



environmental specialists

DRAFT SCOPING AND ENVIRONMENTAL MANAGEMENT PROGRAMME  
REPORT:

PROPOSED ESTABLISHMENT OF A BORROW PIT ON  
THE REMAINDER OF THE FARM SYDENHAM 445,  
BLOEMFONTEIN

SYDENHAM BORROW PIT

<b>Coordinates:</b>	Latitude:	29.209152°	South
	Longitude:	26.207874°	East

February 2013

**Applicant**  
**South African National Roads Agency SOC Ltd**

Contact person

Address

Tel:

C. Roux  
P.O. Box 100410  
Scottsville  
3201  
033 392 8100

Prepared by



environmental specialists

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**Project Team:**

Project Team	Gys Hoon Hanri Van Jaarsveld Louis De Villiers
Postal address:	Suite 158 Private Bag X01 Brandhof 9324
Contact person:	Louis De Villiers Hanri Van Jaarsveld
Tel:	051 444 4700
Fax:	086 697 6132
Email:	hanri@h2on.co.za louis@h2on.co.za

For a detailed CV on the Project team, refer to Appendix A

## Executive summary

The Draft Scoping and Environmental Management Programme report (EMPr) has been undertaken in accordance with the regulations promulgated in terms of the Mineral and Petroleum Resources Development Act, 2002. This Scoping and EMPr is compiled to ensure consideration of the environmental impacts associated with the establishment of a borrow pit on the remainder of the farm Sydenham 445, District: Bloemfontein that will be used during the rehabilitation of the N6 between Onze Rust (Section 8, km 38.0) and Bloemfontein (Section 9, Km 2.486), and to propose mitigation measures to be used during the project.

The Scoping and EMPr is compiled to ensure that the regulating authorities will be supplied with the relevant information to be able to make an informed decision about the project and to guide the contractor to manage all activities which might have an impact on the environment. The relevant regulating authority in terms of this application is the Free State Department of Minerals and Energy in Welkom.

The borrow pit will be established to mine material to be used during the rehabilitation of the N6. The alternative option is to allocate material from commercial sources but these costs will be too high as the amount of material to be used will be very large and the material will have to be transported for long distances. This will not be the case if transport is only from the borrow pit to the construction sites.

The following potential environmental impacts associated with the establishment of the borrow pit were identified:

- Climate
- Topography
- Geology
- Soil
- Vegetation (Flora)
- Animal life (Fauna)
- Air quality
- Surface- and groundwater quality and quantity
- Safety and security
- Aesthetics
- Noise
- Land use

- Archaeological and/or Paleontological impacts
- Socio-economic impact

An additional positive impact associated with the establishment of the quarry to the upgrading of the road, is that individuals from the local community will be temporarily employed. They will receive an income and learn certain skills.

The use of the material for the upgrading of the road will be a positive impact as more people will be able to use the road for transport. The road will be safer to use.

A contractor will be appointed for the duration of the construction, who will appoint an Environmental Control Officer (ECO) to be responsible for the implementation of the EMPr, compliance with all environmental legislation relating to the said activities, monitor construction activities, conduct internal audits and accompany the independent auditor on audits. If it is found that there are certain inadequacies with regard to mitigation measures, the ECO shall rectify it and communicate any environmental issues to his/her superiors. The ECO will also be responsible for monitoring the decommissioning and closure of the borrow pit to ensure that environmental specifications and EMP requirements are met at all times.

The EMPr and all audit reports with consequent mitigation actions taken will be available on site at all times.

SANRAL will ensure that the principles of sustainable development are upheld and no degradation of the physical environment occurs during planning, operational and the decommissioning phases of the proposed project by implementing the management principles and mitigation measures outlined in this report.

## **Scoping Report**

### **1. Methodology applied to conduct scoping**

#### **1.1 Identification of communities**

No community was identified who use or have rights to or interests in, the proposed site as defined in the scoping guideline.

## **1.2 Landowner**

The land is not owned by any communities.

## **1.3 Notification to Land Affairs**

The Department of Land Affairs was not identified as an interested and affected party (I&AP) as no land claim is involved.

## **1.4 Land claim**

No land claim is involved

## **1.5 Traditional authority**

No traditional authority was identified.

## **1.6 Landowner**

The property does not belong to traditional landowners.

The Title Deed Owner is the University of The Free State (Title Deed Number: T2088/1903)

## **1.7 Lawful occupiers of the land**

The land is not occupied by any individuals as it is only used for grazing of livestock.

## **1.8 Possible change of other persons' (adjacent and non-adjacent properties) socio-economic status**

It is not anticipated that the socio-economic conditions of other persons (including on adjacent land and non-adjacent properties) will be negatively affected by the proposed operation. However, the economic conditions of the landowner will improve as the applicant and the landowner entered a lease agreement for the proposed mining area. In addition, the proposed project will result in direct job opportunities to members from the local community, which will result in a positive impact on the local economy of the area as individuals would receive a bigger income for the duration of the project. This will result in more money being spent in the local community. No other person or adjacent neighbour will be economically directly affected, as the mining will be limited to this specific area on the specific farm with its own entrance roads and infrastructure.

### **1.9 Local Municipality**

The land falls within the Mangaung Metro Municipality.

### **1.10 List of the relevant governmental departments, agencies and institutions responsible for the various aspects of the environment, land, and for infrastructure which may be affected by the proposed project**

Department of Water Affairs

Department of Agriculture

Department of Environmental Affairs (DEA/DETEA)

South-African Heritage Resource Agency (SAHRA)

### **1.11 Proof that all identified I&AP's were notified**

The Public Participation Process will be conducted in terms of Sections 16(4)(b) or 27(5)(b) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002). It will include the following:

- An advert was placed in the local newspaper, the Express, on 30 January 2013,
- A site notice was placed at the entrance to the borrow pit,
- Written notifications will be sent to all adjacent landowners and other Interested and Affected Parties notifying them of the project and of the availability of the Draft Scoping and EMPr at the local library, c/o Henry and Wesburger Street, Bloemfontein,
- The public will be granted a time period of 30 days to make comments on the Draft reports,
- All comments received will be addressed and written into the final report that will be submitted to the Department of Minerals Resources.

Please note that the proof of the Public Consultation Process will only be attached in the Final Scoping and EMPr

## **2 Description of the existing status of the cultural, socio-economic and biophysical environment**

The proposed site is located on the remainder of the farm Sydenham 455 approximately 1.125km south west of the township of Blomanda outside Bloemfontein. The total application area is 4.8 hectares in extent and is within a natural vegetation area with no environmental sensitive features such as rivers, wetlands or sensitive habitat on the proposed site. There are

no servitudes for power lines or roads that intersect the site. Please refer to Map 1, Appendix A for an indication of the locality of the proposed mining area.

## **2.1 Confirmation that the description of the environment has been compiled with the participation of the community, the landowner and interested and affected parties**

The EMPr was discussed with the landowner and the applicant who also took part in the site assessment. The Scoping and EMPr will be sent to all I&AP whom comments have been received from for them to review it.

During the public participation process, the public was given the opportunity to give their inputs regarding the description of the environment.

## **2.2 Description of the existing status of the cultural environment that may be affected**

The proposed borrow pit and road construction site will not have any impact on the cultural environment in the area as the land that will be used for the borrow pit is currently used for agriculture and the grazing of livestock. There are thus no inhabitants or cultural activities on that part of the farm.

## **2.3 Description of the existing status of any heritage environment that may be affected**

No sites of archaeological or heritage interest were identified on the application area or nearby. Please refer to Appendix C for a copy of the Heritage Report that was submitted to SAHRA.

## **2.4 A description of the existing status of any current land uses and the socio-economic environment that may be directly affected**

The proposed site is currently used for grazing of livestock (i.e. agriculture). The proposed mining activity will entail that grazing land will be lost for the duration of the activity. However, the mining area will be rehabilitated to its end land use which will remain agriculture. During rehabilitation, the surface of the borrow pit will be levelled, covered with topsoil and re-vegetated. The socio-economic activity is also agriculture and the affect will be temporary since the cattle can be grazed on other areas of the farm (?).

## **2.5 Description of the existing status of any infrastructure that may be affected**

The only infrastructure present on the site is the fences on the border of the site which is in good condition. The fences may be damaged to create access to the site.

## **2.6 A description of the existing status of the biophysical environment that will be affected, including the main aspects such as water resources, flora, fauna, air, soil, topography etc.**

### **— Topography**

The proposed site lies at an elevation of approximately 1421m – 1425m above mean sea level. The topography is relatively flat.

### **— Geology and soil**

The land type for the proposed area was determined to be the Ca22 type. According to the mentioned land type, the geology mainly consists of layers of sandstone, shale and mudstone of the Beaufort Group, with dolerite intrusions. Typical soil forms of the Ca land type are the Hutton, Bainsvlei and Bloemdal forms which consist of red sandy topsoil and clayey subsoil.

### **— Flora and Fauna**

The vegetation in the area consists of the Bloemfontein Dry Grassland (Gh5) bioregion. This bioregion is classified as endangered due to transformation for crop production. The area where the proposed borrow pit will be located is used for grazing with tall dense grassland with patches of Karroid scrub. Please refer to the Ecological report in Appendix C.

It has not been disturbed by human activity. Fauna is expected to consist of typical grassland species: mainly smaller rodents and other small mammals, as well as frogs, toads, snakes, geckos, lizards, birds and grassland invertebrates. Faunal activity should however not be very high as the area is situated close to busy main roads.

### **— Water resources**

There is an artificial dam situated approximately 320m to the west of the proposed site and another artificial dam is situated approximately 230m to the north of the site. A seasonal



stream/wetland runs between the two artificial dams and is within approximately 300m from the proposed borrow pit.

There is a wind pump situated approximately 1.7km to the west of the proposed site, a reservoir approximately 150m south of the site. There are also boreholes situated on the farm.

#### – **Air quality**

There is a busy secondary road (i.e. Church Street) within 20m from the site which may affect the air quality negatively at times when traffic is heavy.

#### – **Noise**

The only noise at the site is that of traffic due to the N6 to the east and Church Street within 20m from the site. Other noise in the area is noise associated with that of agriculture.

#### – **Visual**

The visual aspect of the site is of a rural farming nature with no urban structures. The land use at the site where the proposed borrow pit will be established is agricultural (grazing land). The closest residential area to this site is approximately 1.1km to the north east.

#### – **Sensitive landscapes**

There is a seasonal wetland/stream approximately 300m from the west to the north of the proposed site. It does not form part of the proposed site. Due to the origin of the stream/wetland being in the high density residential areas, the wetland and the stream is severely damaged as a result of pollution.

The borrow pit should not have significant negative impacts on the wetland as it is situated approximately 300m from it (Refer to biodiversity report attached in Appendix C)

#### – **Sites of archaeological and cultural interests**

A Phase 1 Archaeological and Paleontological study indicated that the probability of locating any significant artefacts during the phases of the development is likely very low. Please refer to the Archaeological Impact Assessment attached in Appendix C.

## – Socio-economics

The borrow pit will entail the employment of 15-20 individuals from the surrounding area. This new job creation will contribute to skills development and an income for more households in the area. The project will thus have a positive impact on the regional socio-economic state of the area.

### **2.7 Relevant additional information**

There is no relevant additional information to be added.

## **3 Identification of the anticipated environmental, social or cultural impacts, including the cumulative impacts, where applicable.**

### **3.1 Description of the proposed project including a map showing the spatial locality of infrastructure, extraction area, and any associated activities.**

A borrow pit will be developed for the mining of weathered dolerite. The borrow pit will have a maximum depth of 3 meters and an area of 4.8ha. Sixty thousand (60 000)m<sup>3</sup> of weathered dolerite will be mined from this borrow pit by using excavators.

Please refer to Map 1 in Annexure B for the locality of the borrow pit.

### **3.2 Describe the listed activities according to NEMA EIA regulations, which will be occurring within the proposed project.**

The NEMA EIA regulation listings make provision for the construction of the road associated with the borrow pit and not with the borrow pit itself.

### **3.3 Specifically confirm that the community and identified I&AP's have been consulted and that they agree that the potential impacts identified include them.**

Please refer to Appendix C (Final Scoping Report) for proof of notifications sent to potential I&AP. All the comments received from I&AP's will be attached in the final Scoping and EMPr.

### **3.4 Provide a list and description of potential impacts identified on the cultural environment.**

No cultural artefacts or cultural activities could be identified on site.

#### **3.4.1 Provide a list and description of potential impacts identified on the heritage environment, if applicable**

It is highly unlikely that there will be any impacts on the heritage environment as a result of this activity as no archaeological or paleontological artefacts could be identified on the site (Refer to Appendix B for the specialist report)

#### **3.4.2 Provide a list and description of potential impacts identified on the socio-economic conditions of any person on the property and on any adjacent or non-adjacent property who may be affected by the proposed prospecting or mining operation**

There are no people residing on the site. No individuals' socio-economic conditions will be negatively affected, but people from the local community will be employed during construction. Their socio-economic condition will thus improve as they will receive an income from the operation.

#### **3.4.3 Provide a list and description of potential impacts (positive and negative) on employment opportunities, community health, community proximity, and links to the Social and Labour Plan.**

Employment opportunities within the local community will increase as the contractors will use people from the community as employment for the duration of the contract. This impact will be positive. Community health will not be impacted on by the proposed activity.

**3.4.4 Provide a list and description of potential impacts identified on the biophysical environment including, but not limited to impacts on: flora, fauna, water resources, air, noise, soil etc.**

— **Topography**

The initial impact will be a lowering of the natural elevation of maximum 3 meters. This will be remediated so that the resultant excavation consists of safe slopes.

— **Geology and Soil**

There will be a minor impact on the soil as the surface will be disturbed and topsoil will be removed. The geological profile will be affected since the dolerite component is to be removed, however this impact does not have any consequences for the geology per sé.

— **Flora and Fauna**

Vegetation will be permanently removed during the planning and construction phase, which will be a significant local environmental impact.

Most animal species will leave this area of land due to the removal of vegetation and the presence of humans on the site.

— **Water resources**

If the correct storm water management measures are not in place, it might have a negative impact on the surface water in the area as a wetland is situated approximately 300m from the proposed site.

Spillage of petrochemical and potentially hazardous chemicals may cause ground water pollution.

The proposed borrow pit may change the runoff patterns of the landscape and less water will run to streams and rivers as it will stay in the borrow pit. However, the topography consists of very gentle slopes. There will thus not be a major impact on runoff water.

— **Air quality**

Air quality could be negatively affected by the operation at the proposed borrow pit because of the exhaust gases from machinery and vehicles on site. Particulate matter will also negatively affect the air quality in the area as dust will be emitted by the operation.

– **Noise**

An elevation in noise levels will occur during all phases of the proposed project as ground moving and excavation machinery will be used.

– **Visual**

The visual quality will be negatively affected as the proposed site for the establishment of the borrow pit will be next to a road and will be visible from the road.

– **Sensitive landscapes.**

As discussed under water resources, there is a wetland situated approximately 107m from the proposed site that might be negatively affected if the correct storm water management measures are not implemented at the proposed borrow pit.

– **Sites of Archaeological and cultural interest**

A Phase 1 Archaeological and Paleontological study indicated that the probability of locating any significant artefacts during the phases of the development is likely to be low. Please refer to the Archaeological Impact Assessment attached in Appendix C.

– **Socio-economic**

The proposed activity will have a positive impact on the regional socio-economic structure through its support of the development industry, profit generation contribution to tax revenue, job creation and the skills development of its employees.

### **3.4.5 Cumulative impacts**

The cumulative impacts associated with the proposed project are as following:

- An increase in traffic on the local roads of the area during the construction phase of the proposed project which may have a cumulative impact on the following:
  - Ambient air quality in the area may be negatively affected with an increase in vehicles and machinery in the area, and
  - Noise levels in the area will increase as the cumulative impact of the increase in vehicles and machinery in the area will entail higher noise levels.
- There will be an influx of people in the area during the construction and operational phases;
- Additional water and electrical supply to the area.

However these cumulative impacts are not of a permanent nature and will not remain after the closure of the borrow pit.

#### **4 Land use or development alternatives, alternative means of carrying out the proposed operation, and the consequences of not proceeding with the proposed operation.**

##### **4.1 Alternative land uses that may be affected by the proposed mining operation.**

The land use of the property where the proposed activity will occur is agriculture and the land is used for grazing of livestock. The surrounding land uses also consist of agriculture (small holdings) and the closest urban build up areas are approximately 1km north east of the site. However, the land uses of the mentioned areas will not be negatively affected by the proposed establishment of the borrow pit.

##### **4.2 Land developments which may be affected by the proposed mining operation.**

No current or future land development in the area that may be negatively affected by the proposed activity was identified.

##### **4.3 Proposals made to adjust operational plans to accommodate the needs of the community, landowners and I&AP.**

During the Public Consultation Process, the public will be notified of the project and the Draft Scoping and EMPr will be made available to all adjacent landowners, authorities and other potential I&AP. Proposals received during the time granted for comments, will then be included into the final Scoping and EMPr.

#### **4.4 Consequences of not proceeding with the proposed operation**

If the proposed project does not occur, gravel that would have been mined at the proposed borrow pit will have to be bought from commercial suppliers. The material will have to be transported over greater distances to the construction site which will entail the following:

- More money will be spent to purchase and transport material over longer distances;
- Job opportunities and skills development (a positive socio-economic impact) at the proposed borrow pit will be lost as fewer individuals will have to be employed;
- More roads will have to carry extra loads as transportation vehicles will use them to transport material over greater distances; and
- The carbon footprint of this option will be greater as CO<sub>2</sub> emissions will enter the atmosphere over a larger area.
- With the additional time needed for transport, it will take a longer time before the road is finished, with concomitant ripple effects on the area's socioeconomic activities.

#### **4.5 The most appropriate procedure to plan and develop the proposed mining operation**

The proposed site will be demarcated at the boundaries with the appropriate safety measures in place.. Vegetation will be cleared from the site. Topsoil will be removed from the site and stored and preserved separately from any other soil layers. The vegetation will be mulched in with the removed topsoil to assist in re-growth during rehabilitation. Topsoil stockpiles will not exceed a height of 2m and will have moderate slopes to prevent erosion and loss of the topsoil during raining seasons. Other material removed from the borrow pit that will not be used during the rehabilitation of the road will be stockpiled separately from the topsoil and will be used in the reshaping of the site during rehabilitation. The area as indicated on the layout plans will not be exceeded to prevent any impacts on the surrounding environment and thus limiting the footprint of the development.

Material will be loosened by use of machinery and loading with excavators directly onto haul vehicles.

The material will then be transported to the area of the road under construction.

The borrow pit will be mined to a maximum depth of 3m.

During rehabilitation of the site, the borrow pit will be sloped to make it free draining.

Heavy machinery will not be stored or repaired on site and all lubricants and fuels will be stored at the site office or camp inside designated areas.

#### **4.5.1 Response to the findings of the consultation process and the possible options to adjust the mining project proposal to avoid potential impacts identified in the consultation process.**

All I&AP and relevant authorities will be notified that the Draft Scoping and EMP is available at the start of the project. All comments received from the I&AP and/or relevant authorities will be addressed in the final Scoping and EMP reports.

#### **4.5.2 The most appropriate procedure to plan and develop the proposed mining operation with due consideration of the issues raised in the consultation process.**

Consultation with any member of the public, adjacent landowners and relevant authorities has not yet been conducted. All identified I&AP's will be notified of the availability of the Draft Scoping and EMP reports which they can comment on. All comments received from the I&AP and/or relevant authorities will be addressed in the final Scoping and EMP reports.

## **5 Public Participation Process**

### **5.1 Information provided to the community, landowners, and I&AP's**

The Public Participation Process will be conducted in terms of Sections 16(4)(b) or 27(5)(b) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002). It will include the following:



- An advert was placed in the local newspaper, the Express, on 30 January 2013, (see Appendix D)
- A site notice was placed at the entrance to the borrow pit, (see picture in Appendix D)
- Written notifications and the Draft Scoping and EMP (see Appendix D) was sent to all adjacent landowners and authorities notifying them of the project and of the availability of the Draft Scoping and EMP at the local library, c/o Henry and Wesburger Street, Bloemfontein.
- The public will be granted a time period of 30 days to make comments on the Draft reports,
- All comments received will be addressed and written into the final report that will be submitted to the Department of Minerals Resources.

Refer to Appendix D for the background information document that was sent to all potential I&AP (i.e. neighbouring landowners and other interested individuals).

## 5.2 List of Communities, landowners, lawful occupiers, and other I&AP's.

The property is owned by the University of the Free State.

Table indicating adjacent farms and landowners:

Farm name	Landowner
Adelaide 2874/4	SANRAL
Adelaide 2874/RE	8 Mile Investments
Bella Vista 2545/RE	N.M.H. Nxele
Bella Vista 2545/1	S.L. Wentzel
Driehoek 2518/6	M.H.O. Van Heerden
Driehoek 2518/7	J. H. Van Schalkwyk
Driehoek 2518/5	SANRAL
Driehoek 2518/4	Reyno Hofmeyr
Driehoek 2518/8	Jacobus Engelbrecht Louw
Driehoek 2518/2	SANRAL
Economy 2842/2	SANRAL
Fairview 1169/RE	University of the Free State
Hillside 2594/2	Cherangani Trade and Invest 35
Hope Valley 719/16	Cherangani Trade and Invest 35

Kolbe 1538/RE	University of the Free State
Mountjoy 2782	T. H. Viljoen
Paradise Lost 2095/RE	University of the Free State
Paradys 2832/1	University of the Free State
Rocklands 684/2	Mangaung Local Municipality
Sydenham 445/1	University of the Free State
Thornborough 1382	Adele Coetzer

The landowners indicated above are the landowners whom have been notified of the project at this stage.

### **5.3 Views from communities, landowners, lawful occupiers and I&AP's on existing cultural, socio-economic or biophysical environment.**

No comments have been received at this stage. Any comments received regarding the Draft Scoping and EMPr will be included in the final Scoping and EMPr.

### **5.4 Views from communities, landowners, lawful occupiers and I&AP's on how their existing cultural, socio-economic or biophysical environment will be impacted upon by the proposed mining activity.**

### **5.5 Any other concerns raised by the aforesaid parties**

No comments have been received. Any comments received regarding the Draft Scoping and EMPr will be included in the final Scoping and EMPr.

### **5.6 Minutes and records of consultations**

Results of the minutes of meetings and records of consultations will be included in the final Scoping and EMPr.

### **5.7 Objections received regarding the proposed mining activities**

Results of the minutes of meetings and records of consultations will be included in the final Scoping and EMPr.

## **6 Nature and extent of further investigation including specialist reports that may be required.**

A phase 1 Heritage and Archaeological Impact Study and an Ecological study have been conducted by specialists. Refer to Appendix B for specialist reports.

## **Environmental Management Programme report (EMPr)**

The EMPr is compiled in terms of Regulation 51 of the Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002): Mineral and Petroleum Resources Development Regulations, 2004.

The Environmental Management Programme report is intended to provide environmental specifications for the proposed establishment of a borrow pit to be used during the rehabilitation of the National Route 6 between Onze Rust (Section 8, km 38.0) and Bloemfontein (Section 9, Km 2.486) to put measures in place to mitigate and manage potential environmental impacts arising from the phases of the establishment of the borrow pit on the remainder of the farm Sydenham 445, Bloemfontein district and to ensure an acceptable rehabilitation for the purpose of obtaining closure.

## **1 Description of the environmental objectives and specific goals for mine closure**

### **1.1 Environmental aspects that describe the pre-mining environment**

#### **1.1.1 Topography**

The proposed site lies at an elevation of approximately 1421m – 1425m above mean sea level. The topography is mainly flat.

#### **1.1.2 Geology and soil**

The land type for the proposed area was determined to be the Ca22 type. According to the mentioned land type, the geology mainly consists of layers of sandstone, shale and mudstone of the Beaufort Group, with dolerite intrusions. Typical soil forms of the Ca land type are the Hutton, Bainsvlei and Bloemdal forms which consists of red sandy topsoil and clayey subsoil.

#### **1.1.3 Flora and Fauna**

The vegetation in the area consists of the Bloemfontein Dry Grassland (Gh5) bioregion. This Bioregion is listed as an endangered vegetation type largely due to the transformation for crop production and urbanisation. However, no plant species could be identified on the site that is listed as protected, rare or endangered. The area where the proposed borrow pit will be located is used for grazing with tall dense grassland with patches of Karroid scrub.

Although the study area is used for grazing, it has not been disturbed by human activity. Faunal activity should however not be very high as the area is situated close to busy main roads.

#### **1.1.4 Surface water**

There is an artificial dam situated approximately 320m to the west of the proposed site and another artificial dam is situated approximately 230m to the north of the site.

#### **1.1.5 Air quality**

The busy secondary road (i.e. Church Street) within 20m from the site may affect the air quality negatively at times when the traffic on this road is high.

#### **1.1.6 Noise**

The only noise at the site is that of traffic due to the N6 to the east and Church Street within 20m from the site. Other noise in the area is noise associated with that of agriculture.

### **1.1.7 Visual**

The land use at the site where the proposed borrow pit will be established is agricultural (grazing land). The closest residential area to this site is approximately 1.1km to the north east.

### **1.1.8 Land use**

The land use of the farm is agricultural (grazing of livestock). The mining area will not be used for the grazing of livestock during the proposed construction phase. However, the proposed mining area will be rehabilitated to fit the end land use which is agriculture.

### **1.1.9 Sensitive landscapes**

There are no sensitive landscapes associated with the site.

### **1.1.10 Sites of archaeological and cultural interests**

There are no sites of archaeological or cultural interest on, or in close proximity to the site. Please refer to the phase 1 Archaeological and Paleontological study attached in Annexure B

### **1.1.11 Socio-economics**

The borrow pit will entail the employment of individuals from the area. This new job creation will contribute to skills development. The project will thus have a positive impact on the regional socio-economic state of the area.

### **1.1.12 Cumulative impacts**

Cumulative impacts during the mining activities may include the following:

- Influx of people in the area due to the mining activities in the area;
- Additional water and electrical supply to the area; and
- Additional traffic on the local roads during the mining activities.

## **1.2 Measures required to contain or remedy any causes of pollution or degradation or the migration of pollution, both for closure of the mine and post-closure**

### **1.2.1 Vegetation stripping**

All vegetative material will be removed from areas to be disturbed and will be retained to ensure proper vegetation establishment during the rehabilitation phase. All vegetative material will be stripped and stockpiled for use during the rehabilitation phase. Excavation shall not occur outside the demarcated area. If no gravel is located, trenches shall be backfilled immediately.

### **1.2.2 Topsoil stripping**

All topsoil will be stripped and stockpiled, separately from other material. Removed vegetation can be mulched into the topsoil to be redistributed over the site during rehabilitation. Topsoil will not be stockpiled higher than 2m and the sides will have moderate slopes to prevent any erosion and loss of the topsoil. Other material (e.g. overburden rocks and coarse material) shall be stockpiled at the excavation to be used as backfill material once the gravel has been excavated.

Topsoil will be stockpiled in such a manner that it will not cause damming up of water or wash away. Topsoil stockpiles will not exceed a height of 2m and should the topsoil be stored for a period of more than 6 months, it will be upgraded by removing any alien vegetation that may have settled on it.

### **1.2.3 Levelling of all unutilised material**

All unused material will be levelled to ensure that the mining area blends back into the existing landscape fabric and that resultant slopes are safe (angle of repose). No stockpiled material is to be retained on site. Waste will not be permitted to be deposited in the excavations.

### **1.2.4 Shaping of mining area**

The mining area will be shaped to ensure no stockpiled heaps and that the area blends in with the existing landscape. This will form the basis of the rehabilitation phase.

### **1.2.5 Ensuring mining area is free draining**

During the shaping process the mining area would be shaped to ensure that it is free draining.

### **1.2.6 Spreading of topsoil and vegetative material**

Stockpiled topsoil will be used to cover the rehabilitated area after coarse material, rocks and overburden material. The topsoil and stockpiled vegetative material will be spread over the entire borrow pit site to ensure the re-growth of vegetation.

### **1.2.7 Vegetation establishment**

An appropriate seed mix that contains the species that naturally occur in the Gh5 bioregion will be spread over the mining area to ensure a satisfactory vegetative cover over the entire area.

### **1.2.8 Hydrocarbon and chemical management**

To prevent soil and water pollution with oils, greases and fuels, no vehicle storage or maintenance will be done on site and no containers, whether empty or not, of hydrocarbon materials shall be stored on site. No chemicals will be stored or disposed of on site.

(Alternatively – a hydrocarbon/chemical store that complies with all the relevant environmental and safety and health legislation shall be built at the site office for the storage of oils, fuel and greases, as well as paints and other chemicals).

### **1.2.9 Protection of Plant and Animal Life**

- No hunting of wild animals on site or surrounding area.
- The collection of fire wood is not allowed on site or surrounding area.
- The establishment of access roads should be as indicated in paragraph.

## **2 Environmental objectives and specific goals for the management of identified environmental impacts, including socio-economic and cultural aspects emanating from the proposed mining operation.**

The following table, Table 2, indicated a list of the impacts (2.1), list of activities causing the impacts (2.2) mitigation measures and the responsible person.



Activity	Potential Impact	Mitigation	Performance Indicators	Responsible Person	Schedule
<b>Surface and Ground Water</b>					
<ul style="list-style-type: none"> <li>• Mining of gravel with machinery</li> <li>• Servicing of vehicles at the borrow pit</li> </ul>	<ul style="list-style-type: none"> <li>• Contamination of ground water due to petrochemical spills.</li> <li>• Contamination of surface water due to mixing of clean and dirty storm water.</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that vehicles and machinery are well maintained to prevent petrochemical spills.</li> <li>• No major maintenance work will be done on vehicles at the borrow pit.</li> <li>• If minor repairs are done, drip trays will be used to prevent spillage of petrochemicals.</li> <li>• Spills will be cleaned immediately and managed correctly.</li> <li>• Storm water management systems will be implemented to ensure that storm water is diverted around the site.</li> </ul>	<ul style="list-style-type: none"> <li>• No contamination of ground and surface water.</li> <li>• No spillage of construction vehicles and machinery.</li> </ul>	Maintenance manager	Ongoing
<b>Geology and Soil</b>					
<ul style="list-style-type: none"> <li>• Mining of gravel with machinery</li> <li>• Transportation of gravel with construction vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>• Soil contamination as a result of petrochemical spills.</li> <li>• Soil compaction as a result of vehicles.</li> <li>• Loss of topsoil</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that vehicles and machinery are well maintained to prevent petrochemical spills.</li> <li>• Spills will be cleaned immediately and managed correctly.</li> <li>• No major maintenance work will be done on vehicles at the borrow pit.</li> <li>• If minor repairs are done, drip trays will be used to prevent spillage of petrochemicals.</li> <li>• Use only designated roads when transporting material.</li> </ul>	<ul style="list-style-type: none"> <li>• No contamination of soil</li> <li>• No unnecessary soil compaction</li> </ul>	Maintenance manager	Ongoing

Activity	Potential Impact	Mitigation	Performance Indicators	Responsible Person	Schedule
		<ul style="list-style-type: none"> <li>Topsoil should be stockpiled separately to be used during rehabilitation.</li> </ul>			
<b>Air quality</b>					
<ul style="list-style-type: none"> <li>Mining of gravel by use of machinery.</li> <li>Transportation of material with vehicles.</li> </ul>	Pollution of the atmosphere.	<ul style="list-style-type: none"> <li>Speeds of 50km/h should not be exceeded on gravel roads.</li> <li>Maintenance should be done on vehicles and machinery to minimise CO<sub>2</sub> emissions.</li> <li>Gravel roads will be sprayed with water to suppress dust.</li> </ul>	<ul style="list-style-type: none"> <li>Ambient air quality to acceptable standard.</li> <li>Minimise the CO<sub>2</sub> emissions from vehicles.</li> </ul>	Maintenance manager	Ongoing
<b>Visual impact (Aesthetics)</b>					
Mining of gravel from borrow pit.	Negative aesthetic impact on neighbouring farms and passing motorists.	<ul style="list-style-type: none"> <li>The borrow pit must be clean and tidy at all times</li> <li>A complaints register should be kept on site and should indicate measures that was implemented to address issues</li> <li>No substances will be stored at the borrow pit</li> </ul>	No complaints received from passing motorists or adjacent landowners.	Borrow pit supervisor	Ongoing
<b>Noise</b>					
<ul style="list-style-type: none"> <li>Mining of gravel at the borrow pit</li> <li>Transportation of material with construction vehicles</li> </ul>	Noise generated by the mining activity and transportation vehicles might have a negative impact on adjacent landowners.	<ul style="list-style-type: none"> <li>Vehicles should be serviced on a regular basis to minimise noise from them.</li> <li>Mining activities will only occur during the daytime (e.g. between 6am-5pm).</li> </ul>	No complaints from any adjacent landowners or passing motorists.	Borrow pit and maintenance supervisors.	Ongoing
<b>Vegetation</b>					
<ul style="list-style-type: none"> <li>Transportation of material from the borrow pit</li> </ul>	<ul style="list-style-type: none"> <li>Clearance of vegetation for the establishment of the borrow pit and roads.</li> </ul>	<ul style="list-style-type: none"> <li>Only areas to be used during mining will be cleared of vegetation</li> <li>Construction vehicles and machinery will</li> </ul>	<ul style="list-style-type: none"> <li>Clearance of vegetation only in areas that are mined</li> </ul>	Borrow pit supervisor.	Ongoing

Activity	Potential Impact	Mitigation	Performance Indicators	Responsible Person	Schedule
<ul style="list-style-type: none"> <li>Mining of the borrow pit</li> </ul>	<ul style="list-style-type: none"> <li>Loss of vegetation due to fire</li> </ul>	<ul style="list-style-type: none"> <li>only make use of designated access roads</li> <li>Unnecessary clearance of vegetation will not occur</li> <li>The making of fire will not be allowed at the borrow pit.</li> </ul>	<ul style="list-style-type: none"> <li>and access roads.</li> <li>No fires made on site.</li> </ul>		
<b>Fauna</b>					
Mining of gravel from the borrow pit	Destruction of habitat of fauna on the site.	<ul style="list-style-type: none"> <li>No animals will killed at the borrow pit or the surrounding environment by employees at the borrow pit.</li> <li>Animals found on the site will be removed to a safe location.</li> </ul>	No animals killed or harmed at the borrow pit.	Borrow pit supervisor.	Ongoing
<b>Land use</b>					
Mining of gravel from the borrow pit	Temporary change of land use from agricultural to mining.	The borrow pit will be rehabilitated to fit the end land use.	Rehabilitation of borrow pit.	Borrow pit manager	Rehabilitation
<b>Items of Archaeological or cultural importance</b>					
Mining of gravel from borrow pit	Removing or demolition of items of archaeological or cultural importance	<ul style="list-style-type: none"> <li>If any items are identified to be of archaeological or cultural importance, operation shall be stopped and the relevant authority will be contacted.</li> </ul>	No items of cultural or archaeological importance removed from the site.	Borrow pit supervisor	Ongoing
<b>Socio-economic conditions</b>					
<ul style="list-style-type: none"> <li>Mining of gravel from borrow pit</li> <li>Transportation of material</li> </ul>	Positive impact on the socio-economic conditions in the area.	<ul style="list-style-type: none"> <li>Unskilled labourers to be employed at the borrow pit, should be local individuals.</li> </ul>	Local people employed at the borrow pit.	Borrow pit supervisor	Appointment

## 2.3 Management Control Activities

The following are the roles and responsibilities for the monitoring and management of the impacts:

### **The Contractor shall:**

Roles and Responsibility of contractors during planning and construction phase

- Protect the environment on the site planned for construction.
- Ensure controlled access to the site to prevent degradation.
- Be held responsible for the implementation of the EMP.
- Be held responsible to have the EMP available on site at all times.
- Be held responsible for compliance with all relevant aspects of the EMP.
- Ensure that all problems identified during environmental audits or inspections during construction, are addressed and rectified as soon as reasonable possible.
- After ceasing of construction activities, an environmental audit should be done before commencing with the operational phase, to determine compliance with the EMP.

### Responsibility during operational phase

- Providing a budget for maintenance of infrastructure.
- Maintaining all approved infrastructure in good working order to effectively fulfil its intended purpose to prevent negative environmental impacts.
- Not construct any additional buildings, infrastructure, etc. contrary to the approved RoD, without performing an Environmental Impact Assessment (if required) to evaluate alternatives and identify potential impacts.
- To immediately remedy any factors that contribute to negative environmental impacts.

### **The Environmental Control Officer (ECO) shall:**

- Enforce site protection measures,
- Ensure that all environmental authorisations and permits required in terms of the applicable legislation have been obtained,
- Monitor and verify compliance with the EMP and Contract and keep records of compliance/non-compliance, and make them available to the external auditor,

- Monitor and verify that environmental impacts are kept to a minimum,
- Keep accurate and detailed records of all activities undertaken on site,
- Ensure that environmental training is given to all employees by the contractor,
- Access the contractor's environmental performance from which a brief monthly statement of environmental performance is drawn up for record purposes,
- Ensure that all third parties who carry out all, or part of the contractor's obligations under the contract, comply with the requirements of the EMP,
- Ensure that the contractor complies with all relevant legislation,
- Keep a complaints register at the site office to note any comments or complaints from members of the public,
- Conduct internal audits to ensure compliance to the EMP and notify the engineer on the findings,
- Review the EMP continually and submit any changes to the contractor and engineer for review and approval.

#### **Requirements of the ECO:**

- Good working knowledge of all relevant environmental policies, legislation, guidelines and standards,
- The ECO must have the ability to conduct inspections and audits and produce thorough, readable and informative reports,
- Have the ability to manage public communication and complaints,
- Have the ability to think holistically about the structure, functioning and performance of environmental systems,
- Proven competence in the application of the following integrated environmental management tools:
  - Environmental Impact Assessment,
  - Environmental Management Plans/Programmes,
  - Environmental Auditing,
  - Mitigation and optimisation of impacts,
  - Monitoring and evaluation of impacts,

## **Rehabilitation for closure**

### **Rehabilitation of access roads**

- Any gate or fence erected which is not required after the construction phase must be restored to the pre-construction situation.
- Roads shall be ripped or ploughed, and if necessary, appropriately fertilised (based on a soil analysis) to ensure the re-growth of vegetation.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil must be analysed and any deleterious effects on the soil arising from the development must be corrected and the area be seeded with a representative seed mix.

### **Final Rehabilitation of site**

- All infrastructures, equipment and other items used during the operational period will be removed from the site.
- Scrap metal will be sold to be recycled.
- Waste material of any description, will be removed entirely from the site and disposed of at a recognised landfill facility in the area.
- Waste will not be permitted to be buried or burned on the site.
- Any concrete surface will be removed and compacted areas will be ripped.
- The site will be profiled with acceptable contours and erosion control measures.
- Topsoil will be returned to its original depth over the area.
- Depending of the end-land use, to be decided upon by the land owner at the time, the area will be revegetated with natural occurring vegetation.

### **3 Environmental Objectives and specific goals for socio-economic conditions**

The proposed borrow pit is not a commercial borrow pit and all the material that is excavated from it will be used for the upgrading of the N6. There is thus no Social and Labour Plan.

### **4 Environmental Objectives and specific goals for historical and cultural conditions**

The following are the environmental objectives and goals for the historical and cultural aspects:

- Ensure that the right procedures are in place to implement in the event that a grave is uncovered or an artefact of cultural or historical significance are found on site during the mining activity.

### **5 Implementation Programme**

A description of the appropriate technical and management options chosen for each environmental impact, socio-economic condition and historical and cultural aspects for each phase of the mining operation is to follow:

Impact/socio-economic condition/historical and cultural aspect	Objective(s)	Management measures	Operational phase
Mining is not controlled or contained within the mining area.	To ensure proper control at the mining area by not mining outside the specified area.	<ul style="list-style-type: none"> <li>• The layout plans of the proposed mining area should always be available at the site office for scrutiny during the operational phase.</li> <li>• These plans should indicate the area that is to be mined during operation, all access roads to the borrow pit and all infrastructure on the site.</li> <li>• Should any component of operation change, the change should be indicated on the layout plans. Layout plans will thus be updated regularly.</li> <li>• The mining area will be demarcated at its corners. Where the corner beacons are not visible from one another, beacons will be placed on the boundaries of the mining area.</li> <li>• Mining will not occur outside the mining area as indicated on the layout plans or outside the beacons at its corners or boundaries.</li> </ul>	Management measures will be implemented when contractor is mobilised to borrow pit
Establishing access roads	To ensure that access roads has the minimum	<ul style="list-style-type: none"> <li>• Use existing roads as far as practically possible. If new roads will be constructed, it will be done in</li> </ul>	Management measures will be implemented when contractor is



	<p>amount of negative impact on the environment.</p>	<p>association with, and with consent from, the landowner.</p> <ul style="list-style-type: none"> <li>• New access roads will be constructed in such a way to ensure that: <ul style="list-style-type: none"> <li>– The minimum amount of disturbance to the environment is caused (e.g. vegetation clearance, etc.),</li> <li>– Water courses and steep gradients are avoided if possible,</li> <li>– Storm water management systems (e.g. berms, etc.) are implemented to prevent erosion,</li> </ul> </li> <li>• No new gates or motor grids will be constructed in fence lines without the consent of the landowner,</li> <li>• Vehicles on the borrow pit site will only make use of access roads to gain entrance to the site,</li> <li>• Existing roads will be maintained throughout the mining operation,</li> <li>• The holder of the mining right will be responsible for the maintenance and upgrading of the access road except when the road is used by multiple users. In this case, an agreement will be made between the</li> </ul>	<p>mobilised to borrow pit</p>
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		<p>different users of the road,</p> <ul style="list-style-type: none"> <li>• New access roads will be maintained to minimise dust, erosion or undue surface damage.</li> </ul>	
Rehabilitation of access roads	To ensure that rehabilitation of the roads occur after the mining operation is completed.	<ul style="list-style-type: none"> <li>• If the newly constructed access roads will not be used by the landowner, it will be rehabilitated to fit the end land use. Rehabilitation of the roads includes the ripping and re-vegetation of the roads and removing any construction materials that may hamper the growth of vegetation,</li> <li>• Gates or fences, established by the permit holder of the mine that will not be used by the landowner will be rehabilitated and restored to the pre-mining situation.</li> </ul>	When mining has ceased.
Pollution caused by toilet facility, waste water and refuse disposal	To prevent pollution and maintain hygiene	<ul style="list-style-type: none"> <li>• Toilet facilities will be placed on the borrow pit site for the use by employees if the borrow pit is in operation,</li> <li>• The toilet facilities will be emptied or replaced on a regular basis,</li> <li>• Toilet facilities shall be properly secured to ensure that they are not blown over by strong winds,</li> <li>• There will not be a site camp at the borrow pit.</li> </ul>	When workers are mobilised to borrow pit

		<p>Therefore, there will not be any other effluent other than the sewage from the toilets,</p> <ul style="list-style-type: none"> <li>• All petrochemical spills will be cleaned and managed appropriately to ensure that water or soil contamination does not occur,</li> <li>• Non-biodegradable refuse like glass bottles, plastic bags, metal scrap, etc., shall be stored in a container at a collecting point and collected on a regular basis and disposed of appropriately. No refuse will be dumped in the surrounding fields.</li> </ul>	
Waste disposal	Ensure that waste is managed to prevent pollution and comply with legislation.	<ul style="list-style-type: none"> <li>• Refuse bins or receptacles will be placed on the site for the disposal of waste.</li> <li>• General waste (e.g. paper, glass, etc.) will not be disposed of with any hazardous waste (i.e. any product containing traces of oil or other petrochemical product). Hazardous waste will be disposed of at licensed facilities and general waste at the local landfill site,</li> <li>• All spills will be cleaned immediately by removing the spillage with the polluted soil and by disposing of it at a recognised facility.</li> </ul>	When workers are mobilised to borrow pit.

Visual	To minimise the negative visual impact caused by the mining.	<ul style="list-style-type: none"> <li>Once mining of the borrow pit has ended, rehabilitation should start immediately,</li> <li>Berms should be placed at the side of the road to obscure the mining activities from the travelling public, if possible,</li> <li>Material should be stockpiled in single stockpiles from where it will be moved to the site of work,</li> <li>Unused material will be used to fill the borrow pit and to level it to ensure that the borrow pit blends back into the existing landscape. No stockpiled material will be retained on the site,</li> <li>Topsoil that was stockpiled will be spread out over the entire site and it will be vegetated to ensure the re-growth of vegetation.</li> </ul>	When contractor is mobilised to site.
Noise	<ul style="list-style-type: none"> <li>Minimise the noise from contractors' vehicle movement on site,</li> <li>Minimise potential health impacts on site personnel and</li> </ul>	<ul style="list-style-type: none"> <li>Noise levels shall be kept to a minimum where work takes place in close proximity to residential areas,</li> <li>Working hours shall be limited to weekdays 6:00am – 18:00pm and 08:00am – 16:00pm on Saturdays. I&amp;AP's will be notified when working will occur over extended hours,</li> <li>Vehicles will only be allowed to travel at a speed of</li> </ul>	When personnel are mobilised to borrow pit.

	contractors exposed to noise from construction activities.	<p>50km/h or less,</p> <ul style="list-style-type: none"> <li>• Vehicles will be serviced regularly and maintained throughout to ensure that silencers are in a good working condition,</li> <li>• Safety sirens on construction vehicles and machinery will not be removed from the vehicles,</li> <li>• The relevant authorities (e.g. traffic department) and I&amp;AP and adjacent landowners will be notified well in advance when blasting, or any other activity will occur that might cause high noise levels,</li> <li>• All personnel on site will be required to wear safety equipment with respect to hearing protection.</li> </ul>	
Air quality	Minimise dust emissions from construction mining vehicles and machinery and also from the movement of vehicles on site.	<ul style="list-style-type: none"> <li>• Water spraying systems will be implemented to suppress dust, especially in windy conditions,</li> <li>• Gravel roads will also be sprayed with water to suppress the release of dust from them,</li> <li>• Vegetation stripping will only occur where it is necessary,</li> <li>• Dust levels will be monitored at the borrow pit.</li> <li>• All vehicles will be regularly serviced to prevent unnecessary release of smoke and other exhaust</li> </ul>	When contractors are mobilised to the borrow pit.

		gases.	
Water quality	To prevent contamination of surface and groundwater from the mining.	<ul style="list-style-type: none"> <li>• Storm water management systems will be implemented to direct clean storm water around the mining site,</li> <li>• Care will be taken when handling pollutants,</li> <li>• Spills of potentially hazardous substances will be cleaned immediately and the polluted soil will be removed and disposed of appropriately,</li> <li>• Mining activities will not intersect the water table. Should this happen, DWA will be contacted and the incident reported in the prescribed manner,</li> <li>• No major maintenance work will be done to vehicles or machinery on site. If small repair work has to be done on site, a drip tray will be used to prevent contamination of water.</li> </ul>	When contractors are mobilised to the borrow pit.
Fauna and Flora	To ensure the minimisation of the environmental impact on the fauna and flora at the borrow pit.	<ul style="list-style-type: none"> <li>• Vegetation will only be cleared in areas where the mining activity will occur,</li> <li>• The areas that will not be mined will be re-vegetated, if vegetation has been impacted,</li> <li>• Alien vegetation will be removed before they seed,</li> <li>• Only indigenous and endemic species that naturally</li> </ul>	When contractors are mobilised to the borrow pit.

		<p>occur in this bioregion will be planted during rehabilitation,</p> <ul style="list-style-type: none"> <li>• No animals will be killed or harassed on the site or in the surrounding environment.</li> </ul>	
Geology and soil	Prevent the loss of topsoil.	<ul style="list-style-type: none"> <li>• Topsoil will be removed from the mining areas and it will be stockpiled in piles no greater than 2m in height,</li> <li>• Topsoil will be mixed with vegetation that has been removed to maintain its fertility,</li> <li>• Stockpiles will be kept clear of weed and will not be compacted,</li> <li>• Contamination of the soil will not be allowed to occur. If spillage should occur, the spilled product will be removed with the polluted soil.</li> </ul>	When contractors are mobilised to the site.
Sensitive landscapes (i.e. wetland area west of the site)	Prevent pollution to any sensitive landscapes in close proximity to the borrow pit.	<ul style="list-style-type: none"> <li>• Any spill of potentially hazardous substances will be cleaned immediately and the spill and polluted soil will be disposed of at a licensed facility,</li> <li>• General waste will be removed from the borrow pit regularly to ensure that the waste is not blown to the wetland,</li> <li>• Employees will be made aware of the importance of</li> </ul>	When contractors are mobilised to the site.

		<p>good housekeeping and will receive general environmental awareness training</p> <ul style="list-style-type: none"> <li>• Employees at the borrow pit is prohibited from entering any part of the wetland,</li> <li>• Boundaries of the wetland will be indicated on locality maps and site plans,</li> <li>• No water or any other resources will be used from the wetland.</li> </ul>	
Change in land use	To ensure that the mining area is rehabilitated to fit the end land use.	<ul style="list-style-type: none"> <li>• The dumping of any waste in the borrow pit is prohibited. If the borrow pit is to be used for a dumping site, the necessary authorisation should be applied for with the relevant departments,</li> <li>• The borrow pit will be sloped in such a way to blend in with the surrounding environment. It will then be covered with topsoil and re-vegetated to be used for grazing of animals,</li> <li>• The areas surrounding the mining area that is not included in the layout plans as part of the borrow pit, will not be disturbed in any way.</li> </ul>	When contractors are mobilised to the site and during rehabilitation.
Safety and security of employees and adjacent	Ensure that security measures are in place at	<ul style="list-style-type: none"> <li>• Set adequate security measures (i.e. controlled entry to the site) at the mining area to protect</li> </ul>	When contractors are mobilised to the borrow pit.



landowners	the borrow pit.	<p>workers against robberies and vandalism,</p> <ul style="list-style-type: none"> <li>• Loitering of “truckers” and other people around the mining area will be prohibited,</li> <li>• Employees at the borrow pit will not be allowed to wander into adjacent land.</li> </ul>	
Cultural or Archaeological site	Ensure that proper procedures are in place if an archaeological artefact or grave be uncovered during the mining of the mining area.	<ul style="list-style-type: none"> <li>• If an artefact on-site is uncovered, work in the immediate vicinity shall be stopped immediately. The contractor shall take reasonable precautions to prevent any person from removing or damaging any such article,</li> <li>• The South-African Heritage Resource Agency (SAHRA) if an artefact or grave are found, to appoint an archaeological/heritage resources consultant to record the site and excavate if necessary.</li> </ul>	When contractors are mobilised to the borrow pit.
Topography	To minimise the environmental impact to the topography of the mining area.	<ul style="list-style-type: none"> <li>• Unused material will be levelled inside the borrow pit to blend in with the surrounding environment,</li> <li>• Ensure that the mining area is shaped to be free draining.</li> </ul>	When contractors are mobilised to the borrow pit.
Socio-economic	<ul style="list-style-type: none"> <li>• Ensure that waste generated at the</li> </ul>	<ul style="list-style-type: none"> <li>• Waste management systems will be implemented to ensure that waste is removed from the site and</li> </ul>	When personnel are mobilised to the site.

	<p>mining area is managed,</p> <ul style="list-style-type: none"> <li>• Encourage the transfer of the contractors skills to the local community,</li> <li>• Make use of local service providers and companies for construction and mining.</li> </ul>	<p>managed appropriately,</p> <ul style="list-style-type: none"> <li>• Daily housekeeping will be done to ensure the site and the surrounding site is clean,</li> <li>• The contractor will use labourers from the local community and local services will also be used during the mining process as far as practically possible.</li> </ul>	
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## 6 Proposed time frames for activities

The following time frames will apply once the contractor is on site:

Action and action plans	Time
Vegetation stripping	2 days
Topsoil stripping	2 days
Stockpiling of topsoil and vegetation	2 days
Material excavation	Approximately 30 months
Material stockpiling	
Transporting material to construction site	
Levelling the borrow pit with extra material	2 weeks
Shaping of borrow pit to make it free draining	
Stormwater management and erosion control	
Covering the surface with topsoil and vegetative material	3 days
Vegetation establishment	2 days
Dust suppression	Throughout
Inspections	1 day
Audits	1 day per audit
Awareness training	1 day
Emergency training	1 day
Closure finalisation	3 months

## 7 Environmental emergencies and remediation

The Environmental Emergency Plan will consist of the following environmental preventative, emergency and remediation procedures:

### 5.1 Chemicals

- a. No chemicals, including petrochemical products and paints, will be stored at the borrow pit permanently to prevent any pollution or contamination to the soil or groundwater.

- b. Vehicles and machinery will not be stored, serviced or repaired on site. Should emergency repairs be done on site, drip trays will be used to prevent any spillage of hazardous substances to the environment. The substance contained in the drip tray will be removed from the site after the reparation is completed.
- c. Should any spill of potentially hazardous substance occur on site, the spill will be cleaned by using the spill cleaning kit that will be stationed on site for the duration of the project, and the polluted soil will be removed. Both will be disposed of at a licensed facility.
- d. All used oils, grease or hydraulic fluids, paints, thinners etc. that cannot be re-used shall be placed in a hazardous waste container for disposal at a suitable waste disposal facility.

## **5.2 Fire**

- a. Open fires are prohibited at the borrow pit or in the surrounding environment,
- b. Food will not be cooked at the borrow pit,
- c. At least one fire extinguisher shall be provided on site for the duration of the project and staff shall be trained in the use thereof.
- d. The contractor will have the number of the local fire department on site at all times. Should a fire occur on the site, employees will evacuate the site, trained staff will attempt to contain or kill the fire if possible, the fire department will be contacted and adjacent landowners should be notified.

## **5.3 Excessive rain and floods (stormwater emergencies)**

- a. Specific roads will be used inside the borrow pit to prevent compaction of the whole borrow pit and improve water infiltration;
- b. Vegetation will not be removed unnecessarily to prevent runoff and erosion;
- c. Stormwater management measures will be implemented to divert clean stormwater around the site and to prevent it from entering the borrow pit.

## **5.4 Illegal dumping and waste disposal**

- Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., shall be disposed and stored in suitable containers and collected on a regular basis and disposed off at

an authorized waste disposal facility in the region. Specific precautions shall be taken to prevent refuse from being dumped on or in the vicinity of the site.

- Suitable covered receptacles shall be available at all times and conveniently placed for the disposal of waste for general and hazardous waste.
- Any condemned carcasses shall be managed in terms of the Meat Safety Act, 2000 (Act 40 of 2000), be disposed of safely and in such manner not to cause any odour or health risk.
- Any spillage of effluent or blood will be cleaned immediately.
- Temporary chemical toilet facilities shall be made available on site.
- Sewage from these toilets shall be managed according to best practice and not be disposed of on site or the surrounding environment.

## **8 Monitoring and Performance Assessment**

The borrow pit shall be inspected by the contractor and ECO on a regular basis to ensure compliance to the EMPr and other relevant regulations, requirements and best practices. Audits shall be done once in 3 months by an independent auditor and the audit report shall be available on site at all times.

### **8.1 Inspections and Monitoring**

- 8.1.1 The appointed contractor shall ensure compliance to the conditions set out in the EMPr.
- 8.1.2 Points of compliance will be identified with regard to various impacts that the operation might have on the environment and monitoring requirements for each point will be followed as determined before operation.
- 8.1.3 The site will be inspected by the ECO on a weekly basis.
  - Visual inspections shall be carried out on a weekly basis.
- 8.1.4 Standard procedures for dealing with non-compliance as indicated by monitoring results

### **8.2 Action Plan implementation and monitoring**

An independent auditor will be appointed to monitor the implementation of action plans.

### **8.3 Compliance and performance reporting**

- An independent auditor shall be appointed by the engineer to audit the contractor on a quarterly basis to ensure compliance to the EMP.
- Layout plans will be updated on a regular basis in consultation with the Regional Manager and updated copies will be submitted to the Regional Manager on a six monthly basis.
- Layout plans will be updated whenever changes take place.
- Compile a legal register that will be submitted to the Regional Manager on a regular basis and as decided by the manager.
- Any emergency or unforeseen impacts will be reported as soon as possible to the engineer on site.

## **9 Financial Provision**

SANRAL will make provision for the rehabilitation of land disturbed by mining associated with the proposed borrow pit. The amount to be provided by SANRAL will be disclosed in the final Scoping and EMP.

## **10 Environmental Awareness Plan (EAP)**

- 10.1 The contractor will inform employees of any environmental risk which may result from their work by compiling a risk assessment and discussing this at some of the weekly safety meetings.
- 10.2 An EAP will be compiled that describes how potential environmental pollution and degradation can be avoided by dealing with potential environmental risk. This EAP will be provided on site and discussed with employees at some of the weekly safety meetings.
- 10.3 General environmental awareness training and emergency training shall be done during the weekly safety meeting to ensure that all environmental control measures, monitoring and closure are adhered to and that all employees are informed of environmental procedures, especially waste disposal, fire prevention, etc.

An ECO shall be appointed to monitor the performance of the contractor with regard to compliance to the EMP.

A copy of the EMP will always be available on site.

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# APPENDIX: **A**

## Company Profile and CV's





environmental specialists

21 Dromedaris Street, Dan Pienaar, Bloemfontein 9301  
Suite 158, Private Bag X01, Brandhof, 9324  
Tel: +27(0)51-444 4700  
Faks: +27(0)866976132  
E- pos: hanri@h2on.co.za

## Company Profile

### General information:

<b>Postal Address:</b>	Suite 158, Private Bag X01, BRANDHOF, 9324
<b>Physical Address:</b>	21 Dromedaris Street, Dan Pienaar, BLOEMFONTEIN
<b>Telephone:</b>	+27(0)51-444 4700
<b>Fax No:</b>	+27(0)866976132
<b>E-mail:</b>	hanri@h2on.co.za
<b>Company Reg No:</b>	2002/058636/23
<b>VAT No:</b>	4020225811

### Background

H2ON is a Bloemfontein based company with extended expertise in specific environmental fields but also in the coordination of larger environmental management projects that involve outside contracted expertise for specialist investigations.

We provide our clients with a professional service and cost effective solutions to their environmental problems to conduct their activities, development or explore natural resources like minerals, surface and ground water, without negatively impacting on the environment.

H2ON endeavours to provide a high quality service and prompt completion of deliverables.

### Fields of Expertise:

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Mining authorization application</li><li>• Environmental impact assessments</li><li>• Solid waste management</li><li>• Environmental auditing</li><li>• ISO14001 implementation and auditing</li><li>• Water use licence applications</li><li>• Public consultation processes</li><li>• Water Quality Assessments</li><li>• Development and management of ground- and surface water monitoring programs</li></ul> | <ul style="list-style-type: none"><li>• Biomonitoring</li><li>• Pollution control</li><li>• Geological and geohydrological investigations</li><li>• Heritage Impact Assessments</li><li>• Botanical Surveys</li><li>• Soil Surveys</li><li>• Rehabilitation</li></ul> |
|---|---|

## Professional Team:

Name	Qualification	Specialist field
Gys Hoon	1988 - B.Sc, Geochemistry and Geology 1989 - B.Sc Honors in Geohydrology  Professional Standing: <ul style="list-style-type: none"> <li>Registered as a professional scientist: Pr.Sci.Nat 4 00004/93</li> <li>SAATCA Registered ISO 14001 environmental management systems auditor: E061</li> </ul>	Mining authorization applications ISO 14001:2004, audits, training and implementation Water use right applications Environmental Impact Assessments Groundwater investigations Environmental audits Water quality investigations Catchment management Development of environmental monitoring systems Environmental risk assessments Waste Management Application for mining authorization, water use authorizations and waste disposal permits
Hanri van Jaarsveld	2005 - B.Sc, Biochemistry, Microbiology and Zoology 2006 - B.Sc Honors in Zoology (Best Honors Zoology student) 2009 - Busy with the degree Masters in Environmental Management at UFS	Mining authorization applications Water use right applications Environmental training Environmental Impact Assessments Environmental Management Reports Mammal assessments Ecology
Hanlie Groenewald	2005 - B.Sc, Zoology 2006 - B.Sc Honors in Zoology 2007 - Busy with Masters degree in Aquatic Parasitology at UFS	Environmental Impact Assessments Environmental Management Reports Ecology Water use right applications Environmental awareness training
Louis de Villiers	2011- B.Sc Environmental Geography, UFS	GIS Environmental Impact Assessments Environmental Management Reports

## CV's of project team

### Curriculum Vitae: Gysbert Johannes Hoon

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Nationality : South Africa  
Profession : Scientist  
Specialization : Environmental Management, Geologist/Geohydrologist  
Date of birth : 06 October 1964  
ID-Number : 641006 5128 089

#### QUALIFICATION:

##### UNIVERSITY OF THE FREE STATE

**1988:** B.Sc. Geochemistry and Geology

**1989:** B.Sc. Honours in Geohydrology (Institute for Ground Water Studies)

#### PROFESSIONAL STANDING

Registered as a professional scientist at South African Council for Natural Scientific Professions:  
Pr.Sci.Nat. (400004/93)

SAATCA Registered environmental management systems auditor: E061

#### PROFESSIONAL SOCIETY AFFILIATION:

Member of the Institute of Waste Management (South Africa) (IWM)

Member of the International Association of Impact Assessors (IAIA)

#### EXPERIENCE

##### 1989 to 1993: Geologist on a gold mine in the Free State Gold Fields:

- Geological exploration
- Underground mapping and interpretation of geological structures
- Ore evaluation
- Interpreting the impact of mining activities on the groundwater quality and levels with specific reference to after closure impacts.

##### 1993 to 2004: Assistant Director Water Quality Management, Department of Water Affairs and Forestry, Free State Region:

- Member of the management committee of the Free State branch for the Institute of Waste Management
- Evaluation for approval of environmental impact assessments for various projects ranging from mining operation to new developments.
- Member of the project team for the development of the Minimum Guidelines for Waste Management.
- Managing bio- and chemical monitoring programs and develop resource water quality objectives to support catchment management plans.
- Manage the processing of water use permits/exemptions/licenses.

- Member of the Project Management Committee to develop a policy and strategy for the remediation of contaminated land.
- Member of a project team to evaluate the impact of small-scale miners in the Free State and to develop procedures to assist them to conduct their operation in an environmentally friendly manner but also to ensure legal compliance.
- Project coordinator for the development of a Catchment Management Strategy for the Schoon- and Koekemoerspruit Catchment.
- Project coordinator for the development of a Catchment Management Strategy for the Modder- and Riet river catchment.
- Develop and lectured (part time) for a solid waste management course for B Tech engineering students at the Central University of Technology.
- Project manager of a project to audit all solid waste facilities in the Free State trying to identify sights with significant environmental impacts, non-compliance and prioritizing those facilities that need urgent attention.

#### **2005 to present: Director H2ON Environmental Specialists**

Relevant projects:

- Integrated water use license applications
- Integrated water and waste management plans
- Verification of existing lawful water uses
- Groundwater investigations
- Waste license applications
- ISO14001 EMS audits
- Environmental Compliance Audits
- Environmental Risk Assessments
- Mining authorizations
- Environmental Impact Assessments
- Environmental Management Programs
- Oversee the processing of water use license applications on contract for Department of Water Affairs: Free State Region



## Curriculum Vitae Hanri van Jaarsveld

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Nationality : South Africa  
Profession : Scientist  
Specialization : Environmental Management, Zoology  
Date of birth : 01 December 1983  
ID-Number : 831201 0027 085

### QUALIFICATION:

#### UNIVERSITY OF THE FREE STATE

**2005:** B.Sc. Microbiology and Zoology

**2006:** B.Sc. Honours in Zoology

**2012:** MOB in Environmental Management

### SCIENTIFIC PUBLICATIONS

Publication of abstract titled, '*Die effek van uraanmyne op kleinsoogdierpopulasies*', in the South African Journal of Science and Technology (March 2007)

### CONFERENCES, SYMPOSIA, WORKSHOPS AND COURSES

**Presentation:** Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns (SAAWK) Student symposium (2006): '*Die effek van uraanmyne op kleinsoogdierpopulasies*'

### EXPERIENCE

**2005:** Practical Demonstrator for first- year Zoology and Entomology students at the University of the Free State  
**2006:** Practical Demonstrator for third year Zoology students at the University of the Free State  
Laboratory assistant  
**2007 – 2008:** Clean Stream Environmental Services, Environmental Scientist  
**June 2008 – present:** H2ON Environmental Specialists, Environmental Practitioner

### FIELD OF EXPERTISE

Water use license applications  
Integrated water and waste management plans  
Waste license applications  
Environmental training  
Environmental Impact Assessments  
Environmental Management Reports  
Environmental Management Frameworks  
Environmental Risk Assessments  
Environmental Compliance Audits  
Ecology  
Project Management

## Curriculum Vitae Louis de Villiers

---

Nationality : South Africa  
Profession : Scientist  
Specialization : Environmental Management, Soil Science and GIS  
Date of birth : 22 December 1983  
ID-Number : 831222 5030 080

### QUALIFICATION:

#### UNIVERSITY OF THE FREE STATE

**2010:** B.Sc. Environmental Geography

### EXPERIENCE

**2009:** Practical demonstrator at the UFS (Geography Department): Second Year Geographic Information Systems Students

**2010:** Practical demonstrator at the UFS:

- First year Introduction to Chemistry
- Second year Soil Science
- First year Introduction to Geography
- First year Urban Geography
- Second year Geographic Information Systems

**Dec 2010 – Present:** H2ON Environmental Specialists, Environmental Practitioner

### FIELD OF EXPERTISE

Environmental Impact Assessments  
Environmental Management Reports  
Mining authorisations  
Waste license applications  
Environmental Compliance Audits  
Atmospheric Emission License applications  
Data and GIS management



## Curriculum Vitae Hanlie Groenewald

---

Nationality : South Africa  
Profession : Scientist  
Specialization : Environmental Management, Zoology  
Date of birth : 16 January 1983  
ID-Number : 830116 0085 084

### QUALIFICATION:

#### UNIVERSITY OF THE FREE STATE

**2005:** B.Sc. Zoology

**2006:** B.Sc. Honours in Zoology

**Currently:** Busy with M.Sc. in Zoology

### EXPERIENCE

**2005:** Practical demonstrator at the UFS: (First Year Zoology and Entomology Students)

**2006:** Laboratory Assistant at the Zoology and Entomology Department, UFS  
Practical demonstrator: Zoology and Entomology  
Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns (SAAWK) Student symposium: **Presentation:** *Xenopus laevis* as a biological indicator at South African uranium mines

**2007:** Assistant at the Zoology and Entomology Department, UFS  
Lecturing: Zoolog-practicals  
Parasitological Society of Southern Africa (PARSA) Conference: **Presentation:** Trichodinid Ectoparasites on Anuran Larvae

**2008:** Laboratory Assistant at the Zoology and Entomology Department, UFS,  
Lecturing: Zoology

**2009 - Jun 2010:** Laboratory Assistant at the Zoology and Entomology Department, UFS,  
Lecturing: Zoology  
Parasitological Society of Southern Africa (PARSA) Conference: **Presentation:** Mobiline Peritrich Transmission Between Fish and Tadpoles

**Aug 2010 - present:** H2ON Environmental Specialists, Environmental Practitioner

### FIELD OF EXPERTISE

Environmental Impact Assessments  
Environmental Management Reports  
Environmental Management Frameworks  
Water use license applications  
Water and waste management  
Mining authorisations  
Environmental Compliance Audits  
Environmental training  
Public Participation



## Curriculum Vitae Daniël Petrus van Rensburg

---

Nationality : South Africa  
Profession : Ecological Scientist  
Specialization : Ecological processes, Vegetation Ecology, Karoo vegetation, Riparian vegetation & GIS  
Date of birth : 01 August 1986  
ID-Number : 8608015118088

### QUALIFICATION:

#### UNIVERSITY OF THE FREE STATE

**2005:** B.Sc. Botany and Zoology (1)

**2006:** B.Sc. Botany and Zoology (2)

**2007:** B.Sc. Botany and Zoology (3)

**2008:** B.Sc. (Hons) Botany: Phytosociology of the Rolfontein Nature Reserve (Northern Cape Province)

**2012:** M.Sc. in Vegetation Ecology: A Phytosociological Survey of the Groen River and Related Catchment Communities, Upper Karoo Region

#### CONFERENCES, SYMPOSIA, WORKSHOPS AND COURSES

**2008:** Speaker at Kimberley Biodiversity Symposium

**2009:** Speaker at Orange River Symposium, University of the Free State

**2010:** Speaker at Orange River Symposium, University of the Free State

**2011:** Course in the determination of the present ecological state within the ecoclassification process

**2011:** Speaker at Department of Botany Symposium, University of Johannesburg

**2011:** Speaker at Orange River Symposium, University of the Free State

#### EXPERIENCE

**2008:** Took part in arachnological biodiversity survey for SANSA (South African National Survey of Arachnids) in the Prins Albert and Jansenville districts.

**2009:** Ecological specialist report for Uranium extraction plant, Welkom: H2ON Environmental Specialists

**2009:** Took part in survey of the genus *Babiana* in Western Cape Province. Areas surveyed include Scarborough, Velddrif, Langebaan, St. Helena Bay, Elands Bay, Piketberg, Graafwater, Vanrhynsdorp, Clanwilliam, Harolds Bay

**2009:** Assisted with the field data acquisition for the ecological leg of the Integrated Baseline Assessment of the Wetland Catchments/Watersheds: Motete, Sani and Letseng La Letsie, Lesotho.

**2010:** Took part in a phytosociological survey of the Gnamaseri floodplain in the Okavango Panhandle, Botswana

**2010:** Assisted with the acquisition and interpretation of aerial photographs obtained for the compilation of the Free State Biodiversity Plan currently in process



**2010 – 2011:** Environmental Control Officer for National Long Distance optic fibre project in Bloemfontein to Laingsburg area: Enviroworks Environmental Consultants

**2009 – 2012:** Ecological Specialist for MDA Environmental Consultants for various projects

**2011:** Took part in taxonomical survey in the Eastern Cape Province (Port St. Johns, Somerset East, Queenstown, Great Fish River Conservancy, Fort Beaufort, Stutterheim, Keiskammahoek, King Williams Town, Graaff Reinet, Petersburg).

**2012 – present:** Ecological Specialist for H2ON Environmental Specialists

#### **FIELD OF EXPERTISE**

Environmental Impact Assessments  
Environmental management reports  
Ecological assessments  
Biodiversity analysis  
Vegetation assessments  
Riparian vegetation  
Succulent vegetation

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## **Abbreviated CV – Lloyd Rossouw**

### **Education**

University of the Free State, RSA; Ph.D in Plant Sciences (**to be completed 2007**)

University of the Witwatersrand, Bernard Price Institute for Palaeontology, RSA;  
M.Sc. (cum laude) in Quaternary Palaeontology (**2001**).

University of Stellenbosch, RSA; BA Honours in Archaeology (**1991**).

### **Appointments**

**Museum Scientist 2000 – Present.**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

**Research Officer 1998 - 1999**

Palaeo-anthropological Research Group, University of the Witwatersrand,

**Curator, Florisbad Quaternary Research Station 1996 –1998**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

**Research Assistant 1994 –1996**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

### **Papers presented at conferences**

**INQUA** 17th International Meeting on Quaternary Research, **Cairns, Australië**, Julie 2007.

**SPR** 6<sup>th</sup> Biennial Meeting of the Society for Phytolith Research, **Barcelona, Spain**, September 2006.

**SASQUA** Biennial Conference, UFS **Bloemfontein**, April 2005 (co-organiser of the meeting).

**SA3** Southern African Association of Archaeologists Biennial Conference, **Kimberley**, April 2004.

**SASQUA** Biennial Conference, Wits **Johannesburg**, April 2003.

**Palaeontological Society of Southern Africa** Biennial Conference, **Bloemfontein**, October 2002 (co-organiser of the meeting).

**SA3** Southern African Association of Archaeologists Biennial Conference, **Cape Town**, July 2002.

**Palaeo-Grassland Research** Biennial Conference, **St. Cloud, Minnesota USA**, June 2002.

**Palaeontological Society of Southern Africa** Biennial Conference, Pretoria, September, 2000.

## **Abbreviated CV – Lloyd Rossouw**

### **Education**

University of the Free State, RSA; Ph.D in Plant Sciences (**to be completed 2007**)

University of the Witwatersrand, Bernard Price Institute for Palaeontology, RSA;  
M.Sc. (cum laude) in Quaternary Palaeontology (**2001**).

University of Stellenbosch, RSA; BA Honours in Archaeology (**1991**).

### **Appointments**

**Museum Scientist 2000 – Present.**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

**Research Officer 1998 - 1999**

Palaeo-anthropological Research Group, University of the Witwatersrand,

**Curator, Florisbad Quaternary Research Station 1996 –1998**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

**Research Assistant 1994 –1996**

National Museum Bloemfontein, Department Florisbad Quaternary Research,

### **Papers presented at conferences**

**INQUA** 17th International Meeting on Quaternary Research, **Cairns, Australië**, Julie 2007.

**SPR** 6<sup>th</sup> Biennial Meeting of the Society for Phytolith Research, **Barcelona, Spain**, September 2006.

**SASQUA** Biennial Conference, UFS **Bloemfontein**, April 2005 (co-organiser of the meeting).

**SA3** Southern African Association of Archaeologists Biennial Conference, **Kimberley**, April 2004.

**SASQUA** Biennial Conference, Wits **Johannesburg**, April 2003.

**Palaeontological Society of Southern Africa** Biennial Conference, **Bloemfontein**, October 2002 (co-organiser of the meeting).

**SA3** Southern African Association of Archaeologists Biennial Conference, **Cape Town**, July 2002.

**Palaeo-Grassland Research** Biennial Conference, **St. Cloud, Minnesota USA**, June 2002.

**Palaeontological Society of Southern Africa** Biennial Conference, Pretoria, September, 2000.

**Palaeontological Society of Southern Africa** Biennial Conference, **Stellenbosch**, September 1996.

10th **Pan African** Congress for Prehistory & Related Studies, **Harare**, June 1995

**SASQUA** Biennial Conference, **Cape Town**, May 1995.

## **Publications**

Rossouw, L. & Scott, L. (submitted for review April 2007). Pollen and Grass Phytoliths: microscopic plant remains in Pliocene volcanic sediments around Laetoli, Tanzania. In: T. Harrison (ed). *Palaeontology and geology of Laetoli, Tanzania: Human Evolution in Context*. Springer. New York.

D. Codron, D., Brink, J.S., Rossouw, L., Clauss, M., Codron, J., Lee-Thorp, J.A. and M. Sponheimer, M. (in press). Functional differentiation of African grazing ruminants: an example of specialized adaptations to very small changes in diet. *Biological Journal of the Linnean Society*.

Rossouw, L. 2006. Florisian mammal fossils from erosional gullies along the Modder River at Mitasrust farm, central Free State, South Africa. *Navorsinge van die Nasionale Museum* 22(6): 145-162.

Henderson, Z.L., Scott, L. Rossouw, L. & Jacobs, Z. 2006. The dating, palaeoenvironments and archaeology of the Sunnyside 1 site, Clarens, South Africa. In: T. Rocek (ed.). *Intergrading the diversity of 21<sup>st</sup> century anthropology: the life and intellectual legacies of Susan Kent*. Archeological Papers of the American Anthropological Association Vol. 16 No. 1, pp. 139-149. (doi:10.1525/ap3a.2006.16.1.139)

Scott, L. & Rossouw, L. 2005. Reassessment of botanical evidence for palaeoenvironments at Florisbad, South Africa. *South African Archaeological Bulletin* 60 (182): 96 – 102..

Grab, S., Scott, L. Rossouw, L. & Meyer S. 2005. Holocene palaeoenvironments inferred from a sedimentary sequence in the Tsoaing River Basin, western Lesotho. *Catena* 61: 49 – 62. (doi: 10.1016/j.catena.2005.01.002)

Brink, J.S. & Rossouw, L. 2000. New trial excavations at the Cornelia-Uitzoek type locality. *Navorsinge van die Nasionale Museum* 16(6): 141 – 156.

Churchill, S.E., Brink, J.S., Berger, L.R. Hutchison, R.A., Rossouw L., *et al.* 2000. Erfkroon: a new Florisian fossil locality from fluvial contexts in the western Free State, South Africa. *South African Journal of Science*. 96: 161 – 163.

## **Published Abstracts**

Brink, J.S., Grun, R., Rossouw, L. and Codron, D. 2007. Mid-Quaternary large mammal succession and extinction in southern Africa. *Quaternary International* 167 – 168 (3-486)

Backwell, L.R., Steininger, C.M, Brink, J., Neveling, J., Rossouw, L. & Pereira, L. 2007. Large mammal mass death accumulation in the Holocene of South Africa. PSSA, Grahamstown, South Africa. *Palaeontologia Africana*. 42: 118.



Rossouw, L and Scott, L. 2006. Ecological significance of South African short-cell phytoliths. 6<sup>th</sup> Biennial Meeting of the Society for Phytolith Research in Barcelona, Spain, September 2006. *Society for Phytolith Research Bulletin 1 (1): 14.*

## **Research Reports**

Rossouw, L. 2003. Identification of faunal remains found with KOF 30, Whitworth Dump, De Beers Mine, Koffiefontein. *Unpublished Report for the Dept. of Archaeology, , National Museum Bloemfontein.*

Rossouw, L. 2000. New Late Pleistocene/Holocene fossil vertebrate localities and Stone Age surface sites along the Riet River around Koffiefontein, Free State. *Unpublished Report for the Palaeo-Anthropological Research Group, University of the Witwatersrand*

Rossouw, L. 2000. Preliminary species list of Late Pleistocene / Holocene fossil vertebrate remains from erosional gullies along the Modder River NE of Sannaspos, Free State. *Unpublished Report for the Palaeo-Anthropological Research Group, University of the Witwatersrand.*

Rossouw, L. 1999. Vertebrate fossils identified from Late Pleistocene calcrete horizons at the Brakspruit, Venterspruit and Welgerus Dongas, Free State. *Unpublished Report for the Palaeo-Anthropological Research Group, University of the Witwatersrand.*

Rossouw, L. 1999. Gladysvale Outside excavations: preliminary faunal species list. *Unpublished Report for the Palaeo-Anthropological Research Group, University of the Witwatersrand.*

## **Professional Impact Assessment Reports**

Rossouw, L. 2007. Phase 1 Archaeological Impact Assessment of a 4000 m<sup>2</sup>, portion of land demarcated for development by Coca Cola in Bloemfontein.

Rossouw, L. 2007. Preliminary assessment of potential archaeological impact for the farms Rosmincol 442 JP in the district of Koster, Northwest Province.

Rossouw, L. 2007. Phase 1 AIA and PIA of 30 gravel quarries on the R354 between Calvinia and Sutherland, Northern Cape Province.

Rossouw, L. 2007. Phase 1 AIA and PIA of a portion of the farm Kromellenboog 320 near Christiana, Northwest Province.

Rossouw, L. 2006. Phase 1 Archaeological Impact Assessment of an area proposed for the extension of a slate quarry on portion 19 of the farm Broekmansfontein 294 JP, Groot Marico district, Northwest Province. .

Rossouw, L. 2006. Phase 1 Archaeological Impact Assessment of an old diamond digging on the farm Droogpan 178, Ventersdorp district, Northwest Province. .

Henderson, Z & Rossouw, L. 2006. Assessment of proposed Eskom lines ZM1, ZM3, ZP2, ZP3 and ZP4 in terms of archaeological, palaeontological and other heritage sites.

Rossouw, L. 2006. Phase 1 Archaeological Impact Assessment of a section of road to be constructed between the Metsimatshe Dam in the FS and the Rugged Glen Nature Reserve in KZN.

Rossouw, L. 2006. Phase 1 Archaeological Impact Assessment of a water pipeline pumping system from Armenia Dam, near Thaba Phatshwa to Tweespruit, Excelsior district.

Rossouw, L. 2006. Phase 1 Archaeological Impact Assessment of a certain portion of the remaining extent and portion 1 on the farm Ruby 691, Kroonstad district, Free State Province.

Rossouw, L. 2006. A preliminary evaluation of archaeological and palaeontological impact with regard to the application for prospecting rights on the farms Doornfontein 12, Grasbult 5, Schoolplaats 3, Schoolplaats Annex 4 and Pontdrift 2 in the Warrenton district, Northern Cape region.

Rossouw, L. 2005. Phase 1 Archaeological impact assessment of road construction on the R702/R26, approximately 7 km west of Wepener.

Rossouw, L. 2005. Phase 1 Archaeological Impact Assessment of a 10 km section of road P42/2 to be re-aligned and upgraded between Springfontein and Bethulie, Free State Province.

Rossouw, L. 2005. Phase 1 Archaeological Impact Assessment of an informal Graveyard on the farm Bergendal 1706, Bloemfontein District, Free State Province.

## **Synergistic Activities**

Initiated a plant silica research project using grass phytoliths as palaeo-environmental indicators and building up the first phytolith reference collection in South Africa .

Analysed and assisted in analyzing fossil mammal fauna from several palaeontological / archaeological localities in South Africa.

Served as part-time lecturer on phytolith analysis and large-mammal palaeo-ecology to third-year Botany students at UFS since 2004.

Co-planner of a permanent open-air exhibition at Florisbad Research Station in 2005

Assisted students with faunal identifications during 1996 / 1997 field schools at Florisbad.

Presented regular on-site lectures at Florisbad to members of the public, school groups and students since 1995.

Conducted several fieldwork expeditions to search for new palaeontological and archaeological sites in Botswana and selected parts of South Africa.

Participated in the excavation of 10 different palaeontological / archaeological sites since 1995.

Supervised / co-supervised 6 palaeontological excavations since 1995

Recorded 31 new palaeontological / archaeological open-air localities since 1998.

## **Fieldwork Highlights**

### **Stone Age Archaeology & Palaeontology:**

**Tierfontein, FS October 2007.** Rediscovery and survey of a Pliocene fossil locality on the Vet River

**Erfkroon, Modder River FS, July 2005, April-June 1998 & October-November 1997.** Soil sampling, surveying and excavation of distinct localities exposed in erosional gullies, yielding artefacts characteristic of MSA and LSA, as well as Florisian fossil vertebrates.

**Laetoli, Tanzania, July 2004.** Conduct fieldwork for analytical studies on fossil phytoliths extracted from the Pliocene volcanic beds at Laetoli. Project leader: Terry Harrison, Director, Center for the Study of Human Origins, New York University, U.S.A.)

**Mitasrust, near Maselspoort, FS, August 2003.** Mapping terminal Pleistocene fossil vertebrate localities and MSA surface scatters situated in erosional gullies along the Modder River north of Bloemfontein.

**Dealesville, FS, April 2003.** Sampling for fossil phytoliths at the Baden-Baden archaeological site, FS.

**Braamhoek, KZN, June 2002.** Coring Holocene vlei deposits for pollen and phytolith analytical studies.

**Cornelia, FS, May 2002 & 2000, March 1998 & September 1995.** Extended archaeological excavations into the fossil-bearing deposits of the Cornelia-Uitzoek type locality.

Vaal-Orange River confluence between Warrenton and Douglas NC, August 1999. Palaeontological and archaeological survey of riverbanks and terraces.

**Virginia Railway Cutting, Virginia district, FS, June 1999.** High-resolution theodolite survey of the stratigraphy of the fossil-bearing Plio/Pleistocene river gravels exposed by a railway cutting on the northern bank of the Sand River, Virginia, FS.

**Klip River, MP, May 1999.** Palaeontological survey of extensive erosional gullies near Platrand, Standerton.

**Kromdraai, Sterkfontein Valley, GP, March-April & July 1999.** Analysis of breccia for fossil vertebrate identification.

**Gladysvale Cave, Sterkfontein Valley, GP, March-April & July 1999.** Excavation, plotting and analysis of Late Pleistocene fossil vertebrate remains from the decalcified deposits outside the cave.

**Riet River, Koffiefontein district, FS, February 1999.** Mapping and recording multiple Late Pleistocene/Holocene fossil vertebrate localities and Stone Age surface sites.

**Brakspruit & Venterspruit tributaries, north-eastern FS, January 1999.** Mapping and recording multiple Late Pleistocene/Holocene fossil vertebrate localities and Stone Age surface sites.



**Botswana September 1998 – December 1998.** Mapping and recording of multiple vertebrate fossil localities and Stone Age surface sites and/or material:

Boteti River, between Maun & Tsoe, north-eastern Makgadikgadi

Makowe Pan, northern Makgadikgadi

Ntwetwe Pan, central Makgadikgadi

Sowa Pan & Orapa, central Makgadikgadi

Motloutsi River between Mmadinare & Pontsdrif, Tuli Block

Shashe River, Tuli Block

Molopo River between Metlejane & Tshabong, southern Kalahari

Eastern Kalahari, from Tshabong through Mabuasehube to Maun

**Doring River & Sand River, Virginia district, FS, May – July of 1998, 1997 & 1996.** Palaeontological survey of fluvial deposits and recording of vertebrate fossil localities and Stone Age archaeological surface sites exposed by extensive erosional gullies along the riverbanks.

**Modder River Drainage, Dewetsdorp to Jacobsdal, central FS, May – July of 1998, 1997 & 1996.** Palaeontological survey of fluvial deposits and recording of vertebrate fossil localities and Stone Age archaeological surface sites exposed by extensive erosional gullies along riverbanks.

**Besaansklip, Saldanha Bay, WC, October 1996.** Excavation, plotting, *in situ* preparation, analysis and cataloguing of vertebrate fossil remains from a species-rich, terminal Pleistocene hyaena lair threatened by granite quarry excavations.

**Cango Valley, Oudtshoorn, WC, January 1996.** Mapping and excavation of Late Pleistocene carnivore lairs in the foothills of the Swartberg Mountains.

**Kareepan, Bloemhof, NW, November 1995.** Excavation of Holocene hyaena lairs from the upper Vaal River Gravels.

**Florisbad, FS, October-December 1995.** Excavation of the MSA living floor; *in situ* preparation of fossil remains; recording, plotting and cataloguing stone tools and fossil material.

**Boesmansfontein, Phillipolis, FS, March 1995.** Recording and excavation of eroded Late Pleistocene and historical hyaena lairs.

**Knysna, WC, March 1990.** vibracoring sediment samples in and around Holocene wetlands.

**Bitterputs, NC, March 1989.** Later Stone Age occupation site.

**Klasies River Main Site, EC, Tsitsikamma Coast, January 1989 & April 1992.**

**Historical Archaeology:** Assessment, surveying and excavation of historical sites/buildings.

**Markotter Sports Ground Grave, Stellenbosch, October 1992 - November 1992**

**Bien Donne [Phase 3], Simondium January 1992 - May 1992**



**Zomerlust**, Paarl September 1992

**Keerweder**, Franschhoek February 1992

**Bien Donne [Phase 2]**, Simondium October 1991 - January 1992

**Boekenhoutskloof**, Franschhoek March - April 1991

**Fredericksberg**, Franschhoek . February 1991

**Bien Donne [Phase 1]**, Simondium., December 1990

**17 van Ryneveld Street**, Stellenbosch . December 1989 - February 1990

**First National Bank**, Stellenbosch. December 1989 - February 1990

**Sterhuis**, Grabouw. September 1989

**Rock Art:** Recording and/or rehabilitation of new or damaged sites.

**Traveller's Rest**, Clanwilliam, 1991

**Banghoek**, Piketberg, 1991

**Gifberg (Wiedouw)**, Vanrhynsdorp, 1990/1991

**Kagga Kamma**, Ceres, 1990

## **Current Collaborators**

Dr. Lucinda Backwell, BPI, University of the Witwatersrand.

Dr. James S. Brink, National Museum, Bloemfontein.

Dr. Darryl Codron, University of KZN

Dr. Terry Harrison, Center for the Study of Human Origins, New York University.

Dr. Zoe L. Henderson, National Museum, Bloemfontein

Prof. Louis Scott, Dept. of Plant Sciences, University of the Free State.

Dr. Michael Chazin, University of Toronto.

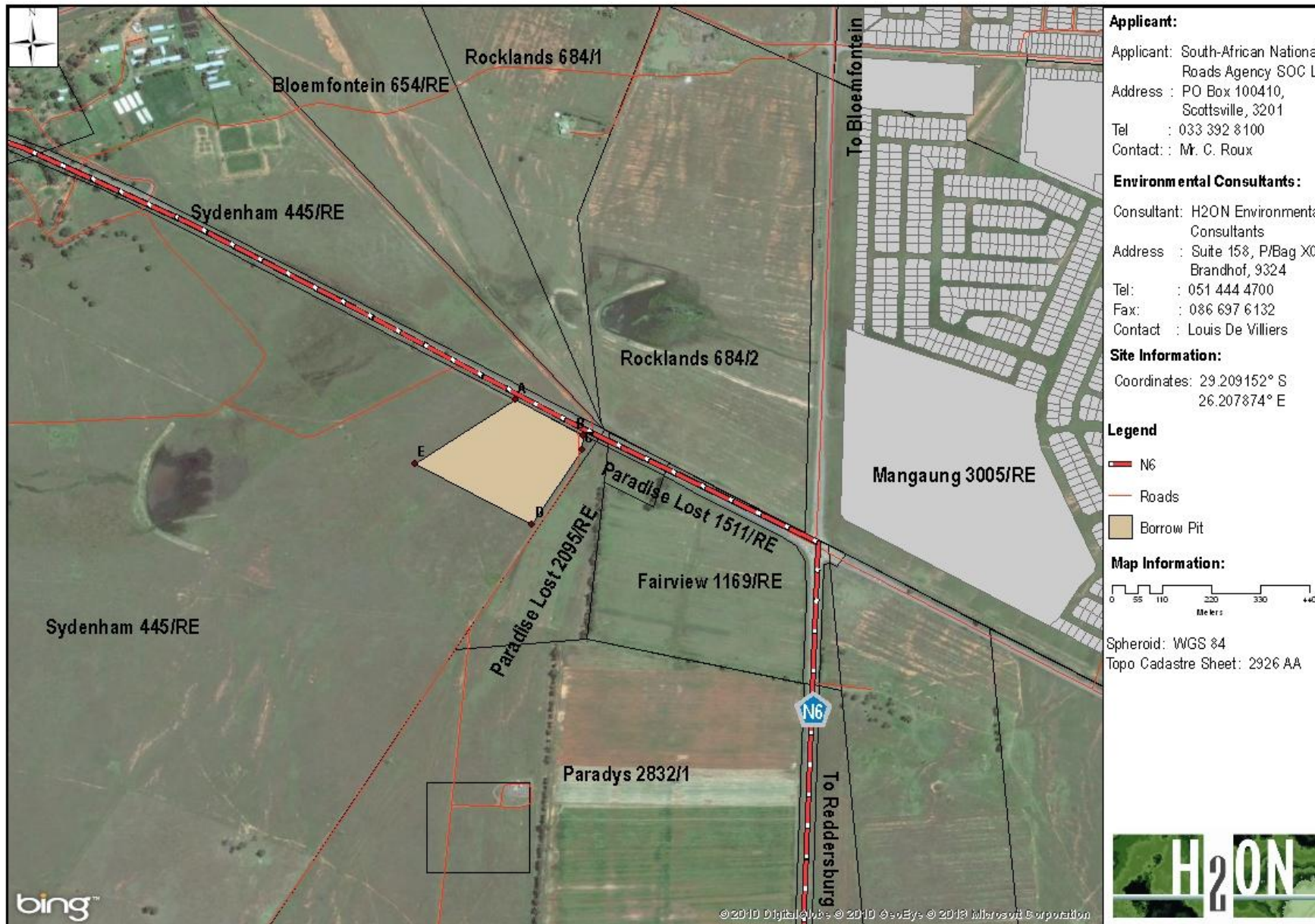




# APPENDIX: **B**

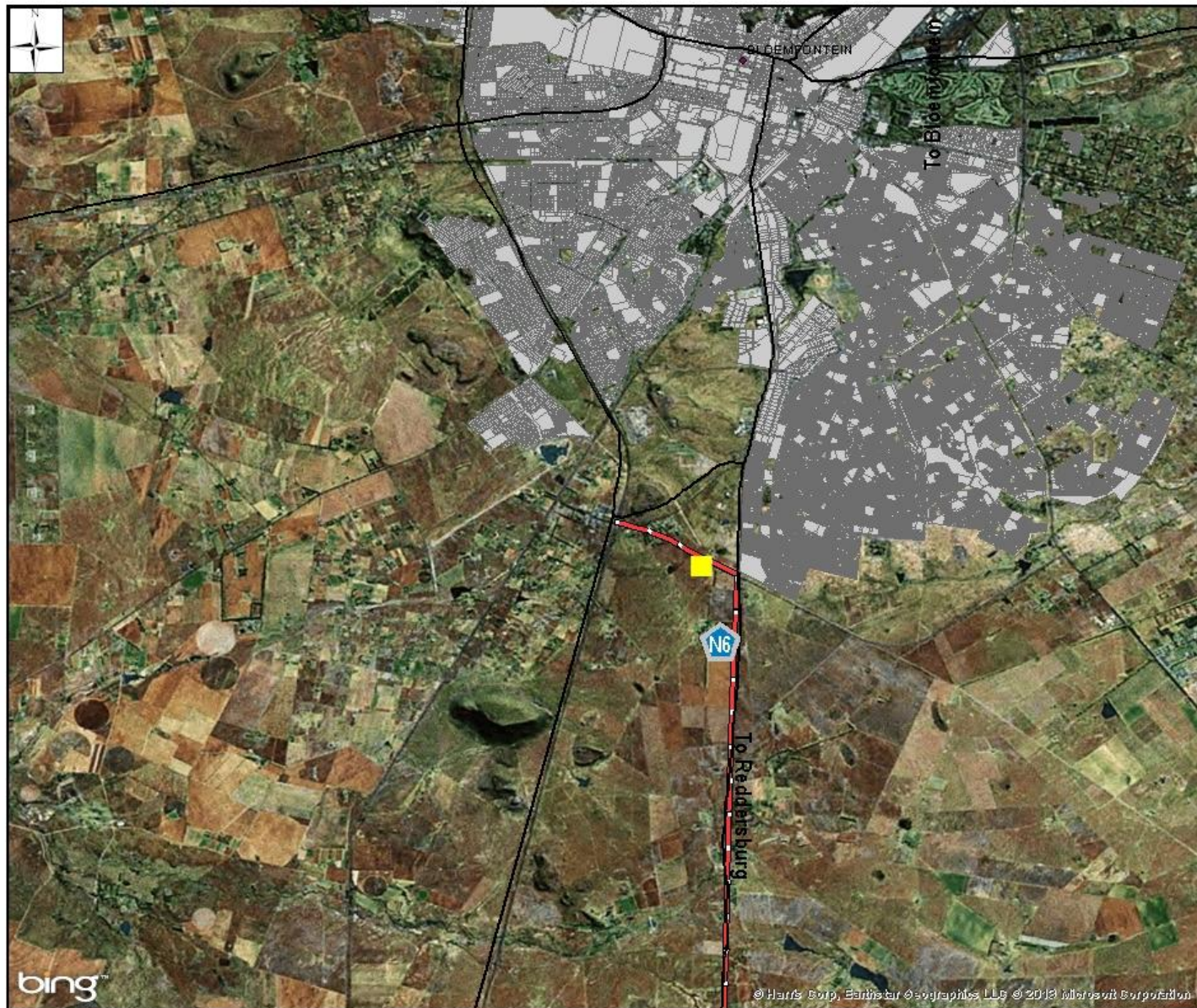
## Locality Maps and Layout Plans

DRAFT



**Map 1: Locality map of the proposed location of the borrow pit on the remainder of the farm Sydenham 445/RE, Bloemfontein**





#### Applicant:

Applicant: South-African National  
Roads Agency SOC Ltd  
Address : PO Box 100410  
Scottsville, 3201  
Tel : 033 392 8100  
Contact : Mr. C. Roux

#### Environmental Consultants:

Consultant: H2ON Environmental  
Consultants  
Address : Suite 158, P/Bag X01,  
Brandhof, 9324  
Tel : 051 444 4700  
Fax : 086 697 6132  
Contact : Louis De Villiers

#### Site Information:

Coordinates: 29.209152° S  
26.207874° E

#### Legend

- BP
- National Roads
- N6

#### Map Information:

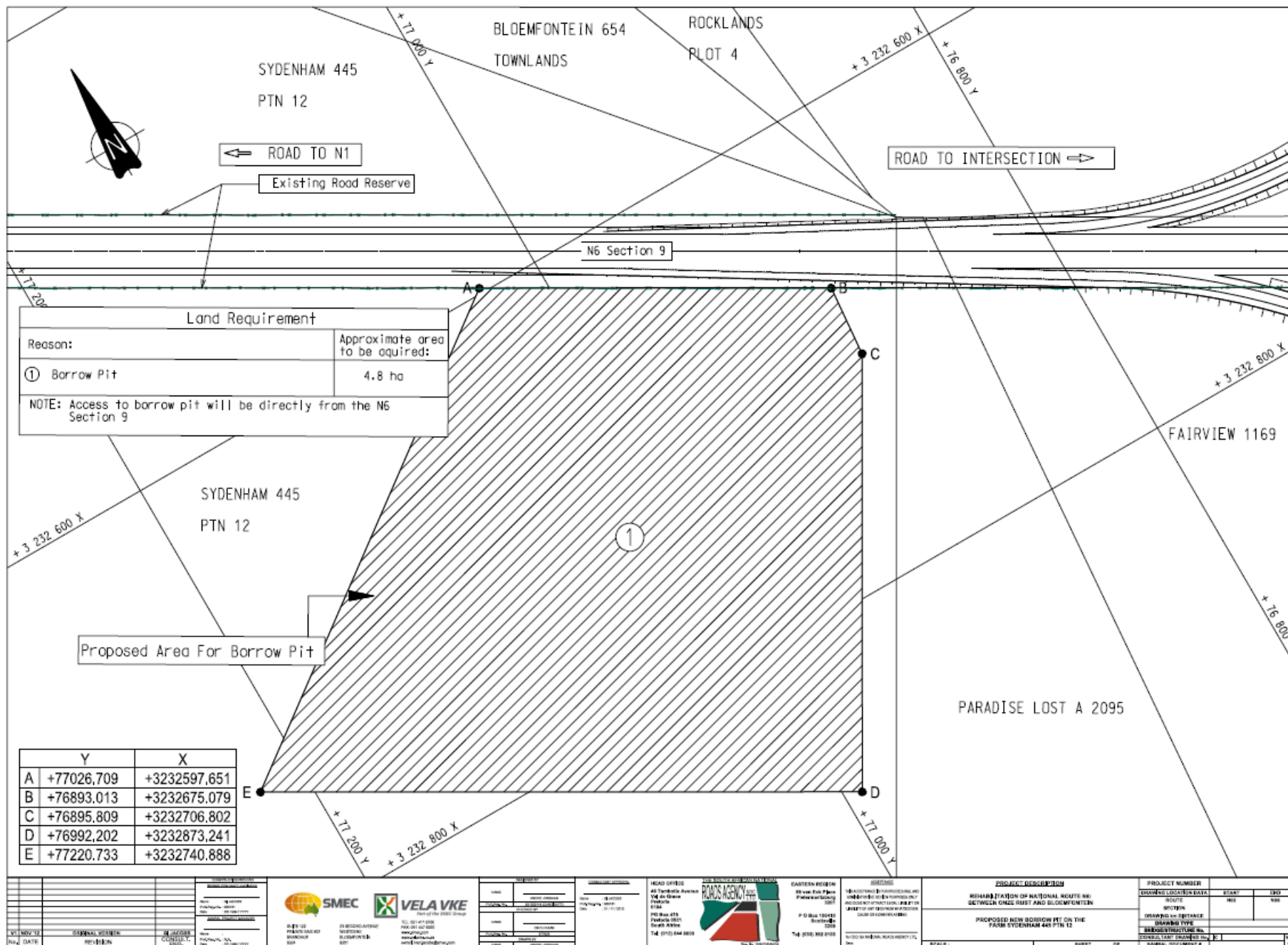
0 500 1,100 2,200 3,300 4,400  
Meters

Spheroid: WGS 84  
Topo Cadastre Sheet: 2926 AA



**Map 2: 1:110 000 Locality map of the proposed location of the borrow pit on the remainder of the farm Sydenham 445/RE, Bloemfontein**

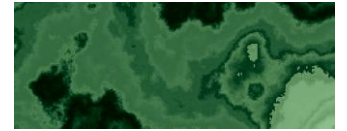






environmental specialists

# APPENDIX: **C**



## Specialist Reports

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See the electronic disc for the specialist reports.

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# APPENDIX: **E**



## Photographic Report

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Photograph taken from the centre of the  
proposed site towards the North



Photograph taken towards the east from the site



Photograph taken towards the south from the proposed site.



Photograph taken towards the west from the proposed site.