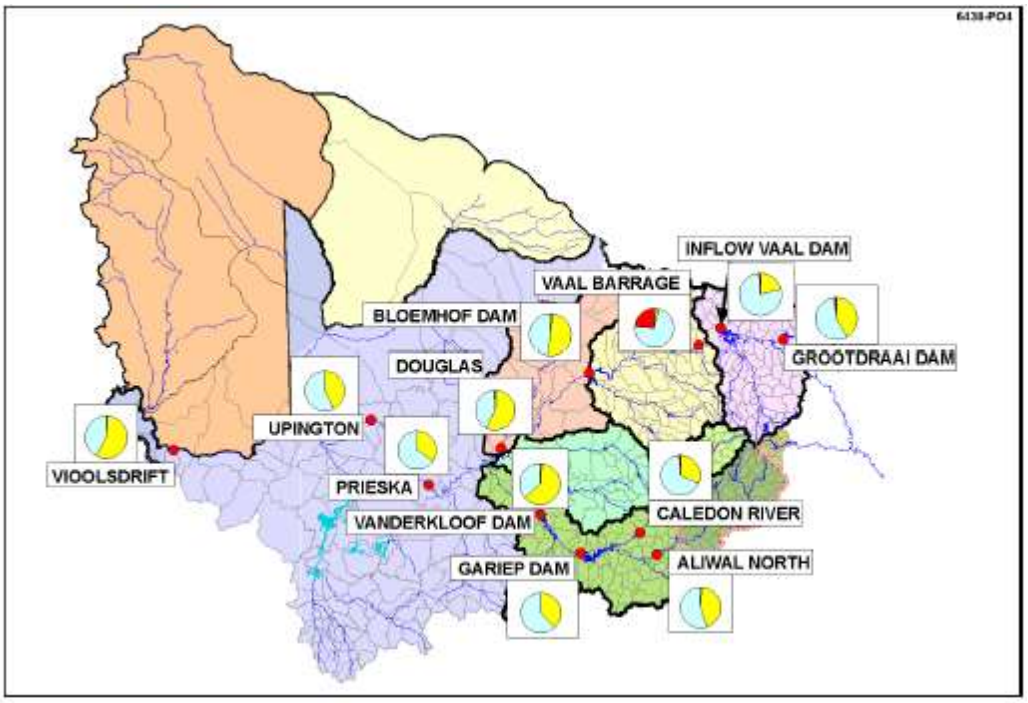


Figure 3: Pie charts showing water quality status for ortho-phosphate in the Orange River Basin

Table: Summary of issues and knowledge gaps

Issue	Description of issue and gap	Proposed measure to address gap
Insufficient water quality data and data management	During the analysis of the water quality data collected in the Orange River Basin, a number of issues related to data collection were identified : Data collection is fragmented between countries and institutions. The location of the water quality monitoring points are not optimal. The water quality variables analysed for are not consistent between institutions. The sampling frequency and the water quality variables. analysed for are insufficient to manage the Orange River Basin successfully. There is no single or standard data management and reporting systems. Lack of information on discharge volumes and qualities from sewage treatment works, mines and industries	A coordinated monitoring programme needs to be developed to address : The establishment of monitoring objectives The monitoring point locations Frequency of monitoring and water quality variables to be tested for The current network of continuous water quality monitoring stations needs to be reviewed and expanded. In designing the system consideration should be given to real time management of both water quality and quantity Database systems, data management and reporting Institutional responsibilities and implementation Program A series of workshops involving the major role players is the approach recommended to achieve the objectives listed above
Eutrophication	The analysis of the water quality data showed that nutrient levels in the Vaal River, particularly in the Vaal Barrage, are such that there is a potential for eutrophic conditions to develop. The problems with excessive algae development are already reported by Sedibeng and MidVaal Water. The following gaps have been identified : A lack of understanding of the fate of nutrients once they are discharged to the river. The pathways for the nutrients, organics and algae growth need to be better understood. A planning level nutrient model needs to be developed and set up for the Orange River Basin. The model should allow for cause and affect modelling so that nutrient management strategies can be developed.	A project should be initiated that will investigate the nutrient mass balance and pathways. The Vaal Barrage catchment is the most impacted and the largest source of nutrients. A pilot scale project to determine the fate of nutrients within this catchment is proposed. If the pilot scale project proves to be successful the model can be rolled out to the entire catchment
Issue	**Description of issue and gap**	**Proposed measure to address gap**
Integrated RWQO	The RWQO are being set in isolation in	The IWQMP for the Vaal River study

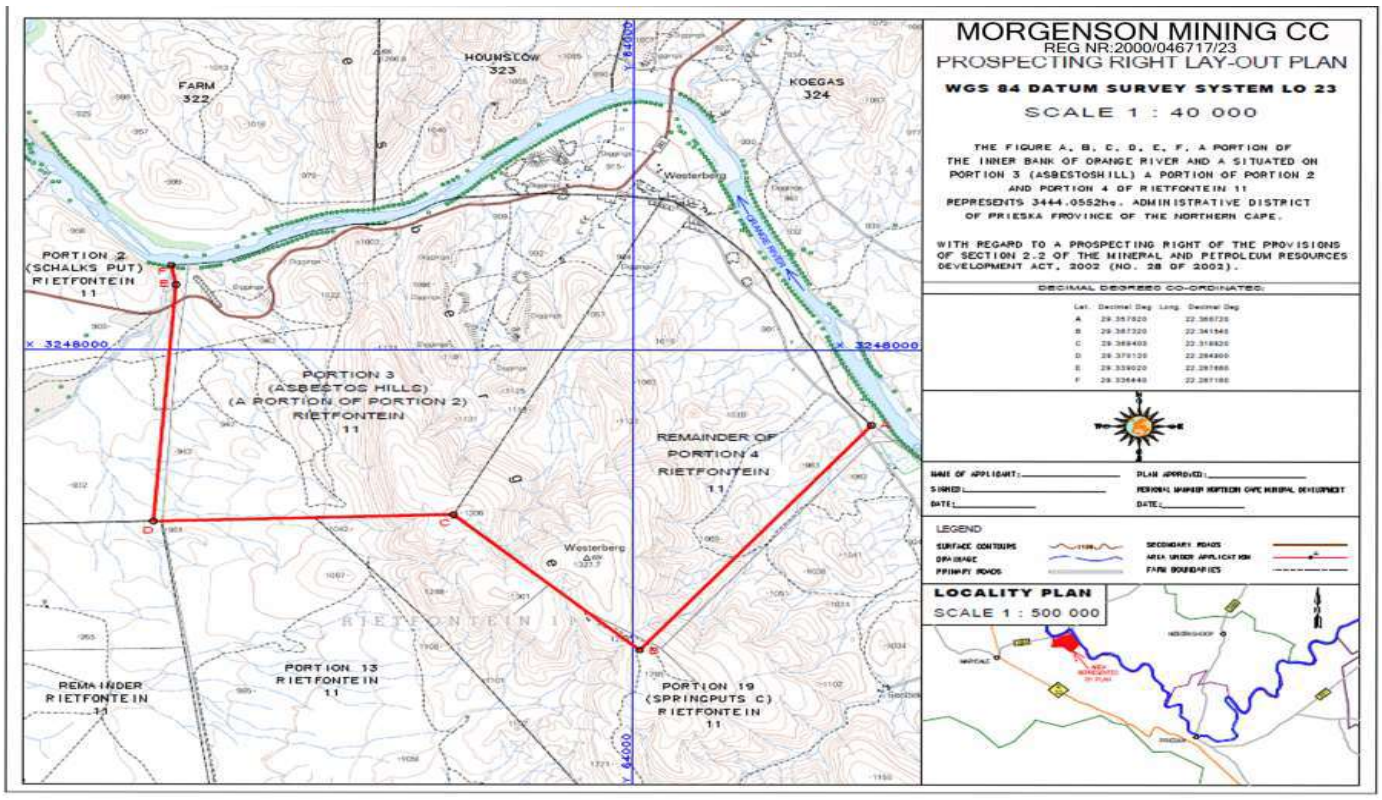
	priority catchments. The integration of the RWQO for the Vaal River is being addressed in the Integrated Water Quality Management Plan (IWQMP) that is being developed for the Vaal River by the South African Department of Water Affairs and Forestry. The link between the Vaal and the Orange river needs to be addressed	needs to be extended to include the Orange River.
Mine water closure planning	The gold mine dewatering discharges contribute a significant salt load to the Vaal River System. The time frames for the continued mining depend on the gold price. Mines are starting to close down and flow of water between mines and the management thereof is becoming an issue. A management strategy for the mine water currently and post closure need to be developed	Projects are being initiated by the South African Department of Water Affairs and Forestry and the Water Research Commission in South Africa to address the mine closure and water management issue
Presence of pesticide and herbicides in the Vaal and Orange Rivers	There is extensive irrigation practised in the Vaal and Orange Rivers where herbicides and pesticides are used. These could be present in the return flows and conveyed in the surface runoff to the river systems. The current water quality database does not support the identification of pesticides and herbicides in the rivers.	A pesticide and herbicide monitoring program should be initiated to determine the extent of the problem

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations can be made as a result of this desktop study:

- The water quality has to be managed in conjunction with the development of the water resource for supply. The reduction in flow from Lesotho due to transfers to Vaal Dam could affect the water quality in the lower Orange. Similarly the management of the system to meet water requirements and generate hydropower should be coupled to the management of water quality;
- The salinity is currently being managed with releases of water for dilution from Vaal Dam. The modelling tools have been set up to manager the salinity aspects of the water quality of the Orange River Basin. The consensus is that the salinity aspects of the water quality meet user requirements. However the water quality must not be allowed to deteriorate further.
- Many of the coal and gold mines are closing down and the workings are starting to fill and will decant sometime in the future. Management strategies have to be developed to manage the filling process and the decants.
- Nutrients and the resulting algal growth are an issue. The modelling of nutrients has not reached the same level as salinity and the nutrient pathways are not well understood. Attention will have to be given to the development of modelling tools, management of point sources such as sewage works as well as diffuse sources associated with runoff from urban areas and agriculture. A nutrient management strategy needs to be developed.
- Currently very little information is available on pesticides and herbicides in the river systems. There is extensive agriculture on the banks of the Vaal and Orange Rivers. The presence of these pollutant types should be determined by designing and carrying out a round of monitoring.
- An integrated water quality monitoring programme and data management systems need to be developed for the Orange River Basin. The monitoring programme should include discharge information.

SURFACE WATER



The study area borders the Orange River on its southern side. Numerous non-perennial natural drainage channels occur on the study area that only receives water during the raining season.

HISTORICAL DATA

Indications of the 1:50 year storm event will lead to a rise in the height of the river between 5 and 8 metres (Report AWS 2002 – unpublished) up to height of 948 mamsl.

The 1:100 year storm event estimates a rise of between 12 to 14 metres to a height of 954 mamsl.

Aquatic Environment

No activity is planned within the Orange River but the assessment give a brief overview of the present aquatic environment of the Orange River.

The overall health of the Orange river is poor due to natural and anthropogenic influences that have changed the structural, species compositional and functional characteristics of the river.

Aquatic Microphytes

Diatoms and blue-green algae are found in the Orange River system with green algae dominating.

Aquatic Macrophytes

The following aquatic macrophytes are found in the river system.
P. pectinatus
P.trichodes
Potamogeton crispus
Myriophullum aquaticum
Azolla fulliculoides
Ceratophyllum demersum

The alien water hyacinth is the macrophyte that is of the greatest concern and is the most serious macrophyte threat to the river system.

Semi-aquatic Macrophytes
The following semi-aquatic macrophytes are found in the river system:
Papyrus sp.
Restio sp
Phragmites australis-the predominant semi-aquatic species in the orange River System.
Ludwiga stolonifera.

Aquatic Animals
Freshwater Invertebrates
The Orange River invertebrates has never been studied and is not well documented. Species known to occur in the river system:
Simuliidae, Gastropod Snails, Schistosoma *[bilharzias]* and turberiarian parasites*, Corbucola Africana, Uniona caffer, Caradina nilotica.* Due to the polluted condition of the river leeches and a variety of fish parasites have also been recorded*.*

Freshwater Fishes:-
Freshwater fish species that occur in the Orange River:

Angullidae mossambica, Barbus anoplus, B. Trimaculatus Paludinous, B.Kimberleyensis, B. aenous, Labeo umbratus Capensis, Cyprius carpio, austroglanis sclateri, Gehydroglanis sclateri, Clarias gariepinus, Cambuscia affinis, Tilapia, Sparmanii, Psedocrenilabrus philander

GROUND WATER
The groundwater flow will follow the topography and the surface drainage direction which will be from the areas of higher altitude to lower which is in the direction of the Orange River.

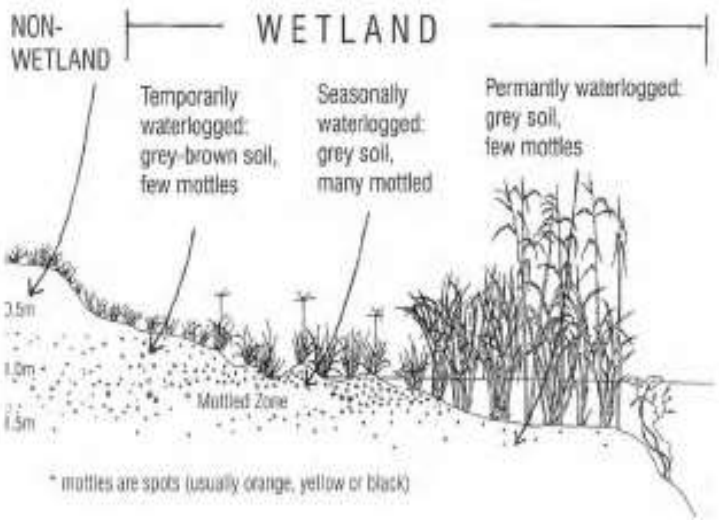
Ground-Water Zone:
The quality of the groundwater will not be negatively affected because of the bulk sampling programme as no harmful toxic properties exist in the gravels being mined. The recycling of the water only requires sediment settling; therefore no aquifers and aquicludes are on the property.

BOREHOLES

Boreholes for agricultural and domestic use are found on the property. The quantity, quality and depth are unknown.

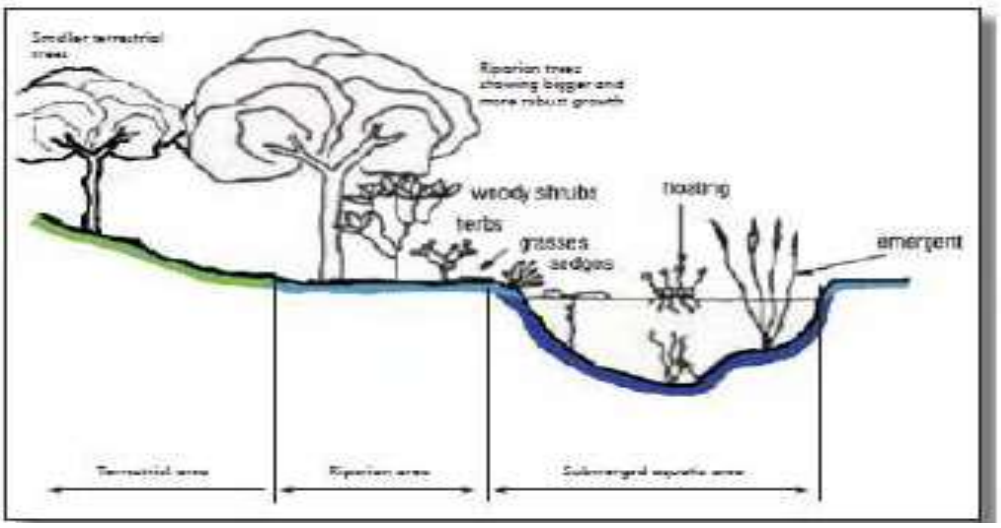
WETLANDS
No dry pans are found on the study area. The only area considered as a wetland is the boundary of the study area with the Orange River.

DELINEATION
Wetlands are identified based on the following characteristic attributes (DWAF, 2005) :
· The presence of plants adapted to or tolerant of saturated soils hydrophytes);
· Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation; and
· A high water table that results in saturation at or near the surface, leading to anaerobic conditions developing within 50cm of the soil surface.



Typical cross section of a wetland

Riparian habitat on the other hand is classified primarily by identifying riparian vegetation along the edge of the macro stream channel. The macro stream channel is defined as the outer bank of a compound channel and should not be confused with the active river bank. The macro channel bank often represents a dramatic change in the energy with which water passes through the system. Rich alluvial soils deposit nutrients making the riparian area a highly productive zone. This causes a very distinct change in vegetation structure and composition along the edges of the riparian area (DWAF, 2005).



Typical cross section of a river channel (DWAF, 2005)

No wetland conditions or riparian vegetation as defined by the National Water Act, 1998 (Act 36 of 1998) were recorded during the desktop assessment of available data or during the field surveys during which soil and vegetation sampling were conducted on the site.

No signs of saturation indicative of wetland conditions were recorded within the study area. Although pans may form during times of high rainfall this would be attributed to soil compaction that results in water being more slowly absorbed into the soil. Although a few areas likely to form temporary pans were observed, this should be verified during the appropriate rain season.

RIVER DIVERSIONS

No river diversions will be required for this project.

AIR QUALITY

The sources of airborne particulate matter include:

- Agricultural activities which result in wind-blown soil dust that occur from bare fields, especially in dry periods,
- Vehicles, unpaved roads and construction,

- Mining/ Prospecting including open pits,
- Domestic fuel burning,
- Industries including power plants and to lesser extent natural sources

PROSPECTING AREA

No site specific air quality data could be found to assess the air quality baseline conditions associated within the study area. Due to minimal activity on the study area the air quality can generally be described as of excellent quality

NOISE

The sources of the noise pollution during prospecting activities are:

- From the operation of earth moving equipment and other vehicles;
- Mineral processing and recovery;
- Generator noise.

The extent of this noise is mostly limited to the prospecting site.

VISUAL

The prospecting activities will be visible from the dirt road (R383) that connects Prieska with Griekwastad

LAND CLAIMS

The Koegas farms (inclusive of Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11 and Remainder of Portion 4 Rietfontein 11), are a successful restitution claim by the Khoi, San and Tswana communities that lived on the farm. A graveyard is on the farm and the prospecting activity should avoid this area. Most of the houses and the Westerberg Club House are abandoned and require repairs.

.SITES OF ARCHAELOGICAL, HISTORICAL AND CULTURAL IMPORTANCE

Archaeological remains can be defined as human-made artefacts, which reflect past ways of life, deposited on or in the ground. All archaeological remains, artificial features and structures older than 100 years and historic structures older than 60 years are protected by the National Heritage Resources Act (NHRA) (Act No. 25 of 1999). No archaeological artefact, assemblage or settlement (site) may be moved or destroyed without the necessary approval from the South African Heritage Resources Agency (SAHRA).

The graveyards are protected under the South African Heritage Resources Act (Act no. 25 of 1999), and by the Human Tissues Act, 1983 (Act No. 65 of 1983). No disturbance to these sites is permitted.

It does not exempt Morgenson Mining (PTY) LTD from its obligation to suspend prospecting activity and immediately report to Provincial Authority and/or SAHRA, if some artefacts will be discovered during the prospecting operation.

Study Area

The study area is directly opposite an area to which a scoping phase evaluation was conducted by the Mc Gregor Museum, Kimberley.

“The McGregor Museum archaeology department was appointed by Mr. Gamja Gool (contact: G. Gool, email: gamjagool@gmail.com tel: 082 654 0798) and M.A. Gool (contact: M.A. Goliath, 22 Goedehoop Avenue, Royldene, Kimberley 8301; email: goliathmalcolm@yahoo.com tel: 0824523693) to conduct a Heritage Impact Assessment for Prospecting Right on the farm: Portion 3 (Asbestos Hills) and Portion 2 and 4 (Rietfontein 11), near Koegas, Administrative District of Prieska, Northern Cape. A scoping phase evaluation of the full site was aimed at providing high-level identification of potential areas of sensitivity together with a recommended methodology for the HIA process.

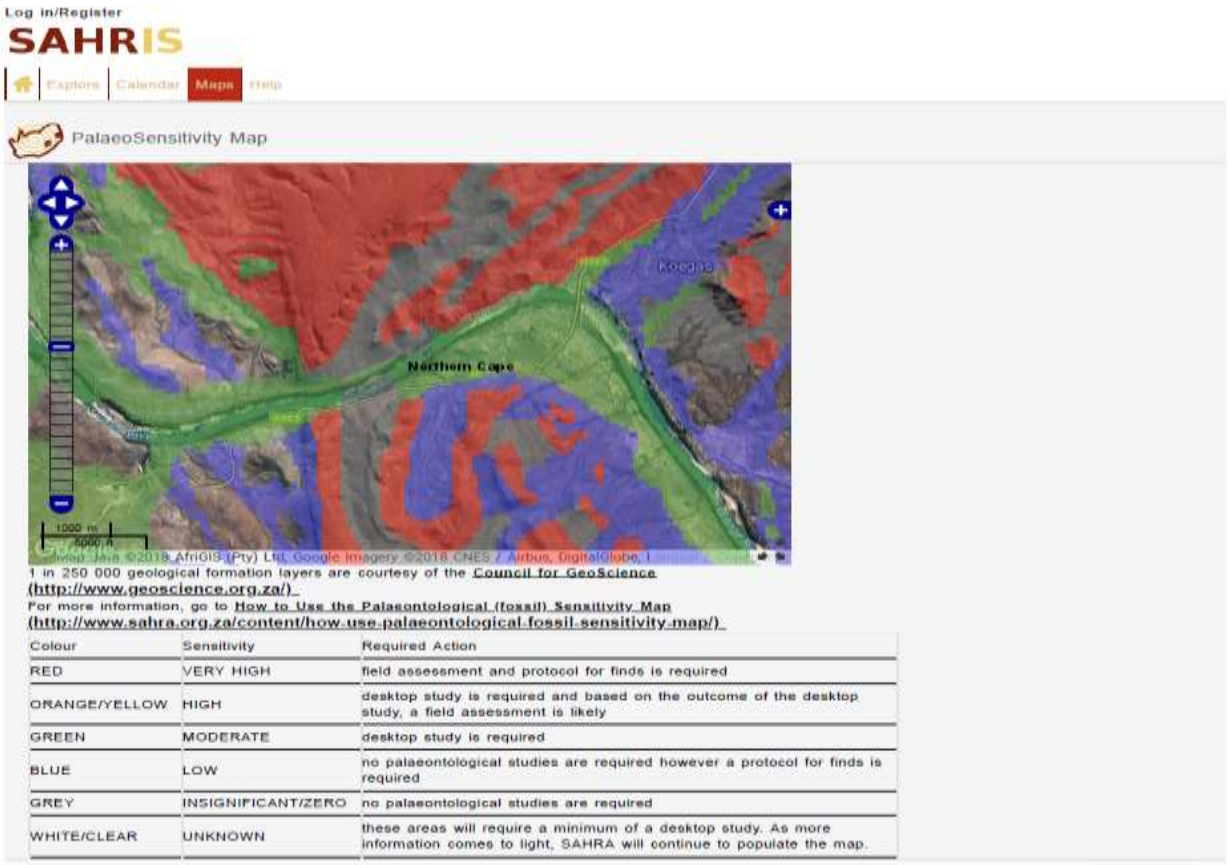
The site was inspected on foot on the 20 April 2018 and relevant observations are indicated in this report.

Fieldnotes and photographs are lodged with the McGregor Museum, Kimberley. “

Full report attached as **APPENDIX A.**

SAHRA

SAHRIS MAP



Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

The SAHRIS paleontological map shows a moderate sensitivity on the target prospecting area and low to very high sensitivity to the south of the study area.

SIYATEMBA LOCAL MUNICIPALITY

SOCIO - ECONOMIC PROFILE

MAP

Siyathemba Local Municipality is part of Pixley Ka Seme District Municipality.

MDB code: NC077

Description: The Siyathemba Local Municipality is a Category B municipality situated within the Pixley Ka Seme District of the Northern Cape Province. It is one of the eight municipalities in the district. The municipality was established as a result of the Local Government Municipal Structures Act of 1998 on 22 September 2000.
Initially it was established as 'Primanday', which was a combination of the names Prieska, Marydale and Niekerkshoop. However, this was not an acceptable solution and on the 25th June 2001, as a result of a Council decision and Provincial Government notice 22/2001, became Siyathemba. The meaning of Siyathemba is 'we hope'.
Prieska was originally named Prieschap, a Koranna word meaning 'place of the lost she-goat', and used to be a fording place for travellers over the Orange River. Known to the locals as 'the gem of the Northern Cape', Prieska is the seat of the municipality and is located on the hills of the Doring Mountains on the southern banks of the Orange River.
Prieska's infrastructure is impressive – it has Eskom power; an abundant water supply from the Orange River, with the Gariep and the Vanderkloof Dams on the upstream side of the river; easy access to the main railway line to Namibia; good tarred road linkage with Kimberley, Upington and De Aar; two landing strips for light aircraft; and complete and reasonably inexpensive industrial stands, with or without siding facilities. Industrial activities include: grain silos; a cotton mill; a bakery; manufacture of furniture, built-in cupboards; cattle fodder pellets; and a tiger's eye processing plant.
Niekerkshoop is attractively placed between hills, and large trees shade the streets. There is no domestic water supply but irrigation water is supplied by a spring to the north of the town. On the north-west side of Marydale is a rich underground water source, and the main means of water supply is by borehole and wind pumps. It depends mainly on sheep farming.

Area: 14 727km^2

Cities/Towns: Copperton, Marydale, Niekerkshoop, Prieska

Main Economic Sectors: Government services (28.9%), financial services (23.8%), agriculture (16.4%)

Siyathemba in Regional Context

Siyathemba is one of eight Local Municipalities in the Pixley Ka Seme District. The other seven Municipalities are:

1. Thembelihle Local Municipality
2. Emthanjeni Local Municipality
3. Siyancuma Local Municipality
4. Umsobomvu Local Municipality
5. Ubuntu Local Municipality
6. Kareeberg Local Municipality
7. Renosterberg Local Municipality

The Population

The local and regional population is illustrated by Table 2.1. From this Table, it is evident that Siyathemba had a local population of just more than 21,000 people during 2010.

Table 2.1 – The Local and Regional Population

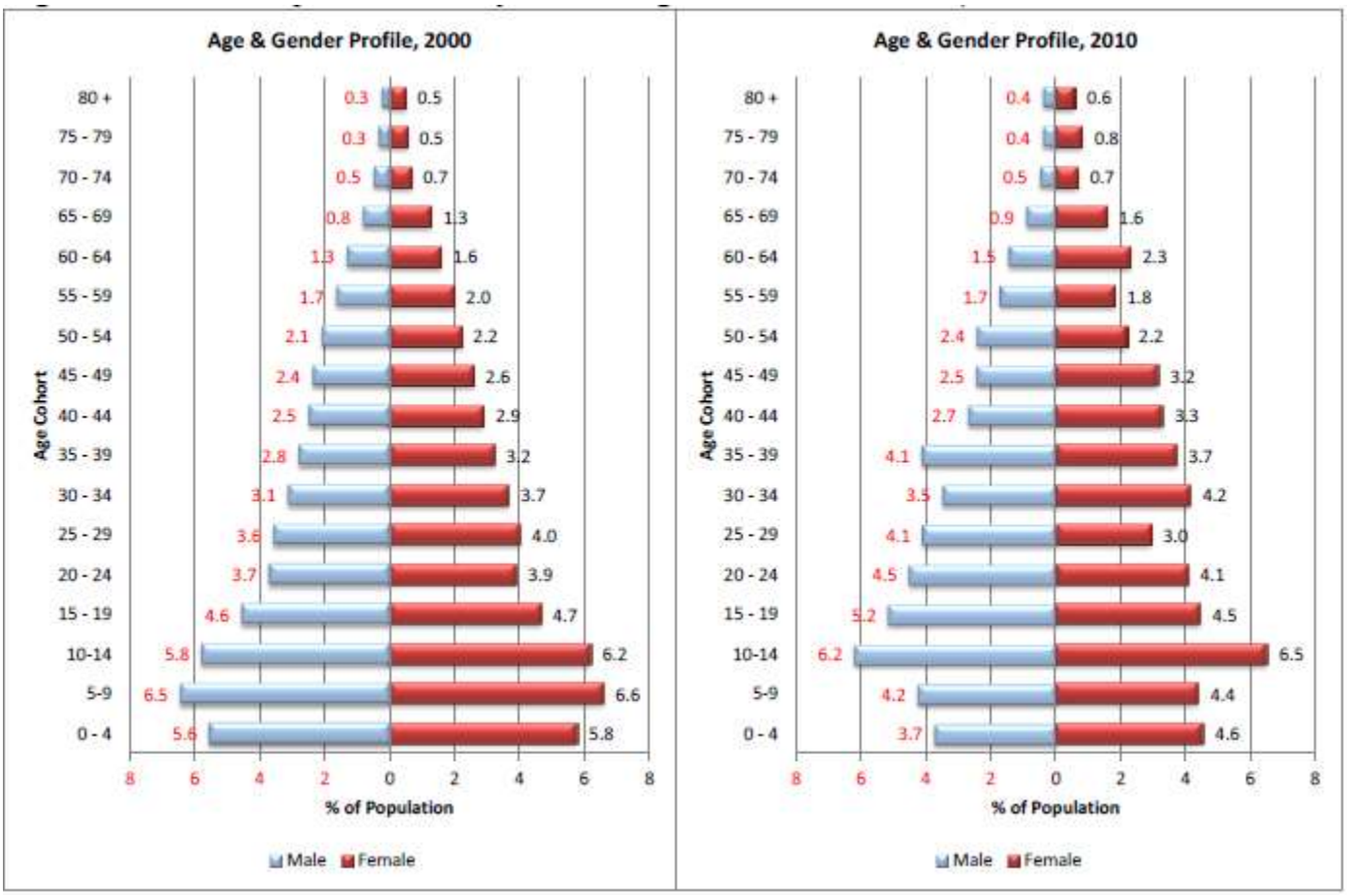
Region	2004	2006	2008	2010
South Africa	46,745,940	47,827,370	48,911,245	49,991,472
Northern Cape	1,088,672	1,089,227	1,093,823	1,103,918
Pixley Ka Seme	190,396	185,334	180,082	179,507
Siyathemba	21,441	21,312	21,239	21,333

Local Municipality				

Source: Quantec Research, 2012

In regional context, this meant that Siyathemba contributed 11.9% to the District population (i.e. the second largest LM in the District by population) and 1.9% to the population of the Northern Cape.

Figure 2.1 – The Siyathemba Population Age & Gender Profile, 2000 & 2010



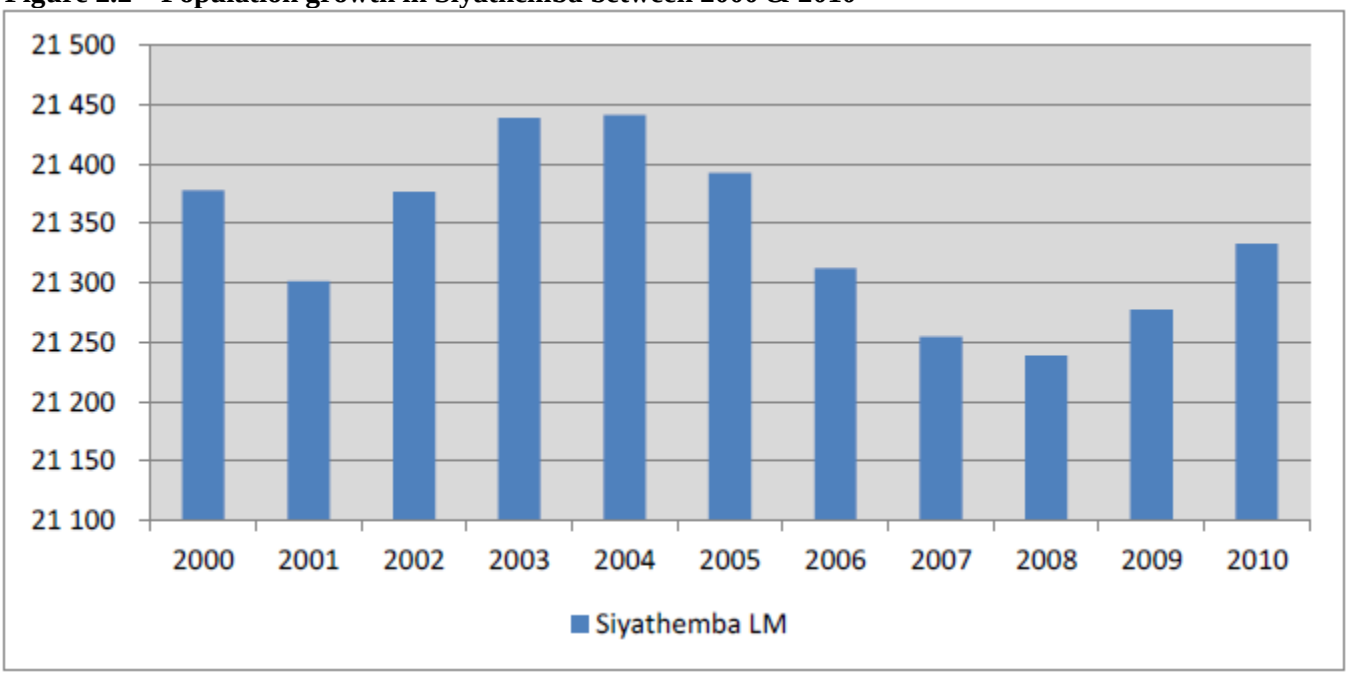
Source: Quantec Research, 2012

The Age & Gender Profile of the local population is illustrated by Figure 2.1. With regards to this profile, the following observations were made:

1. There were slightly more females (51.4%) than males (48.6%) among the local population during 2010. It was, however, noted that the population became slightly less female dominant since 2000 when 52.4% of the population were female.
2. The working age group (15 to 64) contributed 64.4% to the local population in 2010. This age group has increased proportionately (from 58.6% to 64.4%) in relation to the other age groups. Since 2000 this group increased by approximately 1,210 people.
3. The working age population is slightly male dominant. Since 2000, male working age population increased by around 928 men in absolute terms, while the number of women increased by about 282.
4. The age dependency ratio declined from 0.7 in 2000 to 0.6 dependents (children & the elderly) in 2010 for every working age adult.
5. Since 2000, the proportion of children under the age of 15 declined by 6.7%. This means that the age profile of the local population is becoming older. The number of children in the area also declined from around 14,700 during 2000 to just above 12,000 in 2010.

The population of Siyathemba declined from just over 21,370 people in 2000 to about 21,330 in 2010 (see Figure 2.2). This implies that the population contracted by 0.4% on average per annum. This growth rate is slightly lower in the Pixley Ka Seme DM, which contracted 0.7% p.a. The decline of the Siyathemba population was mainly driven by lower fertility rates.

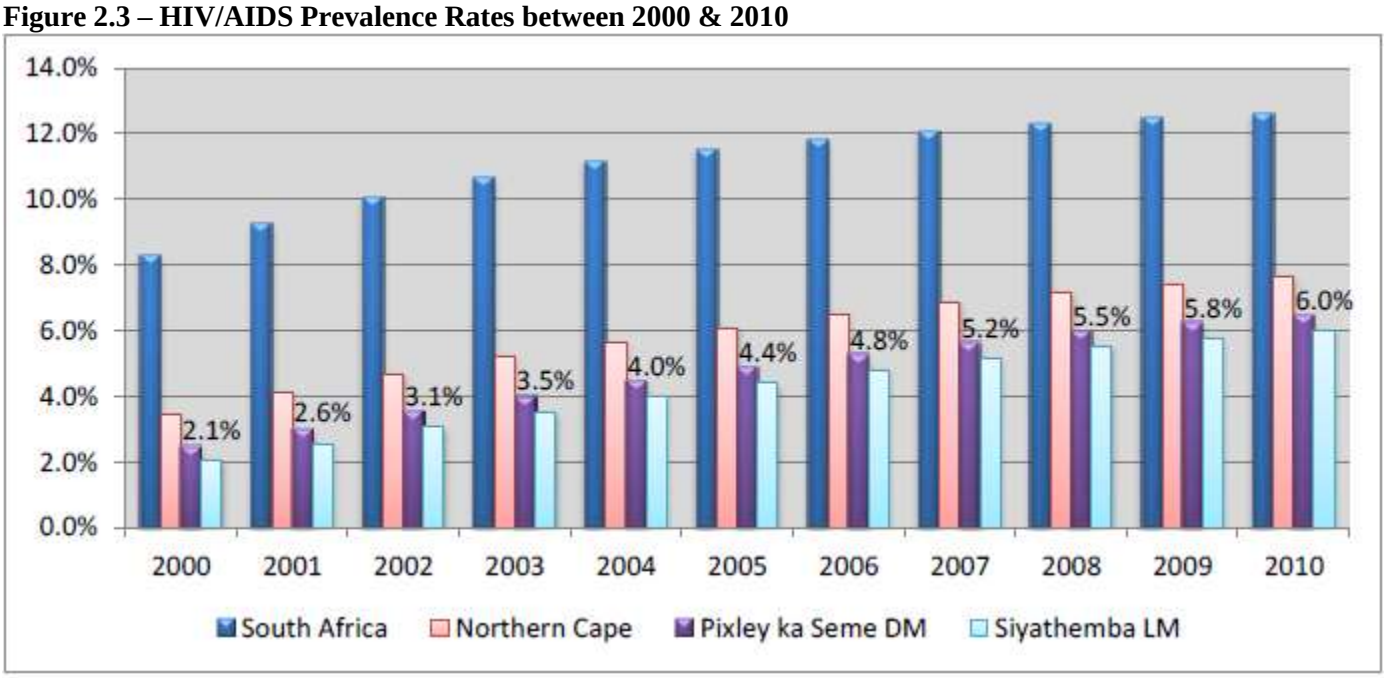
Figure 2.2 – Population growth in Siyathemba between 2000 & 2010



Source: Quantec Research, 2012

The death rate (i.e. the number of deaths per 1,000 people in year) experienced a relative increase from 11.2 deaths per 1,000 people in 1995 to 11.6 during 2010. During 2010, the death rate for Pixley Ka Seme was 11.9 deaths per 1,000 people, while it was 13 for the Northern Cape and 16.4 for the South African population. The reason for the lower death rate in the study area was mainly the result of lower HIV/AIDS prevalence rates when compared with South African averages.

Figure 2.3 – HIV/AIDS Prevalence Rates between 2000 & 2010



Since 2000, the number of people living with HIV/AIDS in the Siyathemba municipal area more than doubled from about 400 to just over 1,200 people in 2010. This means that while the local population compares well with South African averages (in terms of HIV/AIDS), the prevalence rate

is expanding faster in Siyathemba (at 11.2% p.a.) when compared with South Africa (at 5.5% on average per annum since 2000).

Adult Education

The levels of adult education (persons older than twenty years) in Siyathemba and the larger region are illustrated by Table 2.2. From this Table, it is evident that 14.2% of local adults did not complete any type of formal education whatsoever. This observation is relatively higher than the Provincial and National averages

Table 2.2 – The levels of Adult Education in Siyathemba and the larger region, 2010

Level of Adult Education	South Africa	Northern Cape	Pixley Ka Seme DM	Siyathemba LM
Grade 0/No schooling	10.8%	12.7%	18.6%	14.2%
Grade 1/Sub A	1.3%	1.3%	1.7%	1.2%
Grade 2/Sub B	1.9%	1.9%	2.5%	2.8%
Grade 3/Standard 1	2.5%	3.0%	3.7%	3.3%
Grade 4/Standard 2	3.1%	3.9%	4.0%	4.1%
Grade 5/Standard 3	3.3%	4.4%	5.4%	5.5%
Grade 6/Standard 4	4.2%	5.7%	5.4%	6.6%
Grade 7/Standard 5	5.7%	7.3%	7.6%	10.2%
Grade 8/Standard 6/Form 1	7.0%	8.7%	8.6%	10.9%
Grade 9/Standard 7/Form 2	6.4%	7.0%	6.5%	8.7%
Grade 10/Standard 8/Form 3/NTC1	9.2%	9.8%	8.1%	8.3%
Grade 11/Standard 9/Form 4/NTC11	12.1%	7.2%	5.9%	6.0%
Grade 12/Standard 10/Form 5/Matric/NTC111	19.8%	17.4%	13.4%	9.3%
Less than matric & certif/dip	2.8%	2.3%	2.4%	4.0%
Certificate with Grade 12	2.0%	1.9%	1.7%	0.8%
Diploma with Grade 12	3.3%	2.5%	2.2%	1.8%
Bachelor's Degree	2.2%	1.2%	0.9%	0.5%
Bachelor's Degree and Diploma	1.0%	0.7%	0.9%	1.6%
Honours degree	0.9%	0.6%	0.3%	0.2%
Higher Degree (Master's, Doctorate)	0.7%	0.4%	0.3%	0.1%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Source: Quantec Research, 2012

Adults who live within the Siyathemba municipal area do not compare well with the average for the Northern Cape in terms of adults who obtained a matric certificate. In Siyathemba, around 14% of adults have a matric certificate compared to 19.7% of adults in Pixley Ka Seme and 24.7% in the

Northern Cape. In terms of the proportion of adults who obtained a tertiary qualification, Siyathemba (5.1%) was also relatively lower that the District (6.3%) and Northern Cape (7.3%). The adult education profile of Siyathemba did not improve over the past ten years. Since 2000, the number of adults with a matric certificate decreased from about 1,845 (or 15.3% of the adult population) to around 1,820 in 2010 (i.e. an average decrease of 0.1% per annum). It was also noted that the portion of adults with a tertiary qualification had increased from about 530 in 2000 to around 640 in 2010.

Poverty & Social Needs

Household Access to Services

A total of around 5,500 household dwellings were estimated to exist in the Siyathemba municipal area during 2010. This accounted for some 11.7% of all household dwellings in the District, which ranked Siyathemba fourth among Pixley Ka Seme‟s Local Municipalities. Since 2000, the number of dwellings increased by 0.8% on average per annum compared to 0.1% decline in the District and 0.5% growth in the Province.

Table 2.3 – Household Access to Services, 2000 & 2010

Household Indicator	2000	2010	Access	Growth
House or brick structure	4,303	4,419	81.8%	0.3%
Electricity	4,305	4,812	87.3%	1.1%
Piped Water	5,001	5,356	97.5%	0.7%
Refuse removal	4,066	4,546	83.5%	1.1%
Flush or chemical toilet	3,597	4,323	78.6%	1.9%

Source: Quantec Research, 2012

Table 2.3 illustrates the type of dwellings found in Siyathemba and the level of household access to municipal services. In this regard, the following observations were made:

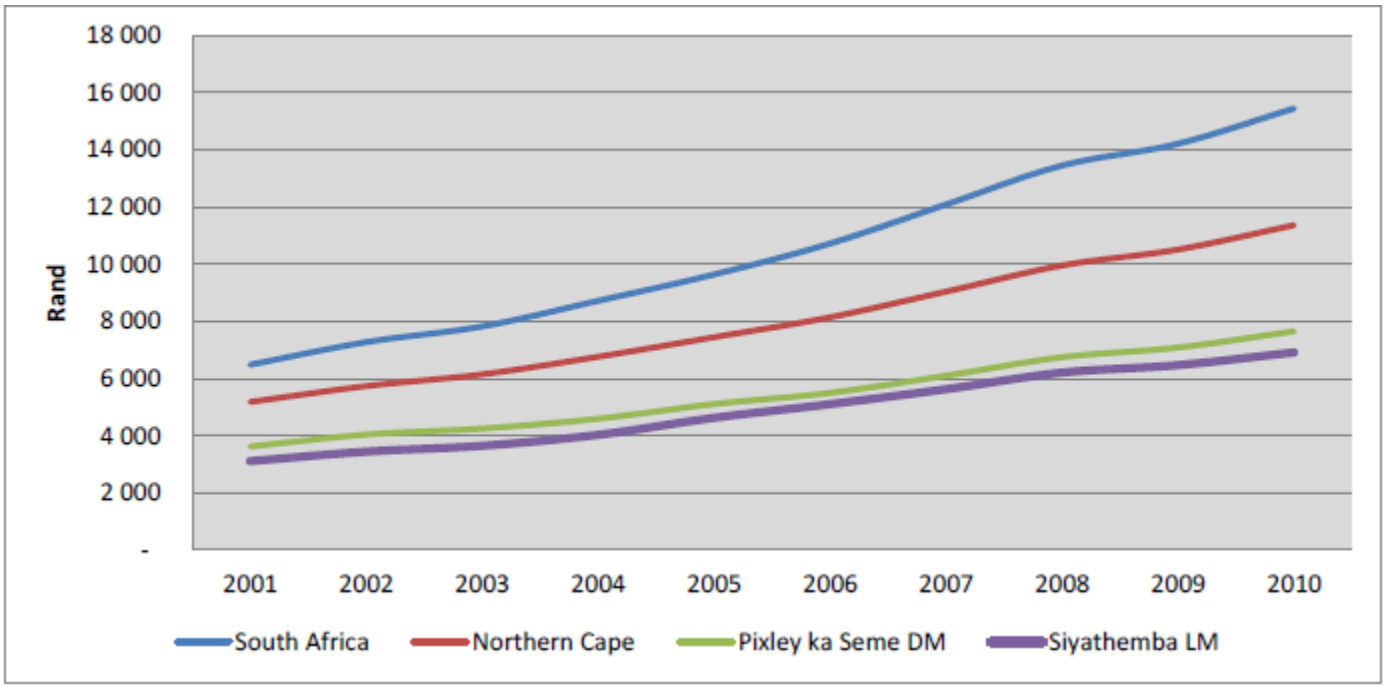
1. More than 81% of household dwellings found in Siyathemba can be classified as houses or brick structures on separate stands. This indicator is slightly higher when compared with the average for Pixley Ka Seme (80.1%) and the Northern Cape (77.4%). Some 8.6% of local dwellings can be described as shacks.
2. Around 87% of household dwellings found in Siyathemba have access to electricity. This indicator is on par with the District and Provincial average.
3. Around 97% of household dwellings found in Siyathemba have access to piped water while the remainder mostly rely on boreholes as a source. The area rated on par in terms of this indicator when compared with Pixley Ka Seme (96.8%) and the Northern Cape (96.2%).
4. Around 83% of local households enjoyed a weekly refuse removal service by the Local Municipality, compared to 76.2% in Pixley Ka Seme and 68.8% in the Northern Cape.
5. Approximately 78.6% of local households have access to flush or chemical toilets. This indicator is relatively higher when compared with the District (67.8%) and Provincial (67.8%) average. Those households that do not have access to flush or chemical toilets, mainly make use of pit latrines as their main source of sanitation.

2.2.2.2. Household Income & Expenditure

Trends in the level of monthly household income are portrayed by Figure 2.4. From this Figure, it is evident that households in Siyathemba experience lower levels of income (on average) when compared with the other regions illustrated in Figure 2.4. During 2010, the average monthly income per household was R6,912 in Siyathemba, relatively lower than the District average of R7,652. Since 2001, household income has grown by 9.3% on average p.a. in Siyathemba compared to 8.7% in Pixley Ka Seme and 9.1% in the Northern Cape. This means that there is a growing welfare gap between households in Siyathemba and the larger region. Income from sources other than labour remuneration has also been increasing. Such non-remuneration income mostly

includes social grants and other forms of transfers. Over the past nine years the monthly non-remuneration income contribution (per household) increased from R994 in 2001 to R1,627 in 2010 (i.e. by 5.6% p.a.). This means that local communities are becoming more dependent on social grants (and other transfers).

Figure 2.4 – Household Income per month, 2001 - 2010



Source: Quantec Research, 2012

From a community development perspective, one should also consider the distribution of income among local households to reflect the gaps between local income levels. A simple average (as indicated by Figure 2.4) may provide a skewed picture of reality if there are a few households that receive incomes that are substantially higher (or lower) than others in an area. From Table 2.4 it is evident that the distribution of income among local households is indeed highly skewed. Around 65% of local households earn less than R3,200 per month and are regarded as poor. In comparison, some 67.8% of households in Pixley Ka Seme and 63.8% in the Northern Cape fall in this category. The largest income group (representing 29.0% of local households) in Siyathemba are households who earn between R1,600 and R3,200 per month. On the other side of the income scale, it can be observed that households who earn more than R12,800 per month only represent 8.0% of households in Siyathemba compared to 7.7% in the District and 9.9% in the Province.

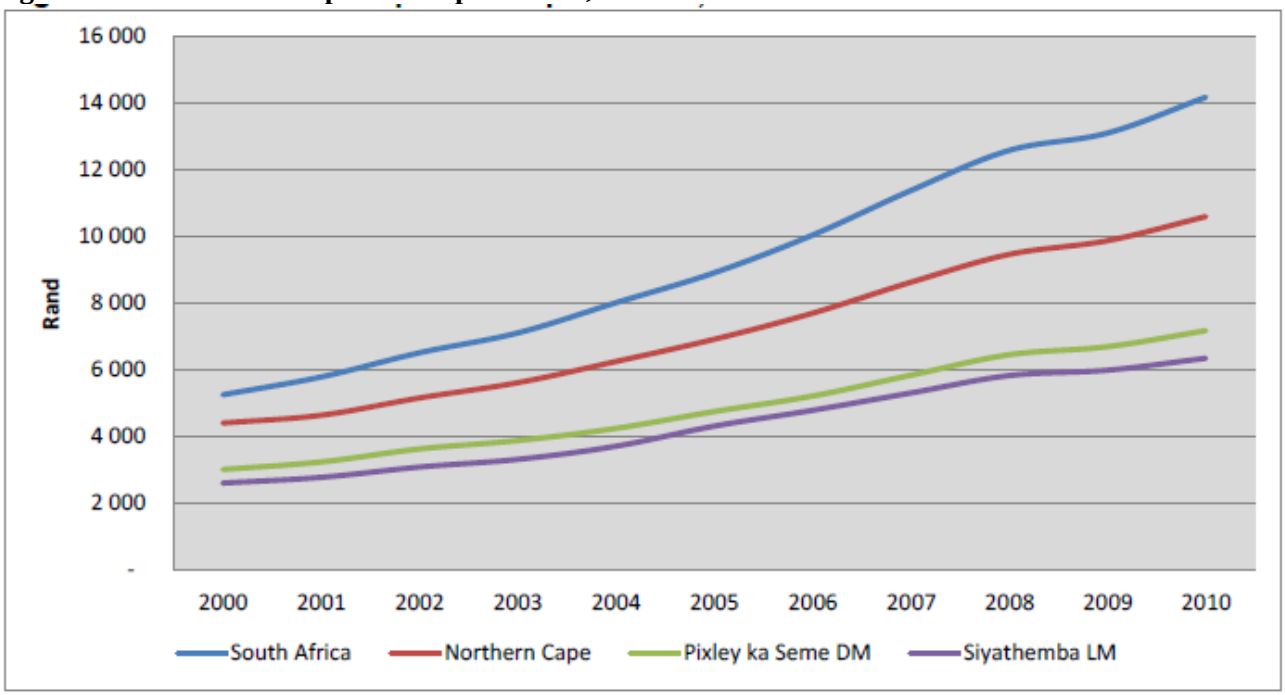
Table 2.4 – Household Income Distribution, 2007

Monthly Income	South Africa	Northern Cape	Pixley Ka Seme DM	Siyathemba LM
R1 - R400	6.2%	4.4%	4.7%	4.1%
R401 - R800	11.1%	9.8%	9.1%	8.3%
R801 - R1 600	23.5%	25.1%	26.8%	23.5%
R1 601 - R3 200	23.7%	24.5%	27.1%	29.0%
R3 201 - R6 400	14.2%	16.4%	16.2%	18.6%
R6 401 - R12 800	9.4%	10.0%	8.3%	8.4%
R12 801 - R25 600	6.6%	5.8%	4.7%	4.4%
R25 601 - R51 200	3.5%	2.8%	1.7%	2.5%
R51 201 - R102 400	1.2%	0.7%	0.4%	0.0%
R102 401 - R204 800	0.4%	0.3%	0.7%	0.9%
R204 801 or more	0.3%	0.3%	0.2%	0.2%

Source: Statistics South Africa – Community Survey, 2007

Trends in the level of monthly household expenditure are portrayed by Figure 2.5. From this Figure, it is evident that households in Siyathemba have experienced increases in expenditure levels (9.3% on average p.a.) over the past decade in comparison with Pixley Ka Seme (9.0%) and the Northern Cape (9.2%).

Figure 2.5 – Household Expenditure per month, 2000 - 2010



Source: Quantec Research, 2012

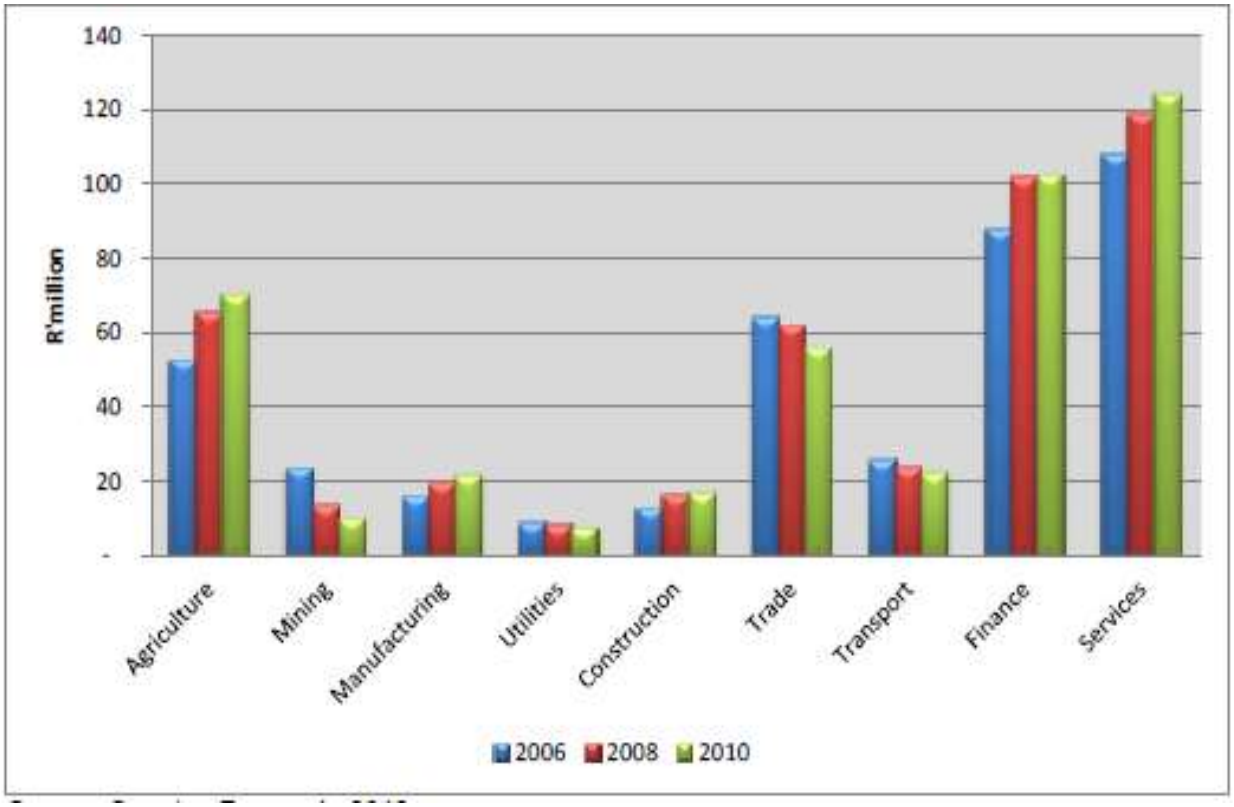
Table 2.5 illustrates the distribution in household consumption expenditure in the study area and the larger region. From this Table, it is evident that households in all the areas under observation spend most of their disposable income on food, beverages and tobacco. This is especially true with regards to households in Siyathemba, which spend around 26% of their income on this product group. In comparison, local households spend slightly less (7.2%) on durable goods, such as furniture and personal transport equipment in line with the Northern Cape (7.2%).

2.3.1. Economic Production & Growth

Gross Domestic Product (GDP) is defined as the market value of all final goods and services produced within an area in a given period of time. The size of an economy is usually measured by its Gross Domestic Product. This value is equal to the economic wealth of the area; all the things of economic value that can be bought or sold that have been produced in the area in one year.

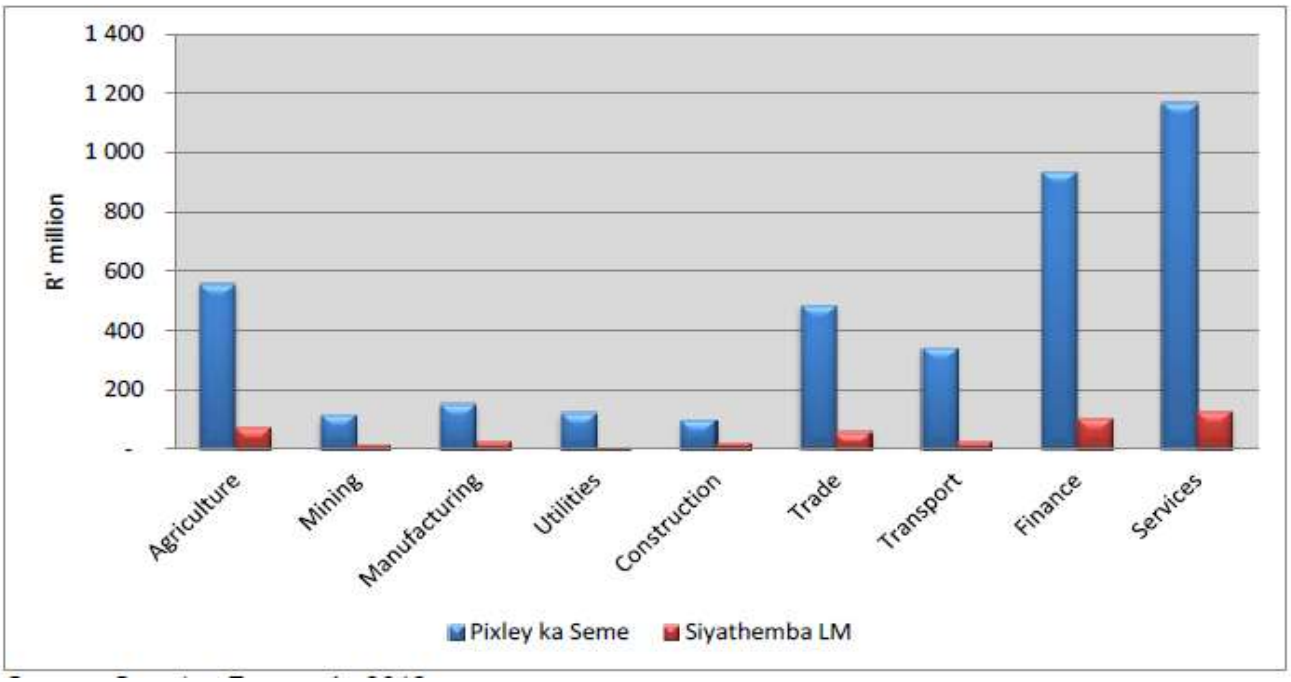
The Sectoral GDP Profile of Siyathemba is illustrated by Figure 2.7. From this profile, it is evident that the economy is highly unbalanced and dominated by the Government Services sector, which contributed R124 million (or 28.9%) to the local economy in 2010. This sector was followed by the Financial Services (23.8%) and Agriculture sectors (16.4%). The rest of the sectors illustrated in Figure 2.7 all contributed around 31% to the local economy

Figure 2.7 – Sectoral Economic Profile of Siyathemba, 2006 - 2010



Since 2006, the local economy grew by 2.0% on average per annum. The fastest growing sectors during this period were Manufacturing (8.3%) and Agriculture (7.7%).

Figure 2.8 – Sectoral Economic Profile of Siyathemba compared to Pixley Ka Seme, 2010



Source: Quantec Research, 2012

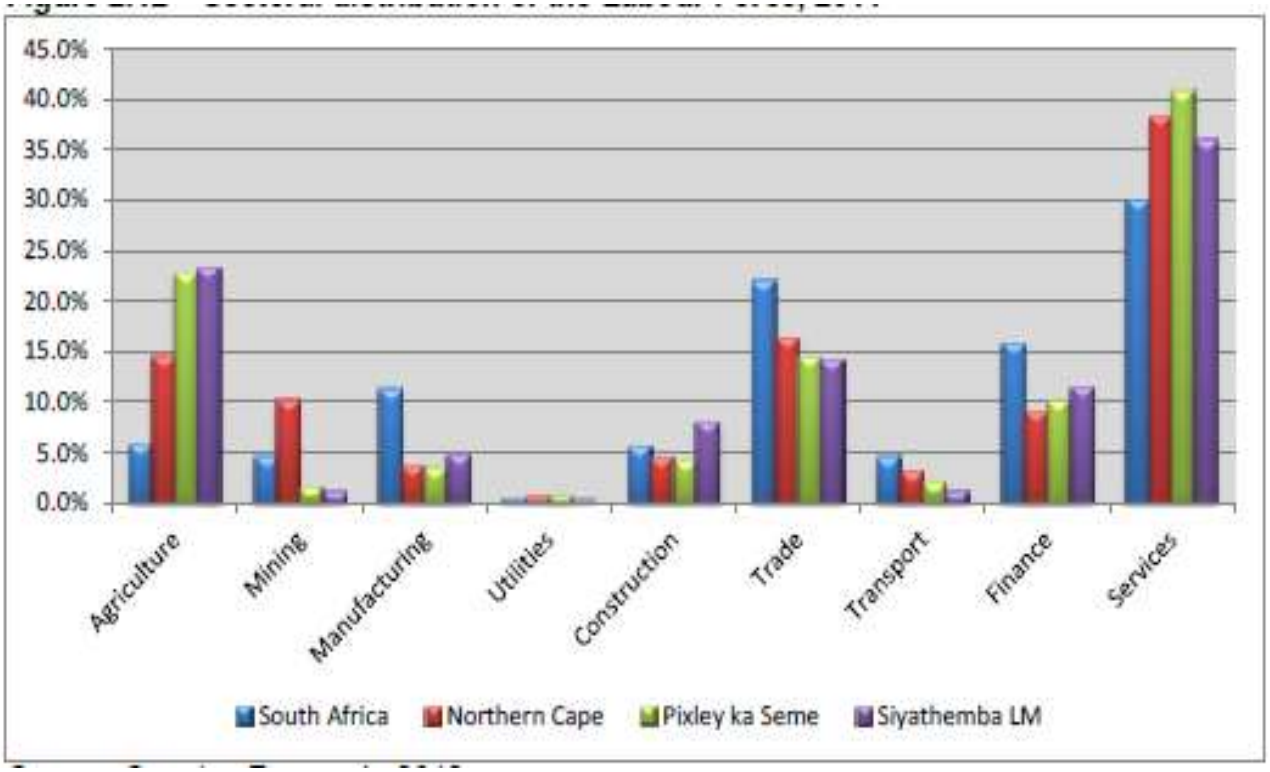
The local economy in District context is illustrated by Figure 2.8. From this profile, it is evident that the Construction sector of Siyathemba makes a significant contribution to that of Pixley Ka Seme (some 18.0% in 2010). Overall, the local economy contributed 10.9% to the District economy during 2010.

Labour Profile

2.4.1. Overview

The 2010 sectoral distribution of the labour force in South Africa, the Northern Cape, Pixley Ka Seme and Siyathemba is illustrated by Figure 2.12. From this profile, it is evident that most workers in Siyathemba are employed in the Government Services sector (around 1,700 workers), followed by Agriculture (about 1,100 workers) and the Trade (about 670 workers) sectors.

Figure 2.12 – Sectoral distribution of the Labour Force, 2011



Source: Quantec Research, 2012

Table 2.8 – Average Annual Employment Growth by Sector, 2000 - 2010

Sector	South Africa	Northern Cape	Pixley Ka Seme DM	Siyathemba LM
Agriculture	1.7%	3.0%	2.0%	4.6%
Mining	0.1%	-1.3%	-5.0%	-13.0%
Manufacturing	2.3%	2.6%	3.9%	10.2%
Utilities	1.8%	-0.5%	-0.7%	-2.8%
Construction	8.3%	5.4%	2.8%	6.6%
Trade	3.1%	2.5%	-0.2%	-0.9%
Transport	5.0%	4.1%	-1.3%	-2.9%
Finance	5.9%	4.3%	6.6%	5.6%
Services	2.8%	2.9%	1.3%	3.1%
Total	**3.5%**	**1.9%**	**1.7%**	**2.0%**

Source: Quantec Research, 2012

When these employment trends are compared with those observed for GDP (see Table 2.7), it is noted that total employment declined over the past decade (by 2.5% p.a.) while the economy

grew by 2.0% per annum in GDP terms. This phenomenon is referred to as “jobless growth” which implies that local economy is becoming less labour intensive and more capital intensive.

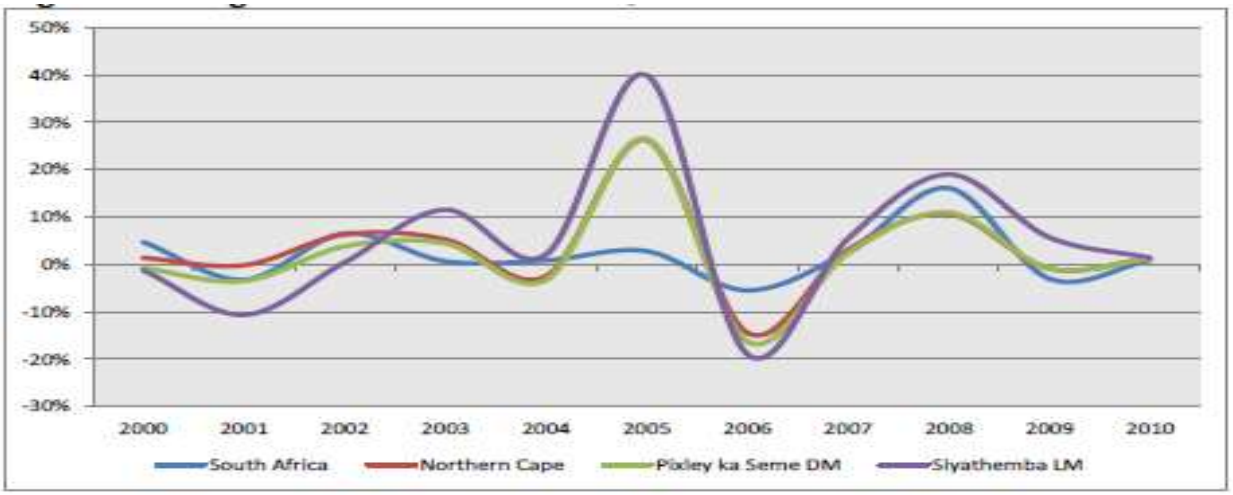
AGRICULTURE

3.2.2. Siyathemba Overview

The Orange River runs through the Municipality and provides ideal conditions for irrigation farming in Siyathemba, especially the cultivation of grains and vegetables. The main livestock farming in the region include cattle, sheep and goat farming. Game farming also takes place in the area and aids in the development of tourism and hunting activities.

Figure 3.1 indicates the Agricultural production growth of Siyathemba from 2000 to 2010, compared with the District, the Province and South Africa. From Figure 3.1 it is apparent that Siyathemba follows a similar production trend to that of Pixley Ka Seme and the Northern Cape Province. The region experienced extensive Agricultural growth from 2006 to 2008.

Figure 3.1 – Agriculture Sector Growth, 2000- 2010



Source: Quantec Research, 2012

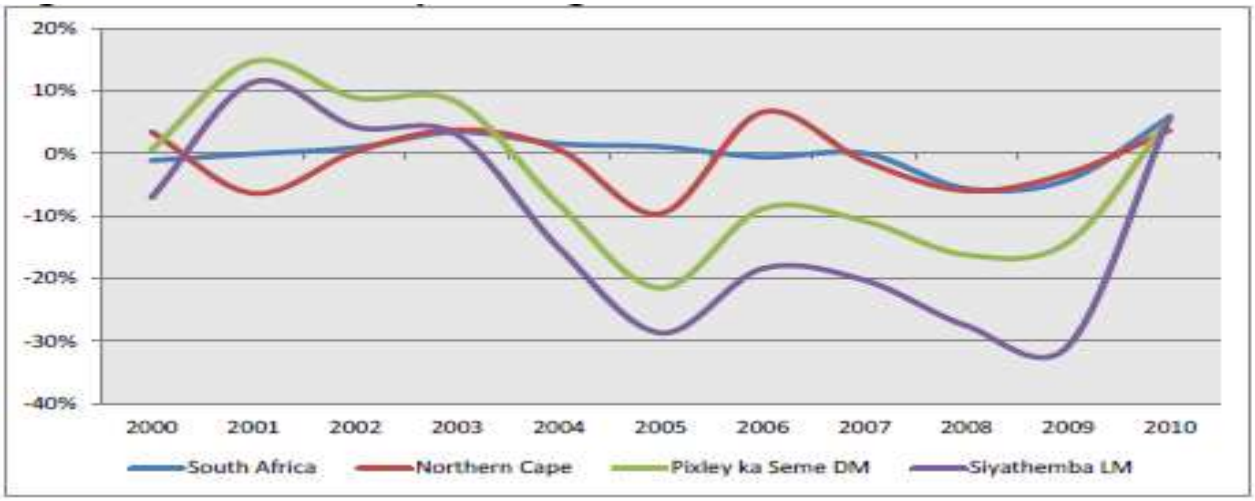
MINING

Siyathemba Overview

The main deposits in Siyathemba include possible alluvial diamond mining along the Orange River, various semi-precious stones, such as tiger-eye and zinc deposits. The region also has various saltpans for the potential of salt production.

Figure 3.3 indicates the Mining production growth of Siyathemba from 2000 to 2010, compared with the District, the Province and South Africa. From Figure 3.3 it is evident that Siyathemba follows a slightly lower production trend to that of the Pixley Ka Seme District‟s mining sector from 2000 to 2010.

Figure 3.3 – Local Municipal Mining Sector Growth, 2000- 2010



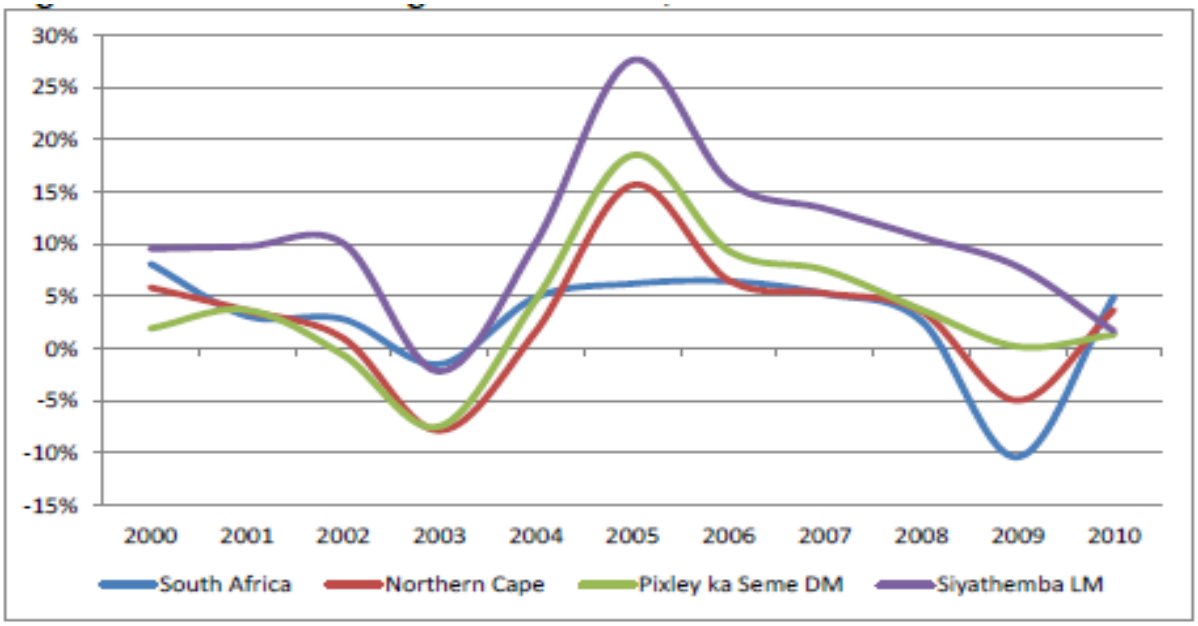
Source: Quantec Research, 2012

MANUFACTURING SECTOR

Siyathemba Overview

Agro-processing is the main Manufacturing activity in Siyathemba, which consists of the production of various plant and meat products. Figure 3.5 indicates the Manufacturing production growth of Siyathemba from 2000 to 2010 as compared with the District, the Province and South Africa. From Figure 3.5, it is evident that Siyathemba follows a relatively higher production trend to that of the Pixley Ka Seme District‟s manufacturing sector, except for a decline post-2009.

Figure 3.5 – Manufacturing Sector Growth, 2000- 2010



Source: Quantec Research, 2012

KOEGAS COMMUNITY

The community are awaiting Government Development Funding to continue with their development program. No families currently reside on the study area except 3 families as caretakers on the adjacent farm Koegas 324 and Hounslow 325

(v) *IMPACTS IDENTIFIED*

Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Duration	Probability	Significance	Extent
Soil	Stripping, stockpiling topsoils and subsoils	Soil erosion and loss of topsoil material resulting in loss of fertility and soil functioning.	M	M	VL	S
	Open pit development	Loss of land capability for agricultural use, grazing and other uses	M	L	L	S
	Development of infrastructure (i.e. haul roads, processing plant)	Soil compaction of the ground will increase surface water run-off thus increasing the potential for soil erosion.	S	M	L	S
Surface Water	Removal of vegetation and construction of infrastructure (i.e. haul roads, processing plant)	Increase in surface water run-off which may cause erosion and ultimately the sedimentation of nearby streams/rivers.	L	M	M	L
	Stockpiling topsoils and subsoils	Wind and water erosion that may potentially result in sedimentation of nearby streams/rivers.	M	M	L	R
Groundwater	Pit dewatering	Potential contamination of groundwater by trace elements such as Mercury (Hg) and Arsenic (As).	S	VL	I	R
	Development of infrastructure (i.e. haul roads, processing plant)	Potential reduction of water quality for human consumption	VS	VL	L	L
	Project water consumption	Potential reduction of water quantity available for domestic use.	VS	VL	L	L
	Development of WRD, pollution control dam and tailings dam	Potential seepage and contamination of trace elements.	M	L	VL	R
Air Quality	Soil stripping, hauling, ore crushing and conveying	Increase in dust emissions (PM_{10}, $PM_{2.5}$ and TSP) thus reducing the ambient air quality of the surrounding.	S	H	M	L
	Use of vehicles and machinery (e.g. haul trucks, diesel generators)	Increase in NO_x and SO_2 and PM_{10} thus reducing the ambient air quality of surrounding communities.	S	VH	L	L
Fauna and Flora	Vegetation removal	Loss of floral species and destruction of faunal habitat, including medicinal plants.	S	M	L	L
	Development of infrastructure (i.e. haul roads, processing plant)	Disturbance to faunal species through noise and light	L	H	M	L
	Rehabilitation	In-migration of faunal species into the	L	L	L	S

		project area (Positive impact) Increased occurrence of invader plant species.				
Wetlands	Development of infrastructure (i.e. haul roads, processing plant)	Loss of wetland habitat thus resulting in desiccation of water resources which may have a negative impact on faunal and floral species	L	L	L	L
Aquatic Ecology	Development of WRD and tailings dam	Potential for oxidative stress in fish and the threat of bioaccumulation in the tissues of exposed fish may pose health impacts to people.	S	M	L	L
Economy	Project capital expenditure	Increase in production and GDP-R of the national and local economies (Positive Impact). Increase in government revenue due to investment (Positive Impact). Benefits derived from investment by the company into the local economic development projects (Positive Impact).	P	D	VH	R
	Direct and indirect employment	Skills development due to the creation of new employment opportunities (Positive Impact). Improved standard of living of households directly or indirectly benefiting from created employment opportunities (Positive Impact).	L	D	VH	N
	Mine development (Prospecting)	Potential impact on current economic activities within the directly affected environment (i.e. tourism or other identified economic activity that may be sensitive to the proposed development). Added pressure on government to provide basic services and social and economic infrastructure. Impact on property and land values in the surrounding area.	VL	D	VH	L
	Mine development (Prospecting)	Loss of agricultural, grazing or collection of natural resources; loss of this land/resources will result in economic	L	L	L	R

		displacement.				
Social	Use of existing access roads for hauling material (R383)	Disruption of daily movement of surrounding communities.	M	VL	VL	L
	Employment	It is possible that conflict might arise between the newcomers (due to population influx) and local residents. An influx of job-seekers may also lead to an increase in various social pathologies, such as drug and alcohol abuse and domestic violence.	L	M	H	L
Community Health	Water management	Surface water run-off reporting to the Orange River streams may potentially be impacted. Trace elements may have a resulting impact on aquatic ecology and people who either use the water for domestic purposes or fish within these streams. Water borne diseases such as cholera, diarrhoea, and typhoid may potentially occur	VL	L	VL	R
	Employment	Overcrowding, due to influx of people may result in an increase in the prevalence of respiratory diseases in the proposed project area increasing prevalence of respiratory health outcomes, including TB, which is likely to be influenced by housing issues, such as overcrowding. Population influx issues may result in potential rises in STIs including HIV/AIDS. The high density population/influx of people from periphery areas seeking employment on the mine, leading to increased inability of the existing health services to cope.	M	L	M	L
Community Health	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially high noise levels. There is sufficient evidence that noise may cause adverse health effects such as cardiovascular effects. Epidemiology studies	S	L	L	S

		have found associations between immune and psychiatric effects and noise exposure.				
	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially hazardous materials and resulting malodours may potential may potentially result in respiratory illnesses.	S	VL	I	S
Cultural Heritage	Development of infrastructure (i.e. haul roads, processing plant)	This activity may cause damage to or destroy any physical heritage resources that may be present within the project footprint areas.	P	M	VH	S
Visual	Open pit, tailings dam, stockpiles	Change of the visual landscape will impact the sense of place/perceptions which has a resulting impact on surrounding receptors including road users.	L	VH	L	L
Traffic	Use of existing access roads and provincial roads for hauling material	Additional traffic and particularly heavy duty vehicles on the existing road network may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	M	L	VL	L
	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	M	M	L	L
Noise	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	M	M	M	L

TABLE

Potential Project Risk (Unplanned Occurrences)	**Aspect Potentially Impacted**	**Project Phase**
Hydrocarbon spill from vehicles and machinery or hazardous materials or waste storage facilities	Soil and water resources which would have a resulting impact on ecological and social systems	Construction, Operation and Decommissioning
Spills/leaks from pipelines, tailings dam, hazardous materials or waste storage facilities	Soil and water resources would have a resulting impact on ecological and social systems	Construction, Operation and Decommissioning
Flooding due to no dewatering	Surface and groundwater resources would have a resulting impact on ecological and social systems	Decommissioning and Post-Closure
Safety risk from heavy vehicle traffic, open pit (excavations), crushing plant.	Mine workers and surrounding communities	Construction, Operation and Decommissioning

(vi) METHODOLOGY

TABLE –EXPLANATION OF DURATION OF IMPACT

DURATION OF IMPACT	EXPLANATION OF DURATION
Very Short (VS)	Less than 1 year
Short (S)	1 to 5 years
Medium (M)	6 to 12 years
Long (L)	13 to 50 years
Very Long (VL)	Longer than 50 years
Permanent (P)	Permanent

TABLE –EXPLANATION OF PROBABILITY OF IMPACT OCCURENCE

PROBABILOITY OF IMPACT OCCURENCE	EXPLANATION OF PROBABILITY
Very Low (VL)	<20% sure of particular fact or likelihood of impact occurring
Low (L)	20-39% sure of particular fact or likelihood of impact occurring
Moderate (M)	40-59% sure of particular fact or likelihood of impact occurring
High (H)	80-79% sure of particular fact or likelihood of impact occurring
Very High (VH)	80-99% sure of particular fact or likelihood of impact occurring
Definite (D)	100% sure of particular fact or likelihood of impact occurring

TABLE –EXPLANATION OF IMPACT SIGNIFICANCE

IMPACT SIGNIFICANCE	EXPLANATION OF IMPACT SIGNIFICANCE
No Impact (I)	There will be no impact at all not even a very low impact on the system or any of its parts
Very Low (VL)	Impact will be negligible. In the cast of negative impact, almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple. In the case of positive impacts alternative means would almost all likely be better, if one or a number of ways, then this means of achieving benefit
Low (L)	Impact would be of low order and with little real effect. In the case of negative impacts, mitigation and /or remedial activity would be either easily achieved or little would be required or both. In the case of positive impacts alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time consuming, or some combination of these
Moderate Significance (M)	Impact would be real but not substantial within the bounds of those which could occur. In the case of negative impacts, mitigation and /or remedial activity would be feasible and fairly easily possible. In the case of positive impacts other means of covering these benefits would be about equal in cost and effort
High Significance (H)	Impacts of substantial order. In the case of negative impacts, mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these. In the case of positive impact other means of achieving this benefit would be feasible but would be more difficult, expensive, time consuming or some combination of these
	Of the highest order possible within the bounds of impact which could occur, in the case of

Very High Significance (VH)	negative impacts, there would be no possible mitigation and /or remedial activity to offset the impact at the spatial or time scale for which was predicted. In the case of positive impact there is no real alternative to achieving the benefit

TABLE-EXPLANATION OF EXTEND OF IMPACT

EXPLANATION OF EXTEND	EXPLANATION OF EXTEND OF IMPACT
Site specific	Direct and indirect impacts limited to site of impact only
Local	Direct and indirect impacts affecting environmental elements within the study area
Regional	Direct and indirect impacts affecting environmental elements within the Northern Cape
National	Direct and indirect impacts affecting environmental element on national level
Global	Direct and indirect impact affecting environmental elements on global level

(vii) POSITIVE AND NEGATIVE IMPACTS

Impact identification is performed by determining the potential source, possible pathways and receptors. In essence the potential for any change to a resource or receptor (i.e. environmental aspect) brought about by the presence of a project component or by a project-related activity has been identified as a potential impact. This section discusses those potential impacts associated with the proposed project activities and considers those potential impacts as identified by I&APs.

With the clearing of the area for the placement of infrastructure and prospecting roads development during the construction phase, the vegetation will be completely destroyed. Some faunal species might be displaced during the construction of roads and placement of the project infrastructure. The same impacts would apply during the bulk sampling activities with the excavations that would be made. The clearing of the natural vegetation might lead to an increase in the alien invasive species.

During the construction and operational phase there is the possibility of oil and fuel spillages that could contaminate the ground and surface water sources. The spillages would be from the use of the Trackless Mobile Machinery and LDV's. Improper management control of hazardous substances would contaminate surface water sources during periods of run off.

During the bulk sampling (excavations) activities, that area would become unavailable for other land use as in this case agriculture and livestock farming. The impact would be low due to the fact that none of those activities are currently performed.

The prospecting programme through its nature of excavations and treatment of the alluvial diamond gravel, will cause noise and dust pollution. The magnitude will depend on the number of the equipment, their condition and the maintenance programme.

The project will use the current road (R383) at times which will impact on the current use by other road uses. The impact would be of low significance as most traffic would be encountered on the study area itself. Management should however ensure compliance with road safety legislation.

The operation would be visible form the R383 in respect of any dust that might be created, the stockpiles that will be erected and the tailings dam.

Socially the area might experience an influx of people (possible job seekers) which will impact on the current social structure. It could increase social ills like theft, robbery and drug and alcohol abuse to name a few.
The study area being remote has a security threat due to the product , diamonds.

There is currently limited economic activity on the 7 farms that the Koegas CPA has successfully claimed through the land restitution process. The study area constitute 2 of the farms and there is no economic activity conducted on them currenlty. The prospecting operation will provide:

- A minimum of 15 employment opportunities
- Increase in economic activity for the surrounding towns, Marydale, Griquatown and Prieska. The opportunity for the establishment of business for daily consumables exists.
- All of the houses and facilities are in a redundant state and require extensive repairs which could be done through the income generated to the CPA that could be used during the project life and beyond.
- If the prospecting operation proof a viable resource, the economic activity would be long term and beyond life of mine.

(vii) **MITIGATION MEASURES**

Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Level of Risk and Mitigation Measures
Soil	Stripping, stockpiling topsoils and subsoils	Soil erosion and loss of topsoil material resulting in loss of fertility and soil functioning.	**Soil Pollution** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur.. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme. **Soil Erosion** **Level of risk:** Very low **Mitigation measures** • Linear infrastructure such as roads and pipelines must be inspected monthly to ensure water management infrastructure is effective in controlling erosion. • Soil stockpiles must be protected with berms to prevent erosion. • Plant cover within no-development zones, should not be removed. • All attempts must be made to avoid exposure of dispersive soils. • Ground exposure should be minimised in terms of the surface area and duration wherever possible. • The prospecting operation must be co-ordinated to void double handling of material.
	Open pit development	Loss of land capability for agricultural use, grazing and other uses	
	Development of infrastructure (i.e. haul roads, processing plant)	Soil compaction of the ground will increase surface water run-off thus increasing the potential for soil erosion.	

			• The run-off from the exposed ground should be controlled with the careful placement of flow retarding barriers • The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion. • Stockpiles must be kept to a minimum and with gentle slopes of 18 degrees and less to avoid erosion induced losses. • Stockpiles susceptible to wind erosion need to be covered during the windy period. • Excavated and stockpiled soil material are to be stored and bermed on the higher laying areas of the footprint area and not in any storm water run-off would naturally accumulate. • Internal audits must be performed at regular intervals to identify areas where erosion is occurring and preventative measures instituted to curb losses. • Measures of dust suppression should not compromise the water balance of the area on local and regional scale.
Surface Water	Removal of vegetation and construction of infrastructure (i.e. haul roads, processing plant)	Increase in surface water run-off which may cause erosion and ultimately the sedimentation of nearby streams/rivers.	**Surface Water** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur. • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities.
	Stockpiling topsoils and subsoils	Wind and water erosion that may potentially result in sedimentation of nearby streams/rivers.	

			• All serving and washing of vehicles occur on site must be done I demarcated areas of which the design will be o concrete foundations, with bund walls and traps to contain any spillages. • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site. • At all times care should be taken not to contaminate surface water resources.
Groundwater	Pit dewatering	Potential contamination of groundwater by trace elements such as Mercury (Hg) and Arsenic (As).	**Groundwater** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme.
	Development of infrastructure (i.e. haul roads, processing plant)	Potential reduction of water quality for human consumption	
	Project water consumption	Potential reduction of water quantity available for domestic use.	
	Development of tailings dam	Potential seepage and contamination of trace elements.	
Air Quality	Soil stripping, hauling, ore crushing and conveying	Increase in dust emissions ($PM_{10,}$ $PM_{2.5}$ and TSP) thus reducing the ambient air quality of the surrounding.	**Air Quality** **Level of risk: Very low** **Mitigation measures** • When vegetation is removed for soil stripping the area should be limited to that required for the prospecting activities only. No over boundaries should allowed. • Wet suppression as practise where dust is created in the course of the activities • Control measures to be implemented include, Loading practise of the FET's, Speed control, design of transfer points in the plant. • When areas are exposed (Excavations) bulk sampling should be commenced with as soon as possible or the least amount of time of exposure
	Use of vehicles and machinery (e.g. haul trucks, diesel generators)	Increase in NO_x and SO_2 and PM_{10} thus reducing the ambient air quality of surrounding communities.	

			• Encourage rehabilitation to be conducted as soon as possible.
Fauna and Flora	Vegetation removal	Loss of floral species and destruction of faunal habitat, including medicinal plants.	**Indigenous Flora** **Level of risk: Very low** **Mitigation measures** • Encourage the growth of natural plant species found on the study area . • Mechanical methods (hand-pulling) of control to be implemented • Annual follow-up operations to be implemented. • Minimise the footprint of transformation that the prospecting activities results to. • Encourage proper rehabilitation of the prospected areas to its natural state. **Fauna** **Level of risk:** Very low **Mitigation measures** • Encourage proper rehabilitation of the prospected areas to its natural state. • All prospecting activities, movement of vehicles and personnel should be restricted to the prospecting demarcated areas and no over boundaries allowed. • Environmental induction should be conducted with all employees, visitors and contractors. • When planning the stockpile placement consideration should be given to the creation of access routes in order to avoid the destruction of habitats and minimise the overall prospecting footprint. • All fauna that are exposed should be relocated to areas not affected by the prospecting activities. • The appointment of a full-time ECO will render guidance to all employees with respect to suitable areas for all related disturbance.
	Development of infrastructure (i.e. haul roads, processing plant)	Disturbance to faunal species through noise and light	
	Rehabilitation	In-migration of faunal species into the project area (Positive impact) Increased occurrence of invader plant species.	
Wetlands (Orange River Border to Study	Development of infrastructure (i.e. haul roads, processing plant)	Loss of wetland habitat thus resulting in desiccation of water resources which may have a negative impact on faunal and floral species	**Wetlands** **Level of risk: Very low** **Mitigation measures** • No prospecting activity within 1:100 floodline of the Orange River

area)			• Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • All serving and washing of vehicles occur on site must be done I demarcated areas of which the design will be o concrete foundations, with bund walls and traps to contain any spillages. • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site. • At all times care should be taken not to contaminate surface water resources.
Aquatic Ecology (Orange River)	Development of tailings dam	Potential for oxidative stress in fish and the threat of bioaccumulation in the tissues of exposed fish may pose health impacts to people.	**Aquatic Ecology** **Level of risk: Very low** **Mitigation measures** • No prospecting activity within 1:100 floodline of the Orange River • Zero tolerance to surface and ground water contamination through hazardous substances • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous

			materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • Berms to avoid run-off water to the Orange River • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site.Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • At all times care should be taken not to contaminate surface water resources.
Economy	Project capital expenditure	Increase in production and GDP-R of the national and local economies (Positive Impact). Increase in government revenue due to investment (Positive Impact). Benefits derived from investment by the company into the local economic development projects (Positive Impact).	**Economy** **Level of risk: Very High (POSITIVE)** **Mitigation measures** • Employment opportunities during the project life. • Skills development beyond the life of the prospecting programme. • Increase in disposable income for the region and local communities being Koegas, Marydale, Prieska and Griquatown. • Stimulate the Koegas CPA development plan through income derived from the surface use. •
	Direct and indirect employment	Skills development due to the creation of new employment opportunities (Positive Impact). Improved standard of living of households directly or indirectly benefiting from created employment opportunities (Positive Impact).	
Social	Use of existing access roads for hauling material (R383)	Disruption of daily movement of surrounding communities.	**Social** **Level of risk: Very low** **Mitigation measures** • Recruitment should as far as possible be done within the local community • Avoid the creation of false expectations • Uncontrolled and informal settlements outside of the prospecting site should be avoided.
	Employment	It is possible that conflict might arise between the newcomers (due to population influx) and local residents. An influx of job-seekers may also lead to an increase in various social pathologies, such as drug and alcohol abuse and domestic violence.	
Community Health	Water management	Surface water run-off reporting to the Orange River streams may potentially be	**Community Health** **Level of risk: Very low**

		impacted. Trace elements may have a resulting impact on aquatic ecology and people who either use the water for domestic purposes or fish within these streams. Water borne diseases such as cholera, diarrhoea, and typhoid may potentially occur	**Mitigation measures** • Management to institute water conservation awareness program • Zero tolerance to surface and ground water contamination through hazardous substances • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • Berms to avoid run-off water to the Orange River • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site.
Community Health	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially high noise levels. There is sufficient evidence that noise may cause adverse health effects such as cardiovascular effects. Epidemiology studies have found associations between immune and psychiatric effects and noise exposure.	**Community Health** **Level of risk: Very low** **Mitigation measures** • Planned maintenance of all equipment and machinery. • Adequate and proper procedures and standards and training of employees to adhere to the standards and procedures. • Corrective management actions where the noise levels exceed the prescribed noise levels • Noise monitoring on a regular basis (three monthly) • Keep complaint register on site for complaints from neighbours or any member of public affected and respond to those complaints.
	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially hazardous materials and resulting malodours may potential may potentially result in respiratory illnesses.	
Cultural Heritage	Development of infrastructure (i.e. haul roads, processing plant)	This activity may cause damage to or destroy any physical heritage resources that may be present within the project footprint areas.	**Cultural/Heritage** **Level of risk: Very low** **Mitigation measures** • Delineation of no-go zones • Heritage and Culture Programme to be part of Induction course to assist employees in the identification of these resources and reporting thereof to Management.
Visual	Open pit, tailings dam, stockpiles	Change of the visual landscape will impact the sense of place/perceptions which has a resulting impact on surrounding receptors	**Visual** **Level of risk: Very low** **Mitigation measures**

		including road users.	• Placement of the infrastructure if possible out of sight from normal view way of road users and neighbours. • Dust suppression during excavation operations especially during windy periods • Control of domestic waste and avoid littering • After care plan when prospecting activities have ended. (closure) • Removal of all infrastructure and equipment.
Traffic	Use of existing access roads and provincial roads for hauling material	Additional traffic and particularly heavy duty vehicles on the existing road network may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	**Traffic** **Level of risk: Very low** **Mitigation measures** • Induction on road safety when using public roads. • Daily breathalyser testing • Implement an on-site Traffic Management Plan. (Mine Health and Safety Act).
	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	
Noise	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	**Noise** **Level of risk: Very low** **Mitigation measures** • Planned maintenance of all equipment and machinery. • Adequate and proper procedures and standards and training of employees to adhere thereto. • Corrective management actions where the noise levels exceed the prescribed noise levels • Provide Personal Protective Equipment on site to employees exposed to high noise levels • Noise monitoring on a regular basis (three monthly) • Keep complaint register on site for complaints from neighbours or any member of public affected and respond to those complaints
Geology and Mineral Resource	Sterilization of Mineral resource	During Decommissioning	**Geology and Mineral Resource** **Level of risk: Very low** **Mitigation measures** • Site selection and placement of all infrastructure and development of roads should ensure access to the mineral

			resource • Delineation of the mineral resource is paramount to ensure maximum access is gained to the mineral resource. • Stockpile placement should avoid sterilisation of the mineral resource
Topography	Excavations for bulk sampling	During operational phase and closure phase	**Topography** **Level of risk:** Low **Mitigation measures** • Stockpile and waste dumps should be levelled and landscaped as far as possible to the natural state of the ground before the prospecting activities started. It is therefore of utmost importance that the dumping activity should be in a planned and controlled manner. • All temporal structures must be removed during the closure phase. • On closure all open pits and mine residue deposits must be stabilised to avoid collapse there.
Land Capability and Land Use	Loss of soil capability. Ground Erosion Water contamination	Successful rehabilitation program	**Land Capability and Land Use** **Level of risk:** Very low **Mitigation measures** • The Surface agreement with land owners should include clauses of no-go areas indicated on the site plan. Land not used for prospecting should be available for other land uses. • The rehabilitation programme should be comprehensive to restore land capability and land use after completion of the prospecting activities. • All prospecting activities must be restricted within the demarcated areas. • Ensure that land which is not used during construction is made available for grazing if possible.

(ix) SITE SELECTION MATRIX

	SCORING	PREFERED LAYOUT	GRAVEYARD AREA	FUTURE LAND USE AREA
Asbestos Location	10	0	10	0
Graveyard	10	0	10	5
Current Infrastructure on site		0		
Current land use	5	0	10	0
Water contamination (Orange river)	5	5	0	0
Diamond gravel resource	10	0	10	10
Prieska-Marydale roads	10	5	5	5
Neighbours Noise Dust Visibility	5	5	0	5
Future land use	5	0	10	0
Closure Objective	10	5	10	0
Fauna and Flora	10	0	0	10
TOTAL	80	20	65	35

SELECTION SCORING
10-Avoidance
5-Mitigation Measures Required
1-MonitoringRequired

(x) ALTERNATIVES INVESTIGATED

Only site selection alternatives considered as per (ix) above. The alluvial diamond gravels are very specific in its location. The initial alternatives which is farm Koegas 324 and Hounslow 325 is under application by a different entity. Therefor no other alternatives to the development footprint was considered.

(xi) CONCLUDING STATEMENT

The applicant has applied for a Prospecting Right and is intending on prospecting the proposed areas in a sustainable manner with regards to the Environment, Health and Safety of employees, positive impact on the surrounding communities.

(i) PLAN OF STUDY FOR THE ENVIORNMENTAL IMPACT ASSESSMENT PROCESS
(i) Description of the alternatives considered including the option of not going ahead with the project.

- The site selection is based on the factors in the table under (ix) which display the alternatives considered. The deciding factors include, distance to diamond gravel resource, destruction of fauna and flora, graveyards on the study area, the rehabilitated asbestos area, successful achievement of the closure plan.
- If the NO-GO option is chosen the following positive impacts lost.
  - CAPEX spend.
  - Employment Opportunities.
  - OPEX
  - Increased disposable income for the Koegas communities and surrounding areas.
  - Loss of revenue to the State in the form of Taxes
  - No immediate development prospects for the Koegas CPA in terms of their development plan

(ii) ASPECTS TO BE ASSESSED AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

ASPECTS
1.Clearance of vegetation for roads, project infrastructure and stockpiles
2. Stripping and stockpiling of topsoil
3. Loading and Hauling Operations inclusive of the transport of bulk sampling product.
4. All supporting infrastructer-Offices, Workshop with washbay, ablution facilities and pipelines
5. Stormwater Control
6. Fuel storage
7. Altering any surface water features
8. Construction and Operation of Processing Plant

(iii) ASPECTS TO BE ASSESSED BY SPECIALITS
A Heritage Impact Assessment Report has been conducted for the proposed Prospecting Right farms by Archaeologist Dr D Morris (APPENDIX A)

(iv) and (v) METHOD OF ASSESSMENT

METHOD OF ASSESSMENT

Methodology used in determining and ranking nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks. The impacts were individually described and assessed using the criteria drawn from the Environmental Impact Assessment (EIA) Regulations, published by the DEA in terms of the NEMA (Act 107 of 1998).The significance of each impact is assessed using the following formula (before and after mitigation):Significance Point (SP) = (Probability + Extent + Duration) x Intensity

The significance of the impacts was determined through the consideration of the following criteria:

Probability:	Provides a description of the likelihood/probability of the impact occurring
Extent:	Describes the spatial scale over which the impact will be experienced
Duration:	The period over which the impact will be experienced
Intensity:	The degree/order of magnitude/severity to which the impact affects the health and welfare of humans and the environment
Significance:	Overall significance of the impact on components of the affected environment and whether it is a negative or positive impact

SP > 75	Indicates **high** environmental significance	An impact that could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 – 75	Indicates **moderate** environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP < 30	Indicates **low** environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

Probability (P)		
None (N)	1	The possibility of the impact occurring in none, due either to the circumstances, design or experience (0%).
Possible (P)	2	The possibility of the impact occurring is very low, due either to the circumstances, design or experience (25%).
Likely (L)	3	There is a possibility that the impact will occur to the extent that provisions must therefore be made (50%).
Highly likely (H)	4	It is most likely that the impacts will occur at some stage of the development and plans must be drawn up before carrying out the activity (75%).
Definite (D)	5	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on (100%).
Extent (E)		
Footprint (F)	1	The impact area extends only as far as the activity which occurs within the total site area.
Site (S)	2	The impact could affect the whole site or a significant portion of the site.
Regional (R)	3	The impact could affect the area including the neighbouring farms, the transport route and/or the adjoining towns.
National (N)	4	The impact could have an effect that expands throughout the country.
International (I)	5	Where the impact has international ramifications that extend beyond the boundaries of the country.
Duration (D)		
The period over which the impact will be experienced		
Temporary (T)	1	0 – 3 years (or confined to the construction period).
Short term (S)	2	3 – 10 years (or confined to the construction and part of the operational period).
Medium term (M)	3	10 – 15 years (or confined to the construction and whole operational period).
Long term (L)	4	For the whole life of mine (including closure and rehabilitation period).
Permanent (P)	5	Beyond the anticipated lifetime of the project.
Intensity (I)		
Insignificant (I)	2	Will have a no or very little impact on the health and welfare of humans and environment
Low (L)	4	Will have a slight impact on the health and welfare of humans and environment
Moderate (M)	6	Will have a moderate impact on the health and welfare of humans and environment
High (H)	8	Will have a significant impact on the health and welfare of

		humans and the environment
Very high/ don't know (V)	10	Will have a severe impact on the health and welfare of humans and the environment

SPECIALIST REPORT ASSESSMENT APPLIED

CHARACTERISING THE SIGNIFICANCE OF IMPACTS

The criteria on which significance of impacts is based include **nature**, **extent**, **duration**, **magnitude** and **probability of occurrence**, with quantification of significance being grounded and calculated as follows:

- The **nature**, namely a description of what causes the effect, what will be affected, and how it will be affected.

- The **extent**, indicating the geographic distribution of the impact:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - impact is regional – assigned a score of 3;
  - impact is national – assigned a score of 4; or
  - impact across international borders – assigned a score of 5.

- The **duration**, measuring the lifetime of the impact:
  - very short duration (0–1 years) – assigned a score of 1;
  - short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4;
  - or permanent - assigned a score of 5.

- The **magnitude**, quantified on a scale from 0-10:
  - 0 is small and will have no affect on the environment;
  - 2 is minor and will not result in an impact on environmental processes;
  - 4 is low and will cause a slight impact on environmental processes;
  - 6 is moderate and will result in environmental processes continuing but in a modified way;
  - 8 is high (environmental processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of environmental processes.

- The **probability of occurrence**, indicating the likelihood of the impact actually occurring (scale of 1-5)
  - 1 is highly improbable (probably will not happen);
  - 2 is improbable (some possibility, but low likelihood);
  - 3 is probable (distinct possibility);
  - 4 is highly probable (most likely); and

- 5 is definite (impact will occur regardless of any prevention measures).

- **The significance**, determined by a synthesis of the characteristics described above and expressed as low, medium or high. Significance is determined by the following formula:
  S= (E+D+M) P; where S = Significance weighting; E = Extent; D = Duration; M = Magnitude; P = Probability.

- The **status**, either positive, negative or neutral, reflecting:
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the degree to which the impact can be mitigated.

- **The significance weightings for each potential impact are as follows:**

  - < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),

  - 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),

  - > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

SUMMARY OF THE SIGNIFICANCE OF IMPACTS

Significance of Impacts, with and without mitigation – based on the worst case scenario – for all area investigated.

Nature:
Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological or other heritage material or object (what affected).
The following assessment refers to impact on physical archaeological/heritage traces.

	Without mitigation	**With mitigation**
Extent	1	Not needed
Duration	5	Not needed
Magnitude	6	Not needed
Probability	2	Not needed
Significance	**22**	
Status (positive or negative)	WEAKLY NEGATIVE	But locally low to very low significance
Reversibility	No	
Irreplaceable loss of resources?	Low density and significance	Loss of context but possible to mitigate.
Can impacts be mitigated?	Not needed	Not needed

(vi) STAGES AT WHICH THE COMPETENT AUTHORITY WILL BE CONSULTED
The competent authority will be consulted throughout the application process. Special stages of consultation would be before submission of the Final Scoping Report and again before submission of the EIA/EMPr Report.

(vii) PARTICULARS OF THE PUBLIC PARTICIPATION PROCESS DURING THE EIA PROCESS

The scoping phase (this process) will assist to identify all the stakeholders that need to be consulted with. This include landowners, adjacent property owners and occupiers of the land, government departments, tribal authorities, local municipality, other competent authorities and institutions. With the placement of an advertisement in a local newspaper Interested and Affected parties (IAPs) will be offered the opportunity to partake in the Public Participation Process. (PPP)

This will enable the compilation of an application database for consultation during the EIA process.
All Reports would be placed at the Waterberg Clubhouse (Koegas) for public access.

Information that will be provided and required from IAPs .

Information to be provided to Interested and Affected Parties.	**Compulsory** • The site plan. • List of activities to be authorised • Scale and extent of activities to be authorised • Typical impacts of activities to be authorised (e.g.surface disturbance, dust, noise, drainage, fly rock etc.) • The duration of the activity. • Sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land)
	Other, specify:
Information to be required from Interested and Affected Parties.	**Compulsory** • To provide information on how they consider that the proposed activities will impact on them or their socio-economic conditions • To provide written responses stating their suggestions to mitigate the anticipated impacts of each activity • To provide information on current land uses and their location within the area under consideration • To provide information on the location of environmental features on site to make proposals as to how and to what standard the impacts on site can be remedied. requested to make written proposals • To mitigate the potential impacts on their socio economic conditions to make proposals as to how the potential impacts on their infrastructure can be managed, avoided or remedied).
	Other, Specify • To indicate whether or not they have an objection, comment or approval in regard to the proposed project • To provide information on how they regard the existing status of the biophysical, socio-economic, cultural and heritage environment. • To provide any additional Environmental attributes which have not yet been listed or described.

(viii) TASKS THAT WILL BE PERFORMED DURING THE EIA PROCESS

Determining the Environmental Attributes
The receiving environment will be determined by means of on-site observations, project description and activities, previous studies undertaken. The receiving environment will include geology, geography, topography, biological, archaeology and cultural sites, ground and surface water, ecology, current and future land use,

Impacts that the prospecting activity would result in include:
Fauna and flora, ground and surface water, heritage resources, current land use, land capability, air quality, noise pollution and the visual aspect of the prospecting programme.

Identification of Impacts and Risks
Impacts that the prospecting activity would result in include:
Fauna and flora, ground and surface water, heritage resources, current land use, land capability, air quality, noise pollution and the visual aspect of the prospecting programme.

Identification and Consideration of Alternatives
The Identification and Consideration of Alternatives is a critical component of the EIA process. Alternatives need to be considered in respect to:
(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

During the EIA process the only alternatives for consideration would be (e) to (f). Points (a) to (d) has been adequately addressed in this document.

Process to Assess and Rank Impacts

The following evaluation criteria will be used.

Methodology used in determining and ranking nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks. The impacts were individually described and assessed using the criteria drawn from the Environmental Impact Assessment (EIA) Regulations, published by the DEA in terms of the NEMA (Act 107 of 1998).The significance of each impact is assessed using the following formula (before and after mitigation):Significance Point (SP) = (Probability + Extent + Duration) x Intensity

The significance of the impacts will be determined through the consideration of the following criteria:

Probability:	Provides a description of the likelihood/probability of the impact occurring
Extent:	Describes the spatial scale over which the impact will be experienced
Duration:	The period over which the impact will be experienced
Intensity:	The degree/order of magnitude/severity to which the impact affects the health and welfare of humans and the environment

Significance:	Overall significance of the impact on components of the affected environment and whether it is a negative or positive impact

SP > 75	Indicates **high** environmental significance	An impact that could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
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Duration (D)		
The period over which the impact will be experienced		
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Long term (L)	4	For the whole life of mine (including closure and rehabilitation period).
Permanent (P)	5	Beyond the anticipated lifetime of the project.
Intensity (I)		
Insignificant (I)	2	Will have a no or very little impact on the health and welfare of humans and environment
Low (L)	4	Will have a slight impact on the health and welfare of humans and environment
Moderate (M)	6	Will have a moderate impact on the health and welfare of humans and environment
High (H)	8	Will have a significant impact on the health and welfare of humans and the environment
Very high/ don't know (V)	10	Will have a severe impact on the health and welfare of humans and the environment

(ix) SUITABLE MEASURES TO AVOID, REVERSE MITIGATE OR MANAGE IDENTIFIED IMPACTS AND DETRMINE THE EXTENT OF THE RESIDUAL RISKS THAT NEEED TO BE MANAGED.

Aspect	Project Activity/ies	Potential Positive and Negative Impact/s	Level of Risk and Mitigation Measures
Soil	Stripping, stockpiling topsoils and subsoils	Soil erosion and loss of topsoil material resulting in loss of fertility and soil functioning.	**Soil Pollution** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur.. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme. **Soil Erosion** **Level of risk:** Very low **Mitigation measures** • Linear infrastructure such as roads and pipelines must be inspected monthly to ensure water management infrastructure is effective in controlling erosion. • Soil stockpiles must be protected with berms to prevent erosion. • Plant cover within no-development zones, should not be removed. • All attempts must be made to avoid exposure of dispersive
	Open pit development	Loss of land capability for agricultural use, grazing and other uses	
	Development of infrastructure (i.e. haul roads, processing plant)	Soil compaction of the ground will increase surface water run-off thus increasing the potential for soil erosion.	

			soils. • Ground exposure should be minimised in terms of the surface area and duration wherever possible. • The prospecting operation must be co-ordinated to void double handling of material. • The run-off from the exposed ground should be controlled with the careful placement of flow retarding barriers • The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion. • Stockpiles must be kept to a minimum and with gentle slopes of 18 degrees and less to avoid erosion induced losses. • Stockpiles susceptible to wind erosion need to be covered during the windy period. • Excavated and stockpiled soil material are to be stored and bermed on the higher laying areas of the footprint area and not in any storm water run-off would naturally accumulate. • Internal audits must be performed at regular intervals to identify areas where erosion is occurring and preventative measures instituted to curb losses. • Measures of dust suppression should not compromise the water balance of the area on local and regional scale.
Surface Water	Removal of vegetation and construction of infrastructure (i.e. haul roads, processing plant)	Increase in surface water run-off which may cause erosion and ultimately the sedimentation of nearby streams/rivers.	**Surface Water** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur. • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a
	Stockpiling topsoils and subsoils	Wind and water erosion that may potentially result in sedimentation of nearby streams/rivers.	

			planned maintenance programme. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • All serving and washing of vehicles occur on site must be done I demarcated areas of which the design will be o concrete foundations, with bund walls and traps to contain any spillages. • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site. • At all times care should be taken not to contaminate surface water resources.
Groundwater	Pit dewatering	Potential contamination of groundwater by trace elements such as Mercury (Hg) and Arsenic (As).	**Groundwater** **Level of risk:** Very low **Mitigation measures** • An Induction programme for all employees, visitors and contractors to ensure preparedness and rapid response to clean-up procedures where spills occur. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme.
	Development of infrastructure (i.e. haul roads, processing plant)	Potential reduction of water quality for human consumption	
	Project water consumption	Potential reduction of water quantity available for domestic use.	
	Development of tailings dam	Potential seepage and contamination of trace elements.	
Air Quality	Soil stripping, hauling, ore crushing and conveying	Increase in dust emissions (PM_{10}, $PM_{2.5}$ and TSP) thus reducing the ambient air quality of the surrounding.	**Air Quality** **Level of risk: Very low** **Mitigation measures** • When vegetation is removed for soil stripping the area should be limited to that required for the prospecting activities only. No over boundaries should allowed. • Wet suppression as practise where dust is created in the course of the activities • Control measures to be implemented include, Loading
	Use of vehicles and machinery (e.g. haul trucks, diesel generators)	Increase in NO_x and SO_2 and PM_{10} thus reducing the ambient air quality of surrounding communities.	

			practise of the FET's, Speed control, design of transfer points in the plant. • When areas are exposed (Excavations) bulk sampling should be commenced with as soon as possible or the least amount of time of exposure • Encourage rehabilitation to be conducted as soon as possible.
Fauna and Flora	Vegetation removal	Loss of floral species and destruction of faunal habitat, including medicinal plants.	**Indigenous Flora** **Level of risk: Very low** **Mitigation measures** • Encourage the growth of natural plant species found on the study area . • Mechanical methods (hand-pulling) of control to be implemented • Annual follow-up operations to be implemented. • Minimise the footprint of transformation that the prospecting activities results to. • Encourage proper rehabilitation of the prospected areas to its natural state. **Fauna** **Level of risk:** Very low **Mitigation measures** • Encourage proper rehabilitation of the prospected areas to its natural state. • All prospecting activities, movement of vehicles and personnel should be restricted to the prospecting demarcated areas and no over boundaries allowed. • Environmental induction should be conducted with all employees, visitors and contractors. • When planning the stockpile placement consideration should be given to the creation of access routes in order to avoid the destruction of habitats and minimise the overall prospecting footprint. • All fauna that are exposed should be relocated to areas not affected by the prospecting activities. • The appointment of a full-time ECO will render guidance to all employees with respect to suitable areas for all related disturbance.
	Development of infrastructure (i.e. haul roads, processing plant)	Disturbance to faunal species through noise and light	
	Rehabilitation	In-migration of faunal species into the project area (Positive impact) Increased occurrence of invader plant species.	

Wetlands (Orange River Border to Study area)	Development of infrastructure (i.e. haul roads, processing plant)	Loss of wetland habitat thus resulting in desiccation of water resources which may have a negative impact on faunal and floral species	**Wetlands** **Level of risk: Very low** **Mitigation measures** • No prospecting activity within 1:100 floodline of the Orange River • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Spill kits should be readily available to clean up accidental spills from earthmoving machinery. • Refuelling of machinery must take place in the demarcated areas assigned and over drip trays to prevent any soil pollution. • Refuelling bays must be contained in a bund wall and so designed to ensure no overflow during accidental spillage. • All machinery and site vehicles should be subjected to a planned maintenance programme. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • All serving and washing of vehicles occur on site must be done I demarcated areas of which the design will be o concrete foundations, with bund walls and traps to contain any spillages. • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site. • At all times care should be taken not to contaminate surface water resources.
Aquatic Ecology (Orange	Development of tailings dam	Potential for oxidative stress in fish and the threat of bioaccumulation in the tissues of exposed fish may pose health impacts to people.	**Aquatic Ecology** **Level of risk: Very low** **Mitigation measures** • No prospecting activity within 1:100 floodline of the Orange River • Zero tolerance to surface and ground water contamination

River)			through hazardous substances • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • Berms to avoid run-off water to the Orange River • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site.Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • At all times care should be taken not to contaminate surface water resources.
Economy	Project capital expenditure	Increase in production and GDP-R of the national and local economies (Positive Impact). Increase in government revenue due to investment (Positive Impact). Benefits derived from investment by the company into the local economic development projects (Positive Impact).	**Economy** **Level of risk: Very High (POSITIVE)** **Mitigation measures** • Employment opportunities during the project life. • Skills development beyond the life of the prospecting programme. • Increase in disposable income for the region and local communities being Koegas, Marydale, Prieska and Griquatown. • Stimulate the Koegas CPA development plan through income derived from the surface use. •
	Direct and indirect employment	Skills development due to the creation of new employment opportunities (Positive Impact). Improved standard of living of households directly or indirectly benefiting from created employment opportunities (Positive Impact).	
Social	Use of existing access roads for hauling material (R383)	Disruption of daily movement of surrounding communities.	**Social** **Level of risk: Very low** **Mitigation measures** • Recruitment should as far as possible be done within the local community
	Employment	It is possible that conflict might arise between the newcomers (due to population influx) and local residents. An influx of job-seekers may also lead to an	

		increase in various social pathologies, such as drug and alcohol abuse and domestic violence.	• Avoid the creation of false expectations • Uncontrolled and informal settlements outside of the prospecting site should be avoided.
Community Health	Water management	Surface water run-off reporting to the Orange River streams may potentially be impacted. Trace elements may have a resulting impact on aquatic ecology and people who either use the water for domestic purposes or fish within these streams. Water borne diseases such as cholera, diarrhoea, and typhoid may potentially occur	**Community Health** **Level of risk: Very low** **Mitigation measures** • Management to institute water conservation awareness program • Zero tolerance to surface and ground water contamination through hazardous substances • Conduct staff awareness programmes to reinforce the need to avoid littering which could contributes to surface water pollution. • Sufficient care must be taken when handling hazardous materials to prevent pollution. • Under no circumstances may ablution occur outside the provided facilities. • Berms to avoid run-off water to the Orange River • .Oil residue must be treated with oil absorbent and this material removed to an approved waste site.
Community Health	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially high noise levels. There is sufficient evidence that noise may cause adverse health effects such as cardiovascular effects. Epidemiology studies have found associations between immune and psychiatric effects and noise exposure.	**Community Health** **Level of risk: Very low** **Mitigation measures** • Planned maintenance of all equipment and machinery. • Adequate and proper procedures and standards and training of employees to adhere to the standards and procedures. • Corrective management actions where the noise levels exceed the prescribed noise levels • Noise monitoring on a regular basis (three monthly) • Keep complaint register on site for complaints from neighbours or any member of public affected and respond to those complaints.
	Development of infrastructure (i.e. haul roads, processing plant)	Exposure to potentially hazardous materials and resulting malodours may potential may potentially result in respiratory illnesses.	
Cultural Heritage	Development of infrastructure (i.e. haul roads, processing plant)	This activity may cause damage to or destroy any physical heritage resources that may be present within the project footprint areas.	**Cultural/Heritage** **Level of risk: Very low** **Mitigation measures** • Delineation of no-go zones • Heritage and Culture Programme to be part of Induction

			course to assist employees in the identification of these resources and reporting thereof to Management.
Visual	Open pit, tailings dam, stockpiles	Change of the visual landscape will impact the sense of place/perceptions which has a resulting impact on surrounding receptors including road users.	**Visual** **Level of risk: Very low** **Mitigation measures** • Placement of the infrastructure if possible out of sight from normal view way of road users and neighbours. • Dust suppression during excavation operations especially during windy periods • Control of domestic waste and avoid littering • After care plan when prospecting activities have ended. (closure) • Removal of all infrastructure and equipment.
Traffic	Use of existing access roads and provincial roads for hauling material	Additional traffic and particularly heavy duty vehicles on the existing road network may have a resulting impact on the road safety conditions thus resulting in traffic related incidences.	**Traffic** **Level of risk: Very low** **Mitigation measures** • Induction on road safety when using public roads. • Daily breathalyser testing • Implement an on-site Traffic Management Plan. (Mine Health and Safety Act).
	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	
Noise	Development of infrastructure (i.e. haul roads, processing plant)	The operation of vehicles and machinery may result in nuisance noise impacts on surrounding communities.	**Noise** **Level of risk: Very low** **Mitigation measures** • Planned maintenance of all equipment and machinery. • Adequate and proper procedures and standards and training of employees to adhere thereto. • Corrective management actions where the noise levels exceed the prescribed noise levels • Provide Personal Protective Equipment on site to employees exposed to high noise levels • Noise monitoring on a regular basis (three monthly) • Keep complaint register on site for complaints from neighbours or any member of public affected and respond to those complaints
Geology and	Sterilization of Mineral resource	During Decommissioning	**Geology and Mineral Resource**

Mineral Resource			**Level of risk: Very low** **Mitigation measures** • Site selection and placement of all infrastructure and development of roads should ensure access to the mineral resource • Delineation of the mineral resource is paramount to ensure maximum access is gained to the mineral resource. • Stockpile placement should avoid sterilisation of the mineral resource
Topography	Excavations for bulk sampling	During operational phase and closure phase	**Topography** **Level of risk:** Low **Mitigation measures** • Stockpile and waste dumps should be levelled and landscaped as far as possible to the natural state of the ground before the prospecting activities started. It is therefore of utmost importance that the dumping activity should be in a planned and controlled manner. • All temporal structures must be removed during the closure phase. • On closure all open pits and mine residue deposits must be stabilised to avoid collapse there.
Land Capability and Land Use	Loss of soil capability. Ground Erosion Water contamination	Successful rehabilitation program	**Land Capability and Land Use** **Level of risk:** Very low **Mitigation measures** • The Surface agreement with land owners should include clauses of no-go areas indicated on the site plan. Land not used for prospecting should be available for other land uses. • The rehabilitation programme should be comprehensive to restore land capability and land use after completion of the prospecting activities. • All prospecting activities must be restricted within the demarcated areas. • Ensure that land which is not used during construction is made available for grazing if possible.

(j) (i) (ii) (iii)

UNDERTAKING REGARDING THE CORRECTNESS OF INFORAMTION

I, Malcolm Angus Goliath, Identity Number 6412145037082, herewith undertake that the information contained in this report is correct and that the inputs from all interested and Affected parties have been correctly recorded.

Signature of the environmental assessment practitioner:

7 February 2019

Date:

(k) (i)

UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, Malcolm Angus Goliath, Identity Number 6412145037082, herewith undertake that the information contained in this report is correct and that the level of agreement with interested and Affected parties have been correctly recorded.

Signature of the environmental assessment practitioner:

7 February 2019

Date:

(ii) Other Information required by the competent Authority

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

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

The prospecting activities will contribute to the local economy via its impact on job creation, total disposable income and value added activities. The operation would further support local businesses in the towns of Prieska, Marydale and Griquatown. The opportunity further exist to open small business in Koegas for daily household needs.The project would further assist with the re-establishment of some of the families to the now abended area.

Five measures of economic impacts can be defined to demonstrate the positive effect of the proposed operation on the local economy of .

- The employment opportunities created
- The income that employees would derive
- The CAPEX spend on fixed assets
- The monthly operational expenditure for consumables (OPEX)

Revenue- the total value of sales arising from the sale of diamonds recovered

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

Please find attached specialist report as APPENDIX A

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

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

The compiler of this document, also the appointed EAP, conducted a field visit and an in-depth desktop study conducted using existing literature and data. During the Investigation numerous reports of the area has been consulted.

ACKNOWLEDGEMENTS

(1) ORANGE RIVER INTEGERATED WATER RESOURCES MANAGEMENT PLAN-ORASCOM 007/2007-WRP (PTY)LTD, JEFFARES GREEN ARKMAN CONSULTANT(PTY)LTD

(2) SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED CONTRACT NRA N.008-068-2016/1F FOR ROUTINE ROAD MAINTENANCE ON NATIONAL ROUTE 8 SECTIONS 6 TO 8 FROM GROBLERSHOOP TO KIMBERLEY GENERAL ROUTINE ROAD MAINTENANCE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD.

(3) DEMOGRAPHIC AND ECONOMIC ACTIVITY IN THE FOUR ORANGE BASIN STATES-D HALL, G JENNINGS

(4) *FINAL SCOPING REPORT* FOR DEVELOPMENT OF MINE ON REMAINDER AND PORTION 1 OF FARM ETTRICK 182- MAWEJE CONSULTING AFRICA

APPENDIX A
To be attached after 17 February 2019

APPENDIX B

BACKGROUND INFORMATION DOCUMENT
SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT PROCESS FOR A PROSPECTING RIGHT APPLICATION, LOCATED IN THE DISTRICT OF PRIESKA, NORTERN CAPE PROVINCE

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The Background Information Document (BID) provides Interested and Affected Parties (I&Aps) with information on the Scoping and Environmental Impact Assessment Report and Environmental Management Programme Report Process for a Prospecting Right Application that Morgenson Mining (PTY) LTD has lodged with the Department of Mineral Resources, Northern Cape Region.

I&Aps are invited to make use of the opportunity to:

- Register as a stakeholder in the public participation process; and
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INVITATION

You will be included in the stakeholder database and receive further documents for comment and input. Your comments will ensure that relevant issues are incorporated into the final documents for approval by the DMR.

All documents will be available on request from:

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M A Goliath
23 Goedehoop Avenue, Royldene, Kimberley, 8301
E-Mail: goliathmalcolm@yahoo.com
Cell :0824523693

PROJECT DESCRIPTION
PROSPECTING
Desktop study and Droning
Geological Mapping
Geological Report

Bulk Sampling
The scope of work will comprise of a bulk sampling operation.

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The application is on the following farms:

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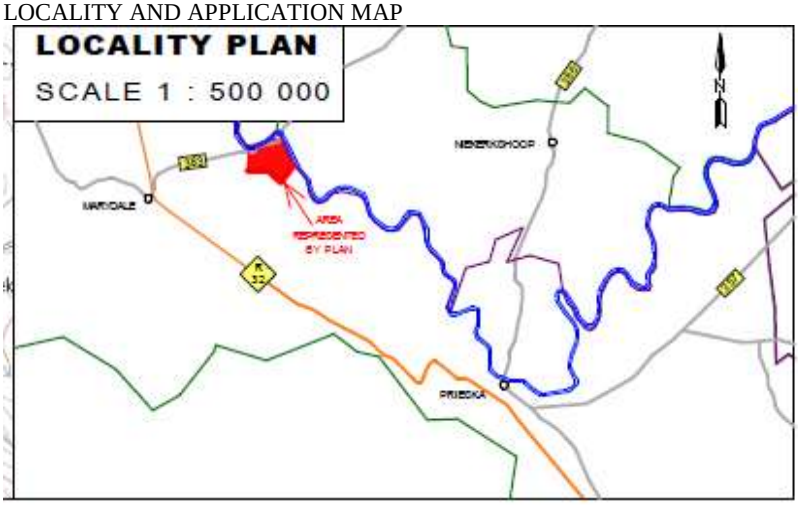
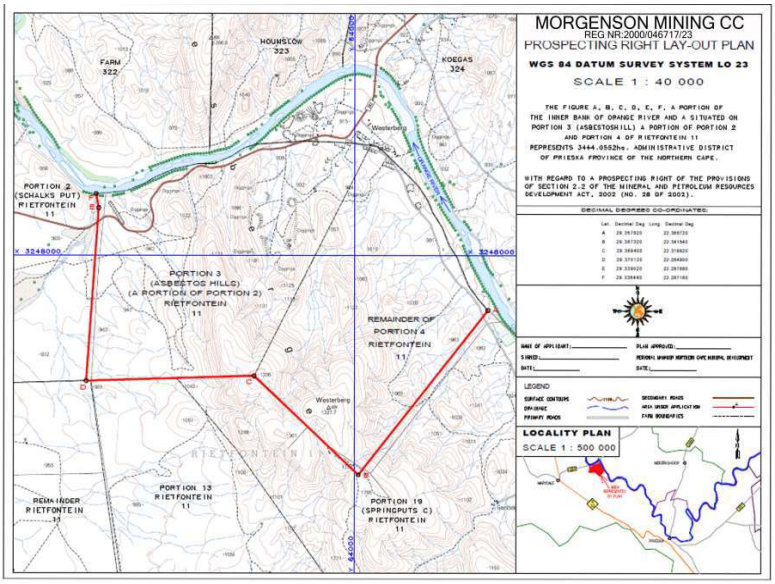
LOCALITY AND APPLICATION MAP





LEGISLATIVE CONTEXT

COMPLIANCE TO: Mineral and Petroleum Resources Development Act, (Act 28 of 2002) (As Amended) and the National Environmental Management Act, (Act 107 of 1998) (As Amended) AFRO-Wits lodged an application for a Prospecting Right with the DMR, Free State Province.

MORGENSON MINING (PTY) LTD , HEREAFTER "MORGENSON" application will consist of an application for Environmental Authorisation, Prospecting Works Program, Scoping Report and EIR and EMP (THIS PROCESS).

The final scoping report for the prospecting application that will incorporate inputs from all stakeholders will be submitted to the DMR latest 8TH March 2019.

The final process of the application is the compilation of the Environmental Impact Assessment Report and Environmental Management Program Report that will be submitted upon receiving approval of the Scoping Report from DMR or, within 106 days from the lodging of the application with the DMR.

❖

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc** **E.g. for mining**,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**Aerial extent of the Activity** **Ha or m²**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** ***(GNR 544, GNR 545 or GNR 546)***
Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Development Act, 2002 (Act No.28 of 2002), including- (c) associated infrastructure, structures and earthworks directly related to the extraction of a mineral resource: or (d) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing: but exclude the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies (Activity 20 of Listing Notice 1	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR 983 Ln 1, Activity 20

The removal and disposal of minerals contemplated in terms of section 20 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002), including- (a) associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource: or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing: but exclude the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies (Activity 19 of Listing Notice 2)	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR 984 Listed 2,Activity 19
Activity 27 of GNR 983 The clearance of an area of 1 hectares or more, but less than20 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.	3444.0552 ha lodged for the surveyed portion only.	**X**	GNR 983 LN 1 Activity 27
Activity 25: “The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.”	Chemical toilets and wash bays for the site.	**X**	NEMA: LN1 (GNR 983)
Activity 9: “The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (vii) with an internal diameter of 0.36 metres or more; or (viii) with a peak throughput of 120 litres per second or more	Water distribution pipelines	**X**	NEMA: LN1 (GNR 983)
Activity 12 : “The development of- (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; Regulation GNR 704, published on 4 June 1999 in terms of the National	Clean and dirty water systems on the site. It is anticipated that the operations will establish storm water control berms and trenches to	**X**	NEMA: LN1 (GNR 983)

Water Act (use of water for mining and related activities)	separate clean and dirty water on the prospecting site		
Activity 27(iv): "the development of – (iv) a road catering for more than one lane of traffic in both directions,'' (both access and haulage road on the prospecting site):	Estimated at 4180m. To be confirmed	**X**	NEMA : LN2 (GNR984)
Pipelines for the bulk transportation of water with diameter of <0.36m and a peak throughput of <120l/s Pipelines for the bulk transportation of slimes with diameter of <0.36m and a peak throughput of <120l/s Pipelines for the bulk transportation of return water with diameter of <0.36m and a peak throughput of <120l/s	To be confirmed		
Activity 15: The continuous establishment and reclamation of temporary stockpiles resulting from activities which require a prospecting right. Production stockpiles, Waste stockpiles and Topsoil stockpiles	2000m^2	**X**	NEMWA Category A (GNR 633)
Activity 15: The establishment of residue deposits (slimes dams) resulting from activities which require a prospecting right	2000m^2	**X**	NEMWA Category A (GNR 633)
DEVELOPMENT FOOTPRINT			
Plant Processing Area (Screen and Crush)	2600m^2		
Waste Stockpiles	1000m^2		
Topsoil Stockpiles	500m^2		
Production Treatment Stockpiles	500m^2		
Portable Ablution Facilities	25m^2		
Tailings and Discard Dam	400m^2		
Clear Process Water Facilities (JOJO)	160m^3		
Workshop	300**m^2**		
Site Office	40**m^2**		
Diesel Bay with Bund wall	32m^2		
Mine Roads (6m width)	720m^2		
Excavations	16 000m^2		
Domestic Waste Facility	4m^2		
Chemical Storage	25m^2		

Description of the overall activity. (Indicate Mining Right, Mining Permit, Prospecting right, Bulk Sampling,	**Prospecting Right with Bulk Sampling** **DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:** (i) Desktop Study (1 month) A first phase of geological investigations comprises of collecting various geological literature relating to the area of interest. This literature may be obtained from relevant books and journals. Information can also be inquired from companies which have previously mined in the area. Satellite images as well as geological maps will be used to identify possible prospecting target areas. (ii) Geological Mapping with aid of UAV (1month)

Production Right, Exploration Right, Reconnaisance permit, Technical co-operation permit, Additional listed activity)	To more accurately identify prospecting target areas, an Unmanned Aerial Vehicle (UAV) or commonly known as a drone will be employed. It has different sensors integrated into the drone, making this more productive and environmentally friendly (no contact with the ground). It is an automated system, with a programmed flight plan, allowing for large areas to be covered in a short period of time. The intention is also to reduce drilling needed (and hence costs). The system also provides a cost effective way to make mineral exploration in new, unexplored areas. *THE FLIGHT IS CONTROLLED BY AN AUTOPILOT. THE AUTOPILOT RECORDS FLIGHT DATA INCLUDING GPS TIME AND POSITION (LATITUDE AND LONGITUDE), THE ORIENTATION (ROLL, PITCH AND YAW), AND BAROMETRIC PRESSURE. THE REAL-TIME FLIGHT IS CONTROLLED BY PC SOFTWARE VIA A TELEMETRY (RADIO) LINK. THE NOMINAL ACCURACY OF THE GPS POSITION IS ABOUT ±1.5 M.* *THE MAGNETIC FIELD IS MEASURED USING A DIGITAL 3-COMPONENT FLUX-GATE MAGNETOMETER. THE MAGNETOMETER DATA (X, Y, Z COMPONENTS AND TOTAL FIELD), ARE RECORDED BY THE COMPANY'S OWN DATA LOGGER. THE GPS TIME AND POSITION ARE SYNCHRONIZED WITH THE AUTOPILOT.* *A BASE STATION LOCATED NEAR THE MOBILE TELEMETRY/CONTROL STATION MEASURES THE TIME VARIATION OF THE TOTAL MAGNETIC FIELD USING A PROTON PRECESSION MAGNETOMETER.* *THIS ALLOWS FOR MORE COST EFFECTIVE (I.E FASTER AND MORE VERSATILE (E.G. SWAMPS OR RIVERS ARE NO OBSTACLES FOR DRONES) AND ENVIRONMENTALLY FRIENDLIER (NO IMPACT ON THE GROUND) EXPLORATION. CHALLENGES REMAINING ARE THE LIMITED PAYLOAD (REQUIRING SURVEY EQUIPMENT TO BE MODIFIED LIGHT WEIGHT), THE LIMITED FLIGHT TIME (REQUIRING COMPREHENSIVE PLANNING FOR LARGER SURVEY AREAS), WEATHER (I.E. WIND) AND DIFFERENT AVIATION POLICY REQUIREMENTS IN DIFFERENT COUNTRIES.* *IMPACT ON THE MINING VALUE CHAIN* • EXPLORATION (incl. permitting) EXPLORATION • safe and fast remote exploration • reduced environmental impact The data so obtained would be incorporated into a drilling plan and the final bulk sampling positions. Thorough filed mapping of the surface geology will be done in order to narrow down target areas for determining the location of the ore body. Field mapping and satellite images makes it possible to eliminate certain areas and focus on the possible ore deposits. Geological Report (months 44-60) This written report comprises of all prospecting results as well as recommendations for future activities. When the prospecting period is

	done decisions will be made regarding the necessity of future prospecting or application for a mining right **DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:** Bulk Sampling(month 3-43) Bulk sampling is done through opencast pitting by using machinery as well as labour. Excavators are used to remove the overburden as well as ore. The dimensions of the excavations is 20m X10m in a checkered pattern. The deviation to this bulk sampling program could be when a particular line of interest is encountered and the prospecting be done along a channel. The ore is then transported to the plant by means of Dump Trucks. The alluvial ore is introduced to the Plant Receiving Bin by means of a Load Haul Dumper.The oversize material (+100mm) is used as backfill in the opened-up excavation areas. The overburden is placed on site where it is later backfilled into the pit, i.e. formations will be placed back in the same sequence it was extracted. The topsoil is then introduced to complete the rehabilitation process. Rehabilitation is thus continous. The ore is treated in a processing plant (Fig4) that consists of 3 x 16 feet rotary pans. These pans operate on the principle of density of which the medium is puddle. The concentrate will report to a recovery house, and the diamonds recovered through grease tables. Production Tonnage Calculation 80 Pits with Dimensions 20mx10mx average depth 12m Average Density Ore 1.8 TONNAGE ORE: 345 600 Overburden Tonnage Calculation 80 Pits with Dimensions 20mx10mx average depth 1.6m Average Density Overburden: 2.2 TONNAGE OVERBURDEN INCLUSIVE OF TOPSOIL: 56 320 TOTAL TONNAGE: 401 920 AERIAL DISTURBANCE OF PITTING: 16 000m^2 : 1.6 ha

POTENTIAL IMPACTS OF THE PROSPECTING AND MINING ACTIVITIES

The following impacts can possible be expected that the Prospecting Activities will act on (POSITIVE AND NEGATIVE):

- Fauna and Flora
- Surface and Groundwater
- Visibility
- Geology and Soils
- Traffic
- Social-Economic
- Possible Heritage and Culture

PUBLIC PARTICIPATION ENQUIRIES AND REGISTRATION

M A Goliath
23 Goedehoop Avenue
Royldene
Kimberley
8301

E:Mail: goliathmalcolm@yahoo.com
Cell: 0824523693

REGISTRATION AND COMMENT SHEET

INSERTED IN THE BID DOCUMENT

ORGANISATION : ……

NAMES : ……

: ……

E-MAIL : ……

POSTAL ADDRESS: ……

……

TELEPHONE NUMBER ……

- **PLEAE FORMALLY REGISTER ME AS AN INTERETSED AND AFFECTED PARTY** ☐

I WOULD LIKE TO RECEIVE A COPY OF:

- **DRAFT SCOPING REPORT** ☐
- **ENVIRONMENTAL IMPACT ASSESSMENT REPORT**
- **AND ENVIRONMENTAL MANGEMENT PROGRAM REPORT** ☐

COMMENTS (please attach additional sheets if required)

- Provide information on how the proposed activities will impact on your socio-economic conditions
- Provide written responses stating their suggestions to mitigate the anticipated impacts of each activity
- Provide information on current land uses and their location within the area under consideration
- Provide information on the location of environmental features on site to make proposals as to how and to what standard the impacts on site can be remedied. requested to make written proposals
- Provide proposals as to how the potential impacts on their infrastructure can be managed, avoided or remedied).

……
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……
……

Any other comments:

……
……
……

APPENDIX C

BACKGROUND INFORMATION DOCUMENT

SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT PROCESS FOR A PROSPECTING RIGHT APPLICATION, LOCATED IN THE DISTRICT OF PRIESKA, NORTERN CAPE PROVINCE

The Background Information Document (BID) provides Interested and Affected Parties (I&Aps) with information on the Scoping and Environmental Impact Assessment Report and Environmental Management Programme Report Process for a Prospecting Right Application that Morgenson Mining (PTY) LTD has lodged with the Department of Mineral Resources, Northern Cape Region.

I&Aps are invited to make use of the opportunity to:

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INVITATION

You will be included in the stakeholder database and receive further documents for comment and input. Your comments will ensure that relevant issues are incorporated into the final documents for approval by the DMR.

All documents will be available on request from:

Project Consultant
M A Gotlieb
11 Goedehoop Avenue, Rietfontein, Kimberley, 8301
E-Mail: gotlieb@mweb.co.za
Cell: 0824523659

PROJECT DESCRIPTION
PROSPECTING
Desktop study and Droning
Geological Mapping
Geological Report

Bulk Sampling
The scope of work will comprise of a bulk sampling operation.

BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:

Received
11/02/2019.

0538077670

Dept of Environment and Nature Conservation

INTRODUCTION

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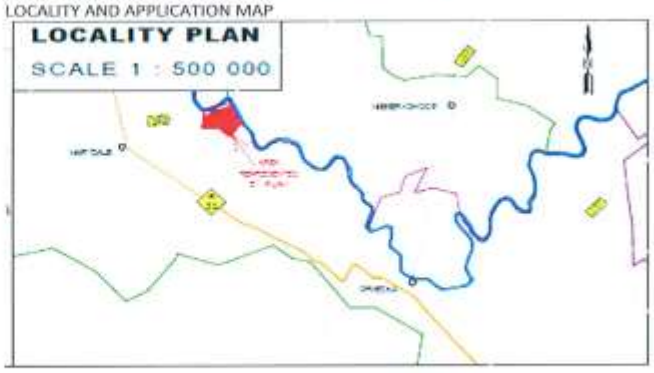
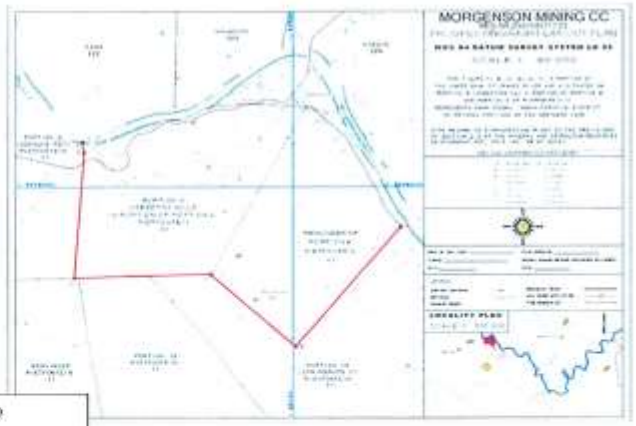
LOCALITY AND APPLICATION MAP





APPENDIX D

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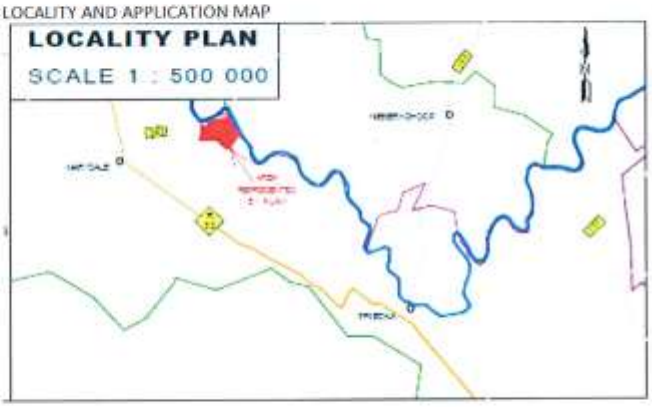
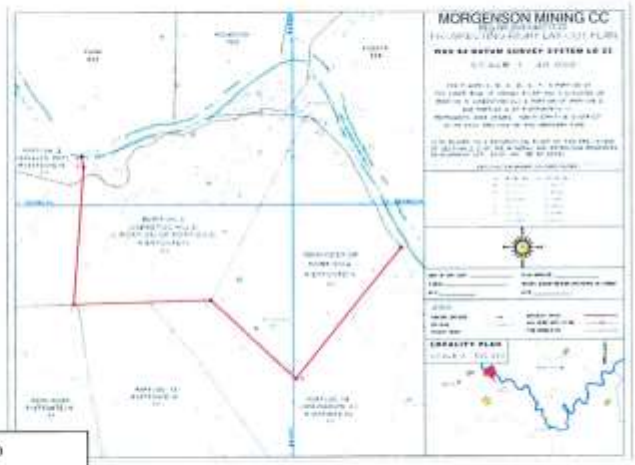




BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:

DEPARTMENT OF AGRICULTURE
LAND REFORM & RURAL DEVELOPMENT
2019 -02- 11
CORRESPONDENCE
RECEIVED

APPENDIX E

BACKGROUND INFORMATION DOCUMENT

SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT PROCESS FOR A PROSPECTING RIGHT APPLICATION, LOCATED IN THE DISTRICT OF PRIESKA, NORTERN CAPE PROVINCE

The Background Information Document (BID) provides Interested and Affected Parties (I&Aps) with information on the Scoping and Environmental Impact Assessment Report and Environmental Management Programme Report Process for a Prospecting Right Application that Morgenson Mining (PTY) LTD has lodged with the Department of Mineral Resources, Northern Cape Region.

I&Aps are invited to make use of the opportunity to:

- Register as a stakeholder in the public participation process; and
- Comment on the Draft Scoping Report , Prospecting Work Program and Environmental Impact Assessment Report and Environmental Management Programme Report .

INVITATION

You will be included in the stakeholder database and receive further documents for comment and input. Your comments will ensure that relevant issues are incorporated into the final documents for approval by the DMR.

All documents will be available on request from:

Project Consultant
M A Goliath
23 Goudshoop Avenue, Rouxbaai, Kimberley, 8301
E-Mail: goliathmaloubaai@yahoo.com
Cell:0824529883

PROJECT DESCRIPTION
PROSPECTING
Desktop study and Droning
Geological Mapping
Geological Report

Bulk Sampling
The scope of work will comprise of a bulk sampling operation.

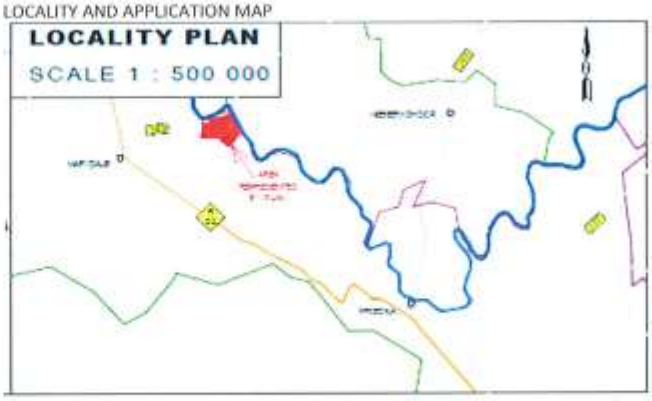
INTRODUCTION

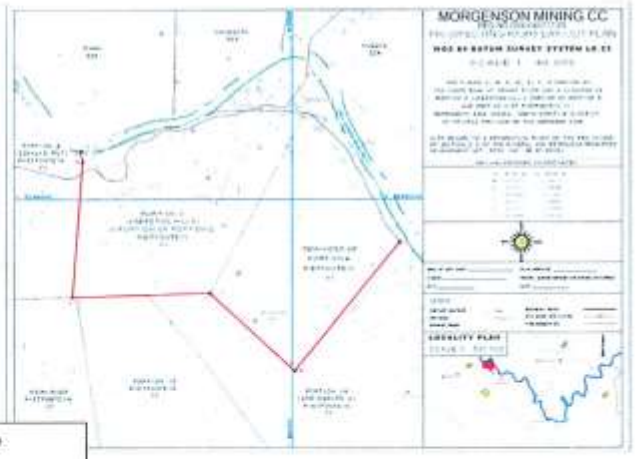
MORGENSON MINING (PTY) LTD has lodged and application for a prospecting right for Diamonds Alluvial with the Department Mineral Resources, Northern Cape, DMR Reference NC 30/5/1/1/2/12320 PR during January 2019.

The application is on the following farms:
(1) Portion 3 (Asbestos Hills-A Portion of Portion 2 Rietfontein 11) 1880.9443 ha and;

(2) Remainder of Portion 4 Rietfontein 11 -1563.1109 ha

LOCALITY AND APPLICATION MAP

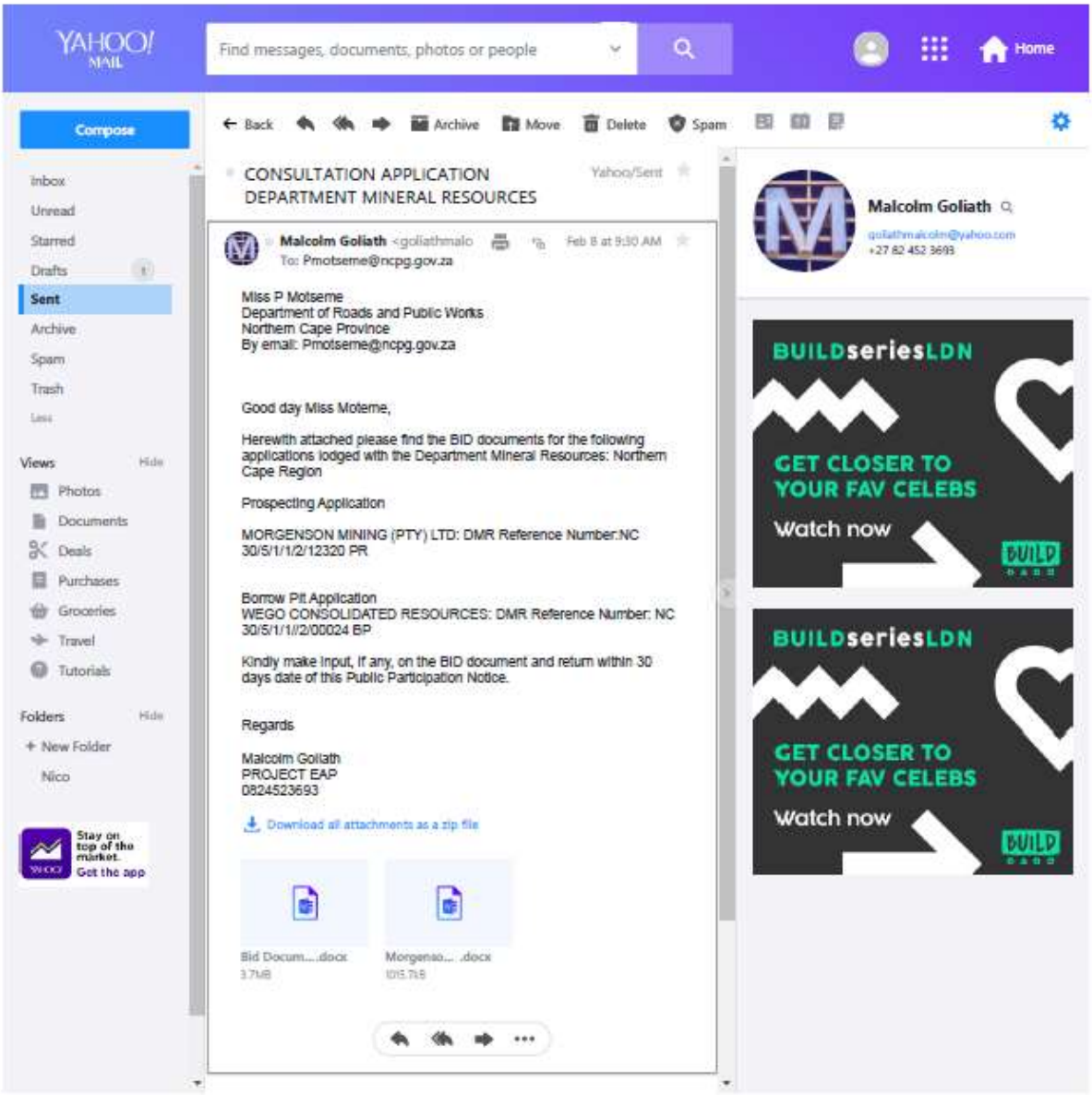




BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:BID ACCEPTED BY DEPARTMENT FOR CONSULTATION PURPOSES:

DEPT. WATER AFFAIRS
NORTHERN CAPE REGION
Private Bag/Privaatsak X6101
2019 -02- 11
KIMBERLEY 8300
NOORDKAAPSTREEK
DEPT. VAN WATERWESE

APPENDIX F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Find messages, documents, photos or people
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Groceries
Travel
Tutorials
Folders
New Folder
Nico
Stay on top of the market. Get the app
Back
Archive
Move
Delete
Spam
CONSULTATION APPLICATION
DEPARTMENT MINERAL RESOURCES
Yahoo/Sent
Malcolm Goliath <goliathmalc
To: Pmotseme@ncpg.gov.za
Feb 8 at 9:30 AM
Miss P Motseme
Department of Roads and Public Works
Northern Cape Province
By email: Pmotseme@ncpg.gov.za
Good day Miss Motseme,
Herewith attached please find the BID documents for the following applications lodged with the Department Mineral Resources: Northern Cape Region
Prospecting Application
MORGENSON MINING (PTY) LTD: DMR Reference Number:NC 30/5/1/1/2/12320 PR
Borrow Pit Application
WEGO CONSOLIDATED RESOURCES: DMR Reference Number: NC 30/5/1/1//2/00024 BP
Kindly make input, if any, on the BID document and return within 30 days date of this Public Participation Notice.
Regards
Malcolm Goliath
PROJECT EAP
0824523693
Download all attachments as a zip file
Bid Docum....docx
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Malcolm Goliath
goliathmalcolm@yahoo.com
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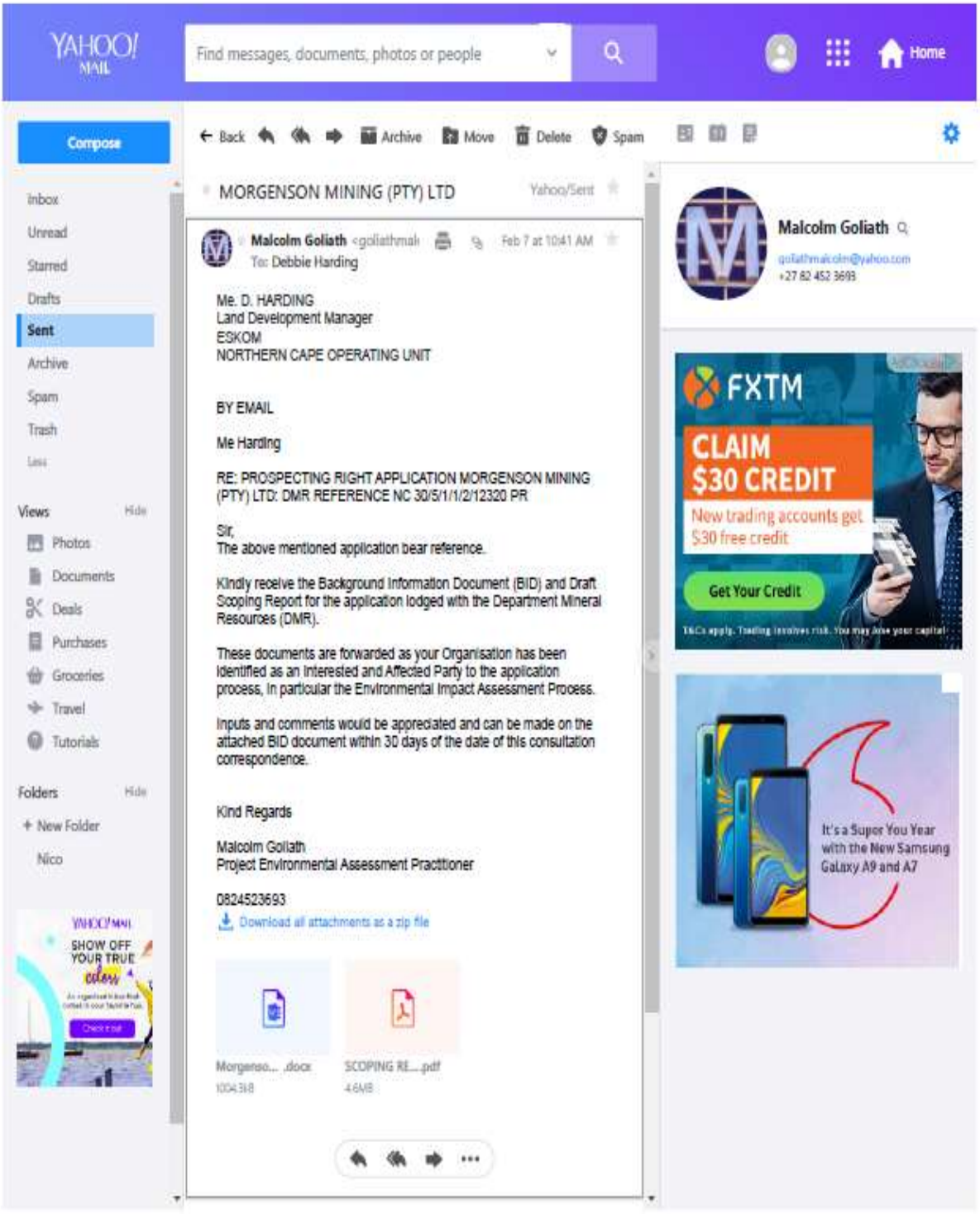
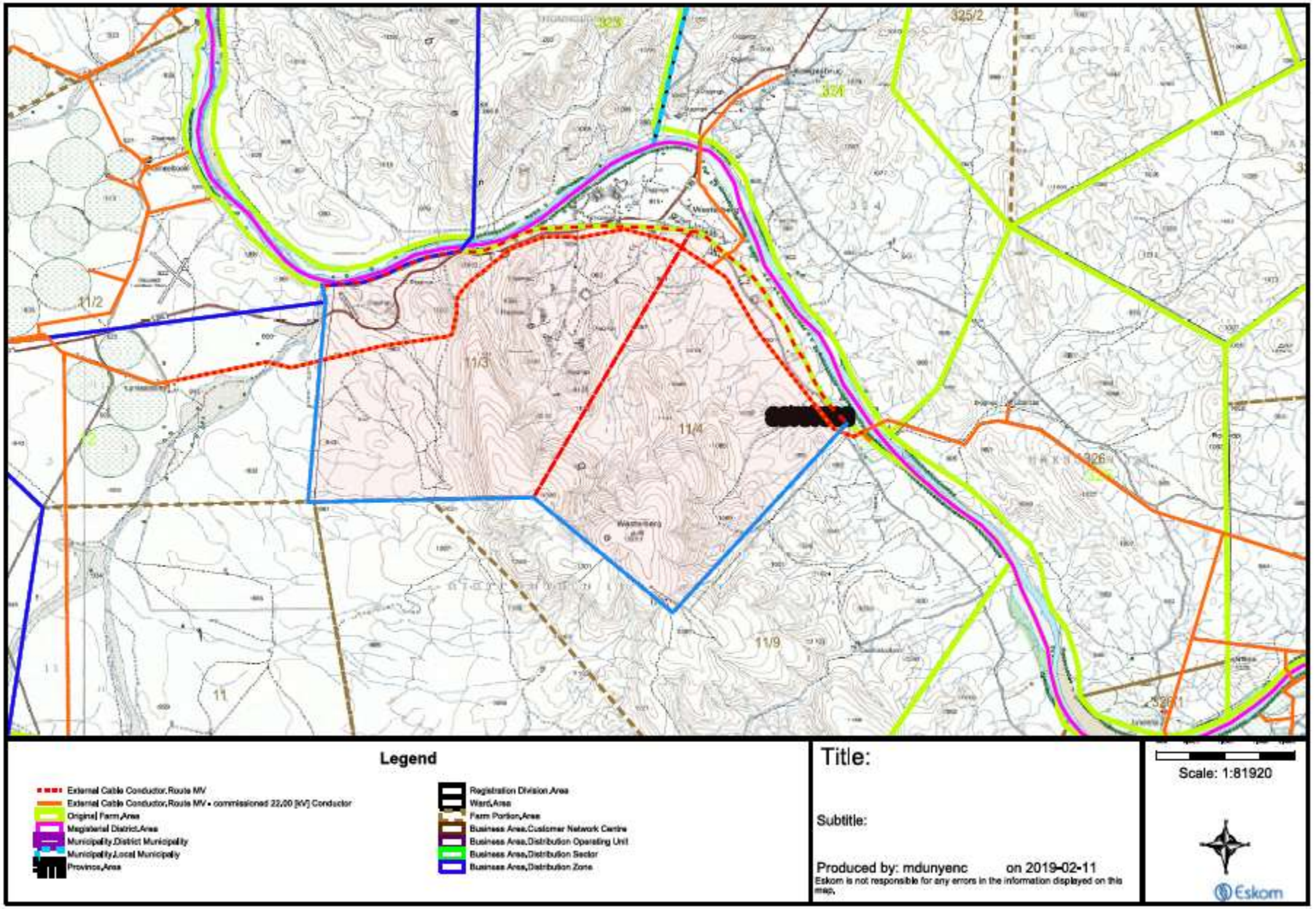
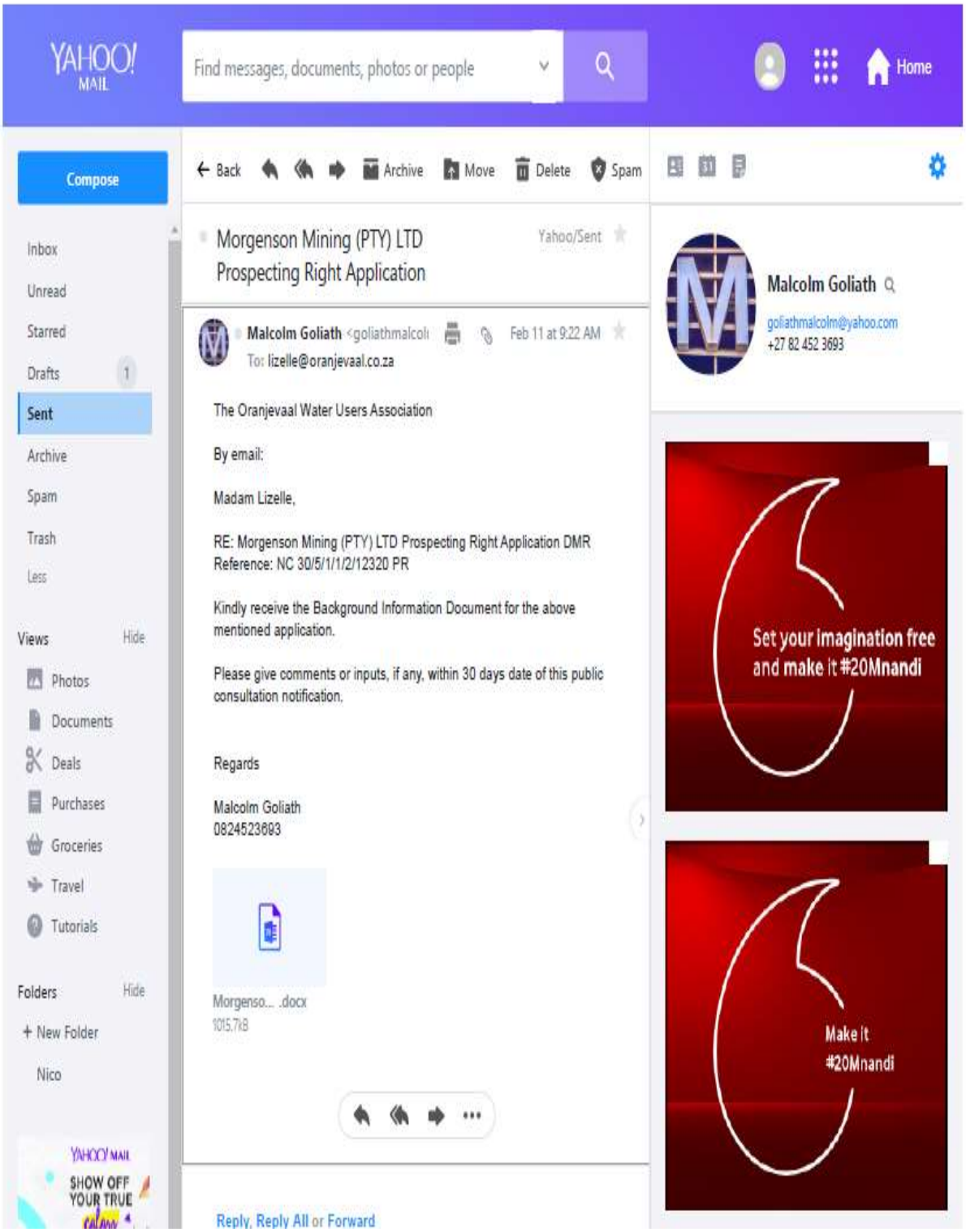
APPENDIX G

2/7/2019 goliathmalcolm@yahoo.com - Yahoo Mail




Legend
External Cable Conductor,Route MV
External Cable Conductor,Route MV • commissioned 22,00 [kV] Conductor
Original Farm,Area
Magisterial District,Area
Municipality,District Municipality
Municipality,Local Municipality
Province,Area
Registration Division,Area
Ward,Area
Farm Portion,Area
Business Area,Customer Network Centre
Business Area,Distribution Operating Unit
Business Area,Distribution Sector
Business Area,Distribution Zone
Title:
Subtitle:
Produced by: mdunyenc on 2019-02-11
Eskom is not responsible for any errors in the information displayed on this map.
Scale: 1:81920
Eskom

APPENDIX H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Photos
Documents
Deals
Purchases
Groceries
Travel
Tutorials
Folders
Hide
+ New Folder
Nico
SHOW OFF YOUR TRUE
Back
Archive
Move
Delete
Spam
Morgenson Mining (PTY) LTD Prospecting Right Application
Yahoo/Sent
Malcolm Goliath <goliathmalcoli
To: lizelle@oranjevaal.co.za
Feb 11 at 9:22 AM
The Oranjevaal Water Users Association
By email:
Madam Lizelle,
RE: Morgenson Mining (PTY) LTD Prospecting Right Application DMR Reference: NC 30/5/1/1/2/12320 PR
Kindly receive the Background Information Document for the above mentioned application.
Please give comments or inputs, if any, within 30 days date of this public consultation notification.
Regards
Malcolm Goliath
0824523693
Morgenso... .docx
1015.7kB
Reply, Reply All or Forward
Malcolm Goliath
goliathmalcolm@yahoo.com
+27 82 452 3693
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Make it #20Mnandi

APPENDIX I

McGregor Museum

Department of Archaeology

Heritage Impact Assessment Report for the proposed Prospecting Right on the farms: Portion 3 (Asbestos Hills) and Portion 2 and 4 (Rietfontein 11) Prieska, Northern Cape

David Morris and Abenicia Henderson

April 2018

Heritage Impact Assessment Report for the proposed Prospecting Right of farms: Portion 3 (Asbestos Hills), and Portion 2 and 4 (Rietfontein 11) Prieska, Northern Cape.

David Morris and Abenicia Henderson, McGregor Museum, Kimberley
P.O. Box 316 Kimberley 8300
Tel 082 2224777 email dmorriskby@gmail.com
April 2018

1. INTRODUCTION

The McGregor Museum archaeology department was appointed by Mr. Gamja Gool (contact: G. Gool, email: gamjagool@gmail.com tel: 082 654 0798) and M.A. Gool (contact: M.A. Goliath, 22 Goedehoop Avenue, Royldene, Kimberley 8301; email: goliathmalcolm@yahoo.com tel: 0824523693) to conduct a Heritage Impact Assessment for Prospecting Right on the farm: Portion 3 (Asbestos Hills) and Portion 2 and 4 (Rietfontein 11), near Koegas, Administrative District of Prieska, Northern Cape. A scoping phase evaluation of the full site was aimed at providing high-level identification of potential areas of sensitivity together with a recommended methodology for the HIA process.

The site was inspected on foot on the 20 April 2018 and relevant observations are indicated in this report.

Fieldnotes and photographs are lodged with the McGregor Museum, Kimberley.

1.1. FOCUS AND CONTENT OF SPECIALIST REPORT: HERITAGE

This archaeology and heritage specialist study is focused on the portion of the farm where the proposed irrigation farming is to be developed.

This study outlines:

- Introduction, explaining the focus of the report (1.1) and introducing the author in terms of qualifications, accreditation and experience to undertake the study (1.2)
- Description of the affected environment (2) providing background to the development and its infrastructure (2.1); Heritage features of the region(2.2);and defining environmental issues and potential impacts (2.3)
- Methodology (3) including an assessment of limitations (3.1); statement of expectations or predictions (3.2) and outline of EIA procedures including criteria for assessing archaeological significance (3.3).
- Observations and assessment of impacts (4), including field observations (4.1); characterizing archaeological significance (4.2); and characterizing the overall significance of impacts (4.3).
- Summary of Significance of Impacts is stated in tabular form (4.3.1).
- Measures for inclusion in a draft Environmental Management Plan for the development are set out in tabular form (5).
- Conclusions (6).

The authors (both on staff of the McGregor Museum) are independent of the organization commissioning this specialist input, and provide this heritage assessment (archaeology and colonial history but not palaeontology) within the framework of the National Heritage Resources Act (No 25 of 1999).

The senior author is a professional archaeologist (PhD) accredited as a Principal Investigator by the Association of Southern African Professional Archaeologists. He has worked as a museum archaeologist and has carried out specialist research and surveys in the Northern Cape and western Free State since 1985. In addition, he has a comprehensive knowledge of the Northern Cape history and built environment, and received UCT-accredited training at a workshop on Architectural and Urban Conservation; researching and assessing local (built) environments (S. Townsend, UCT). He is also Chairman of the Historical Society of Kimberley and the Northern Cape.

The National Heritage Resources Act no. 25 of 1999 (NHRA) protects heritage resources which include archaeological and palaeontological objects/sites older than 100 years, graves older than 60 years, structures older than 60 years, as well as intangible values attached to places. The Act requires that anyone intending to disturb, destroy or damage such sites/places, objects and/or structures may not do so without a permit from the relevant heritage resources authority. This means that a Heritage Impact Assessment should be performed, resulting in a specialist report as required by the relevant heritage resources authority/ies to assess whether authorisation may be granted for the disturbance or alteration, or destruction of heritage resources.

Where archaeological sites and palaeontological remains are concerned, the South African Heritage Resources Agency (SAHRA) at national level acts on an agency basis for the Provincial Heritage Resources Agency (PHRA) in the Northern Cape. The Northern Cape Heritage Resources Authority (formerly called Ngwao Boŝwa ya Kapa Bokone) is responsible for the built environment and other colonial era heritage and contemporary cultural values.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The area for proposed prospecting is approximately 1.6 km from Koegas and 25 km from Marydale. It is situated on the southern bank of the Orange River and located on the west and east side of the R383 national road running from Griekwastad. The area is characterized by exposed gravels in places, otherwise mantled by unconsolidated yellowish white river silt, occasionally formed as dunes. Locally dispersed riverine vegetation includes alien eucalyptus and prosopis with a few *Acacia karoo* trees (Fig. 3-6).

Figure 1. Locality map for the proposed Prospecting area

The surrounding landscape is substantially disturbed by existing agricultural activities/infrastructure, with the settlement of Westerberg being situated upslope to the south. It is likely that the construction of the bridge would have caused disturbance to sediments flanking it. Asbestos (north bank) and alluvial diamond mining is in evidence in the area (Fig. 2). Surface visibility was relatively good at the time of the visit in terms of observing surface archaeological traces, although vegetation is relatively dense in some areas.

It was indicated that although prospecting (for alluvial diamonds) would take place on both areas shown in Fig 2, the preferred area lies on the eastern side of the R383 regional road. The major anticipated impact would thus be on this eastern area.

Figure 2: Locality map


Figure 3: Portion 2 and 4 Rietfontein 11 proposed Prospecting area

Figure 4: Portion 2 and 4 Rietfontein: Abandoned farm buildings

Figure 5: Portion 3 (Asbestos Hills) area for proposed impact


Figure 6: Portion 3 (Asbestos Hills)

2.1. BACKGROUND TO THE DEVELOPMENT-DESCRIPTION OF PROPOSED INFRASTRUCTURE

It was indicated that prospecting, with preferred location on the eastern side of the R383, would take place on an abandoned farm with existing infrastructure, as shown in Fig. 2. Both areas (east and west) were examined.

2.2. HERITAGE FEATURES OF THE REGION

Prior to the survey, there were no known heritage resources on or in the immediate vicinity of the proposed areas for prospecting.

The Northern Cape is known for its rich and varied archaeological resources specifically relating to the Stone Age (Morris 2006). Significant archaeological sites have been discovered at pans in the wider region. For instance, the pan-side site at Bundu (50 kmm to the south) has been found to have important archaeological traces which include ESA, MSA and LSA artefacts and fossil fauna, illustrative of the potential wealth of archaeological material in the area. The ochre mine of Nauga (14 km upstream from Koegas) was excavated by Beaumont (Beaumont & Morris 1990).

No previously recorded sites are on record for the area on SAHRIS and only one heritage study by A.C. Van Vollenhoven (2014) was conducted close to the proposed areas of impact. Van Vollenhoven conducted a study at Marydale which is to the west of the study area.

2.2.1 Colonial frontier

Actions took place in the vicinity of Koegas in May and June 1878, during the Griqualand West uprising of that year, when a “rebel” stronghold on the north bank of the Orange (i.e. within Griqualand West) was attacked by a force sent out from Kimberley.

Figure 7. Illustration from the Griqualand West campaign of 1878.

Subsequently what was dubbed the ‘Koegas Massacre’ took place on 30th October 1878, perpetrated by a patrol of burghers under Field-Commandant Van Niekerk. This took place on the then Cape Colony side of the river, at Luisdraai, about 42 km downstream from Koegas (in the current Buchuberg Water Reserve).

Questions about the incident were raised in the Commons (Parliament of UK) (https://api.parliament.uk/historic-hansard/commons/1879/jul/22/south-africa-griqualand-west-alleged):

> 22 July 1879
> DR. CAMERON asked the Secretary of State for the Colonies, Whether he has observed in the South African Papers just issued (C. 2367), page 78, a Report from Field Commandant Van Niekerk admitting that in an attack upon a party of Natives at Luisdraai, near Koegas, he had killed forty-six, including ten women and children, and captured the rest, being five men and twenty-seven women and children; whether it is a fact that in the same Papers, pages 157 and 158, Mr. Jackson, the Special Commissioner appointed by the Government of Cape Colony to inquire into atrocities alleged to have been perpetrated on the occasion, reports— That a terrible and unjustifiable massacre of a party of bushmen, with their wives and children, had taken place at the hands of burghers under command of Commandant Van Niekerk; adding— Nothing could justify the shooting at Luisdraai, and subsequently on the march to Koegas, of the wounded, among whom were women and little children; and recommending that a preparatory examination should be instituted against Commandant Van

> Niekerk with the view of bringing the guilty parties to justice; and how he reconciles with these statements a despatch from Colonel Lanyon, published at page 120 of the same Papers, which is apparently fairly enough summarized in the index of the Papers, as Showing that the alleged massacre of Natives at Koegas, as referred to by Dr. Cameron in the House of Commons, never occurred?
> §SIR MICHAEL HICKS-BEACH Sir, Colonel Lanyon's despatch is perfectly consistent with the statements quoted by 968 the hon. Member, because in that despatch he merely denies that the occurrence took place in Griqualand West, or that the massacre was perpetrated by Volunteers from his Province. Of course, Colonel Lanyon could not say what had or what had not taken place beyond the limits of his own government; and the mistake is in the index to the Papers, in which Colonel Lanyon's despatch certainly is not fairly summarized as showing that this event "never occurred." I regret that the index was not more carefully compiled.
> DR. CAMERON Is Koegas not in Griqualand West?
> §SIR MICHAEL HICKS-BEACH The massacre certainly took place within the jurisdiction of the Cape Colony, because the Government instituted an inquiry into the facts of the case, and intend to prosecute those who took part in the massacre.

It is clear that neither of these incidents took place at the site of proposed alluvial mining, but cognizance is taken of them with respect to any future mining or development in the wider vicinity. Substantial asbestos mining had already taken place on the north bank.

2.2.2 Later Stone Age

Late Holocene Later Stone Age (LSA) sites are frequently noted in surveys along the Orange River (e.g. Morris & Beaumont 1991; Beaumont et al. 1995). These sites are generally short-duration occupations by small groups of hunter-gatherers. The LSA could be ascribed to either hunter-gatherers or herders. Beaumont identifies two broad categories described as the Swartkop Industry associated with hunter-gatherers and the Doornfontein Industry associated with herders (Beaumont 1995).

Notable in the wider area is the site of Nauga, near the Orange River some 14 km south east of Koegas, an ochre mine recorded by Dunn in 1872 and excavated by Beaumont (Beaumont & Morris 1990:59-61).

Rock art sites also occur in the wider region (Fock & Fock 1989).

2.2.3 Pleistocene: Middle and Earlier Stone Age

Earlier, Middle and Later Stone Age material is documented in river gravels and silts of the Orange-Vaal River Basins (Beaumont & Morris 1990).

Excavations at Bundu Pan, about 50 km south of Koegas, by Kiberd (2001, 2005, and 2006) has demonstrated the presence of stratified deposits that could be associated with the entire span of the Stone Age.

Heritage resources including archaeological sites are in each instance unique and non-renewable resources. Area and linear developments can have a permanent destructive impact on these resources. The objective of an HIA would be to assess the sensitivity of such resources where present, to evaluate the significance of potential impacts on these resources and, if and where appropriate, to recommend no-go areas and/or measures to mitigate or manage said impacts.

In relation to the proposed Prospecting area a great deal of land disturbance is anticipated especially on the south-eastern side of the river bank.

2.3.1 Direct, indirect and cumulative impacts (in terms of nature, magnitude and extent)

The destructive impacts that are possible in terms of the transformation of land, excavation and extraction of minerals tend to be direct, once-off events occurring during the prospecting phase. In the long term, the proximity of such mining operations in the area could result in secondary indirect impacts resulting from the movement of people or vehicles in the immediate or surrounding vicinity.

3. METHODOLOGY

This study defines the heritage component of the EIA process being undertaken for the proposed Prospecting Right. The area was inspected on foot on the 20 April 2018. Heritage traces were evaluated in terms of their archaeological significance.

In preparation for this:

- A desktop assessment was done of the Prospecting Right area relative to the wider known archaeological landscape.
- A search was done on SAHRIS database to determine what previous Archaeological and Heritage Impact studies existed for the area.
- Based on the site's locality preliminary predictions were made which the study would test with observations made in the field.

3.1 ASSUMPTIONS AND LIMITATIONS

It was assumed that, by and large in this landscape, with its sparse vegetation that where shallow soil profiles exist some sense of the archaeological traces to be found in the area would be readily apparent from surface observations (including assessment of places of erosion or past excavations that expose erstwhile below-surface features). However, the aeolian dunes and loose sand present more of a challenge as they may contain buried sites owing to known dune mobility and growth. Hence areas of wind deflation or erosion (e.g. along farm tracks) would be place to examine in particular.

Due to the fact that most cultural remains may occur below surface, the possibility exists that some features or artefacts may not have been discovered/ recorded during the survey. Low ground visibility of parts of the study area is due to sand cover and disturbance from

previous mining and farming , and the possible occurrence of unmarked graves and other cultural material cannot be excluded. Only the portion of impact on the two farms were surveyed and not the entire area as indicated by the Location map in figure (2). It is assumed that information obtained from the broader region is accurate and applicable to this study.

Although the McGregor Museum surveyed the area as thoroughly as possible a proviso is routinely given, that should sites or features of significance be encountered during mining on the site (this could include an unmarked burial, an ostrich eggshell water flask cache, or a high density of stone tools, for instance), specified steps are necessary (beginning with immediate suspension of work, and reporting to the heritage authority).

This study does not comment on Palaeontology.

3.2 PREDICTIONS

- Based on previous experience the terrain on which the proposed Prospecting is taking place may yield significant archaeological traces
- Terraces of River gravels may contain artefacts of Pleistocene and Holocene context
- The plain away from the river may contain topographic features indicative of past human activity, such as pan or vlei margins, and features such as koppies or rocky outcrops. Which may have afforded shelter, a vantage point above the local landscape, and available rock panels for the making of rock engravings.

3.2.1 POTENTIALLY SIGNIFICANT IMPACTS TO BE ASSESSED IN THE HIA PROCESS

Any area or linear, primary and secondary, disturbance of surfaces in the proposed development locale could have a destructive impact on heritage resources, where present. In the event that such resources are found, they are likely to be of a nature that potential impacts could be mitigated by documentation and/or salvage following approval and permitting by the South African Heritage Resources Agency and, in the case of any built environment features, by the Northern Cape Heritage Resources Authority. Although unlikely, there may be some that could require preservation in situ and hence modification of intended footprint

Disturbance of surfaces includes any mining, construction or agricultural farming (including quarries, pits, roads, pipelines, pylons, sub-stations or plants, buildings), or any other clearance of, or excavation into, a land surface. In the event of archaeological materials being present such activity would alter or destroy their context (even if the artefacts themselves are not destroyed, which is also obviously possible). Without context, archaeological traces are of much reduced significance. It is the contexts as much as the individual items that are protected by the heritage legislation.

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (nd) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon nd, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, can be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Assessing site value by attribute

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, National Monuments Council).

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near feature such as hill	On old river terrace
L4	Sandy ground, Coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Sloping floor or small	Flat floor, high ceiling

Class	Landform	Type 1	Type 2	Type 3
			area	
Class	**Archaeo-logical traces**	**Type 1**	**Type 2**	**Type 3**
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell or bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997)

Class	Attribute	Type 1	Type 2	Type 3
1	Length of sequence/context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte/ecofacts
2	Presence of exceptional items (incl regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

4. OBSERVATIONS AND ASSESSMENT OF IMPACTS

The manner in which archaeological and other heritage traces or values might be affected by proposed Prospecting Right on farms: Portion 3 (Asbestos Hills) and Portion 2 and 4 (Rietfontein) may be summed up in the following terms: it would be any act or activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). The obvious impact in this case would be land development.

4.1 FIELDWORK OBSERVATIONS

The site was visited on 20 April 2018. The area of impact is characterized by exposed river gravels, unconsolidated river silt/dunes on the lee side of a bend in the river. The following observations were made:

4.1.1 Occurrence of Stone Age traces:

Most of the area traversed during the survey was found to be without any trace of archaeological materials. The areas of immediate impact were the focus of the assessment and were as follows:

On Portion 2 and 4 (Rietfontein 11)

No archaeological traces were found in the immediate as well as surrounding vicinity.

On portion 3 (Asbestos Hills)

No significant archaeological observations were made in this area. Isolated Stone Age pieces were recorded throughout the study area. The raw material used consists mostly of banded ironstone/jaspilite. The artefacts show a high degree of weathering probably being of secondary alluvial context and therefore of negligible archaeological value. Unretouched flakes and blades were noted, typologically possibly representative of the MSA (derived from exposed river gravels). Artefact densities were generally low and hence recorded as occurrences of low archaeological significance.

However, against this background of paucity, the following sites were found (Table 3)

Table 3. Plotted artefact scatters and observations made.

	Latitude (S)	Longitude (E)	Comment	Significance
1	29°19'10.4"	22°20'49.1"	Prospecting area on the south-eastern side of the river- bank (Fig. 8).	(No artefacts)
2	29°19'06.2"	22° 20'49.8"	Exposed River gravel (Fig. 9).	LOW
3	29°19'03.2"	22°20'51.5"	Quartz flake and Fresh water Mussel shell (Fig. 10).	LOW
4	29°19'03.2	22°20'49.8"	Bridge (Fig. 11).	(No artefacts)
5	29°18'58.1"	22°20'39.7"	Prospecting area on the south-western side of the river- bank (Fig. 5).	(No artefacts)
6-7	29°18'55.4" 29°18'54.9"	22°20'33.3" 22°20'26.5"	Prospecting area on the south-western river - bank landscape (Fig. 6).	(No artefacts)
8	29°19'02.6"	22°20'29.5"	Exposed gravel layers on the south-western side of the river- bank with isolated jaspilite flakes (Fig. 12-13).	LOW
9	29°19'03.4"	22°20'35.1"	MSA flakes; Jaspilite flake with Old sardine tin	LOW

			(Fig. 14-15).	
10	29°19’0.6"	22°20’51.5”	Old Brookes historical bottle (Fig. 16).	LOW
11	29°19’26"	22°20’35.6”	Grave near abandoned farmhouse (Fig. 17).	HIGH

Figure 8a: Archaeological observations as tabulated in table. Plotting of archaeological observations as tabulated in Table 3 (larger scale in Figures 7b.

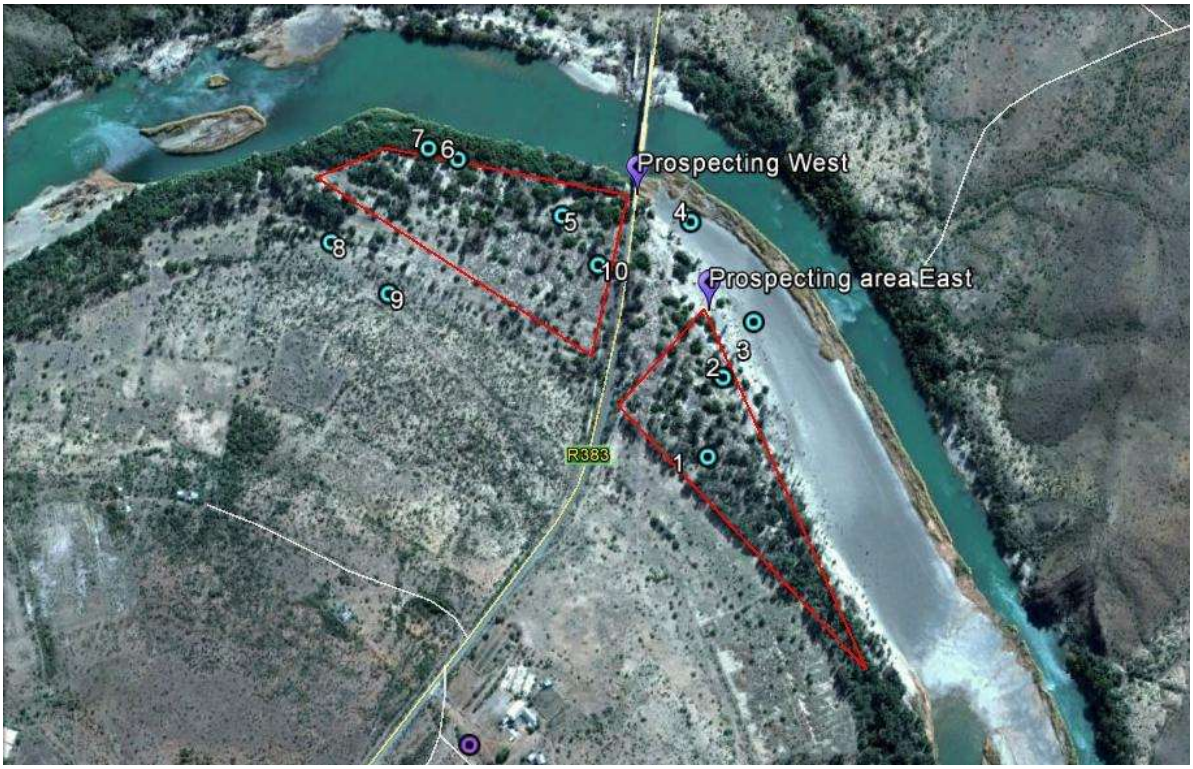

Figure: 8b. Detail of site location indicated in Table

Figure 9: Prospecting area: Observation 1

Figure 10: Exposed River gravels: Observation 2

Figure 11: Quartzite and Shell: Observation 3

Figure 12: Bridge : Observation 4

Figure 13: Lithics scatter-Jaspilite flakes: Observation 8

Figure 14a: Exposed River gravels with dispersed lithic satter: Observation 8

Figure 14b: Observation 8

Figure 15: Jaspilite flakes : Observation 9

Figure 16: Jaspilite flake and old sardine tin: Observation 9

Figure 17: Old Brookes bottle: Observation 10

Figure 18: Grave located near abandoned farmhouse

4.1.2 Colonial era traces

Colonial era traces are seen in the old abandoned farm buildings; recent farm tracks; fencing and other agricultural infrastructure.

4.2 CHARACTERISING THE ARCHAEOLOGICAL SIGNIFICANCE (REFER TO 3.4 ABOVE)

In terms of the significance matrices in Tables 1 and 2 under 3.4 above, the archaeological observations fall under Landform L3, generally Type 2 or 3, i.e. of medium to low potential. In terms of archaeological traces they all fall under Class A3 Type 1. These ascriptions (Table 1) reflect low potential for these criteria. For site attribute and value assessment (Table 2), the observations may be characterised as Type 1 for Classes 1-7.

On archaeological grounds, the Stone Age occurrences, generally sparse, can be said to be of mainly low significance. They are instructive about the exploitation of this landscape in Later Stone Age times and points to the possibility of greater number of occurrences presumably hidden by river silt sand.

For colonial era context, the site has no particular significance in terms of physical heritage traces.

4.3 CHARACTERISING THE SIGNIFICANCE OF IMPACTS

The criteria on which significance of impacts is based include **nature**, **extent**, **duration**, **magnitude** and **probability of occurrence**, with quantification of significance being grounded and calculated as follows:

- The **nature**, namely a description of what causes the effect, what will be affected, and how it will be affected.

- The **extent**, indicating the geographic distribution of the impact:
    - local extending only as far as the development site area – assigned a score of 1;
    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - impact is regional – assigned a score of 3;
    - impact is national – assigned a score of 4; or
    - impact across international borders – assigned a score of 5.

- The **duration**, measuring the lifetime of the impact:
    - very short duration (0–1 years) – assigned a score of 1;
    - short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4;
    - or permanent - assigned a score of 5.

- The **magnitude**, quantified on a scale from 0-10:
    - 0 is small and will have no affect on the environment;

- 2 is minor and will not result in an impact on environmental processes;
- 4 is low and will cause a slight impact on environmental processes;
- 6 is moderate and will result in environmental processes continuing but in a modified way;
- 8 is high (environmental processes are altered to the extent that they temporarily cease); and
- 10 is very high and results in complete destruction of patterns and permanent cessation of environmental processes.

- The **probability of occurrence**, indicating the likelihood of the impact actually occurring (scale of 1-5)
  - 1 is highly improbable (probably will not happen);
  - 2 is improbable (some possibility, but low likelihood);
  - 3 is probable (distinct possibility);
  - 4 is highly probable (most likely); and
  - 5 is definite (impact will occur regardless of any prevention measures).

- The **significance**, determined by a synthesis of the characteristics described above and expressed as low, medium or high. Significance is determined by the following formula:
  S= (E+D+M) P; where S = Significance weighting; E = Extent; D = Duration; M = Magnitude; P = Probability.

- The **status**, either positive, negative or neutral, reflecting:
  - the degree to which the impact can be reversed.
  - the degree to which the impact may cause irreplaceable loss of resources.
  - the degree to which the impact can be mitigated.

- **The significance weightings for each potential impact are as follows:**

  - < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),

  - 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),

  - > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

4.3.1 SUMMARY OF THE SIGNIFICANCE OF IMPACTS

Table 4. Significance of Impacts, with and without mitigation – based on the worst case scenario – for all area investigated.

Nature: Acts or activities resulting in disturbance of surfaces and/or sub-surfaces containing artefacts (causes) resulting in the destruction, damage, excavation, alteration, removal or collection from its original position (consequences), of any archaeological or other heritage material or object (what affected). The following assessment refers to impact on physical archaeological/heritage

traces.		
	Without mitigation	**With mitigation**
Extent	1	Not needed
Duration	5	Not needed
Magnitude	6	Not needed
Probability	2	Not needed
Significance	**22**	
Status (positive or negative)	WEAKLY NEGATIVE	But locally low to very low significance
Reversibility	No	
Irreplaceable loss of resources?	Low density and significance	Loss of context but possible to mitigate.
Can impacts be mitigated?	Not needed	Not needed
Mitigation: Not needed at this stage however, note need for monitoring in management plan recommendations, there is a probability that artefacts occur subsurface. Other possible occurrences are burials and ostrich eggshell on pottery caches, especially within the silt deposits capping the gravels		
Cumulative impacts: Cumulative Impacts: where any archaeological contexts occur, direct impacts are once-off permanent destructive events. Secondary cumulative impacts may occur with the increase in development and operational activity associated with the life of the proposed Prospecting area.		
Residual Impacts: -		

5. MEASURES FOR INCLUSION IN THE DRAFT ENVIRONMENTAL MANAGEMENT PLAN

The objective

Archaeological or other heritage materials that may occur in the path of any surface or sub-surface disturbances associated with any aspect of the Prospecting/ mining are likely to be subject to destruction, damage, excavation, alteration, or removal. The objective is to limit such impacts to the primary activities associated with the mining and hence to limit secondary impacts during the medium and longer term operational life of the operation.

Project component/s	Any road or other infrastructure construction over and above what is outlined in respect of the proposed Prospecting area.
Potential Impact	The potential impact if this objective is not met is that wider areas or extended linear developments may result in further destruction, damage, excavation, alteration, removal or collection of heritage objects (minimal as they are) from their current context along the route.
Activity/risk	Activities which could impact on achieving this objective include

source	deviation from any planned development without taking heritage impacts into consideration.
Mitigation: Target/Objective	An environmental management plan that takes cognizance of heritage resources in the event of any future extensions of infrastructure. Mitigation (based on present observations and development proposal as communicated) is not considered to be necessary.

Mitigation: Action/control	**Responsibility**	**Timeframe**
Provision for on-going heritage monitoring in an environmental management plan which also provides guidelines on what to do in the event of any major heritage feature being encountered during any phase of mining.	Environmental management provider with on-going monitoring role set up by the mining company for the mining phase and for any instance of periodic or on-going land surface modification thereafter.	Environmental management plan to be in place before commencement of mining.
Should unexpected finds be made during development (e.g. precolonial burials; ostrich eggshell container cache; or localised Stone Age sites with stone tools, pottery), the relevant Heritage Authority should be contacted.	Environmental Control Officer should become acquainted at a basic level with the kinds of heritage resources potentially occurring in the area and should report to the Heritage Authority as needed (see next column).	In the event of finding any of the features mentioned in column 1, reporting by the developer to relevant heritage authority should be immediate. Contact: SAHRA Ms N. Higgins 021-4624502 or NC Heritage Resources Authority Mr Andrew Timothy 053-8312537/8074700.

Performance Indicator	Inclusion of further heritage impact consideration in any future extension of mining or any infrastructural elements.
Monitoring	Officials from relevant heritage authorities (National, Provincial or Local) to be permitted to inspect the site at any time in relation to the heritage component of the management plan.

6. CONCLUSIONS

Precolonial/Stone Age material noted and investigated on portions 3 (Asbestos Hills) and 2 and 4 (Rietfontein 11) in this study was found to be generally of low significance. Other possible occurrences to look at are ostrich eggshell and ceramics caches, and burials. This report therefore recommends careful monitoring during the development phase of the proposed agricultural development.

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