

Mining Environmental Management Plan for the Proposed Rehabilitation of the N10 Section 4 between Cradock and Knutsford

Report Prepared for

South African National Roads Agency SOC Limited



On behalf of PD Naidoo and Associates (Pty) Ltd Consulting Engineers

Report Number 443824

Report Prepared by



July 2012

Mining Environmental Management Plan for the Proposed Rehabilitation of the N10 Section 4 between Cradock and Knutsford

South African National Roads Agency SOC Limited

On behalf of PD Naidoo and Associates (Pty) Ltd Consulting Engineers

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Glossary

Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action.

Transformed habitat / land	Land that has been significantly impacted upon by man's activities (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes has been irreversibly altered. Transformed habitats are not capable of being restored to their original states
Degraded habitat / land	Land that has been impacted upon by man's activities (including introduction of invasive alien plants, light-moderate overgrazing, accelerated soil erosion, dumping of waste), but that still retains a degree of its original structure and species composition (although some species loss would have occurred) and where ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management
Untransformed habitat / land	Land that has not been significantly impacted upon by man's activities. These are ecosystems that are in a near-pristine condition in terms of structure, species composition and the functioning of ecological processes

Abbreviations

ASAPA	Association of South African Professional Archaeologists
BP	Borrow Pit
CBA	Critical Biodiversity Area
EMP	Planning, Design, Pre-Construction and Construction Environmental Management Plan
CRM	Cultural Resources Management
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DMR	Department of Mineral Resources
DRT	Department of Roads and Transport
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry (former name of the department)
DEA	Department of Environmental Affairs (National)
EA	Environmental Auditor
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
ER	Environmental Representative
IAP	Interested and Affected Party
IEM	Integrated Environmental Management
masl	meters above sea level
ML	Megalitres (1,000,000 litres)
MPRDA	Mineral and Petroleum Resources Development Act

NEMA	National Environmental Management Act
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SARTM	South African Rural Traffic Model
SDF	Spatial Development Framework
SRK	SRK Consulting
ToR	Terms of Reference
+ve	Positive
-ve	Negative

1 Introduction

The South African National Roads Agency SOC Limited (SANRAL) identified a need to rehabilitate the N10 Section 4 between Cradock and Knutsford in the Inxuba Yethemba Local Municipality in the Eastern Cape to bring it up to National Roads Standards. The project commences at km 1.6 (S 32° 09' 52.61706" E 25° 36' 24.75382") of the road, in the Cradock Industrial Area and extends to km 29.2 (S 31° 56' 57.11963" E 25° 28' 12.53584") at Farm Heffortuin 66 (1.0 km beyond the Knutsford T-junction) (see Figure 2-1 for an illustration of the proposed activities).

The existing N10 consists of a surfaced carriageway about 7.4 m wide flanked by surfaced shoulders each 2.2 m wide making the road prism width about 11.8 m. The road reserve is generally about 32 m wide. The existing in-situ base of the road prism will be re-worked and stabilized and a new 150 mm thick base layer will be added followed by a Cape Seal wearing course. The existing base layer and surfacing will be recycled and new material added to provide rehabilitated cement stabilised sub-base layer. The base layers will be added over the sub-base layer using crushed stone material obtained from an existing commercial source in Cradock.

In addition to the road rehabilitation, the following is proposed:

- Geometric improvements to two intersections (i.e. the turnoff to Correctional services located approximately 2.04 km outside of Cradock as well as the R61 turnoff to Graaff-Reinet located approximately 4.9 km outside of Cradock);
- Lengthening of an existing climbing lane located just outside of Cradock by approximately 1.4 km (between km 1.8 and km 3.2) on the left hand side of the road when travelling from Cradock towards Graaff-Reinet;
- Construction of an agricultural underpass (with associated fill embankment, drainage infrastructure and temporary deviation) at km 24.36, requiring elevation increase of the road by approximately 2 m;
- Repair and resurfacing of Church Street in Cradock;
- The tie in of the deviation road at km 24.6 will be designed in such a way that a formal access onto the N10 will be left in place to serve the farmer in recognition of road safety;
- Extension of some culverts at selected points;
- Establishment of guardrails at selected points;
- Repair and establishment of lined side drains adjacent to the road at selected points; and
- Construction of edge restraints at all farm accesses.

A limited amount of natural gravel will be available from cut widenings within the road reserve. The remainder of the natural gravel required for the proposed road rehabilitation will need to be sourced from borrow pits. Two Borrow pits (i.e. BP 1 and BP2) have been identified, sampled and tested for suitability and are assessed in this EMP. All Crushed Stone Base material will be sourced from the commercial crusher currently in operation in Cradock. Road and concrete aggregates as well as crusher dust for use in blending with the subbase and as a substitute for sand for use in concrete works will be obtained from the same source.

SRK Consulting was appointed as the independent consultants to assess the environmental impacts and requirements in terms of the National Environmental Management Act (Act 107 of 1998)(NEMA) and the Mineral and Petroleum Resources Development Act (Act 28 of 2002)(MPRDA). This includes

submitting a Basic Assessment application to the National Department of Environmental Affairs as well as an application for a mining right (this document) for the proposed two borrow pits. Borrow Pit BP1 is a new proposed borrow pit located on a greenfields site. Borrow pit BP2 is an existing borrow pit which is proposed to be extended. This EMP is prepared in accordance with the requirements of the Mineral and Petroleum Resources Development Act (MPRDA) and Department of Mineral Resources (DMR).

1.1 Applicant Details

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Fax: 041 398 3222

Email: strydoms@nra.co.za

1.2 Environmental Assessment Practitioner Details

Company: SRK Consulting

Contact person: Ms Tammy Arthur

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Tel: (041) 509 4800

Fax: (041) 509 4850

Email: tarthur@srk.co.za

1.3 SRK Profile and Expertise of Relevant Environmental Assessment Practitioners (EAP's)

SRK Consulting (SRK) has been appointed by South African National Roads Agency SOC Limited (SANRAL) as the independent consultants to compile the Environmental Management Plan (EMP) required in terms of the applicable legislation.

SRK Consulting comprises over 900 professional staff worldwide, offering expertise in a wide range of environmental and engineering disciplines. SRK's Eastern Cape environmental department has a distinguished track record of managing large environmental and engineering projects and has been practising since 2001. SRK has rigorous quality assurance standards and is ISO 9001 accredited.

The qualifications and experience of the individual practitioners responsible for this project are detailed in Box 1 below.

Project Reviewer

- Rob Gardiner is a partner at SRK Consulting and the Head of SRK Consulting's Environmental Department in the Eastern Cape. He has over 17 years environmental consulting experience covering a broad range of projects, including Environmental Impact Assessments (EIA), Environmental Management Systems (EMS), environmental management plans (EMP), and environmental auditing. His experience in the development, manufacturing, mining and public sectors has been gained in projects within South Africa, Lesotho, Botswana, Angola and Argentina.
- Robyn Thomson is an Environmental Scientist and a member of SRK's Environmental Department in East London. She has over 8 years of experience in the environmental management field. Her expertise includes Environmental Impact Assessments (EIAs), Basic Assessments, Environmental Management Plans (EMPs), Public Participation, Geographic Information Systems (GIS) and Environmental Control Officer (ECO) work.

Environmental Assessment Practitioner

- Tammy Arthur is an Environmental Scientist with over two year's experience. Her expertise includes Environmental Basic Assessments, Environmental Management Plans, Environmental Auditing, Waste License and Water Use License Applications, report writing and public participation facilitation. Her training is in Botany and Geography and she has a sound knowledge in Conservation Biology.

1.4 Legal and Administrative Requirements

There are a number of regulatory requirements at local, provincial and national level with which the proposed development will have to conform. A brief summary is provided below of the acts that are relevant to this study. Some of the key environmental legal requirements include:

- Mineral and Petroleum Resources Development Act 28 of 2002;
- The National Environmental Management Act 107 of 1998; and
- The National Heritage Resources Act 25 of 1999.

Note that other legislative requirements may pertain to the proposed development, but identification and interpretation of these is beyond the brief of this study. As such, the summary provided below is not intended to be definitive or exhaustive, and serves to highlight key environmental legislation and obligations only.

The environmental legislation which is applicable to the authorisation of the proposed project is summarised in this section.

1.4.1 Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA)

The MPRDA was promulgated to ensure the sustainable development of South Africa's mineral and petroleum resources within a framework of national environmental policy, norms and standards while promoting economic and social development. The objectives of the Act are described as follows:

- a) recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic;

- b) give effect to the principle of the State’s custodianship of the nation’s mineral and petroleum resources;
- c) promote equitable access to the nation’s mineral and petroleum resources to all the people of South Africa;
- d) substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation’s mineral and petroleum resources;
- e) promote economic growth and mineral and petroleum resources development in the Republic;
- f) promote employment and advance the social and economic welfare of all South Africans;
- g) provide for security of tenure in respect of prospecting, exploration, mining and production operations;
- h) give effect to section 24 of the Constitution by ensuring that the nation’s mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- i) ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.

Section 5(4) states that:

“(4) No person may prospect for or remove, mine, conduct technical co-operation operations, reconnaissance operations, explore for and produce any mineral or petroleum or commence with any work incidental thereto on any area without—

(a) an approved environmental management programme or approved environmental management plan, as the case may be;

(b) a reconnaissance permission, prospecting right, permission to remove, mining right, mining permit, retention permit, technical co-operation permit, reconnaissance permit, exploration right or production right, as the case may be; and

(c) notifying and consulting with the land owner or lawful occupier of the land in question.”

Legal requirements for this project

SANRAL has a responsibility to obtain a mining permit for the relevant project and ensure that the proposed activities conform to the objectives and specifications of the MPRDA. Mining activities should then be conducted according to the EMP approved by DMR.

1.4.2 National Environmental Management Act (Act No. 107 of 1998) as Amended (NEMA)

NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of the State, as well as to provide for matters connected therewith. Section 2 of NEMA establishes a set of principles that apply to the activities of all organs of state that may significantly affect the environment. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;

- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised; and
- Responsibility for the environmental health and safety consequences of a policy, project, product or service exists throughout its life cycle.

Section 28(1) states that:

“Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring.”

If such degradation / pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution / degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and
- Remedying the effects of the pollution.

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities that may not commence without an environmental authorisation or existing activities in respect of which an application for environmental authorisation is required. In this context, EIA Regulations contained in five General Notices in terms of NEMA (GNR 543 to 547) came into force on 2 August 2010.

GNR 543 lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment process (GNR 544 and 546) or a Scoping and EIA process (GNR 545) is required to obtain environmental authorisation. The regulations for both alternative processes stipulate that:

- Public participation must be undertaken at various stages of the assessment process;
- The assessment must be conducted by an independent Environmental Assessment Practitioner;
- The relevant authorities respond to applications and submissions within stipulated timeframes; and
- Decisions taken by the authorities can be appealed by the proponent or any other interested and affected party.

Legal requirements for this project

SANRAL has a responsibility to ensure that the proposed development and construction activities and the EIA process conform to the principles of NEMA. The proponent is obliged to take actions to prevent pollution or degradation of the environment in terms of Section 28 of NEMA.

SANRAL should also conduct a Basic Assessment process as per GNR 544 of the 2010 NEMA EIA Regulations. The Basic Assessment process and associated public participation is in progress and a Final Basic Assessment Report will be submitted to the National Department of Environmental Affairs (DEA) shortly.

1.4.3 National Heritage Resources Act No. 25, 1999

The protection and management of South Africa's heritage resources is controlled by the National Heritage Resources Act 25 of 1999. The enforcing authority for this act is the South African Heritage Resources Agency (SAHRA).

In terms of the Act, historically important features such as graves, trees, archaeological artefacts / sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of Section 38 of the National Heritage Resources Act, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required.

The Act requires that:

“...any person who intends to undertake a development categorised as the ... or any development or other activity which will change the character of a site exceeding 5 000 m² in extent or involving three or more existing erven or subdivisions thereof must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development...”

Legal requirements for this project

Archaeological and Heritage specialist studies for the borrow pits and quarries were undertaken and are included under Appendix E.

1.5 Approach to the Environmental Assessment

The approach taken in this study is guided by the principles of Integrated Environmental Management (IEM) as described in the IEM guidelines published by the Department of Environmental Affairs and Tourism in 1992. The approach is therefore guided by the principles of transparency which is aimed at encouraging decision-making. The underpinning principles of IEM are:

- Informed decision making;
- Accountability for information on which decisions are made;
- A broad interpretation of the term “environment”;
- Consultation with IAP's;
- Due consideration of feasible alternatives;
- An attempt to mitigate negative impacts and enhance positive impacts associated with the proposed project;
- An attempt to ensure that the social costs of the development proposals are outweighed by the social benefits;

- Regard for individual rights and obligations;
- Compliance with these principles during all stages of the planning, implementation, and decommissioning of the proposed development or activity; and
- Opportunities for public and specialist input in the decision-making process.

The study has also been guided by the requirements of the EIA regulations set out in terms of the National Environmental Management Act (NEMA). However, Section 38A (1) of the MPRDA states that:

“The Minister(of Mineral Resources) is the responsible authority for implementing environmental provisions in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as it relates to prospecting, mining, exploration, production or activities incidental thereto on a prospecting, mining, exploration or production area.”

Therefore, the assessment and document have mainly been guided by the MPRDA Regulations No 527 as promulgated in Government Gazette 26275 on 23 April 2004 in which the requirements for mining applications are stipulated.

1.6 Contents and Structure of the Report

This report incorporates all the information required in terms of the DMR regulations for Environmental Management Plans, namely:

- A description of the environment likely to be affected by the proposed mining operation;
- An assessment of the potential impacts of the mining operation on the environment, socio-economic conditions and cultural heritage, if any;
- A summary of the assessment of the significance of the potential impacts and the proposed mitigation measures and management measures to minimise adverse impacts and enhance benefits;
- Proof of financial provision;
- Planned monitoring and performance assessment of the environmental management plan;
- Closure and environmental objectives;
- A record of the public participation undertaken and the results thereof; and
- An undertaking by the applicant regarding the execution of the environmental management plan.

Specialist studies undertaken during the process were informed by the issues identified in the Basic Assessment. Results from the study have been incorporated into the EMP, particularly into the description of the affected environment (Chapter 3), impact assessment (Chapter 5) and mitigation and management measures (Chapter 6).

Table 1-1: Specialist Studies Undertaken

Specialist Study	Specialist
Archaeological Impact Assessment	Karen van Ryneveldt – Archaeo Maps
Palaeontological Assessment	Rob Gess

This report is divided into seven chapters:

Chapter 1: Introduction

Provides an introduction and background to the proposed project, provides details of the project applicant, summarises the qualifications and experience of the EAPs and outlines the approach to the study. Also, provides a brief summary and interpretation of the relevant legislation.

Chapter 2: Description of Activity Proposal

Describe the various elements of, and the motivation for, the proposed activities.

Chapter 3: Nature of the Affected Environment

Briefly describes the biophysical and socio-economic receiving environments that DMR will consider in their assessment of the project.

Chapter 4: The Public Participation Process

Describes Public Participation Process followed.

Chapter 5: Assessment of Environmental Impacts

Describes and rates environmental impacts associated with the proposed project. The associated mitigation measures are listed in Chapter 6. The relevant references are made.

Chapter 6: Mitigation and Management of Identified Impacts

Stipulates mitigation measures for the identified significant environmental impacts and provides environmental management guidelines that should be implemented in the construction, operation, rehabilitation and closure stages of the proposed borrow pits.

Chapter 7: References

Provides references for documents cited in the EMP Report.



2 Description of Activity Proposal

2.1 Activity Motivation

The South African National Roads Agency Limited (SANRAL) identified a need to rehabilitate the N10 Section 4 and appointed a project team to conduct the relevant tasks. The need for the rehabilitation of the road is mainly based on the bad condition of the road and associated structures and the safety for road users.

The engineering assessment of the road pavement, undertaken by PDNA, indicated that it is in poor condition with sections in severe distress (with respect to cracking, pumping and deformation).

The road pavement layers have deteriorated over the years to where they are no longer able to provide the necessary support.

The visual assessment found crocodile and map cracks mainly in the outer wheel paths that are starting to spall. Most of the cracking observed show varying degrees of associated pumping (between 5 and 20mm) and deformation which has culminated into structural failures in the form of pot holes. Vast areas of the section of road have been patched or are currently being patched and some are showing early signs of failure resulting in poor riding quality.

In many instances the cracking can be associated with poor drainage along the road and in particular, through cuttings and on relatively old patches which are now showing signs of distress. Cracking was viewed as one of the mechanisms of deterioration as it allows ingress of water into the base resulting in pumping with the associated loss of fines and pavement deterioration.

The visual assessment furthermore noted that limited sections have edge breaks of between 25 to 75mm with the more severe cases being around accesses and drop off zones along the route.

IRI measurements indicated that the entire length of road under consideration is in a warning to severe condition with respect to riding quality using the performance criteria for a category A road.

It is proposed that two Borrow Pits (P 1 and BP2) in the vicinity of the road will provide the required material for obtaining fill and selected layerworks materials for construction of the deviation and possible raising of the N10 for the construction of a cattle creep culvert (hereon referred to as the agricultural underpass).

Construction waste from the proposed activities will be spoiled in existing borrow pits and will be used during rehabilitation of these sites. It is important to mention that the existing BP2 has not been properly rehabilitated after previous use, and it is the intention of SANRAL to rehabilitate only the sites that will be used during this project.

A comparative assessment of the two proposed borrow bits is provided in Table 2-1 below.

Table 2-1 Comparative Assessment of Potential Borrow Pits

Location and Description	Prelim Geotech Results	Existing/ Greenfields and Vegetation (Mucina and Rutherford, 2006 and the Vegetation of Southern Africa, SANBI)	Wetland/ Rivers/ Dams	Visual	Heritage	Social	Haul Distance Impacts i.e. CO2 emissions, dust, noise	Spoil
Borrow Pit 1								
Located at km 14.5 and is ± 5.238 ha in extent.	± 5 000 m ³ of G6/G7 and ± 5 000 m ³ of G7/G9 material. Access to the site exists; very little spoil material	Greenfields site located adjacent to a maize farm. Vegetation is classified as Eastern Upper Karoo and is least threatened.	No wetlands or rivers are located in close proximity. A non-perennial stream/ drainage line extends in proximity to the proposed borrow pit from the east. A dam is located approximately 240 m north-west of the site. Due to the topography of the site, drainage of this area may be a problem.	Visual impacts already exist as located adjacent to an existing borrow pit situated directly next to the R61.	Low significance. Generally protected C Field rating. SAHRA Site Destruction permit required for partial destruction of stone age artefacts.	Minimal. A small farm house is located close by.	Low. Located approx. 1.5 km away from the N10	500 m ³
Borrow Pit 2								
Located at km 28.3 and is ± 9.948 ha in extent.	± 5 000 m ³ of G6/G7 and ± 5 000 m ³ of G7/G9 material. Access to the site exists. Site includes an existing poorly rehabilitated borrow pit	Existing. It is proposed that the existing borrow pit be extended. The vegetation type that historically covered the existing borrow pit is classified as Eastern Upper Karoo (least threatened) and Tarkastad montane Shrubland (least threatened).	No wetlands or rivers are located in close proximity. A dam is located approximately 280 m south-west of the site and a non-perennial stream/ drainage line is located approximately 50 m south of the site.	Site is hidden, approximately 2.7 km away from R61. Only one farm house south-west of the site. Visual impacts already exist as located adjacent to an existing borrow pit.	Low significance. Generally protected C Field rating. A colonial Period stone wall is located east of the existing borrow pit. Design plans to be altered to ensure that the stone wall is conserved.	Minimal to moderate. Dust creation may affect vehicles accessing nearby farms. However the existing borrow pit has been poorly rehabilitated and dust creation is currently an issue under windy conditions.	Low. Located approx. 1.2 km away from the N10	500 m ³

Legend	
1	Most Desirable
2	
3	
4	

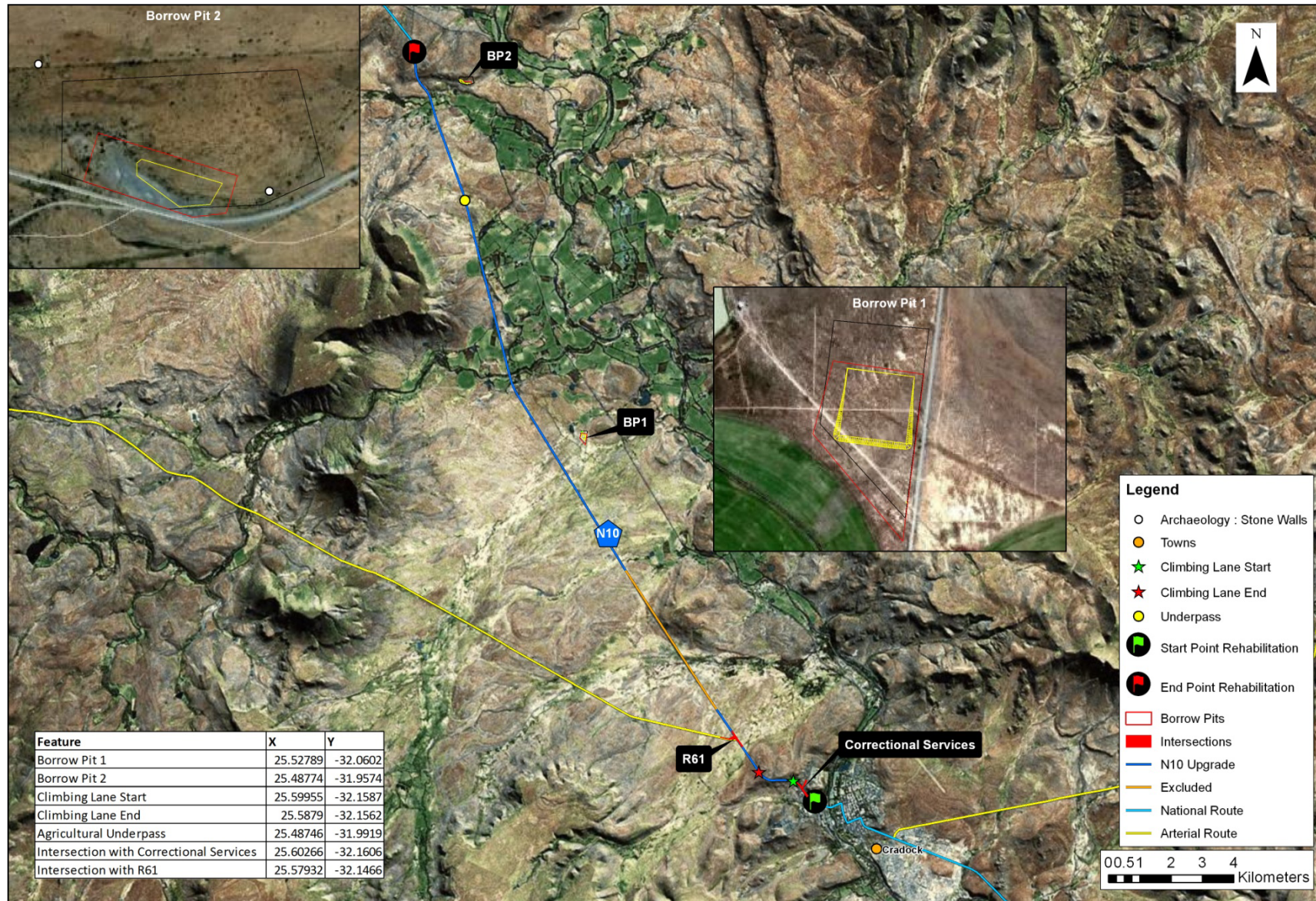


Figure 2-1: Proposed rehabilitation of the N10/S4 between Cradock and Knutsford for which material from the proposed borrow pits will be used

2.2 Activity Description

The proposed activities entail the use of one existing and one new borrow pit adjacent to the N10/S4 (see Figure 2-1 for the locality plan). Detailed information on each borrow pit is included in Table 2-2 to Table 2-2.

Table 2-2: Information on proposed new Borrow Pit 1 (km 14.5)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Portion 1 of Farm Spekboom Berg No. 127 owned by Mr A.S Jordaan
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	X 25.52789 Y -32.0602
Magisterial District	Inxuba Yethemba Local Municipality
Name of registered owner of property	Mr A.S Jordaan
Details of property owner	Cell - 072 729 3558
Current uses of the property and surrounding areas	Maize is farmed directly adjacent to the proposed borrow pit. The site is generally used for grazing.
Any other, existing land uses that impact on the environment in the proposed mining area	The site has not previously been impacted on as this is a new borrow pit. The borrow pit site is located approximately 1.5 km to the east of the N10.
What is the name of the nearest town and specify the distance	Cradock – 14.5 Km
Information on the mining activity	
Mineral to be mined	G6 – G9 quality decomposed Dolerite gravel material
Ultimate depth of the proposed mining operations	1.5 to 2 m below natural ground level
Total area of mining activities	Total footprint – 19617 m ² Total area of cut – 19500 m ²
Approximate volume of material to be mined	12 000 m ³
Time period of mining operations to be conducted	16 month mining period & 1 year rehabilitation

Table 2-3: Information on proposed Borrow Pit 2 (km 28.3)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Remainder of Farm Burnside No. 592 owned by Mr William Walker
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	X 25.48774 Y -31.9574
Magisterial District	Inxuba Yethemba Local Municipality
Name of registered owner of property	Mr William Walker
Details of property owner	Cell - 082 651 3821
Current uses of the property and surrounding areas	There is an existing borrow pit which is proposed to be

	expanded. The surrounding areas are used mainly for agricultural purposes (i.e. grazing)
Any other, existing land uses that impact on the environment in the proposed mining area	The site has already been impacted on as this is an existing borrow pit. The borrow pit site is located approximately 1.2 km to the east of the N10.
What is the name of the nearest town and specify the distance	Cradock – 28.3 km
Information on the mining activity	
Mineral to be mined	G6 – G9 quality mudstone gravel material
Ultimate depth of the proposed mining operations	2.5 to 4 m below natural ground level where extended into the existing hillside.
Total area of mining activities	Total footprint – 7334 m ² Total area of cut – 4919.09 m ²
Approximate volume of material to be mined	8000 m ³
Time period of mining operations to be conducted	16 month mining period & 1 year rehabilitation

2.3 Activity Location

The proposed borrow pits are located east of the N10/S4 less than 1.5 km away from the N10. Borrow Pit 1 is a new proposed Borrow Pit as opposed to Borrow Pit 2 which is existing and has been previously mined. Access (in the form of gravel roads) to both proposed borrow pits exists. These existing roads will be graded once a month in order to maintain a smooth riding quality.

Since the Borrow Pits are located in close proximity to the road rehabilitation, transportation of material would result in fewer emissions, fewer impacts on road infrastructure and vehicles and fewer impacts on the town of Cradock caused as a result of hauling material through the town centre. Hauling material shorter distances will also significantly decrease the associated cost.

The section of the road to be rehabilitated and the location of the existing borrow pits can be seen in Figure 2-1. The coordinates of the proposed borrow pit corners are listed in Table 2-4. Mining plans, showing the positions of the listed fencing coordinates are included in Appendix B of this report.

Table 2-4: Coordinates of the proposed borrow pits

Borrow Pit	Coordinates	
	Y(m)	X(m)
B1		
BP1E	3548662.273	-49769.462
BP1F	3548515.951	-49795.935
BP1G	3548533.898	-49935.436
BP1H	3548682.599	-49925.829
B2		
BP2F	3537266.575	-46018.738
BP2G	3537273.143	-46010.179
BP2H	3537295.312	-46009.964
BP2J	3537352.195	-46086.698
BP2K	3537347.823	-46142.403

BP2L	3537309.995	-46164.523
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2.4 Mining Work Plan / Methods

The following information was provided by the appointed consulting engineer and will form part of the basis of this EMP. As the minerals differ from site to site, mining methods may vary to some degree. Below is a general description of the planned activities at the proposed borrow pits. A short description of activities at the individual sites are included where necessary. The geological structures and the material available at each site are described in section 3.1.2.

General Work Plan

The boundaries of the mining areas will be demarcated using stone beacons on corners as indicated on the layout plans. The perimeter of the mining area will also be fenced with temporary stock-proof fencing as indicated on the layout plans. The access gateway for the proposed new mining area shall be secured with a suitable lock. The important colonial stone walls in close proximity to the proposed Borrow Pit 2 site will be demarcated by means of danger tape / or construction netting during the construction phase as per the requirements of the Archaeological Impact Assessment (attached to Appendix E2). Permanent signage will also be erected at these sites indicating that they are 'No entry: Heritage / Archaeological sites'.

Blasting of material will not be required. Material will be loosened by means of a track mounted excavator and loaded directly onto haulage trucks for disposal. Should ripping be required a D6 type dozer will be used. The extent of mining is illustrated in the mining plans attached to Appendix B. The approximate volume of material in each proposed borrow pit is given in Table 2-2 and Table 2-3.

All Crushed Stone Base material will be sourced from the commercial crusher currently in operation in Cradock. Road and concrete aggregates as well as crusher dust for use in blending with the subbase and as a substitute for sand for use in concrete works will be obtained from the same source.



3 Nature of the Affected Environment (Pre-mining Environment)

3.1 Biophysical Environment

3.1.1 Topography

Borrow Pit 1

The proposed Borrow pit 1 consists of relatively flat terrain with poor drainage.

Borrow pit 2

The proposed Borrow Pit 2 is characterised by a northern slope and a southern depression which was formed as a result of previous mining activities.

3.1.2 Geology and Soils

Geology and Palaeontology of study area (Rob Gess, 2012)

The entire study area is underlain by strata of the middle to upper Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup), including the Daggaboersnek Member, the sandstone dominated Barberskrantz Member and the greyish mudstone dominated Elandsberg Member. These are intruded by dolerite dykes and sills implaced during the Jurassic.

The strata of the Karoo Supergroup were deposited within the Karoo sedimentary Basin, which resulted from shortening and thickening of the southern margin of Africa, with coeval folding and uplift of the Cape Supergroup strata along its southern margin. The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this interval the basin evolved from an inland sea flooded by a melting ice cap, to a giant lake (the Ecca Lake) fed by seasonal meandering (and at times braided) rivers. This lake steadily shrank as it filled with sediment and the basin's rate of subsidence stabilised. As the lake shrank the plains behind the shoreline grew. Rivers crossing the plains deposited sediment as channel fills and overbank flood deposits. The land became increasingly arid and was covered with wind-blown sand towards the end of its cycle. Finally the subcontinent was inundated with basaltic lava that issued from widespread linear cracks within the crust, to form the capping basalts of the Drakensberg Group.

The flood planes of the Beaufort Group (Karoo Supergroup) provide an internationally important record of life during the early diversification of land vertebrates. During its deposition giant amphibians coexisted with diapsid reptiles (the ancestors of dinosaurs, birds and most modern reptiles), anapsids (which probably include the ancestors of tortoises) and synapsids, the dominant group of the time which included the diverse therapsids (including the ancestors of mammals). Rocks of the Beaufort Group provide the world's most complete record of the important transition from early 'reptiles' to mammals.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content. The Barberskrantz and Elandsberg Members of the Balfour Formation fall within the Dicyonodon Assemblage Zone.

The Dicyonodon Assemblage Zone is characterised by the co-occurrence of two therapsids, Dicyonodon and Theriognathus. It demonstrates the Beaufort Groups greatest diversity of vertebrate

taxa, including numerous genera and species of dicynodont, biarmosuchian, gorgonopsian and therocephalian and cynodont therapsid Synapsida, together with diverse captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Fish. Trace fossils of invertebrates and vertebrates as well as Glossopteris flora plants have also been described.

During the formation of the volcanic Drakensberg Group (Stormsberg Group, Karoo Supergroup), during the Jurassic, crack like fissures in the earth's crust became filled with molten lava that later cooled to form dolerite dykes. Other magma was injected under pressure between horizontal sedimentary strata and cooled to form extensive horizontal sills of dolerite. Dolerite, being an intrusive igneous rock, contains no fossils.

Much of the area is covered in a thick deposit of Quaternary alluvium some of which has been calcretised. This is unlikely to contain palaeontologically sensitive material.

Palaeontology at Borrow Pit 1

Borrow Pit 1 is entirely covered by alluvium. In places small steps in the surface are marked by weathered sandstone fragments, indicating the presence of thin sandstone interbeds within mudstone. A nearby borrow pit exhibited a coarse greenish mudstone which was not found to be fossiliferous. Paleontological Evaluation of this site will not be possible until after works have proceeded (Rob Gess, 2012).

Palaeontology at Borrow Pit 2

Borrow Pit 2 exhibits a thick bed of fine greenish mudstone which contains shallow water ripple planes. This is in part overlain by a coarser layer within which a horizon containing well-preserved sphenophyte stems. These Balfour Formation sediments underlie the dolerite sill. The intention is to extend the borrowpit backwards to exploit aggregate contained in a small spur. This spur is topped by a loose pavement of weathered sandstone and alluvium, except in the north-west corner of the proposed site where dolerite caps the strata. Although no fossils of high significance were located during the survey, this site has the potential to contain important fossils (Rob Gess, 2012).

Borrow Pit Investigation

A detailed borrow pit investigation has been conducted to source sufficient material for the project. The intention is to utilise existing borrow pits in order to reduce the environmental impact of opening new borrow pits. Engineers identified a few existing borrow pits (including Borrow Pit 2), however the material in all existing borrow pits identified (other than BP2) was not sufficient and the Engineers had to pursue the option of a new (greenfields) Borrow Pit.

Also, existing borrow pits have in the past been poorly rehabilitated and are unsightly scars in the landscape. Identifying, using and rehabilitating Borrow Pit 2 to be used for this project according to the EMP (this document) will substantially improve the visual impact on the environment.

The material types found in the identified borrow pits generally consists of weathered dolerite that meet the relevant requirement for the road layers and agricultural underpass to be constructed. The material available at each borrow pit below.

Borrow Pit 1

The material to be used from this borrow pit consists primarily of G6 – G9 quality decomposed dolerite gravel material. The estimated quantity available is approximately 12 000 m³.

Sufficient topsoil is available at the site and will be removed and stockpiled for later reinstatement. Approximately 500 m³ of spoil material will be produced and will be stockpiled to be used later in the rehabilitation process.

Borrow Pit 2

The material in borrow pit 2 consists of G6 – G9 quality mudstone gravel material. The estimated quantity available is approximately 8000 m³.

The existing Borrow Pit will be extended into the northern hillside Mining will take place by advancing the face away from the existing face towards the proposed limit of mining, in order to mix the materials from the upper portion with those from the lower portion of the face.

Since this is an existing borrow pit site, very minimal topsoil will be available for rehabilitation. All topsoil available must be stockpiled for rehabilitation. Hydroseeding may need to be considered.

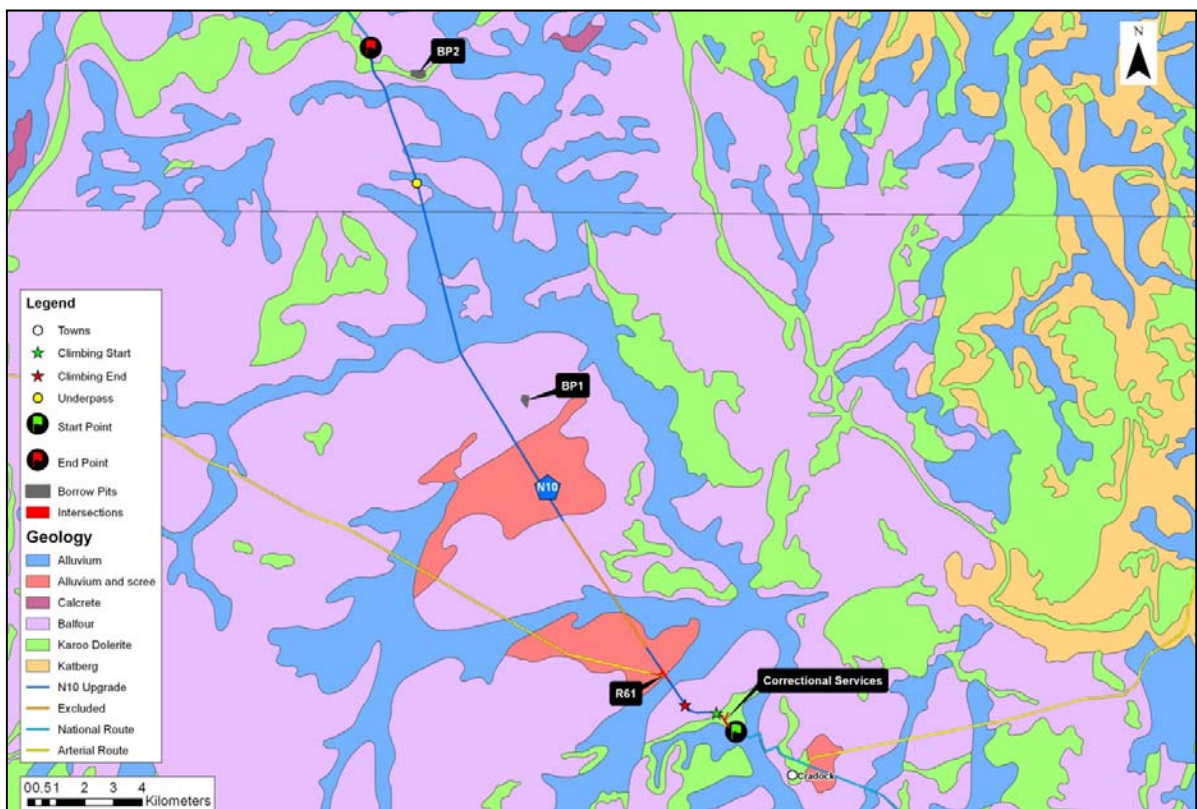


Figure 3-1: Geology at each borrow pit site

3.1.3 Hydrology

No wetlands or rivers are located in close proximity to BP1. According to the SA topographical map, a non-perennial stream/ drainage line extends in proximity to the proposed borrow pit from the east (see Figure 3-2 and Figure 3-3). A dam is located approximately 240 m north-west of the site. Due to the topography of the site, drainage of this area may be a problem.

No wetlands or rivers are located in close proximity to BP2. A dam is located approximately 280 m south-west of the site and a non-perennial stream/ drainage line is located approximately 50 m south of the site (see Figure 3-2 and Figure 3-3).

The establishment of BP1 and extension of BP2 is not expected to have a major impact on these systems provided that stormwater mitigation measures are in place. Stormwater and runoff from BP2 will need to be adequately managed in order to prevent erosion.

Groundwater resources could potentially be affected by the borrow pit activities due to the fuels and oils needed in the machinery. If the management measures stated in this EMP are adhered to, it is not anticipated that groundwater resources would be significantly affected by the borrow pits.

After rehabilitation of the borrow pits, these areas will probably be natural accumulation areas for runoff from the surrounding areas and become small dams in the long-term.

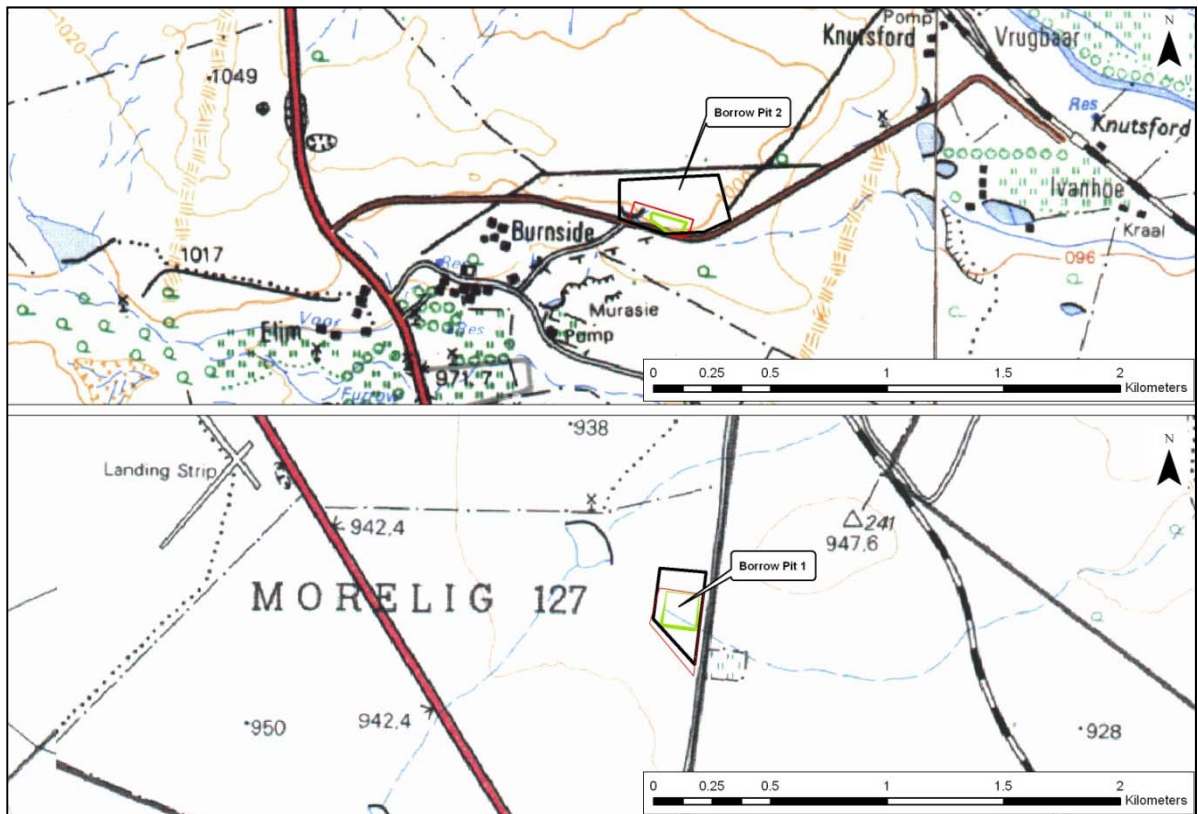


Figure 3-2: Topographical map illustrating the hydrology within 500 m of each Borrow Pit site

Yellow line – proposed borrow pit excavation

Red line – proposed fence line

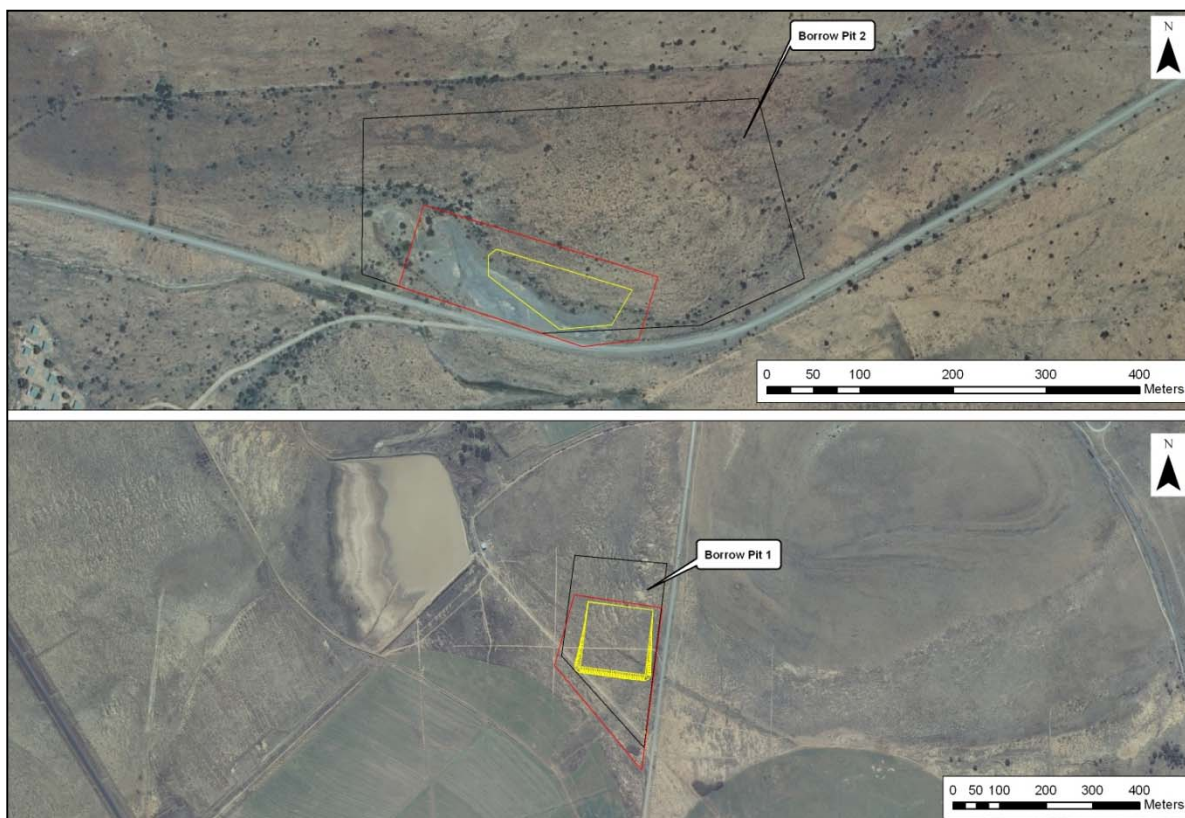


Figure 3-3: Aerial photograph illustrating the hydrology within 500 m of each Borrow Pit site

Yellow line – proposed borrow pit excavation

Red line – proposed fence line

3.1.4 Land Use

The dominant land use surrounding each borrow pit is predominantly crop, livestock and game farming. A maize field is located adjacent to Borrow Pit 1.



Figure 3-4: Maize field adjacent to Borrow Pit 1

3.1.5 Ecology

According to the South African Vegetation Map (Mucina and Rutherford, 2006), the vegetation type located at Borrow Pit 1 is Eastern Upper Karoo. This vegetation type is dominated by dwarf microphyllous shrubs, with white grasses (mainly *Aristida* and *Eragrostis* genera). Endemic taxa include succulent shrubs such as *Chasmatophyllum rouxii* and *Hertia cluytiifolia*, tall shrubs such as *Phymaspermum scoparium* and low shrubs such as *Aspalathus acicularis*. This vegetation type is widely distributed, with some 98% of the original extent remaining. However, there is very little currently formally conserved (0.7%) and the target for conservation is 21%. The vegetation conservation status is classified as “least threatened”

According to the South African Vegetation Map (Mucina and Rutherford, 2006), the vegetation type located at Borrow Pit 2 is Eastern Upper Karoo and Tarkastad Montane Shrubland. Tarkastad Montane Shrubland consists of low, semi-open mixed shrubland with white grasses and dwarf shrubs. Endemic taxa include low shrubs such as *Eriocephalus africanus* and *Senecio acutifolius* and small trees such as *Encephalartos friderici-guilielmi*. This vegetation type has been classified as “least threatened” and has a conservation target of 28%. Only 1-2 % of it is formally conserved (Mucina and Rutherford, 2006).

It is recommended that a search and rescue operation for Red Data Species be undertaken at both borrow pit sites prior to site clearing. The necessary permits must also be obtained prior to the search and rescue operation.

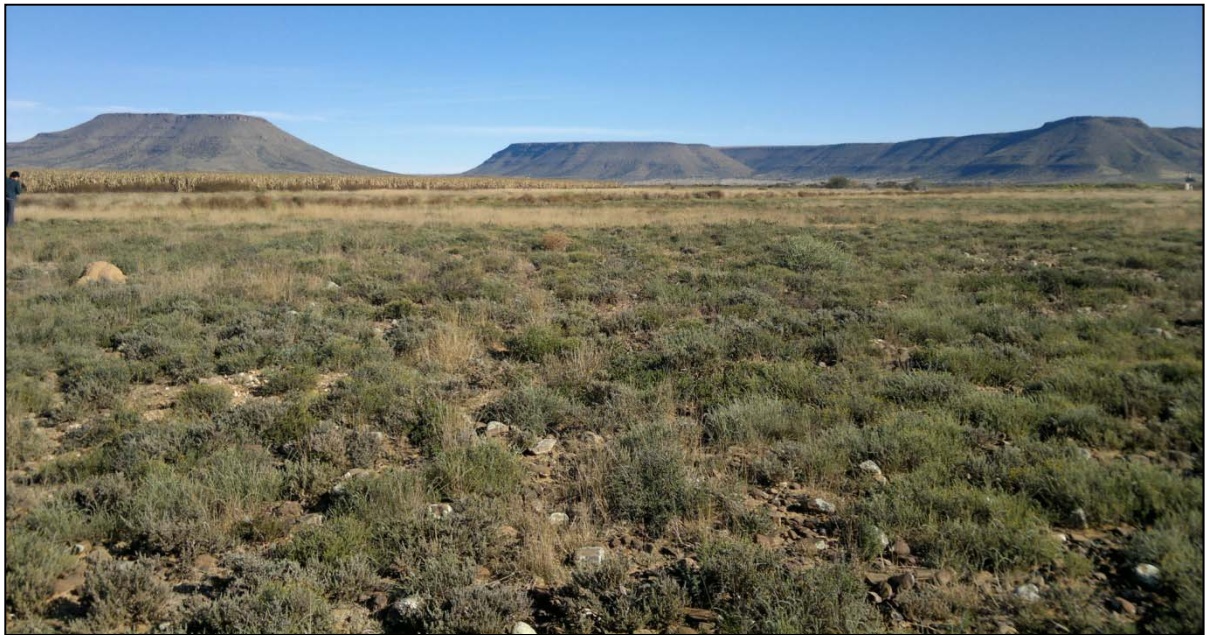


Figure 3-5: Vegetation at Borrow Pit 1



Figure 3-6: Vegetation at Borrow Pit 2

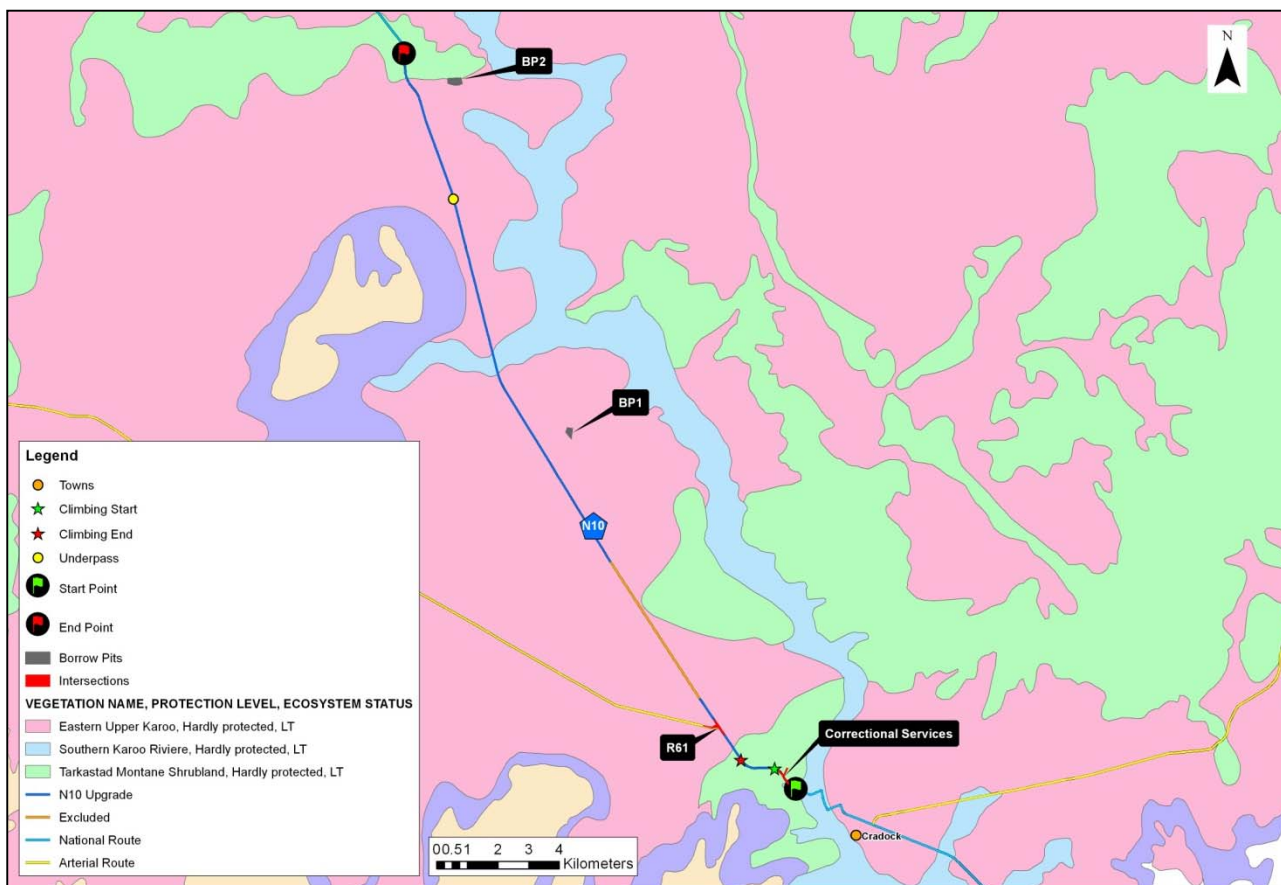


Figure 3-7: Vegetation type at each borrow pit site

3.1.6 Air quality

Air quality levels around the relevant sites are typically good, but may be temporarily affected by Borrow Pit operations during construction of the road. Please refer to Table 5-1 for the assessment of impacts.

3.1.7 Noise

The borrow pit sites are situated in relatively close proximity to the N10 which is an existing source of noise in the area. The current ambient noise levels are assumed to be relatively high due to traffic volumes on the N10.

Receptors of noise impacts during operation of the borrow pits would be farm houses nearest to the sites. A small farm house is located 270 m north-west of Borrow Pit 1 (BP1). Some farm houses were observed approximately 700 m south-west of Borrow Pit 2 (BP2). Farmers that use the access roads to the borrow pits (particularly BP 2) may also be temporarily impacted by noise generated by Borrow Pit operations. No other receptors are located within close proximity to the Borrow Pits.

3.1.8 Sites of archaeological and palaeontological interest

Specialist Heritage input (Archaeological and Palaeontological Assessments) was obtained from Archaeomaps Archaeological Consultancy and Rob Gess Consulting, respectively and the relevant findings are described below. The South African Heritage Resource Agency has not yet provided their comment on the project. Their comment will be forwarded to the Department of Mineral Resources once received.

3.1.9 Palaeontological sites

Findings of the Palaeontological Impact Assessment are included in Appendix E1. According to the specialist, Borrow Pit 1 is entirely covered by alluvium and evaluation of this site will not be possible until after works have proceeded. A nearby Borrow Pit did however exhibit a coarse greenish mudstone which was not found to be fossiliferous.

Borrow Pit 2 exhibits a thick bed of fine mudstone which contains shallow water ripple planes. This is in part overlain by a coarser, sandy layer within which a horizon containing well preserved sphenophyte stems was located. Although no fossils of high significance were located during the survey, this site was found to have the potential to contain important fossils.

For this reason it is recommended that:

- The EO is notified to look out for fossil plants and bones during excavation of the two Borrow Pits; and
- The two Borrow Pits are inspected by a palaeontologist towards the end of their exploitation, but prior to back filling and rehabilitation.

3.1.10 Archaeological sites

Findings of the Archaeological Impact Assessment are included in Appendix E2. A summary of the findings is described as follows:

Borrow Pit 1

BP 1 is characterized by a surfacing gravel substrate, occurring in patches across the extent of the study site. A low quantity of Stone Age artefacts are typologically ascribed to the Middle Stone Age (MSA), characterized by the predominance of flake and blade types, while a few smaller lithics that may be indicative of either on site knapping (production debitage) or may in fact represent a Later Stone Age (LSA) admixture; particularly low artefact quantities however doesn't allow a more substantial interpretation.

Technologically artefacts seem to be of a fair standard, produced from a mixture of baked shale and granite, but without an evident raw material source in the immediate vicinity. The low density Stone Age occurrence can reasonably be expected to extend for a significant area beyond the boundaries of the proposed borrow pit study site and existing farming development has evidently already impacted thereon. Slight sub-surface disturbances, including scraped access roads and a number of animal burrows indicates that the occurrence is surface restricted.

The low density MSA (and LSA) Stone Age occurrence is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Based on particularly low artefact quantities characterizing the occurrence, the lack of a sub-surface stratigraphic component and the vast extent of many a low density Stone Age occurrence across the Karoo, it is recommended that development of proposed borrow pit N10-4/BP1 proceed provided that partial destruction of the occurrence be done under a SAHRA Site Destruction Permit.

Borrow Pit 2

Site N10-4/BP2.1 (S31 57'22.2"; E25 29'05.3") demarcates the locality of a Colonial Period stone wall, recorded for approximately 640m, but extending both east and west of the recorded area and following the aerially visible linear vegetation alignment. The stone wall follows an early farm portion and later farm sub-division alignment of the property Het Fortuin 66. However, the size of the wall remains excessive as a farm or farm camp boundary and it is inferred that an original farm or farm camp boundary may well have been reinforced as defense mechanism during times of

political upheaval for example during the time of the Boer Wars (1st Boer War – 1880-1881, 2nd or Anglo Boer War – 1899-1902).

Proposed development of BP2 has clearly taken the presence of the Colonial Period wall into account and the northern boundary of the proposed borrow pit site is situated more than 30 m south of the Site N10-4/BP2.1 stone wall. The wall will not be impacted on and formalization (formal fence) of the borrow pit study site will ensure the continued conservation of the wall. However, due to close proximity it is recommended that additional conservation measures be put in place to ensure the conservation of the Site N10-4/BP2.1 stone wall.

Site N10-4/BP2.2 (S31 57'29.6"; E25 29'21.2) demarcates the locality of a 2nd Colonial Period stone wall, situated just east of the existing borrow pit area of impact and running for approximately 100 m towards the north-east following the ridge contour, where decay has taken its obvious toll on the site remains but remains again continue further to the north-east along the aerially visible vegetation alignment and cross cutting the Site N10-4/BP2.1 wall remains. Again it is inferred that the origin of the wall may well have been for farming purposes (due to its extensive extension towards the north-east), but reinforcement thereof during times of political turmoil may well have proven very useful specifically relating to the view over the valley to the south from the site. The current development proposal will directly impact on the Site N10-4/BP2.2 Colonial Period stone wall. It is recommended that the developer considers revision of the study site in order to ensure at least a 30 m conservation barrier between the borrow pit and Site N10-4/BP2.2. Slight extension of the study site towards the west will not impact on any cultural heritage remains. Should a change to the study site not prove a viable development option, the developer should ensure that Phase 2 archaeological mitigation (archaeological excavation, documentation and analysis) precede development in order to record necessary data relating to the stone wall prior to destruction.

Recommendations

Colonial Period stone wall remains within the proposed study site and in direct proximity thereto necessitates further conservation or Phase 2 archaeological mitigation measures prior to development. Both Colonial Period stone walls, Site N10-4/BP2.1 and Site N10-4/BP2.2 are ascribed SAHRA Low Significances and Generally Protected C Field Ratings. While Site N10-4/BP2.1 will be conserved by the development, additional conservation measures are necessary. Site N10-4/BP2.2 will within the current development design be impacted on. It is recommended that the developer firstly consider alteration of the study site in order to ensure that the stone wall be conserved.

Should a revised development area not be feasible the developer should ensure that adequate Phase 2 archaeological mitigation be done before development impacts on the site. Recommended conservation and Phase 2 mitigation for borrow pit N10-4/BP2 is summarized as:

SITE N10-4/BP2.1:

In situ Conservation

- Construction Phase: Temporary visual demarcation & Temporary sign posting –The site should be visually clearly demarcated by means of danger tape or construction netting during the construction phase. In addition temporary signage should be erected indicating the site as a 'No entry: Heritage / Archaeological site' area.
- Post-construction Phase: Permanent sign posting –The site should be permanently sign-posted.

SITE N10-4/BP2.2:**In situ Conservation (alteration to layout)**

- Construction Phase: Temporary visual demarcation & Temporary sign posting – The site should be visually clearly demarcated by means of danger tape or construction netting during the construction phase. In addition temporary signage should be erected indicating the site as a 'No entry: Heritage / Archaeological site' area.
- Post-construction Phase: Permanent sign posting – The site should be permanently sign-posted.

OR

- Phase 2 archaeological mitigation and monitoring to precede and coincide with development (current layout)

Phase 2 archaeological mitigation: Archaeological excavation, recording and analysis – Phase 2 archaeological mitigation should be done under a SAHRA excavation permit issued to an ASAPA accredited CRM archaeologist. Upon submission of a Phase 2 archaeological mitigation report to SAHRA the developer can, under a SAHRA Site Destruction Permit, proceed to legally destroy the site.

The proposed N10-4/BP2 site layout plan has been altered to conserve the Site N10-4/BP2.2 Colonial Period stone wall feature, in accordance with SAHRA's recommendations (preferred heritage management option).



Figure 3-8: Sites identified by the archaeologist based on original BP 2 layout (Karen van Ryneveld, June 2012)

3.2 Social and Economic Environment

3.2.1 Social value of the proposed activity

The proposed upgrading and rehabilitation of the N10 Section 4 will improve the condition of the road and therefore improve road safety to all road users as well as to the surrounding communities. The proposed intersections as well as the agricultural underpass will specifically improve the safety for road users and the associated local farmer.

No people should be directly affected by the proposed mining operations at the borrow pits, however the noise from these operations might have a temporary affect on residents, however this is not expected to be significant as there are no residents in close proximity (i.e. within 100 m) to the sites.

The local economy should also benefit from employment opportunities created during the construction phase of the road and the mining activities.



4 Public Participation Process

4.1 Public Consultation

A public participation process has been carried out as part of the Environmental Basic Assessment process. Advertisements were placed in the media (Die Burger on the 2nd of April 2012 and the Cradock Courant on the 4th of April 2012) and Background Information Documents (BID's) were distributed to identified Interested and Affected Parties (IAP's), surroundings landowners, other stakeholders and State Departments. Posters were also put up at various public places. The Draft Basic Assessment Report was made available to Interested and Affected Parties from 26 June 2012 to 5 August 2012 for review and comment. These informed the public of the proposed activities to be undertaken by the proponent.

No comments were received regarding the proposed mining operations to obtain material for the proposed activities on the N10 section 4.

4.2 Landowner Consultation

Landowner consultation is a requirement for the proposed mining application. The land along the N10 Section 4 has been surveyed and registered by the Chief Surveyor General and is divided into farms owned by individual landowners.

BP1 is situated on Portion 1 of Farm Spekboom Berg No. 127 owned by Mr A.S Jordaan. BP2 is situated on the Remainder of Farm Burnside No. 592 owned by Mr William Walker.

Landowner consultation was done by PD Naidoo and Associates (Pty) Ltd Consulting Engineers. The landowner consent letters are included in Appendix D of this document.



5 Assessment of Environmental Impacts

5.1 Potential Impacts

The key environmental issues were identified by the environmental consultants and were assessed and rated in order to determine the significance of each potential impact. Specialist studies were conducted for impacts with a potentially high significance or where it is a legal requirement. The objective of the specialist studies was to further investigate each of the issues identified and assess their potential environmental impact in order to determine their significance and propose mitigation measures to address the impacts, if required.

The identification of potential impacts is based on:

- The legal requirements;
- The nature of the proposed activity; and
- The nature of the receiving environment.

After consideration of these aspects, the following potential impacts were identified and have been addressed by SRK in consultation with the project team consultants and engineers:

- Air quality impacts;
- Noise impacts;
- Socio-economic impacts;
- Storm water and erosion impacts; and
- Waste management impacts.

The specialist studies mentioned below have been conducted in order to investigate the potential environmental impacts associated with the proposed activities. Specialists were required to assess the significance of anticipated impacts and to recommend mitigation measures. The specialist studies have been attached to this document under Appendix E.

- Palaeontological Impact Assessment; and
- Heritage Impact Assessment.

Table 5-1 summarises the potential impacts of the proposed borrow pits on the surrounding environment. The status and significance of the relevant impacts are also listed (see Appendix G for the detailed impact rating table and rating methodology). All measures recommended to mitigate and manage the identified impacts are incorporated into Chapter 6 which lists the mitigatory specifications for the different phases of the proposed mining operations. The completed specialist studies and their findings have been integrated into Table 5-1 and Chapter 6.

Table 5-1: Potential impact on the surrounding environment

Element	Description of Potential Impact	Status	Significance		Reference to Mitigation
			Without Mitigation	With Mitigation	
Topography	Alteration of topography through excavation of borrow pits and removal of material, and the deposition of material for the proposed road.	-ve	Medium	Low	Section 6.9.1
Geology	Permanent alteration of geology through the removal of material from borrow pits.	-ve	Medium	Low	Refer to Section 6.7 for Borrow Pit 11
Soils	Potential loss of soil from borrow pits due to removal of topsoil and stockpiling for rehabilitation.	-ve	Medium	Low	Section 6.5.2
Vegetation	Small scale loss of vegetation associated with activities (BP1, establishment of camp site, removal of overburden, and topsoil stockpiles).	-ve	Medium	Low	Sections 6.4.2 & 6.5.1
Fauna	Potential small scale loss of fauna, particularly small animals confined to borrow pit, resulting from habitat loss.	-ve	Low	Insignificant	Sections 6.5.1
Surface / Storm Water	Potential increased sediment load in runoff water from borrow pits and road works.	-ve	Medium	Low	Sections 6.6.2
Groundwater	Potential impact on groundwater as a result of seep water contaminated with fuels and lubricants required for operation of plant machinery.	-ve	Low	Very Low	Sections 6.5.7, 6.6.3 and 6.6.4.
Air quality	Nuisance impact of dust generated from excavating, stockpiling and road works on traffic on the N10/ S4 and nearby residents.	-ve	Medium	Very Low	Section 6.5.6
Land capability	No permanent or significant impact on land capability is expected.	-ve	Very Low	N/A	None required
Noise	Noise impacts during mining activities are expected on nearby residents.	-ve	Low	Very Low	Section 6.5.5
Archaeology	Archaeological sites will be affected if recommended mitigation is not implemented.	-ve	High	Low	Section 6.5.3
Palaeontology	Potential palaeontological sites may be affected if recommended mitigation is not implemented.	-ve	Medium	Low	Section 6.5.3
Visual impact	An existing visual impact occurs at borrow pits 2 as it is an existing borrow pit site which has not been properly rehabilitated previously. After rehabilitation, the proposed activities may substantially improve the visual impact on the environment. Borrow pit 1 is hidden from the N10 by the adjacent maize field.	+ve (<i>with mitigation</i>)	Low (-ve)	Very Low (+ve)	Section 6.5.4
Socio-economic impacts	The surrounding community should benefit from employment opportunities created during the construction phase of the road and	+ve	Low	Low	Section 6.8

Element	Description of Potential Impact	Status	Significance		Reference to Mitigation
			Without Mitigation	With Mitigation	
	the mining activities. Further to this the construction of the road would continue to positively affect the local economy as well as the provincial economy as this is an important transport route between Port Elizabeth and Johannesburg.				
Waste management	Pollution of construction and domestic waste as well as waste water could lead to other visual impacts and loss of natural habitat.	-ve	Low	Insignificant	Sections 6.5.7, 6.6.3 and 6.6.4.



6 Mitigation and Management of Identified Impacts

6.1 Introduction and scope

This chapter describes how the environmental aspects identified above should be managed and the potential impacts mitigated in the event of mining authorisation being granted. Although the mitigation measures are written as if the project has been authorised, this approach in no way presupposes that the project will be approved. Rather, the style of writing is aimed at providing a clear picture to the Department of Mineral Resources (DMR), other organs of state, and IAP's, regarding the management of environmental aspects associated with the construction and operational activities of this project.

The preceding chapters in this document form an integral part of this chapter as they provide details regarding the sensitivity of the affected environment, and the findings of the impact assessment. As such, while this Chapter provides a list of environmental specifications aimed at mitigation of the identified impacts, and in a more general sense compliance with environmental and mining legislation, the preceding Chapters are particularly useful for understanding the importance of the measures proposed here.

For easy reference, specific mitigation measures for the pre-mining and mining phases are included in sections 6.3 to section 6.8, while the rehabilitation plan and measures for closure are listed in section 6.9.

It is important to note that the guidelines, operating procedures and rehabilitation / pollution control requirements described in this Chapter will be binding on the holder of the mining permit after approval of the EMP.

6.2 Responsibility

The environment affected by the mining operations shall be rehabilitated by the holder, as far as is practicable, to its natural state or to a predetermined and agreed to standard or land use which conforms with the concept of sustainable development. The affected environment shall be maintained in a stable condition that will not be detrimental to the safety and health of humans and animals and that will not pollute the environment or lead to the degradation thereof.

It is the responsibility of the holder of the mining permit to ensure that the manager on the site and the employees are capable of complying with all the statutory requirements which must be met in order to mine, which includes the implementation of this EMP.

6.3 Environmental Procedures

6.3.1 Monitoring and Reporting

- a) Regular monitoring of all the environmental management measures and components shall be carried out by the holder of the mining permit in order to ensure that the provisions of this EMP are adhered to.
- b) Ongoing and regular reporting of the progress of implementation of this programme will be done.
- c) Various points of compliance will be identified with regard to the various impacts that the operations will have on the environment.

- d) Inspections and monitoring shall be carried out on both the implementation of the EMP and the impact on plant and animal life.
- e) Visual inspections on erosion and physical pollution shall be carried out on a regular basis.
- f) Layout plans will be updated on a regular basis and updated copies will be submitted to the Regional Manager on a basis decided by the said Manager.
- g) Any emergency or unforeseen impact will be reported as soon as possible.
- h) An assessment of environmental impacts that were not properly addressed or were unknown when the plan was compiled shall be carried out and added as a corrective action.

6.3.2 Training

The manager on site is responsible for ensuring that the sentiments of the EMP are conveyed to all personnel (including sub-contracted personnel). It is recommended that regular training sessions (including basic environmental awareness training at induction) be conducted to fulfil this purpose. Training registers shall be kept as proof for auditing purposes. The environmental training should, as a minimum, include (but not be limited to) the following:

- a) The importance of conformance with all environmental policies;
- b) The environmental impacts, actual or potential, of the proposed activities;
- c) The environmental benefits of improved personal performance;
- d) Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with this EMP, including associated procedures and emergency preparedness and response requirements;
- e) The potential consequences of departure from specified operating procedures; and
- f) The mitigation measures required to be implemented when carrying out their work activities.

6.3.3 Environmental Incidents

- a) The manager on site shall maintain a register of all environmental incidents occurring as a result of the activities associated with the contract. Environmental incidents that shall be recorded include (but are not limited to):
 - Fires;
 - Accidents (e.g. traffic);
 - Spills of hazardous materials, contaminating soil or water resources;
 - Non-compliances with applicable legislation; and
 - Non-compliances with this EMP.
- b) Each environmental incident shall be investigated by the competent person and an environmental incident report shall be forwarded to the holder of the permit. Such incident report shall be presented within five working days of the incident occurring.
- c) Environmental incident reports shall include (as a minimum) a description of the incident, the actions taken to contain any damage to the environment, personnel, or the public, and the actions taken to repair / remediate any such damage.

- d) Additional measures shall be prescribed that may be required to remediate damage resulting from the incident and / or to prevent similar incidents occurring in the future.

6.4 General Requirements

6.4.1 Layout Plan

- a) A copy of the layout plans as provided in Appendix B of this document must be available at the mining site for scrutiny when required. These plans must include details on site locality, site boundaries, layout of the waste management facilities, access roads and entry points to each site, drainage features and control of stormwater (to reduce the potential for erosion), storage facilities (water, fuel and lubricants, chemicals and other materials, aggregate stockpiles, spoil areas) and intended mitigation measures to reduce potential impacts.
- b) The plan must be updated on a regular basis with regard to the actual progress of the establishment of surface infrastructure, mining operations and rehabilitation (a copy of the updated plan shall be forwarded to the Regional Manager on a regular basis).
- c) A final layout plan must be submitted at closure of the borrow pits or when operations have ceased.

6.4.2 Demarcating the Mining Area

- a) The mining area must be clearly demarcated by means of beacons at its corners, and along its boundaries if there is no visibility between the corner beacons.
- b) Permanent beacons as indicated on the layout plan or as prescribed by the Regional Manager must be firmly erected and maintained in their correct position throughout the life of the operation.
- c) Mining and resultant operations shall only take place within this demarcated area.
- d) A detailed photographic record of the demarcated areas, prior to any mining activities, shall be taken. These records are to be kept by the Contractor for reference purposes during the rehabilitation of the site.

6.4.3 Fencing

- a) The perimeter of the mining area shall be fenced with stock-proof fencing as indicated on the layout plan (Appendix B).
- b) The access gateway for the proposed new mining area shall be secured with a suitable lock.

6.4.4 Signage

- a) Signage (as per SARTM) shall be erected on either sides of the intersections of access on the N10.
- b) There will be 'No unauthorised access' signs at the borrow pit gates.
- c) There will be heavy vehicle crossings at the intersections of the access tracks and the road.
- d) Caution signs and 40 km/hr signs shall be placed at regulation distance from heavy vehicle crossing signs.

6.4.5 Restrictions on Mining

- a) On assessment of the application, the Regional Manager may prohibit the conducting of mining operations in vegetated areas or over portions of these areas.
- b) In the case of areas that are excluded from mining or prospecting, no operations shall be conducted within 5 m of these areas.

- c) A botanical specialist must be appointed to screen the sites for potential plant species of special concern (SSC) and recommend the required permits in terms of relevant legislation. SSC may only be removed once relevant permits are in place.

6.4.6 Existing Services

- a) Existing services infrastructure (e.g. Telkom and Eskom lines and water pipelines) should be clearly marked and must not be damaged in any way.
- b) If for any reason services do need to be interrupted, consent should be obtained from the relevant service provider and the relevant landowners should be notified in advance.

6.5 Environmental Requirements

6.5.1 Protection of Flora and Fauna

- a) A search and rescue operation for Red Data Species should be undertaken prior to site clearing.
- b) The indigenous vegetation encountered on the site is to be conserved and left intact as far possible.
- c) Clearing should be kept to the minimum and must take place in a phased manner (i.e. the entire area to be developed should not be cleared all at once), to enable animal species to move into safe areas and to prevent wind and water erosion of the cleared areas.
- d) Stripped vegetation (excluding exotic invasive species) should also be temporarily stored during mining operation for later use to stabilise slopes.
- e) Fauna disturbed by the mining process on the site shall be carefully and safely removed from site to an equivalent environment.
- f) No animals shall be harmed during the course of mining.
- g) No workers will be allowed to collect any plant or snare any animal. The Contractor shall provide sufficient fuel for cooking and heating as is needed by the site staff. All animal life, vegetation, firewood, etc., will remain the property of the land owner and will not be disturbed, upset or used without their express consent.
- h) No domestic animals will be permitted on site.
- i) Only trees and shrubs directly affected by the works, and such others as may be indicated by the Engineer in writing, may be felled or cleared.
- j) Any proclaimed weed or alien species that propagates during the contract period shall be cleared by hand before rehabilitation of the area. Removal of alien plants shall be done according to the Working for Water Guidelines.
- k) The Contractor shall be held responsible for the removal of proclaimed weed or alien vegetation within all areas disturbed during mining activities, including (but not limited to) the access roads, construction camps, borrow pits areas, and temporary storage areas.
- l) The Engineer in consultation with relevant authorities, may at his discretion, order the removal of alien plants when necessary. This includes areas within the confines of the borrow pit.
- m) Alien plants will be disposed of by temporarily storing it within a cleared area designated by the Engineer. Seeds from the alien plants will also be collected from the ground surface. All alien plant material (including brushwood and seeds) should be removed from site and

disposed of at a registered waste disposal site. Should brushwood be utilised for soil stabilization or mulching, it must be seed free.

- n) Rehabilitation of vegetation on the site will be done as described in the Rehabilitation Plan (section 6.9.1).
- o) Fires shall only be allowed in facilities or equipment specially constructed for this purpose. A firebreak shall be cleared and maintained around the perimeter of all camps and office sites.

6.5.2 Soil Aspects

- a) Topsoil shall be removed from all areas where physical disturbance of the surface will occur. Topsoil means that layer of soil covering the earth and which provides a suitable environment for the germination of seeds, allows the penetration of water, and is a source of micro organisms, plant nutrients and in some cases seed.
- b) All available topsoil shall be removed after consultation with the Regional Manager prior to the commencement of any operations.
- c) Topsoil shall be stockpiled only in the areas indicated on the layout plans (Appendix B), even if the topsoil is only partially cleared.
- d) The topsoil removed, shall be stored in a bund wall on the high ground side of the mining and in such a way that it will not cause damming up of water or washaways, or wash / blow away itself. Piles will not exceed a height of two meters, and if left stored for longer than six months, will be rehabilitation before replacement.
- e) Stockpiles shall be managed so as to maintain the regrowth potential of the topsoil. Should the stockpiles stand for too long (greater than 12 months) it can be considered barren from a seed bank point of view. In this case reseeding may be required. Stockpiles should ideally be stored for no longer than six months.
- f) The topsoil shall be stored so that it can be placed on the exposed subsoil as soon as the mining of the excavation or the relevant section of it has been completed and its slopes have been finished off to the acceptable gradient as part of the rehabilitation process.
- g) The overburden, i.e., that layer of soil immediately beneath the topsoil, will be removed and stored separately from the topsoil.
- h) No chemical pollution shall be allowed to contaminate the soils; any plant equipment found to be attributing to this shall be removed from the site and repaired.
- i) In the event of a petrochemical (diesel, oil, fuels, etc.) spill, the Contractor must take suitable measures to contain the pollution and prevent it from spreading or seepage. Once the spill has been contained, contaminated material (soil, etc.) shall be removed and disposed of at a registered hazardous waste disposal site.

6.5.3 Historical, Archaeological and Palaeontological Sites

Archaeological Sites

- a) The low density MSA (and LSA) Stone Age occurrence at Borrow Pit 1 is ascribed a SAHRA Low Significance and a Generally Protected C Field Rating. Based on particularly low artefact quantities characterizing the occurrence, the lack of a sub-surface stratigraphic component and the vast extent of many low density Stone Age occurrences across the Karoo, it is recommended that development of proposed borrow pit N10-4/BP1 proceed provided that partial destruction of the occurrence be done under a SAHRA Site Destruction Permit;

- b) The Colonial stone walls at Borrow Pit 2 are ascribed SAHRA Low Significances and Generally Protected C Field Ratings and should be clearly demarcated by means of danger tape or construction netting during the construction phase. In addition permanent signage should be erected indicating the site as a 'No entry: Heritage / Archaeological site' area.
- c) If any evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations), unmarked human burials or other categories of heritage resources are found during mining activities, SAHRA APM Unit (Mariagrazia Galimberti/Nonofho Ndobochani, 021 462 4502) must be alerted immediately, and an accredited professional archaeologist must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological significance a Phase 2 rescue operation might be necessary.
- d) If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately.
- e) The contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the Engineer of such discovery.
- f) Work may only resume once clearance is given in writing by the archaeologist.
- g) No stone robbing or removal of any material from these sites for construction purposes is allowed. Any disturbance or alteration of these sites would be illegal and punishable by law.
- h) Only existing roads may be used during the development phase of the project. It is recommended that all new access roads, once identified, must first be surveyed for heritage sites before construction may commence.

Graves

If a grave is uncovered on site, or discovered before the commencement of work, then all work in the immediate vicinity of the gravesite shall be stopped and the Engineer informed of the discovery. The following will be adhered to in the event of the discovery of graves during mining activities and the management of identified grave sites:

- a) Where it is possible the area where the grave is located should not be disturbed, particularly in instances where exhumation cannot be undertaken or is deemed not permissible by SAHRA.
- b) Where it is necessary to exhume and re-bury graves the contractor will apply for the necessary permissions. This will include acquisition of permits from SAHRA, national and provincial health departments, community (and next of kin) consultation, and collaboration with a forensic archaeologist if new graves are located during construction or operation.
- c) Site preparation will be delayed until permission for exhumation is granted.
- d) The mine will adhere to the requirements as laid out in the Human Tissues Act (No 65 of 1983) and the National Heritage Resources Act (No 25 of 1999).
- e) Due respect will be given to the customs and beliefs of the affected relatives, and where requested exhumations will be conducted in the presence of the relatives or community representatives.

- f) Exhumations under the Human Tissues Act will be conducted under the supervision of an undertaker or specialist.
- g) Exhumations conducted under the National Heritage Resources Act will be conducted under the supervision of an archaeologist.
- h) Notify SAHRA in the event that additional graves are located during construction and operation and obtain permits for relocation of graves.

Palaeontological Sites

- a) Borrow Pit 2 exhibits a thick bed of fine mudstone which contains shallow water ripple planes. This is in part overlain by a coarser, sandy layer within which a horizon containing well preserved sphenophyte stems was located. Although no fossils of high significance were located during the survey, this site was found to have the potential to contain important fossils. For this reason it is recommended that:
 - The contractor shall be watchful of fossil plants and bones during excavation of the two Borrow Pits and notify the ECO of any findings; and
 - The two Borrow Pits are inspected by a palaeontologist towards the end of their exploitation, but prior to back filling and rehabilitation.

6.5.4 Visual Aspects

- a) Care should be taken to rehabilitate the borrow pits to blend in with the natural environment as far as possible.
- b) On completion of the project, the surface crust shall be broken to obliterate temporary roads or working surfaces. Earth embankments to prevent erosion will be established where appropriate.
- c) The remains of all structures that may have been erected at the borrow pits shall be demolished and removed on completion of the project.
- d) Care must be taken to ensure that all rehabilitated areas merge with the immediate environment and any negative visual impacts will be rectified to the satisfaction of the Regional Manager.
- e) Overburden will be placed back into the excavated areas as part of the rehabilitation programme (see section 6.9.1).

6.5.5 Noise

- a) Road construction will be limited to daylight hours. The hours of the activities will be reviewed on receipt of complaints (if any).
- b) Compliance with the appropriate legislation with respect to noise is mandatory.
- c) Regular maintenance of equipment and vehicles will be undertaken.
- d) In the event that activities continue outside the stipulated hours the contractor will communicate such occurrences to potentially affected communities prior to commencing such activities.
- e) A complaints register should be made available on site, should members of the surrounding communities wish to lodge complaints. In the event of a complaint being recorded the contractor will deal with the complaint appropriately and timeously.

6.5.6 Dust

- a) A dust complaints register will be developed to manage complaints relating to impacts on the nearby communities.
- b) Dust caused by strong winds and / or mining activities on the works shall be controlled by means of water spray vehicles, if required.
- c) No over-watering of the mining area or road surfaces should occur.
- d) In open areas which are very exposed to wind, wind screens should be used to reduce wind and also dust at the site.

6.5.7 Waste Management

- a) A suitable site for spoiling excavated material needs to be identified. It is recommended that excavated spoil be stockpiled and used in profiling and rehabilitation of borrow pits.
- b) Sufficient weather and scavenger- proof bins (with lids, to prevent the escape of litter) shall be provided, and be easily accessible at all points where wastes are generated.
- c) The sites shall be kept clean and free of litter and no litter from the site shall be allowed to disperse to surrounding areas.
- d) All personnel shall be instructed to dispose of all waste in the proper manner.
- e) The Contractor shall identify and separate materials that can be reused or recycled to minimise waste e.g. metals, packaging and plastics, and provide separate marked bins for these items.
- f) All construction materials (e.g. bags of cement) must be suitably stored and protected, so that they do not become damaged and unusable.
- g) The Contractor shall be responsible for the regular disposal (at suitable and licensed municipal waste disposal facilities) of all waste generated as a result of the construction. Waste disposal slips shall be kept for auditing purposes.
- h) Excess material may also be spoiled in used borrow pits as part of the rehabilitation process.
- i) Construction waste should be removed immediately upon completion of each phase of the project and disposed of appropriately.
- j) No waste may be burned on site. Where potentially hazardous substances are to be disposed of, a safe disposal slip shall be kept on record as proof of final disposal.
- k) General waste is to be collected either by the local Municipality or removed by the project contractor. The frequency of collections will be such that waste containment receptacles do not unduly accumulate or overflow.

6.5.8 Fires

- a) Making of fires will only be permitted in facilities or equipment designed to control the spread of fire.
- b) A firebreak shall be cleared and maintained around the perimeter of all camps and office sites, if applicable.
- c) Sufficient fire-fighting equipment shall be maintained and be accessible on sites at all times. In particular, such fire fighting equipment shall be readily on hand in areas where hot work may be required.

- d) In the event that the fire is too large for the on-site personnel to control, the Fire Brigade shall be called to extinguish it.

6.6 Infrastructural Requirements

6.6.1 Access to Site

Access roads exist to the borrow pits. Only existing roads may be used during the development phase of the project. It is recommended that all informal access roads, once identified, must first be surveyed for heritage sites before construction may commence.

Construction and Maintenance of access roads

- a) In the case of dual or multiple use of access roads by other users, arrangements for multiple responsibility must be made with the other users. If not, the maintenance of access roads will be the responsibility of the holder of the mining permit.
- b) The open or closed status of gates shall be clarified in consultation with the landowner and maintained throughout the operational period.
- a) No other routes will be used by vehicles or personnel for the purpose of gaining access to the site.
- c) Reasonable speeds will be maintained at all times.
- d) Access roads shall be adequately maintained so as to minimise dust, erosion or undue surface damage.

Dust control on the access and haul roads

- a) The liberation of dust into the surrounding environment shall be effectively controlled by the use of, inter alia, water spraying and / or other dust-allaying agents. The speed of haul trucks and other vehicles must be strictly controlled to avoid dangerous conditions, excessive dust or excessive deterioration of the road being used.

Rehabilitation of access roads

- a) Whenever a mining permit is suspended, cancelled or abandoned or if it lapses and the holder does not wish to renew the permit, any access road or portions thereof, constructed by the holder and which will no longer be required by the landowner, shall be removed and / or rehabilitated to the satisfaction of the Regional Manager.
- b) Any gate or fence erected by the holder which is not required by the landowner, shall be removed and the situation restored to the pre-mining situation.
- c) Roads shall be ripped or ploughed, and if necessary, appropriately fertilised (based on a soil analysis) to ensure the regrowth of vegetation. Imported road construction materials which may hamper regrowth of vegetation must be removed and disposed of in an approved manner prior to rehabilitation.
- d) If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation, be corrected and the area be seeded with a seed mix to the Regional Manager's specification.

6.6.2 Stormwater and Erosion Control

- a) Stormwater Management Plans should be developed for each borrow pit and should include the management of stormwater during construction, as well as the installation of stormwater and erosion control infrastructure and management thereof after completion of construction.
- b) Drainage works are required to prevent stormwater from entering or exiting the borrow pits to prevent silt laden surface water from draining into the river systems in proximity to the borrow pit sites (i.e. stormwater must be prevented from entering or running off the borrow pit sites).
- c) Borrow pit slopes should be profiled to ensure that they are not subjected to excessive erosion but capable of drainage run-off with minimum risk of scour (maximum 1:3 gradient).
- d) If necessary, diversion channels should be constructed ahead of the open cuts as well as above emplacement areas and stockpiles to intercept clean run-off and divert it around disturbed areas into the natural drainage system downstream of the borrow pits.
- e) All existing mined areas (where works will take place) will be rehabilitated to control erosion and sedimentation.
- f) Existing vegetation must be retained as far as possible to minimise erosion problems.
- g) Rehabilitation of borrow pits and quarries shall be planned and completed in such a way that the run-off water (if any) will not cause erosion (see section 6.9.1).
- h) Visual inspections shall be done on a regular basis with regard to the stability of water control structures, erosion and siltation (if required).
- i) Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams;
- j) No river or surface water may be affected by silt emanating from the borrow pits.

6.6.3 Office / Camp Sites

Establishing office / camp sites

- a) Office and camp sites shall be established, as far as is practicable, outside the flood plain, above the 1 in 50 flood level mark within the boundaries of the mining area.
- b) The area chosen for these purposes shall be the minimum reasonably required and which will involve the least disturbance to vegetation. Topsoil shall be handled as described in 6.5.2 above.
- c) No camp or office site shall be located closer than 100 metres from a stream, river, spring, dam or pan.
- d) No trees or shrubs will be felled or damaged for the purpose of obtaining firewood, unless agreed to by the landowner.
- e) Fires will only be allowed in facilities or equipment specifically constructed for this purpose. If required by applicable legislation, a fire-break shall be cleared around the perimeter of the camp and office sites.
- f) Lighting and noise disturbance or any other form of disturbance that may have an effect on the landowner and persons lawfully living in the vicinity shall be kept to a minimum.

Toilet facilities, waste water and refuse disposal

- a) As a minimum requirement, the holder of the mining permit shall, at least, provide pit latrines for employees in such a way that they do not cause water or other pollution and proper hygiene measures shall be established.
- b) Portable toilets shall be provided adjacent to the site entrance indicated on the layout plans (Appendix B) and shall be screened with shade cloth.
- c) The use of existing facilities must take place in consultation with the landowner.
- d) All effluent water from the camp washing facility shall be disposed of in a properly constructed French drain, situated as far as possible, but not less than 200 metres, from any stream, river, pan, dam, spring or borehole.
- e) Only domestic type wash water shall be allowed to enter this drain and any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility.
- f) Spills should be cleaned up immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility.
- g) Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., shall be stored in a container at a collecting point and collected on a weekly basis and disposed of at a recognised disposal facility. Specific precautions shall be taken to prevent refuse from being dumped on or in the vicinity of the camp site.
- h) Biodegradable refuse generated from the office / camp site, processing areas vehicle yard, storage area or any other area shall either be handled as indicated above or be buried in a pit excavated for that purpose and covered with layers of soil, incorporating a final 0,5 meter thick layer of topsoil (where possible). Provision should be made for future subsidence of the covering.

Rehabilitation of the office / camp site

- a) On completion of operations, all buildings, structures or objects on the camp / office site shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002). This means that the holder of the permit may not demolish or remove any building, structure, or object which may not be demolished in terms of any other law, which has been identified in writing by the Minister for purposes of this section; or which is to be retained in terms of an agreement between the holder and the landowner, which agreement has been approved by the Minister in writing. The above does not apply to *bona fide* mining equipment which may be removed.
- b) Where office / camp sites have been rendered devoid of vegetation / grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
- c) Areas containing French drains shall be compacted and covered with a final layer of topsoil to a height of 10 cm above the surrounding ground surface.
- d) Rehabilitation of vegetation on the site will be done as described in the Rehabilitation Plan (section 6.9.1).
- e) If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious

effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

- f) Photographs of the camp and office sites, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.

6.6.4 Vehicle Maintenance Yard and Secured Storage Areas

Establishing the vehicle maintenance yard and secured storage areas

- a) The vehicle maintenance yard and secured storage area will be established as far as is practicable, outside the flood plain, above the 1 in 50 flood level mark within the boundaries of the mining area.
- b) The area chosen for these purposes shall be the minimum reasonably required and involve the least disturbance to tree and plant life. Topsoil shall be handled as described in section 6.5.2 above.
- c) The storage area shall be securely fenced and all hazardous substances and stocks such as diesel, oils, detergents, etc., shall be stored therein. Drip pans, a thin concrete slab or a facility with PVC lining, shall be installed in such storage areas with a view to prevent soil and water pollution.
- d) The location of both the vehicle maintenance yard and the storage areas are to be indicated on the layout plan.
- e) No vehicle may be extensively repaired in any place other than in the maintenance yard.

Maintenance of vehicles and equipment

- a) The maintenance of vehicles and equipment used for any purpose during the mining operation will take place only in the maintenance yard area.
- b) Equipment used in the mining process must be adequately maintained so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid.
- c) Machinery or equipment used on the mining area must not constitute a pollution hazard in respect of the above substances. The Regional Manager shall order such equipment to be repaired or withdrawn from use if he or she considers the equipment or machinery to be polluting and irreparable.

Waste disposal

- a) Suitable covered receptacles shall be available at all times and conveniently placed for the disposal of waste.
- b) All used oils, grease or hydraulic fluids shall be placed therein and these receptacles will be removed from the site on a regular basis for disposal at a registered or licensed disposal facility.
- c) All spills should be cleaned up immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility.

Rehabilitation of vehicle maintenance yard and secured storages areas

- a) On completion of mining operations, the above areas shall be cleared of any contaminated soil, which must be dumped as referred to in section above (Waste disposal).

- b) All buildings, structures or objects on the vehicle maintenance yard and secured storage areas shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002.
- c) The surface shall then be ripped or ploughed to a depth of at least 300 mm and the topsoil previously stored adjacent to the site, shall be spread evenly to its original depth over the whole area. The area shall then be fertilised if necessary (based on a soil analysis).
- d) Rehabilitation of vegetation on the site will be done as described in the Rehabilitation Plan (section 6.9.1).
- e) If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

6.7 Excavations

6.7.1 Establishing the Excavation Areas

Excavations shall be done as described in section 2.4 of this document. Whenever excavation of the borrow pits is undertaken, the following operating procedures shall be adhered to:

- a) It is suggested that mining commence at the access and then advance rapidly therefrom.
- b) Excavations shall take place only within the approved demarcated mining area.
- c) Temporary batter boards are to be erected as required as mining proceeds to indicate the sideways and downward limit of mining.
- d) Topsoil shall, in all cases be handled as described in section 6.5.2 above.
- e) Overburden rocks and coarse material shall be placed concurrently in the excavations or stored adjacent to the excavation, if practicable, to be used as backfill material once the gravel has been excavated.
- f) Each successive mined area shall be bound by temporary 1v:2h slopes along its edge with unmined ground, and a final permanent slope of 1V:3H along its edge of ground not to be mined.
- g) Trenches shall be backfilled immediately if no fill can be located (not likely).

6.7.2 Rehabilitation of Excavation Areas

- a) Rocks and coarse material removed from the excavation must be dumped into the excavation.
- b) Excavations may be used for the dumping of construction wastes (i.e. cured concrete, spoil material). This shall be done in a way to aid rehabilitation.
- c) Waste (non-biodegradable refuse) will not be permitted to be deposited in the excavations.
- d) Once excavations have been refilled with overburden, rocks and coarse natural materials and profiled with acceptable contours and erosion control measures, the topsoil previously stored shall be returned to its original depth over the area.
- e) The area shall be fertilised if necessary to allow vegetation to establish rapidly. Rehabilitation of vegetation on the site will be done as described in the Rehabilitation Plan (section 6.9.1).

- f) If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation, be corrected and the area be seeded with a vegetation seed mix to his or her specification.
- g) Final rehabilitation shall comply with the requirements mentioned in the Rehabilitation Plan (section 6.9.1).

6.8 Labour and Affected Parties

6.8.1 Labourers on Site

- a) Labourers from the nearby local communities should be appointed where possible.
- b) Suitable accommodation and security must be provided by the contractors for their workers during construction (if applicable).
- c) The contractor in conjunction with the client shall develop policies and procedures with regard to employee accommodation (if applicable).
- d) The contractor will implement management commitments with respect to noise, dust and safety. Furthermore the contractor shall ensure that their staff are trained regarding the Safety Health and Environmental (SHE) procedures to be followed on site. Penalty clauses for transgressions shall also be considered in this regard.
- e) The contractor shall ensure that the standard safety measures as stipulated in the Mine, Health and Safety Act are complied with.
- f) All employees and contractors shall be briefed about appropriate road safety measures. Penalties and disciplinary actions will be imposed on employees and contractors for non compliance with safety, environmental and social measures.

6.8.2 Other Affected Parties

- a) Any complaints, if they arise, will be timeously dealt with. This will require the joint formulation of compliance contracts and grievance procedures and project-specific communication mechanisms (for example keeping of a complaints register).
- b) Inadvertent access to dangerous construction areas shall be prevented. Such areas will be strictly controlled using fencing, warning signs and access control.

6.8.3 Prevention of Social Disruptions

- a) Wherever “outsiders” are accommodated in construction camps, the Contractor shall implement strict access control measures with only authorised personnel allowed at the camp site;
- b) Workers may only be housed in surrounding villages if the relevant authorities in the villages are satisfied with this arrangement.

6.9 Rehabilitation and Closure

6.9.1 Rehabilitation Plan

General requirements

- a) Rehabilitation will be restricted to areas excavated and used for the purposes of this project.
- b) The objective of rehabilitation will be to restore the borrow pits to a condition which is as far possible to the natural environment or to their pre-determined end use.

- c) Rehabilitation shall commence as soon as the advancing face and sufficient working / loading area moves away from an area that has been mined out to the proposed limit of mining.
- d) Final rehabilitation will take place on completion of the borrow process and shall continue for six months after completion of the project or until a certificate of closure is issued by the Department of Mineral Resources, whichever is the longer.

Surplus material and topsoil

- a) On completion of borrowing, all surplus material in and around the excavations, including any stockpiled gravel or oversized rocks, but excluding topsoil, shall be returned and the sides of the pits shall be graded at 1V:3H slopes.
- b) Stockpiled gravel will be left inside the pits for use on future projects.
- c) The topsoil stockpiled prior to mining shall be spread evenly over designated areas of the borrow pit, to a thickness of not less than 75 mm.
- d) Topsoil from adjacent road clearing activities can also be used to supplement topsoil for mining areas where topsoil is deemed to be inadequate by the engineer.
- e) The topsoil must be keyed into the re-profiled surfaces to ensure that they are not eroded or washed away.
- f) The top-soiled surface shall also be left fairly rough to enhance seedling establishment, reduce water run-off and increase infiltration.

Landscaping

- a) All borrow pit slopes shall be finished to produce a smooth rounded concave / convex surface.
- b) Ensure that hard rock slopes are safe. Benching of these slopes is preferred.
- c) Slopes shall be smoothed over.
- d) The floor of the borrow pit shall be made gently undulating in keeping with the landscape surrounding the excavation.
- e) The rehabilitated land will merge with the immediate environment, and any negative visual impact will be rectified to the satisfaction of the Regional Manager.

Re-vegetation

- a) No seeding of replaced topsoil should be required, unless topsoil has been stored for a period longer than 12 months. Once replaced, the topsoil will be left to revegetate naturally unless the process does not occur unaided or if significant topsoil erosion occurs.
- b) The prepared surfaces shall be irrigated regularly for the initial 30 day period and monitored for natural re-growth. If necessary, planting or seeding shall be undertaken if natural vegetation did not begin to establish after 30 - 60 days (specialist guidance shall be sought to determine the exact requirements).
- c) Should the initial approach be deemed insufficient, the problem areas shall be seeded with suitable grass species to provide an initial ground cover and stabilize the soil surface.
- d) During rehabilitation, specific consideration must be given to the slopes as these areas are more prone to erosion before the new vegetation can establish.
- e) No alien species shall be planted at any time in this area.

Drainage works / erosion protection

- a) Areas where mining is completed shall be rehabilitated immediately to reduce the opportunity for erosion.
- b) Mining operations should be conducted in phases, thereby limiting the scale of erosion.
- c) The final surface level shall be free draining (unless otherwise indicated) and the necessary measures will be taken to prevent erosion until such time that the vegetation is sufficiently established.
- d) Runnels, erosion channels or wash-aways developing after rehabilitation shall be backfilled and consolidated and the areas restored to a proper stable condition.
- e) Brush packing can be used in erosion runnels or at drainage outlets.
- f) Central borrow pit areas are likely to become water traps in the long-term and the rehabilitation procedure should aim to complement this - i.e. the use of locally occurring water tolerant grasses, sedges and reeds would be recommended.

General site clean-up

- a) All infrastructure, equipment, plant, fencing, temporary services and foreign materials shall be removed from the site (according to section 44 of the MPRDA).
- b) Waste material of any description, including receptacles, scrap, rubble and tyres will be removed entirely from the mining area and disposed of at a recognised landfill facility. It will not be permitted to be buried or burned on the site.
- c) Internal access tracks, not required by the landowner, shall be obliterated by breaking the surface crust and scarifying the area to a depth of 250 mm, whichever is the shallower, and then be covered with stockpiled topsoil.
- d) The borrow pits will be kept in a neat and tidy condition at all times.

Additional measures

- a) No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been finished off.
- b) Only persons or equipment required for the preparation of areas, application of fertiliser and spreading of top material shall be allowed to operate on these areas.
- c) Permanent, stock-proof fencing shall be erected / reinstated alongside the road.

6.9.2 End Use

After rehabilitation of the borrow pits, these areas will probably be natural accumulation areas for runoff from the surrounding areas and become small dams in the long-term. These areas may also be transformed into artificial wetlands or used for livestock watering where applicable.

6.9.3 Closure

When the holder of the mining permit intends closing down the mining operations, an environmental risk report shall accompany the application for closure.

6.10 Safety and Security

It is noted that this EMP is not a Health & Safety Plan. It is the Contractor's responsibility to ensure that a Health & Safety Plan, as per the requirements of the Occupational Health & Safety Act, is

prepared prior to any physical work occurring on the site. Safety in terms of labourers on site is discussed in section 6.8. In general, the Contractor shall maintain the borrow pits such that they do not become a danger to persons or livestock. The Contractor shall at all times observe proper and adequate safety precautions on the site and shall be deemed to be responsible for security of the mining site.

7 References

Mucina, L., & Rutherford, M. (2006). The vegetation of South Africa, Lesotho and Swaziland. Pretoria: Strelitzia 19, South African National Biodiversity Institute.

Contract NRA N.010-040-2004/2F. The rehabilitation of the National Route 10 Section 4 from Cradock (KM 1.6) to Knutsford (KM 29.2). Detailed Assessment and Design Report (2012). Prepared by PD Naidoo & Associates Consulting Engineers.

Appendices

Appendix A - Site Locality Plan

Appendix B – Borrow Pit Layouts

Appendix C – Photographs



Photo C1: Existing access to borrow pit 1



Photo C2: Vegetation south of the access road that runs across borrow pit 1



Photo C3: Vegetation north of the access road that runs across borrow pit 1. Note the maize field in the background.



Photo C4: Animal burrow on borrow pit 1 site.



Photo C5: Poorly rehabilitated existing borrow pit 2

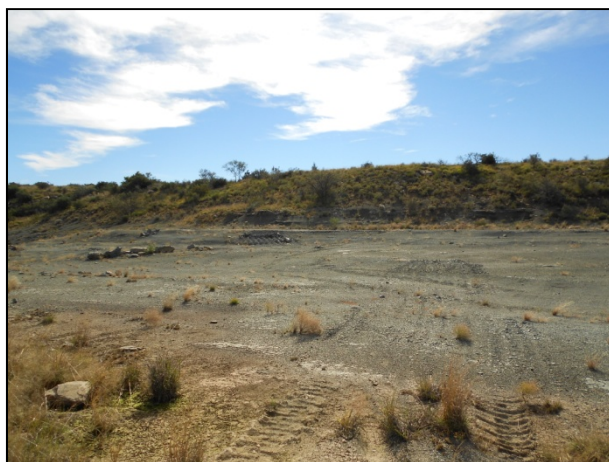


Photo C6: Hillside of borrow pit 2 which will be cut back in order to extend the borrow pit



Photo C6: Western section of existing borrow pit 2 when looking towards the south. Note the farm houses in the background.



Photo C7: Eastern section of existing borrow pit 2 when looking towards the south.

Appendix D – Proof of Landowner’s Consultation

TO WHOM IT MAY CONCERN

1. This is to certify that I, A.S. Jordaan am the legally registered owner of the farm Meadows / Spekboomberg and that I hereby give permission to PDNA to perform the required material investigations on my farm.

A.S. Jordaan
Signature Name

4 July 2012
Date

2. I hereby certify that I, A.S. Jordaan (the legally registered owner of the farm Meadows / Spekboomberg) would in future be willing to enter into a negotiation process with SANRAL, or its designated representative, for obtaining the right and reasonable compensation for the area and/or road building material as may be required. With this I do not certify that I will accept any price/compensation, but only that I will be willing to enter into a negotiation process therefore.

A.S. Jordaan
Signature Name

4 July 2012
Date

4. Legally registered owner information:

Name: Andrew Schoeman Jordaan

ID number: 5212115034080

Contact information:

Tel no.: 048-8813228

Fax no.: 048-8813228

Cell no.: 0824641575 / 0727293558

E-mail: wj@agrimex.com

Postal Address: P.O. box 438

Craddock
5880

TO WHOM IT MAY CONCERN BURNSIDE FARMS PROPERTY TRUST

1. This is to certify that I, represent am the legally registered owner of the farm No. 592 and that I hereby give permission to PDNA to perform the required material investigations on my farm.

[Signature] W.A.M. WALKER 14/7/12
Signature Name Date
BURNSIDE FARMS PROPERTY TRUST

2. I hereby certify that I, represent (the legally registered owner of the farm No. 592 would in future be willing to enter into a negotiation process with SANRAL, or its designated representative, for obtaining the right and reasonable compensation for the area and/or road building material as may be required. With this I do not certify that I will accept any price/compensation, but only that I will be willing to enter into a negotiation process therefore.

[Signature] W.A.M. WALKER 14/7/12
Signature Name Date

4. Legally registered owner information:
Name: BURNSIDE FARMS PROPERTY TRUST .
ID number: IT 1113 \ 2007 .
Contact information:
Tel no.: 082 651 3821 .
Fax no.: 048 881 4708 .
Cell no.:
E-mail: burnsidewam@intekom.co.za : 39 .
Postal Address: P.O. Box 12
CRADOCK
5880 .

WAM WALKER .
6201135099081 .

[Signature]

Appendix E: Specialist Studies

Appendix E1 – Palaeontological Impact Assessment

Appendix E2: Archaeological Impact Assessment

Appendix F – Impact Rating Table & Rating Methodology

Impact Rating Methodology

A significance rating is allocated to each potential impact, based on consideration of the probability, intensity, extent, duration and possible mitigation of the potential impact. These terms are explained as follows:

- **Probability:** the likelihood of the impact occurring;
- **Intensity:** the ‘severity’ of the impact or extent to which ecological and social processes are altered;
- **Extent:** the scale of the impact on a local - national level;
- **Duration:** the length of time the impact will last, which may be anything from several days to the entire lifetime of the development; and
- **Mitigation:** ways in which an impact can be avoided, minimised or managed to reduce its environmental significance.

Each rating is based on observations made during the site visits and on professional judgement. Based on a synthesis of the above criteria, significance of an impact is rated as follows:

- **High significance:** where the impact would influence the decision to authorise the road rehabilitation regardless of any mitigation measures;
- **Moderate significance:** where the impact should influence the decision to rehabilitate the road, and where mitigation measures can, and must, be specified to reduce the overall impact; and
- **Low significance:** where the impact would not have any influence on the decision to authorise the rehabilitation of the road.

Appendix G – Letter Confirming Financial Provision for Rehabilitation



Southern Region

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Tel +27 (0) 41 398 3200 Fax +27 (0) 41 398 3211 / 3222

Reference:	16/1/4 – N.010-040-2004/2 (#456 156v1)	Your Ref	
Date:	06 July 2012	Fax Number:	+27 (0) 41 398 3222
Enquiries	Sean Strydom	Direct Line:	+27 (0) 41 398 3207
Email:	strydoms@nra.co.za	Website:	<u>www.nra.co.za</u>

Department of Minerals and Energy
Private Bag X6076
PORT ELIZABETH
6000

Attention: Ms D. Watkins

Dear Ms Watkins

CONTRACT NRA N.010-040-2004/2 –FOR THE REHABILITATION OF NATIONAL ROUTE 10 SECTION 4 FROM CRADOCK (KM 1,6) TO KNUTSFORD (KM 29,2): CONFIRMATION OF SANRAL PROJECT

This letter is submitted in support of the Environmental Management Plan for the proposed mining sites to be used for the rehabilitation of National Route 10 Section 4 from Cradock (km 1,6) to Knutsford (29,2). We confirm that this is a South African National Roads Agency Limited (SANRAL) project.

We also confirm that financial provision has been made available and is reserved for the rehabilitation of all relevant quarries and/or borrow pits, upon completion of the works.

Kind Regards

Fanie van Aardt
Acting for M.S. Peterson
Regional Manager: Southern Region

Appendix H – Undertaking



REGISTRATION NO. 1998/009584/06

Southern Region

Delivery: SANRAL House, Southern Life Gardens, 70 2nd Avenue, Newton Park, Port Elizabeth
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Email:	strydoms@nra.co.za	Website:	www.nra.co.za

Creating
wealth through
infrastructure

The Regional Manager
Department of Mineral and Energy
Private Bag X6076
PORT ELIZABETH
6000

Attention: Ms. D. Watkins

Dear Madam

**CONTRACT NRA N.010-040-2004/2: REHABILITATION OF NATIONAL ROUTE 10
SECTION 4 FROM CRADOCK (KM 1,6) TO KNUTSFORD (KM 29,2)**

UNDERTAKING

I, Stephanus van Aardt acting for M.S. Peterson

the undersigned and duly authorised thereto by the South African National Roads Agency Ltd, hereby undertake to implement all the aspects contained in the EMPR concerning mining activities for this project and accept full responsibility therefore.

SIGNED AT Port Elizabeth this 06 day July 2012.

SIGNATURE

WITNESSES:

1.

2.

Official use

**CONTRACT NRA N.010-040-2004/2: REHABILITATION OF NATIONAL ROUTE 10
SECTION 4 FROM CRADOCK (KM 1,6) TO KNUTSFORD (KM 29,2)**

APPROVAL

Approved in terms of the provisions of the Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002).

SIGNED at.....this.....day2012.

**Regional Manager
Eastern Cape**

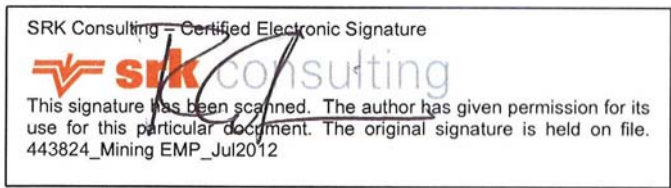
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Mr Sean Strydom	SANRAL	3	9 July 2012	R Gardiner
Mr Danfred Adams	PDNA	4	9 July 2012	R Gardiner
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Approval Signature:



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