Proposed Upgrade of the Provincial Road from Centane to Kei River Mouth

Report Prepared for

Eastern Cape Department of Roads and Public Works

Report Number 430816/5

On behalf of Makhetha Development Consultants

Report Prepared by

srk consulting

November 2011

Proposed Upgrade of the Provincial Road from Centane to Kei River Mouth

Eastern Cape Department of Roads and Public Works

On behalf of Makhetha Development Consultants

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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.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA, used to focus the EIA

Scoping Report	A written report describing the issues identified to date for inclusion in an EIA
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
DEDEA	Department of Economic Development and Environmental Affairs
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)
EC DR&PW	Eastern Cape Department of Roads and Public Works
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
IDZ	Industrial Development Zone
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
NMBM	Nelson Mandela Bay Municipality
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SARTM	South African Rural Traffic Model
SDF	Spatial Development Framework
SRK	SRK Consulting
ToR	Terms of Reference
+ve	Positive
-ve	Negative

1 Introduction

The Eastern Cape Department of Roads and Public Works (EC DR&PW) identified a need to upgrade and tar the road between Centane and Kei River Mouth (see Figure 2-1 for an illustration of the proposed activities). 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 Department of Economic Development and Environmental Affairs as well as an application for a mining right (this document) for the proposed four borrow pits (BP2 (section 2A and section 2F2), BP3 (section F1 and section F2), BP5 and QF BP3) located along this route to the Department of Mineral Resources (DMR). This EMP is prepared in accordance with the requirements of the MPRDA and DMR.

1.1 Applicant Details

Eastern Cape Department of Roads and Public Works	Contact person: Mr JF Majiba
01 Cowan Street, Stellenbosch Park, King Williams Town	Tel: 043 604 7640
Private Bag X002	Fax:
5600	Email: Jongikaya.majiba@dpw.ecape.gov.za

1.2 Environmental Assessment Practitioner Details

SRK Consulting	Contact person: Ms Robyn Thomson
PO Box 15739	Tel: (043) 748 6292
Beacon Bay	Fax: (041) 748 1811
5205	Email: rthomson@srk.co.za

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

SRK Consulting (SRK) has been appointed by EC DR&PW as the independent consultants to undertake the Environmental Management Programme (EMPr) process 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.

Project Manger

- Robyn Thomson is an Environmental Scientist and a member of SRK's Environmental Department in East London. She has over 7 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.

Box 1: Environmental Assessment Practitioner Details

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

EC DR&PW 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

EC DR&PW 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.

EC DR&PW 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 are in process and will be submitted to the Department of Economic Development and Environmental Affairs (DEA).

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 m^2 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

A Heritage (Archaeological and Palaeontological) specialist study has been undertaken and is 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 Assessment	Albany Museum
Palaeontological Assessment	Rob Gess Consulting

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 Eastern Cape Department of Roads and Public Works (EC DR&PW) identified a need to upgrade the Centane Kei River Mouth Road and appointed a project team to conduct the relevant tasks. The need for the upgrading of the road is mainly based on the condition of the road and associated structures and the safety for road users.

This road forms part of the proposed "Wild Coast Meander". The Centane to Kei River Mouth section will connect to the existing road from the N2 to the Kei River Mouth to the remainder of the proposed "Wild Coast Meander" towards the east.

The traffic count done in January 2011 recorded 337 cars, 5 buses and 20 trucks that use this road daily. This accounted for quick deterioration of the wearing course, showing that the road is unsuitable for the traffic it carries. The end result being the regular re-gravelling operations which not only impede the movement of traffic but are also costly.

The geometrical alignment also showed sharp curves and steep slopes which needed re-alignment to allow for smooth flow of traffic.

The proposed road is to be upgraded to surfaced standard with road width of 7.4 m. This will be made up of two lanes of 3.4 m width and 0.3 m shoulder each. The rest of the shoulder will be unsurfaced with 0.2 m width. Bus bays and sidewalks will be introduced in populated villages along the route.

Borrow pits are required in order to meet the materials requirements of the proposed road upgrade. Quarry material will be sourced from an existing commercial licensed quarry located at Butterworth.

Spoil material 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 borrow pits have not been properly rehabilitated after previous use, and it is the intention of EC DR&PW to rehabilitate the sites that will be used during this project.

Table 2-1 Comparative Assessment of Potential Borrow Pit Sites

Site ID	Existing/ Greenfields	Vegetation - Mucina and Rutherford, 2006, The Vegetation of Southern Africa, SANBI	Wetland/ Rivers/ Dams	Heritage
BP1-TH1	Existing (unrehabilitated)	Bhisho Thornveld - Least Threatened.		
BP2 (F2 and 2 G5-G7)	Existing (unrehabilitated)	Bhisho Thornveld - Least Threatened. Alien plants present		
BP3 (F1 and F2)	Existing (unrehabilitated)	Eastern Valley Bushveld - Least Threatened. Alien plants present	Ponding	
BP4	Existing (unrehabilitated)	Bhisho Thornveld - Least Threatened. Alien plants		

Site ID	Existing/ Greenfields	Vegetation - Mucina and Rutherford, 2006, The Vegetation of Southern Africa, SANBI	Wetland/ Rivers/ Dams	Heritage
		present		
BP5	Existing (unrehabilitated)	Eastern Valley Bushveld - Least Threatened. Alien plants present		
BP6	Existing (unrehabilitated)	Bhisho Thornveld - Least Threatened. Alien plants present		
BP7	Existing (unrehabilitated)	Bhisho Thornveld - Least Threatened. Alien plants present	river 30m from BP 7	
BP8	Existing (unrehabilitated)	Transkei Coastal Belt - Vulnerable. Alien plants present		
QF BP1	Existing (unrehabilitated)	Transkei Coastal Belt - Vulnerable. Alien plants present		
QF BP2	Existing (unrehabilitated)	Transkei Coastal Belt - Vulnerable. Alien plants present	Ponding	Possible trace fossils
QF BP3	Existing (unrehabilitated)	Scarp Forest - Least Threatened. Alien plants present.		

Legend
1 Most Desirable
2
3
4
5 Least Desirable

Figure 2-1: Proposed upgrade of the Centane and Kei River Mouth for which material from the proposed borrow pits

2.2 Activity Description

The proposed activities entail the use of four existing borrow pit sites (total of seven borrow pits) along the Centane Kei River Mouth Road (see for the locality plan). Detailed information on each borrow pit is included in Table 2-2 to Table 2-7.

Table 2-2: Information on proposed Borrow Pit 2A (Km 2.72)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Farm No 146
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 18' 11.401" E 32° 31' 21.324" S
Magisterial District	Centane
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Velapi 073 238 2763
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 for subsistence agricultural purposes (crops and 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 Centane to Kei River Mouth road located to the west of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 2.72 km
Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	415 masl
Total area of mining activities (ha)	Max 0.2784ha
Approximate volume of material to be mined	17,661 m^3
Time period of mining operations to be conducted	3 years

Table 2-3: Information on proposed Borrow Pit 2 F2 (km 2.460)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Farm No 144
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 18' 11.401" E 32° 31' 21.324" S
Magisterial District	Centane

Required Information	Available Information
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Velapi 073 238 2763
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 for subsistence agricultural purposes (crops and 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 Centane to Kei River Mouth road located to the west of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 2.460 km
Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	405.00 masl
Total area of mining activities (ha)	Max. 0.1935 ha
Approximate volume of material to be mined	5886.90 m^3
Time period of mining operations to be conducted	3 years

Table 2-4: Information on proposed Borrow Pit 3 F1 (km 4.460)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Farm No 144
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 18' 2.236" E 32° 32' 17.120" S
Magisterial District	Centane
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Velapi 073 238 2763
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 for subsistence agricultural purposes (crops and 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 Centane to Kei River Mouth road located to the west of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 4.460 km

Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	315.00 masl
Total area of mining activities (ha)	Max. 0.4647 ha
Approximate volume of material to be mined	49658.920 m³
Time period of mining operations to be conducted	3 years

Table 2-5: Information on proposed Borrow Pit 3 F2 (km 4.460)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Farm No 144
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 18' 2.236" E 32° 32' 17.120" S
Magisterial District	Centane
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Velapi 073 238 2763
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 for subsistence agricultural purposes (crops and 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 Centane to Kei River Mouth road located to the west of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 4.460 km
Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	315.00 masl
Total area of mining activities (ha)	Max. 0.4450 ha
Approximate volume of material to be mined	33613.480 m³
Time period of mining operations to be conducted	3 years

Table 2-6: Information on proposed Borrow Pit 5 (Km 5.46)

Required Information	Available Information
Information on the site	

Required Information	Available Information
Full name of the property on which mining operations will be conducted	Farm No 145
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 18' 27.906" E 32° 32' 33.664" S
Magisterial District	Centane
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Velapi 073 238 2763
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 for subsistence agricultural purposes (crops and 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 Centane to Kei River Mouth road located to the west of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 5.460 km
Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	312 masl
Total area of mining activities (ha)	Max 0.696ha
Approximate volume of material to be mined	71,406.540 m³
Time period of mining operations to be conducted	3 years

Table 2-7: Information on proposed Borrow Pit QF-BP3 (Km 28.06)

Required Information	Available Information
Information on the site	
Full name of the property on which mining operations will be conducted	Farm No 2
Name of subdivision	N/A
Co-ordinates of mining area: Latitude & Longitude	28° 23' 1.794" E 32° 40' 10.140" S
Magisterial District	Centane
Name of registered owner of property	Communal/ Tribal (Unregistered)
Details of property owner	Councillor Manxila 073 381 3205
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 for subsistence agricultural purposes (crops and grazing)

Required Information	Available Information
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 Centani-Qolorha road located to the east of the borrow pit site also contributes to environmental impacts through vehicle emissions and noise
What is the name of the nearest town and specify the distance	Centane – 28.06 km
Information on the mining activity	
Mineral to be mined	Aggregate (RM) Dimension Stone – General (M) Stone Aggregate Gravel (St)
Ultimate depth of the proposed mining operations	32 masl
Total area of mining activities (ha)	Max 0.739ha
Approximate volume of material to be mined	43,774 m^3
Time period of mining operations to be conducted	3 Years

2.3 Activity Location

The borrow pits are existing pits which have been mined previously. The proposed borrow pits are located adjacent to the Centane to Kei River Mouth Road which is to be upgraded, with the furthest site being 320 m from the road and the closest being immediately adjacent to the road. Borrow pits BP2, BP3 and BP5 are located on the eastern side of the road and QF-BP3 is located on the southern side of the road. The section of the road to be upgraded and the location of the borrow pits can be seen in Figure 2-1. The coordinates of the corners of the areas within which the proposed borrow pits will be made are listed in Table 2-8. Mining plans, showing the positions of the listed coordinates are included in Appendix B of this report.

Table 2-8: Coordinates of the four corners of the proposed borrow pits

Borrow Pit	Coordinates	
BP 2 G5-G7	Y(m)	X(m)
A	+ 65 478.798	+ 3 599 995.438
B	+ 65 512.631	+ 3 599 988.915
C	+ 65 489.299	+ 3 599 948.238
D	+ 65 458.979	+ 3 599 952.745
BP 2 F2	Y(m)	X(m)
F 2A	+65 482.571	+3 600 063.655
F 2B	+65 464.050	+3 600 027.087
F 2C	+65 430.275	+3 600 040.047
F 2D	+65 451.684	+3 600 080.418
BP 3 F1	Y(m)	X(m)
1A	+65 725.973	+3 601 746.923
1B	+65 769.158	+3 601 717.656
1C	+65 757.878	+3 601 690.642
1D	+65 702.555	+3 601 672.006
1E	+65 703.702	+3 601 740.902

Borrow Pit	Coordinates	
BP 3 F2	Y(m)	X(m)
2A	+65 703.702	+3 601 740.902
2B	+65 702.555	+3 601 672.006
2C	+65 649.305	+3 601 681.030
2D	+65 652.176	+3 601 724.032
BP5	Y(m)	X(m)
2A	+ 65 093.835	+3 602 240.297
2B	+ 65 080.732	+ 3 602 206.728
2C	+ 64 972.598	+ 3 602 246.186
2D	+ 64 983.497	+ 3 602 276.681
QF-BP3	Y(m)	X(m)
A	+ 57 821.965	+ 3 616 316.000
B	+ 57 866.894	+ 3 616 270.227
C	+ 57 786.881	+ 3 616 198.851
D	+ 57 747.000	+ 3 616 249.000

2.4 Mining Work Plan / Methods

The following information is 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 all the proposed borrow pits. A short description of activities for all the borrow pit sites are also included where necessary. The geological structures and the material available at each site are described in section 3.1.2.

General Work Plan

The material will be mined by means of blasting (where necessary), to loosen and break down the bigger boulder material. A bulldozer will be utilized with a ripper (if necessary to excavate through hard material) and either a front end loader or a tracked excavator to load loose or loosened material. 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. The extent of mining will be determined by the volume of material required at that time. The approximate volume of material in each proposed borrow pit or quarry area is given in Table 2-2 to Table 2-7.

Temporary batter boards will be erected as required as mining proceeds to indicate the sideways and downward limits of mining.

Borrow Pits

The existing borrow pits can be extended to the north, south and east depending on their location. Heavy ripping and stockpiling of material may be required here. Single stage crushing may be considered to reduce the volume of oversized material for the selected G7 and G5 layers.

All removed topsoil will be stockpiled and re-used for the rehabilitation of the borrow pit as shown on the drawings.

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

3.1 Biophysical Environment

3.1.1 Topography

The surrounding area can generally be described as undulating with gentle hills and steeper slopes located at rocky outcrops. Drainage of the region is towards the south east.

3.1.2 Geology and Soils

Geology of the Area

The area of the proposed project is underlain by strata of the Karoo Supergroup, which were deposited within the Karoo sedimentary Basin and is underlain mainly by mudstones and sandstones of the Tarkastad and Adelaide Subgroups of the Beaufort Group. Numerous dolerite intrusions in the form of dykes are present throughout the area.

The Tarkastad Subgroup consists of an interbedded sequence of indurated hard rock mudstone, hard rock siltstone and to a lesser extent very hard rock, fine grained sandstone horizons. The thickness of the formation is estimated to be in the order of 1,000 m.

The Karoo-age rocks of the Balfour Formation have been extensively intruded by very large, Jurassic-age dolerite sills, dykes and other intrusions. Due to the resistant nature of the rock, weathering has resulted in the formation of ridges in low-lying areas or capping on hills. The mode of dolerite intrusion is in the form of concordant slightly transgressive sills. Local undulations and variation in thickness of these sills can be observed. The dolerite intrusions have metamorphosised the adjacent Karoo strate. The mudstones, shales and sandstones have been indurated by the baking effect of the intruding very hot magma. This has resulted in a recrystallisation of the quartz minerals within the contact zone with these sedimentary layers, which ultimately increase the rock hardness.

The Adelaide Subgroup consists of alternating units, a few metres to tens of metres thick of grey, fine-grained ultra-lithofeldspathic sandstone (±20 %) and greenish-grey, bluish-grey or greyish-red mudstone (±80 %), generally constituting distinct upward fining cycles. Red mudstone is relatively abundant immediately below the top of the Adelaide Subgroup, over a vertical interval of 50 to 100m. The sandstone displays flat-bedding, trough cross-bedding and micro-cross lamination. The sandstone is poorly stratified or massive. Cut-and –fill structures are common.

The Burgersdorp Formation consists mainly of alternating fine-grained litho-feldspathic sandstone and greyish-red mudstone lithosomes. The strata are generally horizontal or dip at low angles (less than 5°). Steeper dips may be present locally in close proximity to dolerite intrusions.

The Katberg Formation consists of thick zones of sandstone, with thin irregular mudstone layers and lenses. Alternating with the sandstone zones are thin zones of mudstone, containing minor interbedded sandstone and siltstone beds and lenses.

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 and excavations in order to reduce the environmental impact of opening new borrow pits. Also, the existing borrow pits have in the past been poorly

rehabilitated and are unsightly scars in the landscape. Identifying, using and rehabilitating the borrow pits 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 dolerite and sandstones and mudstones that meet the relevant requirement for the road layers to be constructed.

The material available at each borrow pit and quarry is discussed individually below.

Borrow Pit 2 (F2 and G5-G7)

The material to be used from this borrow pit consists primarily of mudstone on the borrow pit floor. The material is suitable for use as aggregate (RM), dimension stone – general (M) and stone aggregate gravel (St). The estimated quantity available is just under 24,000 m³. Topsoil will be stockpiled separately for the rehabilitation of the borrow pit.

Borrow Pit 3 (F1 and F2)

The material to be used from this borrow pit consists primarily of dolerite on the borrow pit floor. The material is suitable for use as aggregate (RM), dimension stone – general (M) and stone aggregate gravel (St). The estimated quantity available is just under 50,000 m³. Topsoil will be stockpiled separately for the rehabilitation of the borrow pit.

Borrow Pit 5

The material to be used from this borrow pit consists primarily of sandstone with interbedded dark greenish shale. The material is suitable for use as aggregate (RM), dimension stone – general (M) and stone aggregate gravel (St). The estimated quantity available is approximately 71,000 m³. Topsoil will be stockpiled separately for the rehabilitation of the borrow pit.

Borrow Pit QF-BP 3

The material to be used from this borrow pit consists primarily of sandstone. The material is suitable for use as aggregate (RM), dimension stone – general (M) and stone aggregate gravel (St). The estimated quantity available is approximately 43,000 m³. Topsoil will be stockpiled separately for the rehabilitation of the borrow pit.

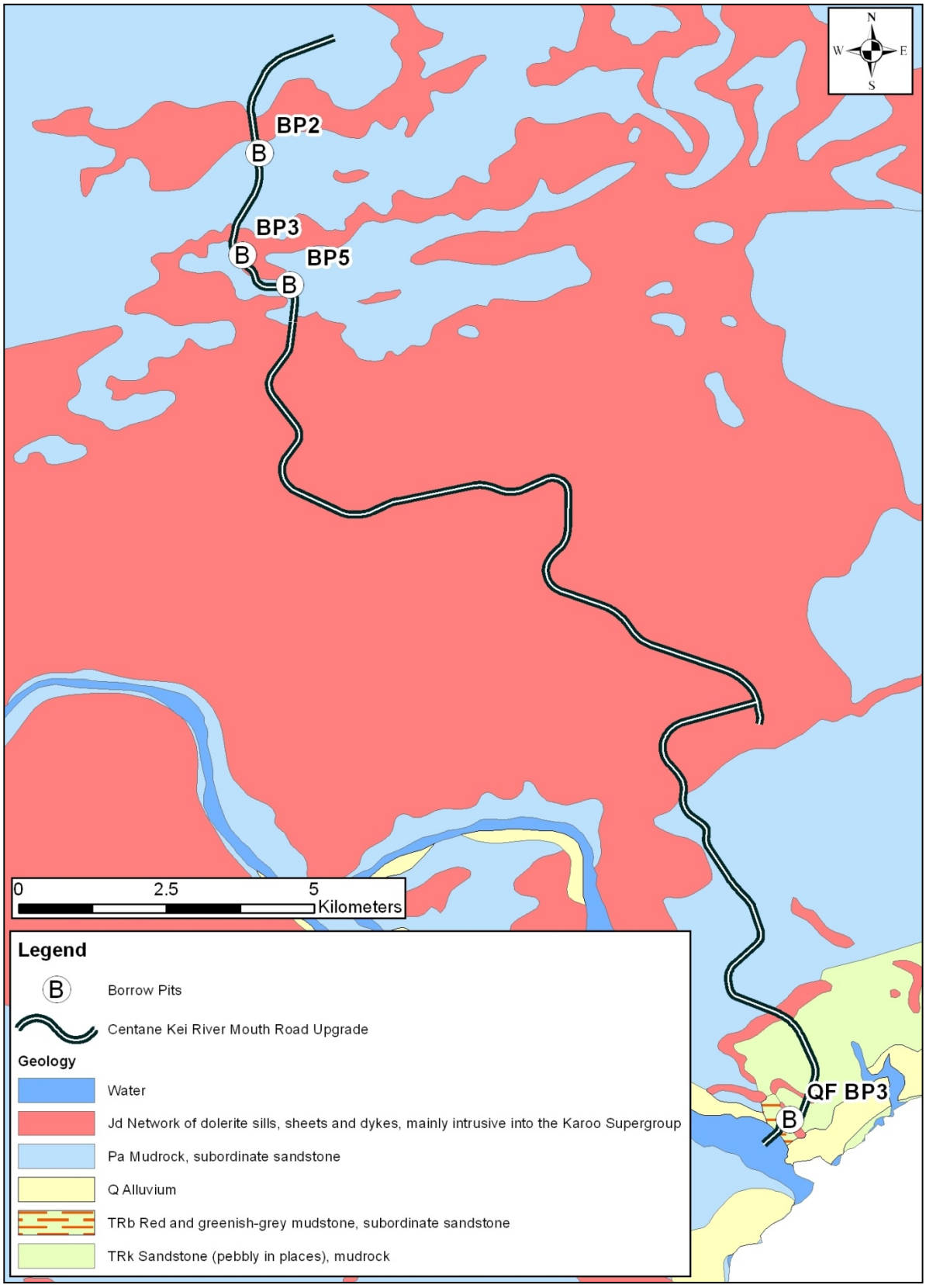


Figure 3-1: Geology at each borrow pit site

3.1.3 Hydrology

The Centane to Kei River Mouth Road crosses the Qolora and Gxara Rivers, which drain towards the Indian Ocean in the south-east. Several minor seasonal streams also occur in the surrounding area. In some instances the borrow pits are situated within 100 m of these streams, namely BP2 (96 m), QF BP 3 (37 m). If the mitigation measures recommended in this report are adhered to, these borrow pits are not expected to have a major impact on this system (see Table 5-1). Stormwater and runoff from the borrow sites will need to be adequately managed in order to prevent increased turbidity of the river systems downstream. The rivers are visible on the locality plan (see Figure 2-1).

Groundwater resources could potentially be affected by the quarrying activities due to the fuels needed in the machinery and chemical components required for blasting. 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.

3.1.4 Land Use

The proposed borrow pits are existing mined areas. The dominant land use in the area is subsistence farming with several villages dotted across the area. Subsistence farming consists of small scale crops and livestock, namely, sheep, cattle and goats.

Blasting activities at the borrow pits may affect the nearby houses and infrastructure. A blasting assessment needs to be undertaken to establish the threshold values for blasting activities in relation to houses and infrastructure

3.1.5 Ecology

According to the South African Vegetation Map (Mucina and Rutherford, 2006), the vegetation types in the area of the borrow pits are:

1. Bhisho Thornveld (Savanna Biome) is widely distributed with some 80% of the original extent remaining and is classified as least threatened (Mucina and Rutherford, 2006). BP2 is located in this vegetation type.
2. Eastern Valley Bushveld (Savanna Biome) is widely distributed with some 84% of the original extent remaining and is classified as least threatened (Mucina and Rutherford, 2006). BP3 and BP5 are located within this vegetation type.
3. Scarp Forest (Forest Biome) is found in the Eastern Cape, KwaZulu-Natal and Mpumalanga Provinces as well as Swaziland with some 95% of the vegetation type conserved and is classified Least threatened in protected areas, but is exposed to over-exploitation elsewhere (Mucina and Rutherford, 2006). QF-BP3 is located within this vegetation type.

The proposed mining activities are to take place on previously disturbed (mined) areas; and as such a vegetation specialist study has not been undertaken. However, it is recommended that a botanical survey be undertaken prior to commencement of construction, where a search and rescue operation for Protected Species is undertaken.

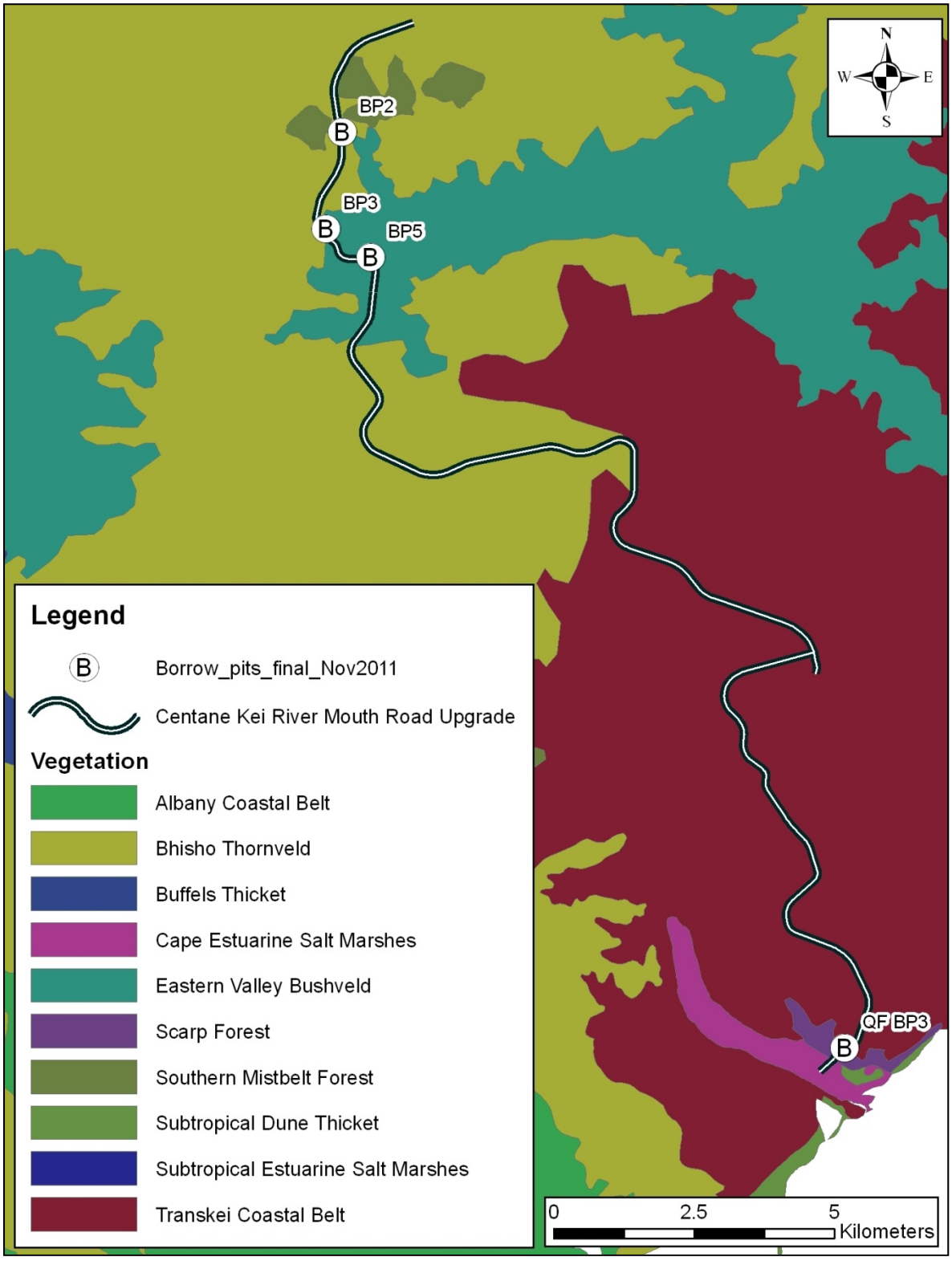


Figure 3-2: Vegetation type at each borrow pit site

Figure 3-3: Vegetation at BP3 (Eastern Valley Bushveld)

Figure 3-4: Vegetation at QF-BP3 (Scarp Forest)

3.1.6 Air quality

Air quality levels around the relevant sites are affected by the current gravel road, resulting in high levels of dust. Quarrying operations during construction of the road may also result in dust generation, however, this is a short-term impact. Please refer to Table 5-1 for the assessment of impacts.

3.1.7 Noise

The identified sites for the borrow pits and quarries are situated in relatively close proximity to the Centane Kei River Mouth Road which is an existing source of noise in that area. The current ambient noise levels are assumed to be relatively high due to the road being a gravel road (i.e. rough surface) as well as traffic volumes on the road. Receptors of noise impacts during operation of the borrow pits would be residents in the villages nearest to the sites. Luxeni and Mpentse Villages are located approximately 1 Km to the west and east respectively from BP2. Nxorharha Village is located approximately 1 Km to the north of BP3. KwaNdesane Village is located approximately 800 m to the south of BP 5. Kei Mouth is located approximately 1 Km south of QF-BP3.

3.1.8 Sites of archaeological and cultural interest

Specialist Archaeological input was obtained from Albany Museum. No visible cultural or archaeological sites were identified within the proposed sites for the borrow pits, and no heritage resources that are protected by the National Heritage Resources Act (Act No. 25 of 1999) are known to occur on site. The Archaeological Impact Assessment is included under Appendix F.

3.1.9 Palaeontological sites

SAHRA requires that a Palaeontological Impact Assessment is carried out for this project. The assessment was undertaken by Rob Gess. According to the specialist, it is unlikely that any Palaeontological material will be exposed or disturbed during work on at the borrow pits. The Palaeontological Impact Assessment is included in Appendix E.

3.2 Social and Economic Environment

3.2.1 Social value of the proposed activity

The proposed upgrading and rehabilitation of the Centane to Kei River Mouth Road will improve the condition of the road and therefore improve road safety to all road users as well as to the local communities living adjacent to the road.

No people should be directly affected by the proposed mining operations at the borrow pits or the quarries, however the noise from these operations might have a temporary affect on residents of nearby villages.

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 (The Daily Dispatch) 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. A public meeting was held on 20 July 2011 to obtain additional issues and concerns. The Draft Basic Assessment Report was made available to Interested and Affected Parties from 29 June 2011 to 8 August 2011 for review and comment. These informed the public of the proposed activities to be undertaken by the proponent.

Comments received regarding the proposed mining operations to obtain material for the proposed activities on Centane Kei River Mouth Road are included in the Table 4-1 below.

Table 4-1 Comments from IAPs on Proposed Mining Activities

Commentator	Comment / Issue Raised	Response
Heritage Issues		
Dr Mariagrazia Galimberti – South African Heritage Resources Agency (SAHRA)	A Heritage Impact Assessment must be undertaken. This must include the archaeological component (Phase 1). Appropriate (Phase 2) mitigation must be done as required. A Palaeontological Impact Assessment is necessary for borrow pit located along the road.	[SRK] An archaeological Impact Assessment has been undertaken by the Albany Museum and a Palaeontological Assessment has been undertaken by Rob Gess. These reports are included under Appendices E and F of this report.
Socio-economic Issues		
Ms Thami Mashini – IWIP	IWIP (Ingolovane Quarry) should be considered for a project of this nature as they are: • A fully licensed quarry mine within approximately 30Km from the site works; • A BBBEE company; • An SMME;	Makhetha – The quarry will be selected based on the quality of the material available and the price offered to the contractor, compliance with mining and environmental legislation and the procurement policies of the proponent.

Commentator	Comment / Issue Raised	Response
	• A Local supplier; • A company where community groups have a stake as their only source of economic participation.	
Mr Hector H Mbanga – Ingolovane Investment Consortium	The beneficiation program (i.e. existing Ingolovane Quarry) is the only means for locals to participate in this large project.	Makhetha – The quarry will be selected based on the quality of the material available and the price offered to the contractor, compliance with mining and environmental legislation and the procurement policies of the proponent. The contract will make provision for the participation of local people as follows: • 120 jobs for local people. • A requirement of the contract is that preference is given to SMMEs from the Amathole District. • The capital value of local labour and SMMEs is 40 to 60% of the contract amount. • 63% of this will accrue to previously disadvantaged individuals.
Mr Hector H Mbanga – Ingolovane Investment Consortium	**Comment (Based on Ms Makhetha's Response)** – presented a motivation regarding the use of the Ingolovane quarry as a source of material.	[SRK] Comment noted. The Environmental Impact Assessment Process is not the forum for procurement issues to be finalised. These issues have been forwarded to the project engineers and social facilitators (Uluntu Skills Development) for the project. The development proposal includes an application for authorisation for project specific borrow pits, Provided that these borrow pits are environmentally acceptable, then the selection of these versus obtaining material from a commercial source, will be based on technical and economic criteria by the contractor during the construction phase.
Ms Thami Mashini – IWIP	Highlighted that IWIP are the women component of Ingolovane Investment Consortium's mining permit.	[SRK] Comment Noted.
Ms Thami Mashini – IWIP	Commented on the procurement policy regarding women who are licensed especially in open cast mining.	[SRK] Comment noted.
Mr Bonisile Mpahlwa – Ward 30	How will the contractor plow back into the community?	[Uluntu Skills Development – Social Facilitators] – 70 % (of the labour) will be sourced from the community. Further to this there will skills development/ training.

Commentator	Comment / Issue Raised	Response
Ms Nomzi Sibini – Ward 29	Local SMME's should be preferred. Is this still closed (i.e. Coega Registration)?	[Makhetha] – Preference is give to SMME's in the Amathole region. Tendering is by invitation to those registered on the Coega supplier data base for this project. Registrations are closed for Phase 1, however, are still open for Phase 2.
Chief N Xikiti	It is important that the contract plows back into the community.	Comment Noted. Details regarding procurement and compensation will be negotiated with the social facilitators.
Mr Tamsanga Magoswana – Ward 29	Environmental Affairs affect the time frames of these projects.	[SRK] Comment noted.
Ms Azola Gaca – Youth Cooperative	Commented that the Youth Cooperative is has positioned itself to assist the youth of the Feni community in accessing opportunities associated with this, and other, construction programmes.	[SRK] Comment noted.
General Issues		
Mr Eric Maguhle – Ward 30	What does G4, G5 and G9 mean in the presentation?	[Makhetha]These refer to the strength of material (i.e. crushed stone, gravel etc) required for construction, with G1 being the strongest and G9 being the weakest.
Mr Bonisile Mpahlwa – Ward 30	Why is the contractor site camp located at the Seagull's Hotel?	The site camp is located 3 Km away from the Seagull's Hotel, not at the hotel.
Ms Azola Gaca – Youth Cooperative	Our comment did not reflect in the Executive Summary and consequent to that absence of response to it, however, the matter was discussed telephonically with Robyn of SRK Consulting.	[SRK] Comment noted. Verbal comment on the BID was received after the closing date of the comment period provided and the issue of the Draft Basic Assessment Report and as such could not be included in the DBAR executive summary. All written comments received from the Youth Cooperative have been included in this Final BAR.

4.2 Landowner Consultation

Landowner consultation is a requirement for the proposed mining application. The land along the Centane Kei River Mouth Road is tribal land falling under the jurisdiction of the Department of Rural Development and Land Affairs who require that a community resolution be obtained prior to giving consent for the mining application.

Landowner consultation was done by Community Liaison Consultants, Uluntu Skills Development. The landowner consent letter/ community resolution is 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 Appendices E and F respectively.

- Palaeontological Impact Assessment; and
- Heritage Impact Assessment.

Table 5-1 summarises the potential impacts of the proposed borrow pits and rock quarries 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 quarry 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 and quarry.	-ve	Low	Low	None required
Soils	Potential loss of soil from borrow pits and quarry due to removal of topsoil and stockpiling for rehabilitation.	-ve	Medium	Very Low	Section 6.5.2
Vegetation	Small scale loss of vegetation associated with activities (establishment of camp site, removal of overburden, and topsoil stockpiles).	-ve	Medium	Very Low	Sections 6.4.2 & 6.5.1
Fauna	Potential small scale loss of fauna, particularly small animals confined to borrow pit and quarry sites, resulting from habitat loss. No endangered or rare species threatened.	-ve	Very Low	Insignificant	Sections 6.5.1
Surface 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 blasting chemicals as well as 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, blasting, crushing, stockpiling and road works on traffic on the Centane Kei River Mouth Road and nearby residents.	-ve	Low	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 blasting and crushing activities are expected on nearby residents.	-ve	Low	Very Low	Section 6.5.5
Structural impacts (due to blasting)	Blasting activities at the borrow pits may affect the nearby houses and infrastructure. A blasting assessment needs to be undertaken to establish the risk of damage to structures in proximity to the site.	-ve	Low	Very Low	Section 6.7.2
Archaeology / Heritage	No archaeological or cultural sites will be affected.	N/A	N/A	N/A	Section 6.5.3
Palaeontology	There is a limited possibility that palaeontological material is situated beneath the surface in mudstones and sandstones of the Adelaide Subgroup (Beaufort Group) which will be disturbed by the planned activities.	-ve	Insignificant	N/A	Section 6.5.3

Element	Description of Potential Impact	Status	Significance		Reference to Mitigation
			Without Mitigation	With Mitigation	
	It would not, however, be practical for these activities to be monitored.				
Visual impact	An existing visual impact occurs at the borrow pits as they are existing sites which have mostly not been properly rehabilitated previously. After rehabilitation, the proposed activities may substantially improve the visual impact on the environment.	+ve *(with mitigation)*	Medium (-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 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 tourist destination.	+ve	Insignificant	Very Low	Section 6.8
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 be 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 shall be erected on either sides of the intersections of access on the Centane Kei River Mouth Road.

b) There will be ‘No unauthorised access’ signs at the borrow pit gates.

c) There will be a heavy vehicle crossings at the intersections of the access tracks and the road (Centane Kei River Mouth).

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) As no species of special concern have been identified on the proposed sites, construction activities may commence directly after demarcation of the mining areas.

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 upgraded 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) 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.

b) If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately.

c) 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.

d) Work may only resume once clearance is given in writing by the archaeologist.

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 it 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) There is a limited possibility that palaeontological material is situated beneath the surface in mudstones and sandstones of the Adelaide Subgroup (Beaufort Group) which will be disturbed by the planned activities. It would not, however, be practical for these activities to be monitored.

6.5.4 Visual Aspects

a) 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.

b) The remains of all structures that may have been erected at the borrow pits and quarry shall be demolished and removed on completion of the project.

c) Care must be taken to ensure that all rehabilitated areas merges with the immediate environment and any negative visual impacts will be rectified to the satisfaction of the Regional Manager.

d) Overburden will be placed back into excavation as part of the rehabilitation programme (see section 6.9.1).

6.5.5 Noise

a) Road construction and blasting activities 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 rehabilitating of borrow pits and quarries.

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.

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) 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 and quarry sites (i.e. stormwater must be prevented from entering or running off the borrow pit and quarry sites).

b) 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).

c) 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.

d) All existing mined areas (where works will take place) will be rehabilitated to control erosion and sedimentation.

e) Existing vegetation must be retained as far as possible to minimise erosion problems.

f) 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).

g) Visual inspections shall be done on a regular basis with regard to the stability of water control structures, erosion and siltation (if required).

h) Sediment-laden run-off from cleared areas should be prevented from entering rivers and streams;

i) No river or surface water may be affected by silt emanating from the borrow pits or quarries.

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 or quarry 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 Blasting Activites

a) A blasting assessment should be undertaken to establish the risks to infrastructure located in proximity to the activities.

6.7.3 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. 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, safety and blasting. Furthermore the contractor shall ensure that their staff is 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 and quarry 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 quarry or hard rock slopes are safe. Benching of these slopes is preferred.

c) Slopes shall be smoothed over.

d) The floor of the borrow pit and quarry shall me 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.

Revegetation

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. *Melinis repens* and *Themeda triandra* are species that can work in this regard and can either be collected on site (using a mower or by hand) or purchased from a relevant local seed supplier.

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 and quarry 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 and quarry 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 unto 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 and the hard rock quarry, 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 and quarry 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 Biodiveristy Institute.

Appendices

Appendix A – Site Locality Plan

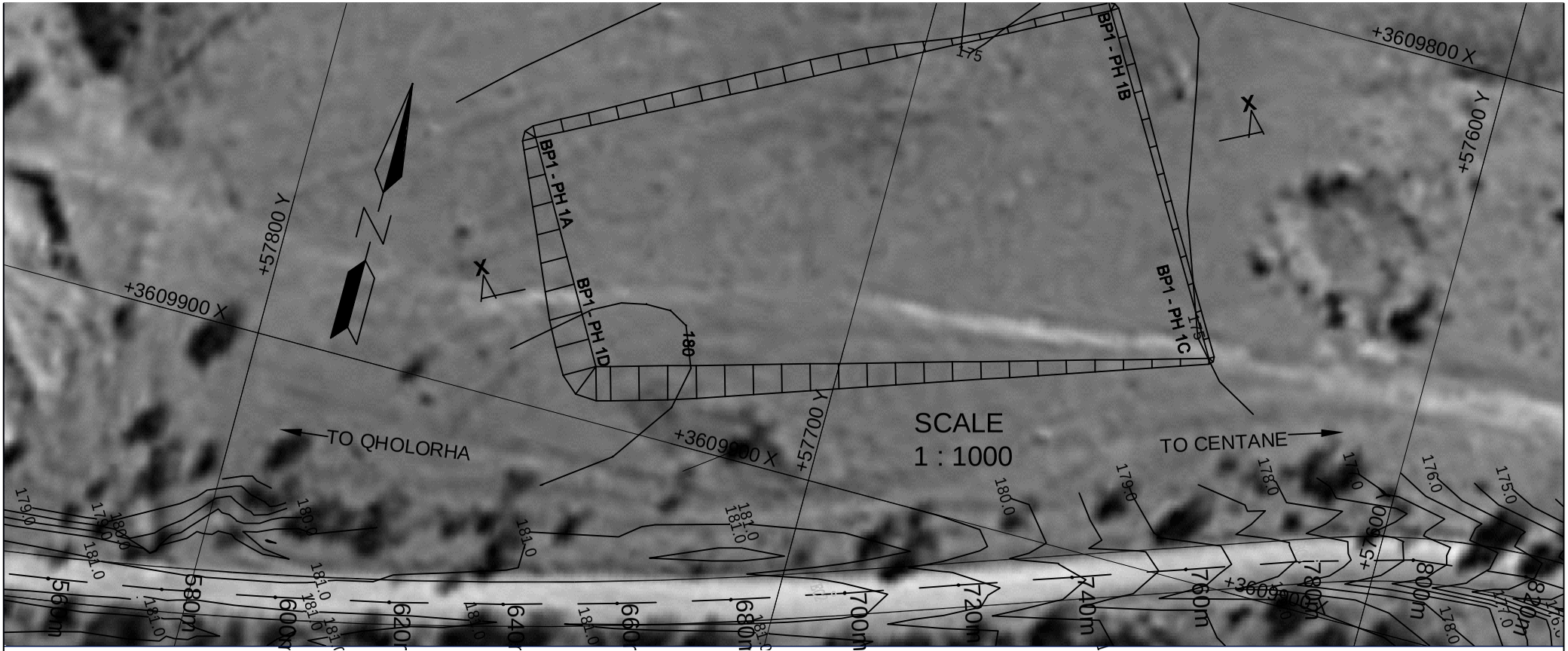
Project No:	Datum:	Date:	Scale:
430816	HH 1994	07/03/2011	1:125,000
	Projection: DD	Compiled by: THOR	Fig No: 001
	Central Meridian/Zone: N/A	Revision: A	Date: 11/11/2011

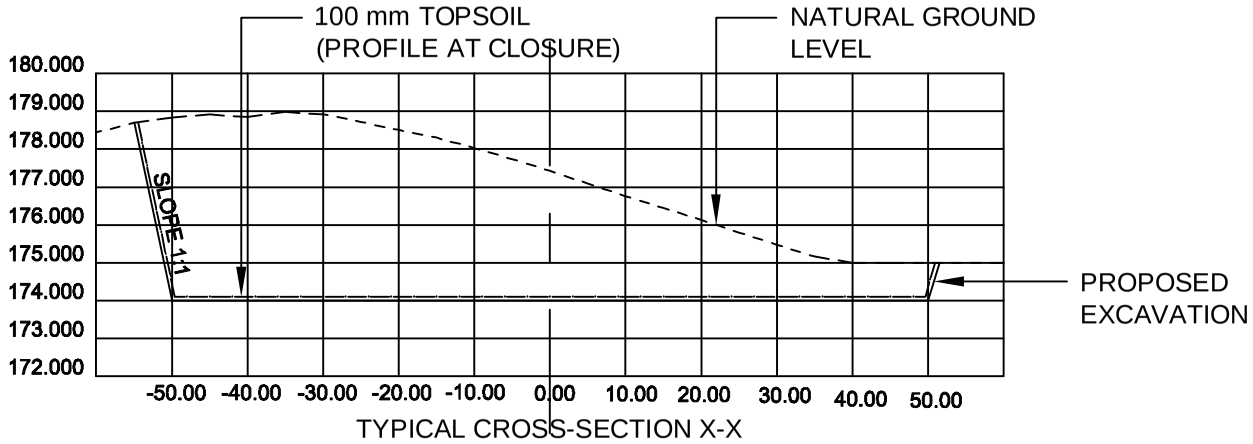
PROVINCIAL ROAD CENTANE QOLORA UPGRADE

LOCALITY

G:\PROJECTS\CURRENT PROJECTS\430816_MAKHETHA CENTANE BA\8GIS\GISPROJ\MXD

Appendix B – Borrow Pit Layouts





TYPICAL CROSS-SECTION X-X

Km DISTANCE =20.700

Area = 6354.00 m^2

ESTIMATED VOLUME AVAILABLE =18430.94m^3

SETTING OUT POINTS BORROW PIT 1 - PH1 G7

REF NO	COORDINATES	
	Y	X
BP1 - PH 1A	57 761.841	3 609 854.278
BP1 - PH 1B	57 670.094	3 609 806.615
BP1 - PH 1C	57 637.690	3 609 861.131
BP1 - PH 1D	57 741.175	3 609 890.357

No.	DATE	DESCRIPTION	ID BY	MM CHD	MM APP	REFERENCE REFERENCE DRAWINGS
0	12-08-2011	Borrow Pit Drawings				

MAKHETHA DEVELOPMENT CONSULTANTS
P. O. BOX 27278
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6057
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DRAWN BY	L. D LANJWA
CHECKED BY	M MAKHETHA

APPROVED BY

M.MAKHETHA Pr Eng 980444
for CONSULTING ENGINEER

DATE: _____

COEGA DEVELOPMENT CORPORATION

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COEGA IDZ BUSINESS CENTRE
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DEPARTMENT OF ROADS & PUBLIC WORKS
PROVINCE OF THE EASTERN CAPE
PRIVATE BAG X0023,
BHISHO,
5605

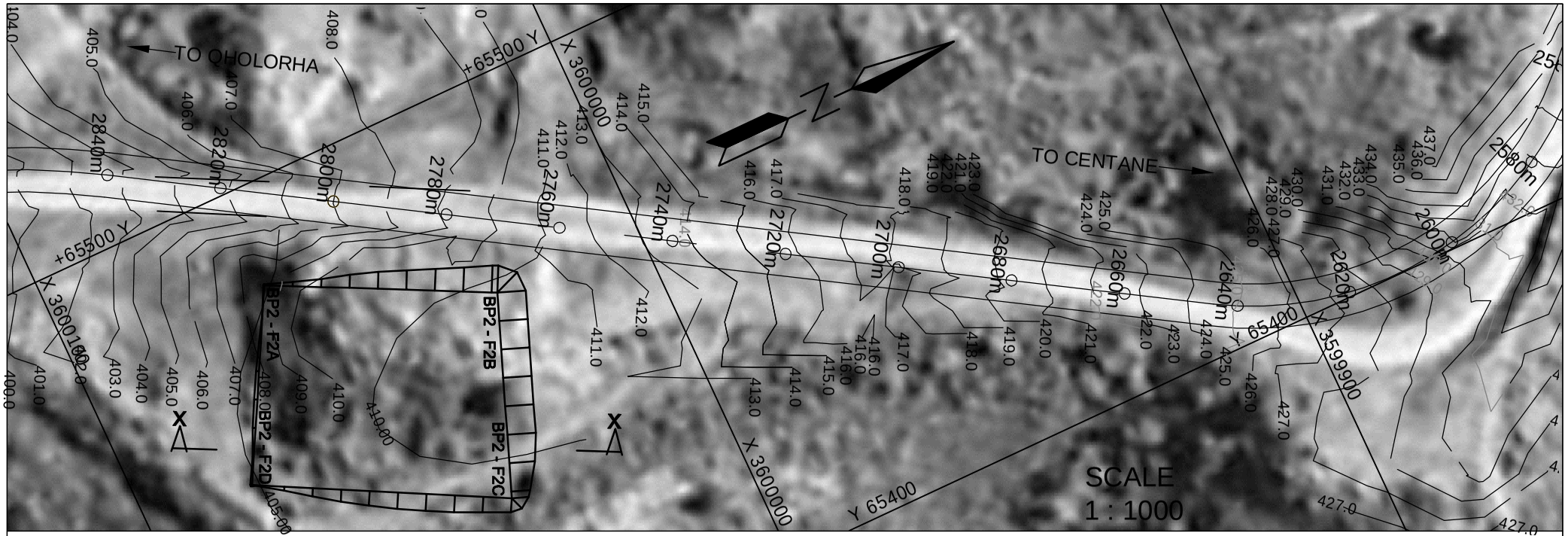
DRAWING TITLE
CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PIT1 - PHASE 1

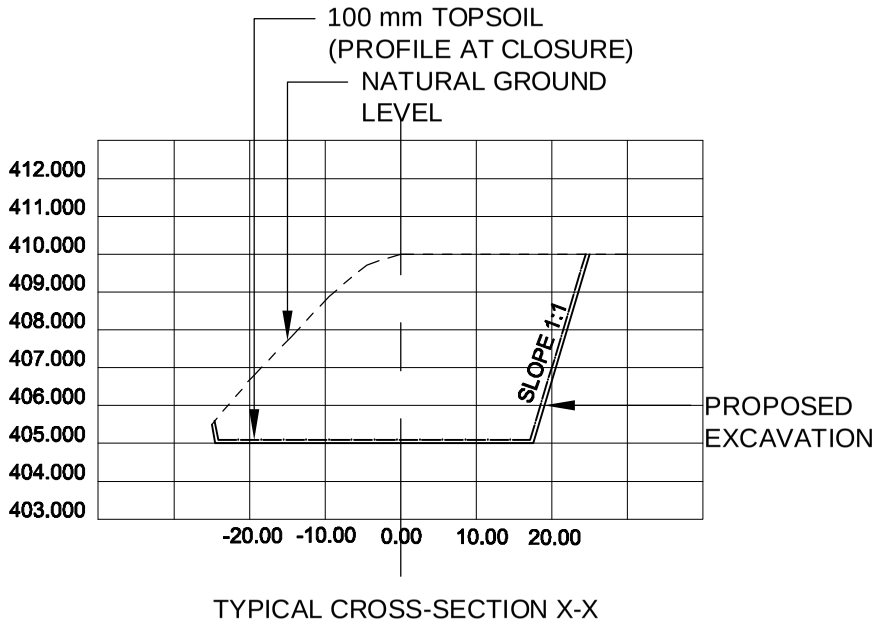
CONSULTANTS JOB NO.

FIGURE 6 Rev A

SHEET 6 OF 7

CDC DRAWING No. Rev A





TYPICAL CROSS-SECTION X-X

Km DISTANCE =2.460
Area = 1935.00 m^2
ESTIMATED VOLUME AVAILABLE = 5886.90m^3

SETTING OUT POINTS BORROW PIT 2 - F2 G6

REF NO	COORDINATES	
	Y	X
BP2 - F2A	65 482.571	3 600 063.655
BP2 - F2B	65 464.050	3 600 027.087
BP2 - F2C	65 430.275	3 600 040.047
BP2 - F2D	65 451.684	3 600 080.418

No.	DATE	DESCRIPTION	BY	CHD	APP	REFERENCE DRAWINGS
0	12-08-2011	Borrow Pit Drawings	LD	MM	MM	REFERENCE

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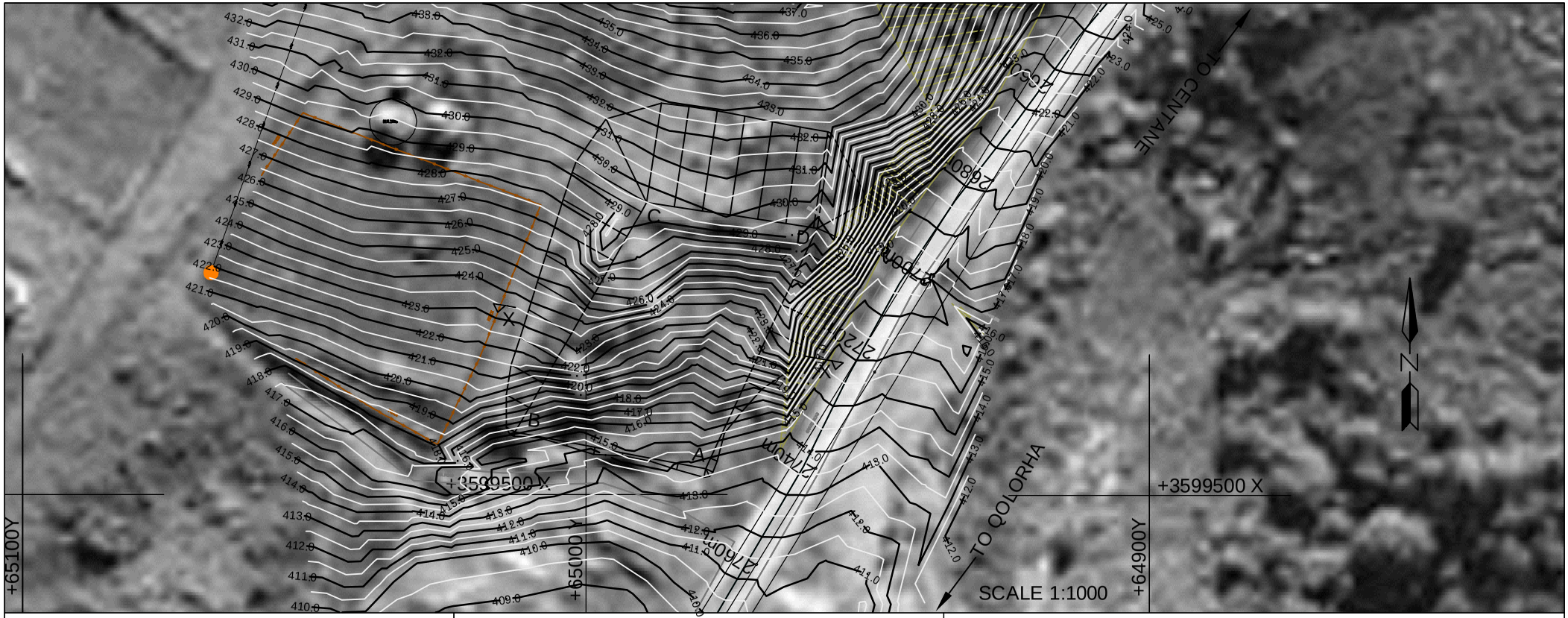
DRAWING TITLE
CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PIT2 - F2

CONSULTANTS JOB NO.
FIGURE 1 Rev A
SHEET 1 OF 7
CDC DRAWING No. Rev A



SETTING OUT POINTS BORROW PIT BP2B

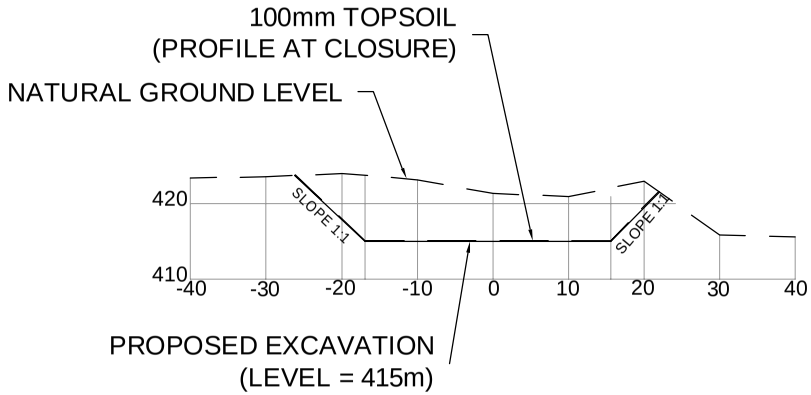
POINT	Y	X
A	65478.798	3599995.438
B	65512.631	3599988.915
C	65489.299	3599948.238
D	65458.979	3599952.745

Km DISTANCE = 2,72

AREA = 2784m^2

ESTIMATED VOLUME AVAILABLE: G5 = 12429m^3

G7 = 5232m^3



BP2B TYPICAL CROSS SECTION X-X

SCALE 1:1000

No.	DATE	DESCRIPTION	BY	CHD	APP	REFERENCE DRAWINGS
0	12-08-2011	Borrow Pit Drawings	NM	MM	MM	REFERENCE

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PROVINCE OF THE EASTERN CAPE
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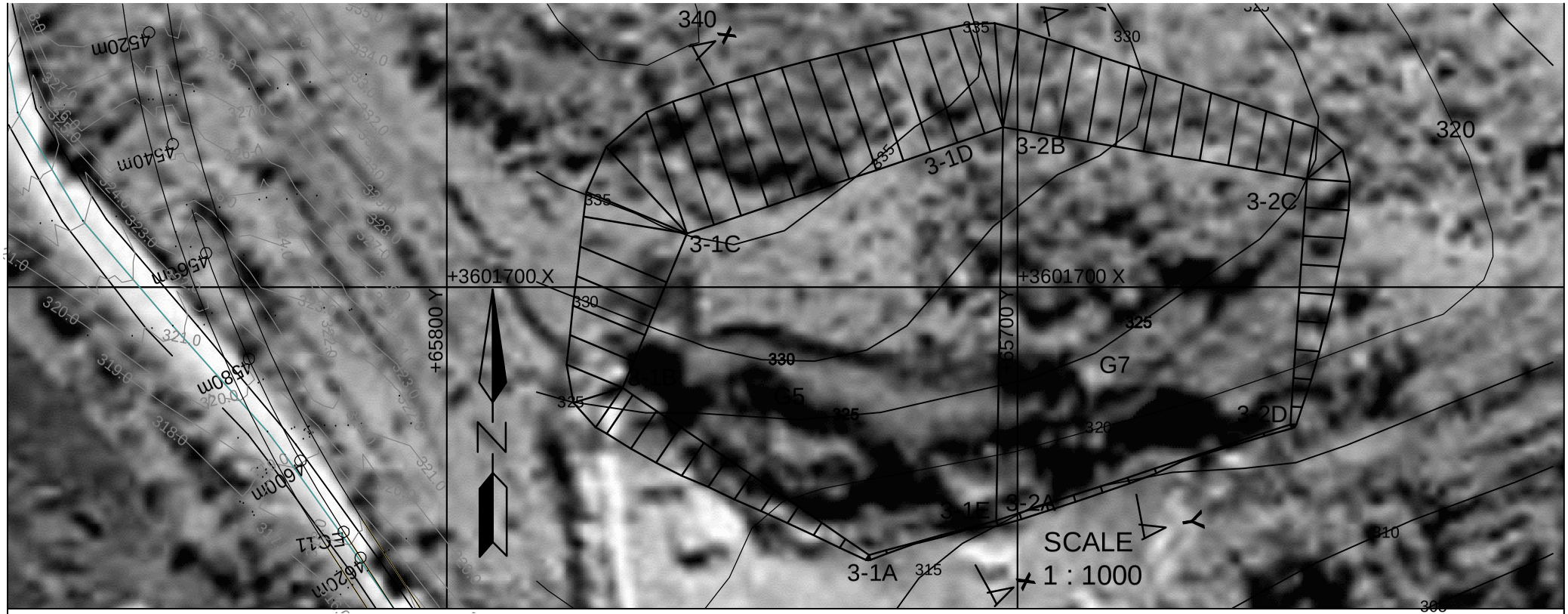
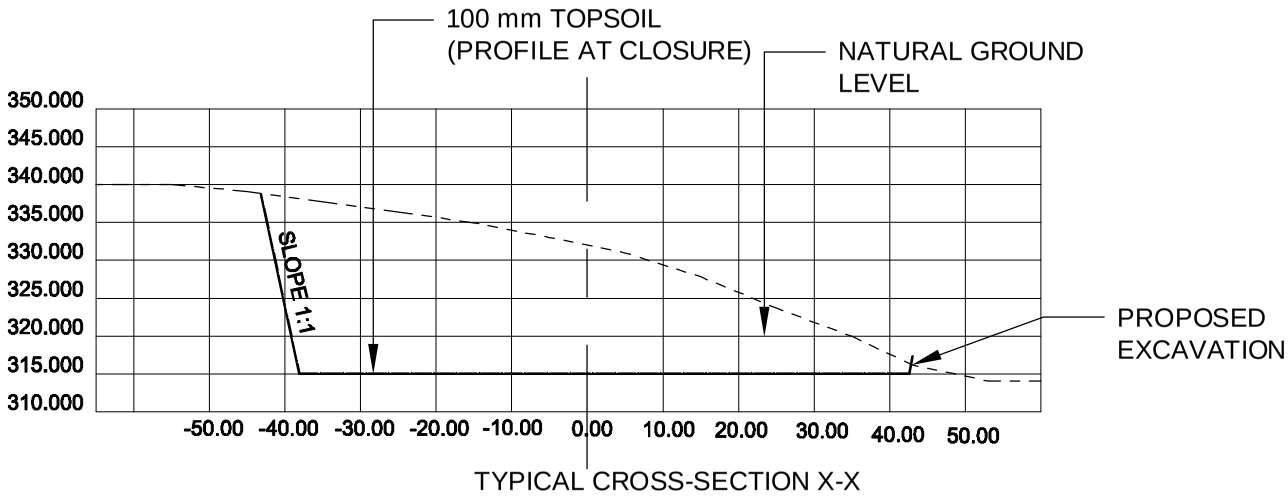
DRAWING TITLE
CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PIT 2A

CONSULTANTS JOB NO.
FIGURE 2
SHEET 2 OF 7
CDC DRAWING No.





TYPICAL CROSS-SECTION X-X

Km DISTANCE =4.460

Area = 4647.000m^2

ESTIMATED VOLUME AVAILABLE =49658.920m^3

SETTING OUT POINTS BORROW PIT 3 G5

REF NO	COORDINATES	
	Y	X
BP3 -1A	65 725.973	3 601 746.923
BP3 -1B	65 769.158	3 601 717.656
BP3 -1C	65 757.878	3 601 690.642
BP3 -1D	65 702.555	3 601 672.006
BP3 -1E	65 703.702	3 601 740.902

No.	DATE	DESCRIPTION	BY	CHD	APP	REFERENCE DRAWINGS
0	12-08-2011	Borrow Pit Drawings	LD	MM	MM	REFERENCE

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M.MAKHETHA Pr Eng 980444
for CONSULTING ENGINEER
DATE: _____

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DEVELOPMENT CORPORATION

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DEPARTMENT OF ROADS & PUBLIC WORKS
PROVINCE OF THE EASTERN CAPE
PRIVATE BAG X0023,
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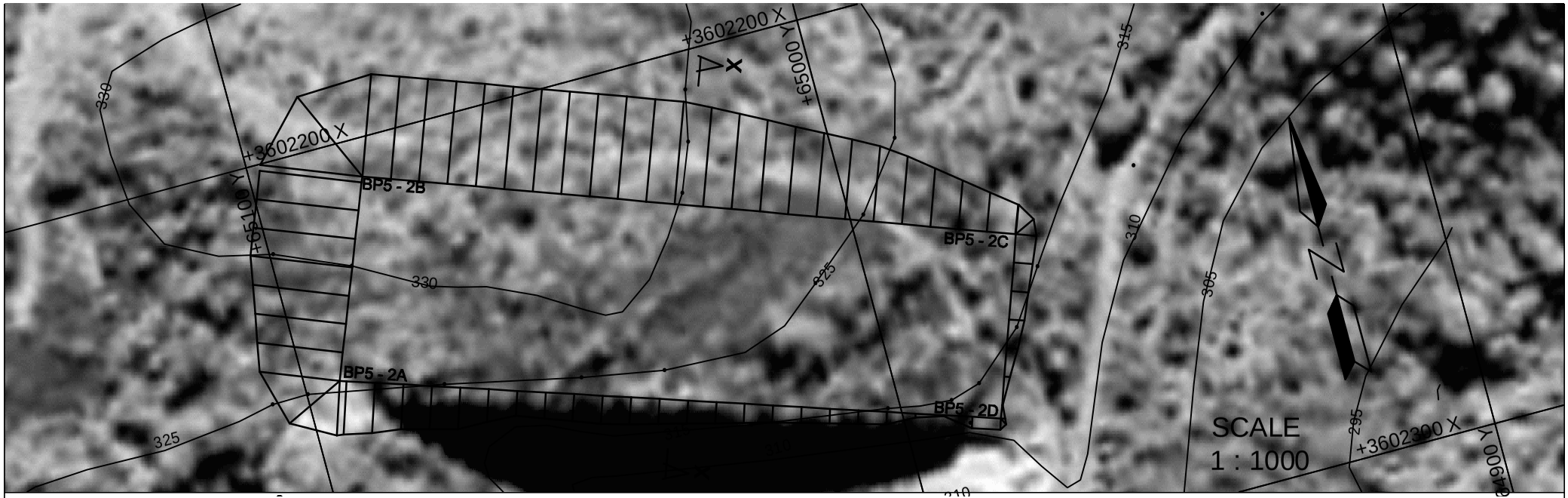
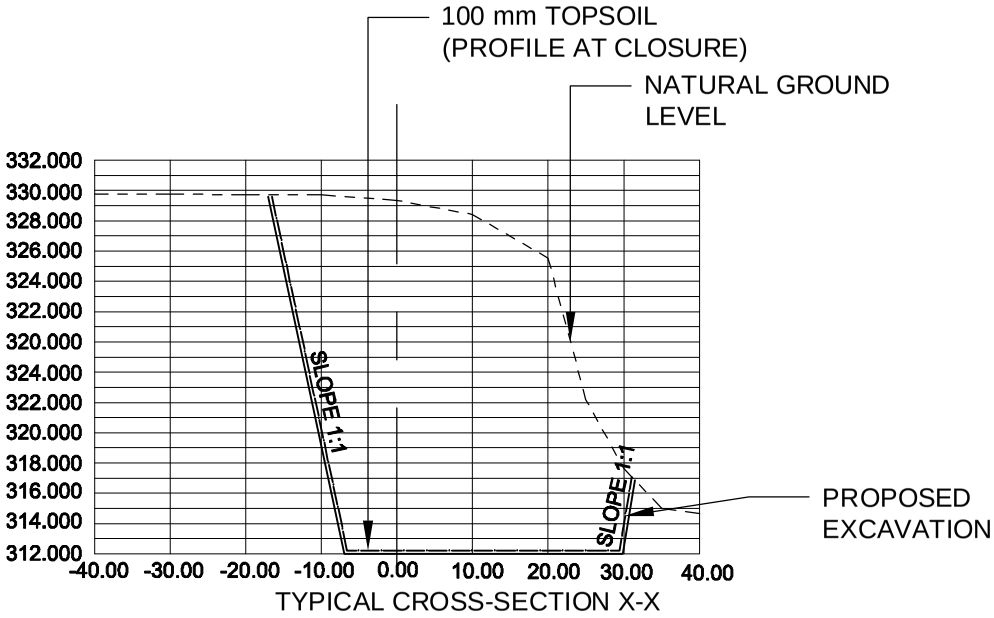
DRAWING TITLE
CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PIT3

CONSULTANTS JOB NO.
FIGURE 3
SHEET 3 OF 7
CDC DRAWING No.





Km DISTANCE = 5.460
Area = 6957.000m^2
ESTIMATED VOLUME AVAILABLE =71406.540m^3
SETTING OUT POINTS BORROW PIT 5 G6

REF NO	COORDINATES	
	Y	X
BP5 -2A	65 093.835	3 602 240.297
BP5 -2B	65 080.732	3 602 206.728
BP5 -2C	64 972.598	3 602 246.186
BP5 -2D	64 983.497	3 602 276.681

No.	DATE	DESCRIPTION	BY	CHD	APP	REFERENCE DRAWINGS
0	22-06-2011	Borrow Pit Drawings	LD	MM	MM	REFERENCE

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M.MAKHETHA Pr Eng 980444
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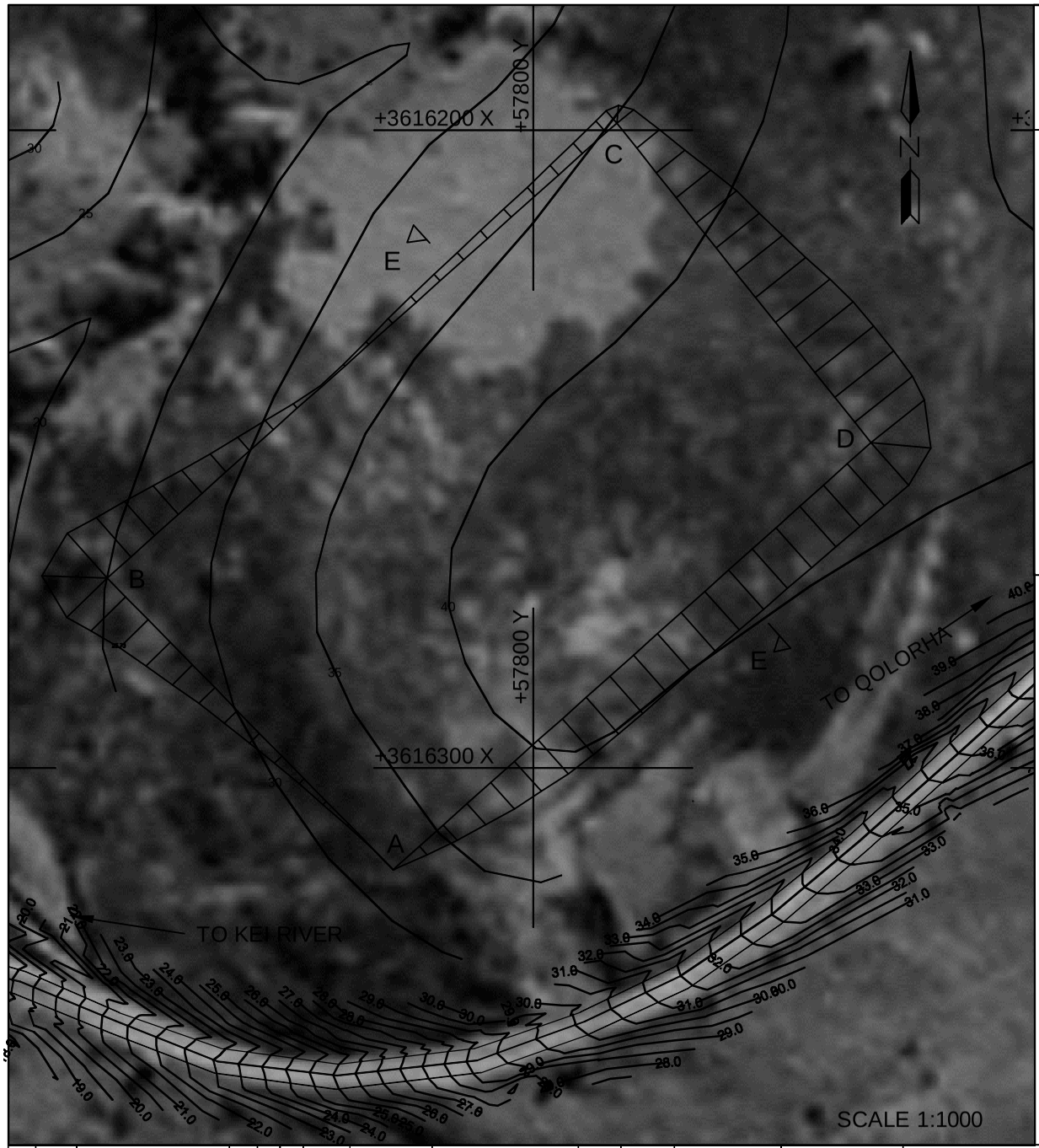
DRAWING TITLE
CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PITS

CONSULTANTS JOB NO.
FIGURE 5
SHEET 5 OF 7
CDC DRAWING No.

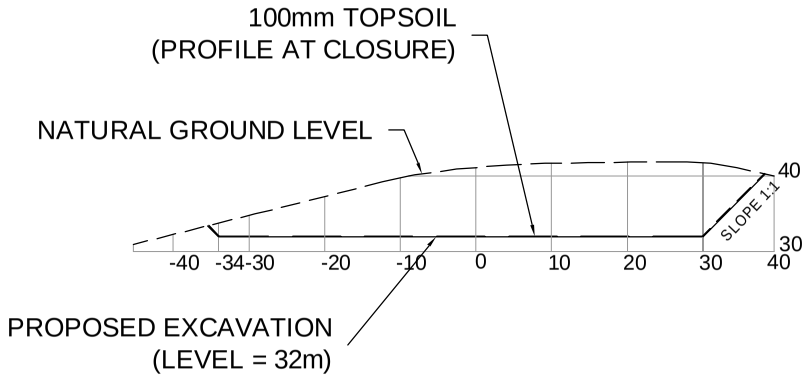


AREA = 7390m^2

ESTIMATED VOLUME AVAILABLE: G7 = 43774m^3

SETTING OUT POINTS BORROW PIT QF-BP3

POINT	Y	X
A	57821.965	3616316.000
B	57866.894	3616270.227
C	57786.881	3616198.851
D	57747.000	3616249.000



QF BP3 TYPICAL CROSS SECTION E-E

SCALE 1:1000

No.	DATE	DESCRIPTION	BY	CHD	APP	REFERENCE DRAWINGS
0	12-08-2011	Borrow Pit Drawings	NM	MM	MM	REFERENCE

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CHECKED BY	M.MAKHETHA	
DRAWN BY	N. MAHACHI	N.MAKHETHA Pr Eng 980444 for CONSULTING ENGINEER
CHECKED BY	M.MAKHETHA	DATE: _____

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DEPARTMENT OF ROADS & PUBLIC WORKS

PROVINCE OF THE EASTERN CAPE
PRIVATE BAG X0023,
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DRAWING TITLE

CENTANE - QHOLORHA
LAYOUT PLAN
BORROW PITQF-BP3

CONSULTANTS JOB NO.

FIGURE 7

SHEET 7 OF 7

CDC DRAWING No.

Appendix C – Photographs

Figure C-1: BP 2

Figure C-2: BP 3 North

Figure C-3: BP 3 South East showing ponding

Figure C-4: BP 5 East showing alien vegetation

Figure C-5: QF-BP 3

Figure C-6: QF-BP 3 showing the proximity of the road

Appendix D – Proof of Landowner's Consultation

22 Graham Road; Southernwood; EAST LONDON; 5200
P.O. BOX 11229; Southernwood; EAST LONDON; 5213
Tel: 043 722 9185
Fax: 086 602 4504
Cell: 083 381 8181
E-mail info@uluntuskills.co.za
PAETA2642, Code.P2UL00000000605: ETQA ID NO: 605

Uluntu Skills Development Centre

Fax

ATT ROBYN THOMSON FROM : L.Gcingca

FAX : 043 748 6292 PAGES : 2

PHONE : 043 748 1811 DATE : 19/09/2011

RE : Community resolution Qholora

CC :

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

- Comments:

Please confirm when you receive this fax.

Thank you,

Ludwe Gcingca

Qolorha Community

P.O.Box

Centane

Attention Robyn Thompson

To whom it may Concern

This letter serves as a confirmation of our resolution as the community of QHOLORA that we all know about this project and we will give all the support that it might need.

For any information regarding the content of this letter can be directed to the undersigned.

Yours Truly

Mr Thandaphi .Chair Person (Project Steering Committee)

Appendix E – Palaeontological Impact Assessment Report

PALAEONTOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED UPGRADE OF THE PROVINCIAL ROAD FROM CENTANE TO QHOLORA AND KEI RIVER MOUTH

Prepared for: SRK Consulting

P O Box 15739

Beacon Bay

5205

South Africa

Compiled by: Robert Gess (PhD)

Bernard Price Institute for Palaeontological Research

University of the Witwatersrand

(Research Associate of the Albany Museum)

c/o Box 40

Bathurst

6166

robg@imaginet.co.za

July 2011

Contents:

Background

The proposed project includes the rehabilitation and upgrade and tarring of the Provincial Road from Centane to Qholora and Kei River Mouth, Mnquma Local Municipality in the Eastern Cape (see Locality Plan included).

The existing gravel road is a made up of two lanes (one lane per direction) with each lane being approximately 3.4 m in width with approximately 1 – 1.5 m shoulder width. The road has a number of accesses closer to Qholorha.

The proposed road upgrade involves the tarring and widening of approximately 36.1 km of the existing road from Centane to Qholorha and the Kei River Mouth. The road will be widened from an 8.6 m unsurfaced road to a 8.8 m surfaced road comprising of a 7.4 m bitumen surface and 0.7 m unsurfaced section on either side of the surfaced road.

The proposed scope of works is to include the following:

- Tarring and widening of approximately 36.1 km of the existing provincial road;
- Three bridges to be upgraded as necessary;
- Upgrading of culverts if necessary to accommodate hydraulic load and changes to road width and/or grade line.

Assessments will also be done for the utilisation and development of borrow pits/ quarry along the road. An application will be submitted to the Department of Mineral Resources.

Rob Gess Consulting was contracted by SRK to conduct a Phase One Palaeontological Impact Assessment.

Geology and Palaeontology

The area is underlain by strata of the **Karoo Supergroup**, which were deposited within the Karoo sedimentary Basin. This basin 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. 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. 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 worlds most complete record of the important transition from early reptiles to mammals

Therapsid diversity, along with that of most plant and animals was decimated during the end-Permian extinction event, a serious contender for the most severe extinction event to affect life on Earth. Ongoing research on the effects of this extinction event is facilitated by the detailed record afforded by Beaufort Group strata of life immediately before and after the event, as well as the gradual recovery of life afterwards.

Most of the study area falls within the outcrop area of the mudstone dominated Adelaide Subgroup (Beaufort Group, Karroo Supergroup), which is extensively intruded with dolerite. In the extreme south east of the area small amounts of stratigraphically higher strata been downthrust along a fault and outcrop near to Kei River mouth. These comprise strata of the Katberg Formation (Tarkastad Subgroup, Beaufort Group, Karroo Supergroup) and Burgersdorp Formation (Tarkastad Subgroup, Beaufort Group, Karroo Supergroup).

The **Adelaide Subgroup** (**Beaufort Group**, **Karoo Supergroup**) was deposited as the Ecca Lake silted up and exposed a subaerial (exposed) shoreline. The lake steadily shrank towards the centre of the basin, leaving behind flat silty plains across which long rivers meandered from the Cape Mountains towards the much reduced lake. Sands were deposited along the river channels whereas periodic flooding deposited muds on the broad flood planes. These in time came to form the interbedded sandstones and mudstones of the Adelaide Subgroup.

Though including the upper *Cistephalus* Assemblage Zone and possibly the lowermost *Lystrosaurus* Assemblage Zones, the **Balfour Formation** (**Adelaide Subgroup, Beaufort Group, Karoo Supergroup**) largely corresponds to the *Dicynodon* Assemblage Zone. Characterised by the co-occurence of *Dicynodon* and *Theriognathus* this zone demonstrates the Beaufort Groups greatest diversity of vertebrate taxa, including numerous taxa of dicynodont, biarmosuchian, gorgonopsian and therocephalian and cynodont therapsid Synapsida, together with diverse captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Pisces. *Glossopteris* flora plants and trace fossils are also described.

The beginning of the Triassic Period in South Africa was marked by a change in sedimentation, leading to the distinct sandstone dominated lithology of the **Katberg Formation** (**Tarkastad Subgroup, Beaufort Group, Karoo Supergroup**). Extensive sandy deposits resulted from multi channelled braided river systems that replaced the meandering rivers of the underlying Adelaide Subgroup. This change may have resulted from increased erosion of the landscape due to widespread extinction of plant groups during the end-Permian mass extinction. A marked faunal change occurs between the *Dicynodon* and *Lystrosaurus* Assemblage Zones approaching the top of the Balfour Formation, corresponding with the major extinction event associated with the Permo-Triassic boundary. The Katberg Formation falls entirely within the *Lystrosaurus* Assemblage Zone.

The *Lystrosaurus* Assemblage Zone is dominated by a single genus of dicynodont, *Lystrosaurus,* which together with the captorhinid reptile, *Procolophon*, characterise this zone. Biarmosuchian and gorgonopsian Therapsida do not survive into the *Lystrosaurus* Assemblage Zone, though therocephalian and cynodontian Therapsida exhibit moderate abundance. Captorhinid Reptilia are reduced, however an unprecedented diversity of giant amphibians characterises this interval.

The effects of the end Permian extinction event are also evident in the extensive and important record of fossil plants present in the rocks of the Karoo. Whereas faunas of Permian age are dominated by a wide range of early seed plants, the Glossopteridales (which probably include the ancestors of modern gymnosperms and ultimately angiosperms), this group appears to have gone entirely extinct during the end-Permian extinction. The rocks of the Karoo provide an unrivalled sequential record of these changes and the diversification of other groups of plants in the aftermath of the extinction. The strata of the Karoo basin have also yielded fossil insects and insect leaf damage of a range of ages.

A return to a meandering river system, possibly as a result of a recovery of vegetation cover is reflected in the mudstone dominated strata of the **Burgersdorp Formation** (**Tarkastad Subgroup, Beaufort Group, Karoo Supergroup**). Though including the uppermost level of the *Lystrosaurus* Assemblage Zone, the Burgersdorp Formation largely corresponds to the *Cynognathus* Assemblage Zone. Synapsid therapsid diversity does not demonstrate recovery between the *Lystrosaurus* and *Cynognathus* assemblage zones. The Dicynodontia, *Lystrosaurus* and *Myosaurus* are replaced by *Kombuisia* and the giant *Kannemeyeria*. Therocephalia exhibit a

turnover of taxa at generic level, but an overall reduction in diversity. Cynodontia (Therapsida, Synapsida) alone amongst synapsids demonstrate a slight increase in genera. These include the small advanced Cynodont, *Cynognathus*, which together with the Cynodont *Diademodon* and the Dicynodont *Kannemeyeria*, characterise this assemblage zone. Eosuchid and captorhinid Reptilia are moderately common, though showing no generic continuity with taxa of the underlying zone. Amphibia remain diverse, though they are not as gererically diverse as in the *Lystrosaurus* Assemblge Zone and likewise demonstrate no genus level continuity therewith. Fossil fish reach their greatest known Karoo Supergroup diversity in the Burgersdorp Formation (*Cynognathus* Assemblage Zone). Plants (*Dadoxylon*, *Dicroidium* and *Schizoneura*), trace fossils (including both vertebrate and invertebrate burrows) and a freshwater bivalve (*Unio karooensis*) have also been recovered.

Dolerite, being an igneous rock does not contain fossils.

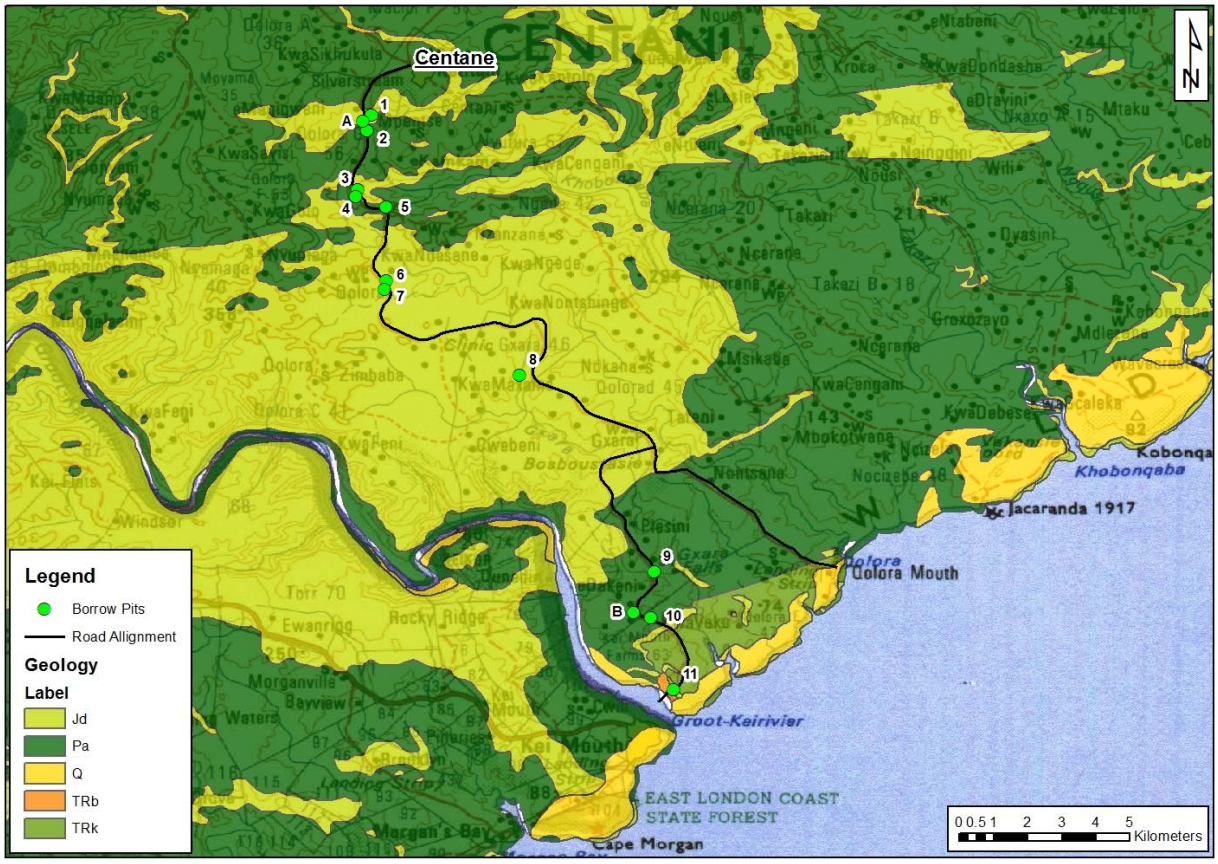

Figure 1. Geological map of the study area showing the positions of borrow pits (1-11) as well as other areas of interest. Pa = Adelaide Subgroup, TRk = Katberg Formation (Tarkastad Subgroup), TRb = Burgersdorp Formation (Tarkastad Subgroup), Jd = dolerite, Q = Quaternary cover

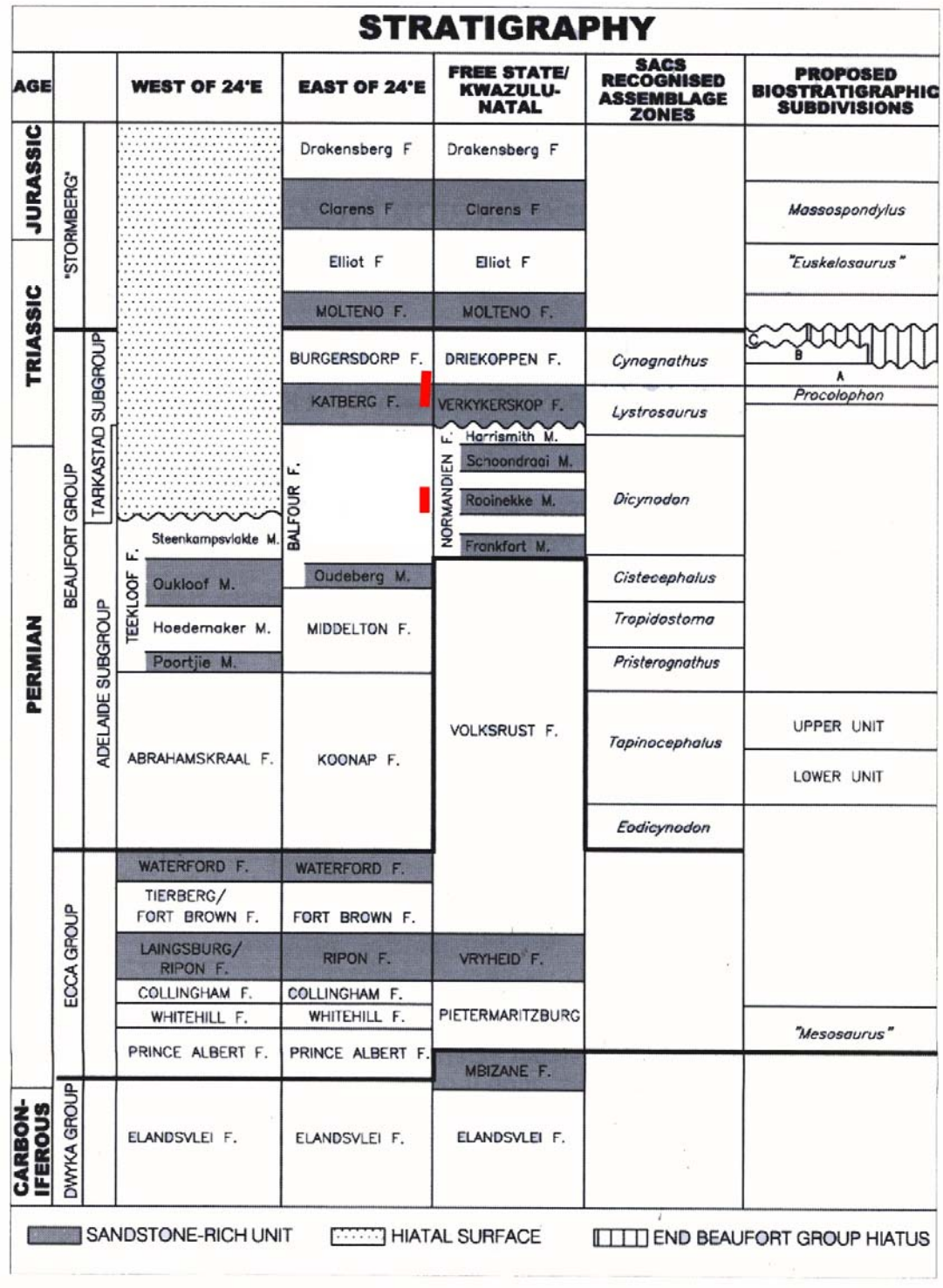

Figure 2. Stratigraphic column and corresponding biostratigraphy of the Karoo Supergroup

(modified after Rubidge, B.S. 2005. *South African Journal of Science*. 108: 135-172). Red line indicates strata affected by the development)

Site Visit

The proposed route was surveyed on the 27th and 28th of June 2011. All borrow pits were examined and all outcrops along the road route were examined.

Borrow pits 1, 3, 6, 7 and 8 consist entirely of dolerite and are therefore of no palaeontological interest.

Figure 3. Dolerite borrowpits. Borrowpit 8 (above) and borrowpit 6 (below)

Borrowpits 2, 4, 5, 9 and 10 are situated in sandstones and mudstones of the **Adelaide Subgroup**.These were all exhaustively examined for palaeontological material, without significant success.

Borrowpit 2 consists of of interbedded tan sandstone and crumbly mudstone.

Figure 4. Mudstone at borrowpit 2

Borrowpit 4 is a small borrowpit consisting of pale sandstone containing abundant ripple cross lamination and interbedded shale layers.

Figure 5. Borrowpit 4 (above) with detail of ripple cross lamination (below).

Borrowpit 5 consists of a fairly large quarry comprised mainly of sandstone with interbedded dark greenish shale. These are much altered by dolerite dykes, one of which cuts through the outcrop. Rocks are jointed into baked blocks and Iron/magnesium rich fluids have permeated the cracks leaving behind abundant mineral precipitates that form dendrites. These should not be mistaken for fossils.

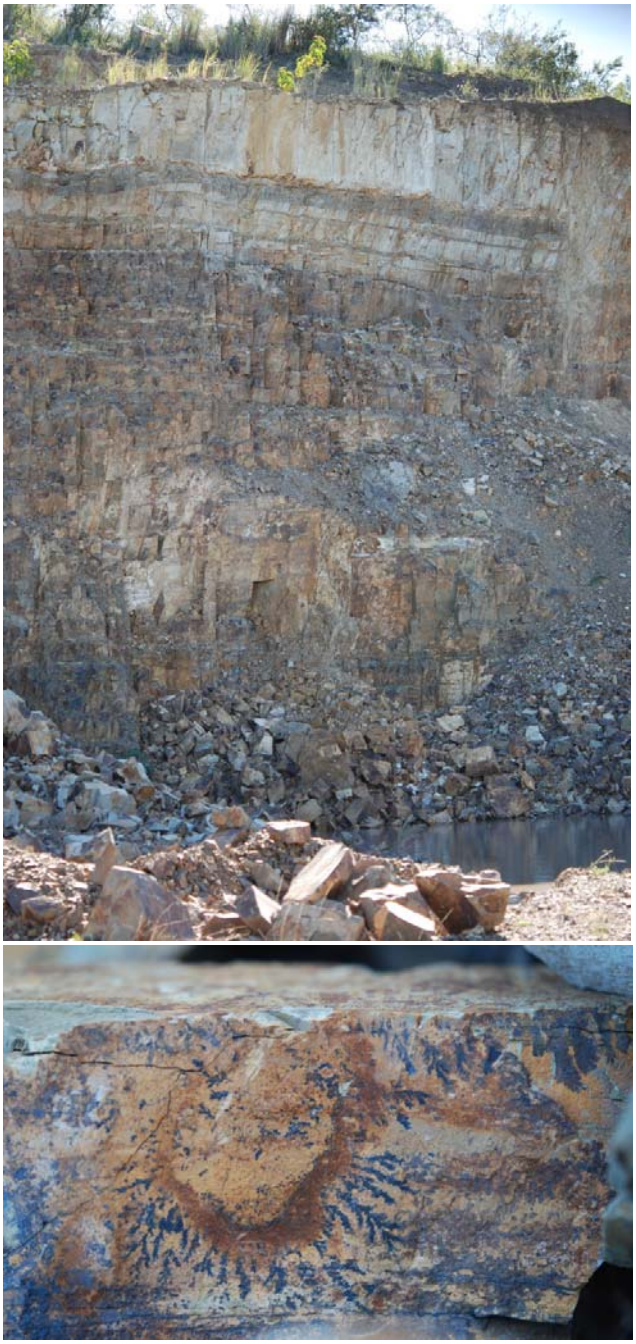

Figure 6. Borrow pit 5. Sandstone with interbedded mudstone, cut by a dolerite dyke on the extreme right (above). Dendrites (not fossils) below.

Borrowpit 9 is a small borrowpit, the source of pale coarse sandy aggregate.

Figure 7. Coarse grained aggregate at borrowpit 9

Borrowpit 10 consists of a large quarry exposing fine olive greenish mudstone with whitish interbedded sandstones. Small discoids within some sandstone layers may represent some form of trace fossil.

Figure 8. Laminated mudstones and sandstones at borrowpit 10 (above). Detail of possible trace fossils at borrowpit 10 (below).

Only one outcrop of Tarkastad subgroup strata is sampled by a borrow pit within this study area. This outcrop was identified as belonging to the Burgersdorp Formation (Tarkastad Subgroup) by the Geological Survey maps.

Within the borrowpit (borrowpit 11) is a small amount of baked sandstone containing alteration concretions resultant from its close proximity to a dolerite dyke, exposed in the back wall of the borrowpit.

Figure 9. Tarkastad Subgroup strata exposed in borrowpit 11.

The **Road Route** itself largely passes over rolling deeply weathered grassy hills. As a result there is not much bedrock exposed along the route. Exeptions include a small pass approximately two kilometers south of Kentani (see Figure 1, A). The eastern side of the pass exposed sandstone and some tan mudstone of the Adelaide Subgroup.

Figure 10. Sandstone and mudstone of the Adelaide Subgroup exposed in road cuttings about 2 km south of Kentani (see Figure 1 A)

Small amounts of sandstone outcrop at the junction of the Trenneries and Kei mouth turnoffs and small outcrops of pale greenish mudstone occur in the roadbank between this turnoff and Trenneries. Somewhat larger outrops occur in roadbanks alongside the road to Kei River mouth, notably at Pleseni, and just after Mazinyo (see Figure 1 B). Although all these outcrops were rigourously examined for palaeontological material only one trace fossil was found. This comprised a small horizontal invertebrate burrow south of Mazinyo (Figures 1 B, 11).

Figure 11. Adelaide Subgroup mudstones exposed in the roadbank south of Mazinyo (see Fig 1 B) (top), natural cast of a horizontal invertebrate burrow (below).

Conclusions and Reccomendations

1. Those borrow pits that are cut into dolerite will in no way impinge on palaeontological heritage.

2. There remains the possibility that palaeontological material is situated beneath the surface in mudstones and sandstones of the Adelaide Subgroup (Beaufort Group) which will be disturbed by the planned activities. It would not, however, be practical for these activities to be monitored.

3. **It is therefore recommended that these cuttings should be re-inspected after completion of the construction phase and before any vegetation or other rehabilitation is conducted. This should form part of the Environmental Management Plan**.

Appendix F – Archaeological Impact Assessment

A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED CENTANE TO QHOLORA AND KEI RIVER MOUTH ROAD UPGRADE, MNQUMA LOCAL MUNICIPALITY, AMATHOLE DISTRICT MUNICIPALITY, EASTERN CAPE PROVINCE.

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May 2011

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Note: This report follows the minimum standard guidelines required by the South African Heritage Resources Agency for compiling Phase 1 Archaeological Impact Assessment (AIA).

EXECUTIVE SUMMARY

Purpose of the Study

The purpose of the study was to conduct a phase 1 archaeological impact assessment (AIA) for the upgrade of the gravel road between the village of Centane and Qholora and Kei River Mouth as well as eleven existing borrow pits that occur adjacent to or close to the proposed area situated within the Mnquma Local Municipality, Amathole District Municipality, Eastern Cape Province. The survey was conducted to establish the range and importance of the exposed and *in situ* archaeological heritage features, the potential impact of the development and, to make recommendations to minimize possible damage to these sites.

Brief Summary of Findings

The proposed road for the upgrade is situated within 20km of the coast to the Qholora and Kei River Mouths. The area has in the past been heavily disturbed by the construction and continuing maintenance of the current gravel road, the construction of houses, fences, underground pipes, telephone and electricity poles, and water drainage areas adjacent to the road. No archaeological material remains or features were observed during the survey.

The proposed area for development is rated as having low local cultural significance. Development may proceed as planned.

Recommendations

The area is of a low cultural sensitivity and development may proceed as planned, although the following recommendation must be considered:

1. Although the area has been disturbed it is possible that human remains may be uncovered during construction. If human remains and concentrations of archaeological heritage material are uncovered during construction, all work must

cease immediately and be reported to the Albany Museum and/or the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken by a professional archaeologist.

BACKGROUND INFORMATION

The phase 1 archaeological impact assessment (AIA) is a section of the required environmental impact assessment (EIA) study.

Developer:

Eastern Cape Department of Roads and Public Works

Consultant:

SRK Consulting
P.O. Box 15739
Beacon Bay
5205
Tel: 043 748 6292
Fax: 043 748 1811
Contact person: Ms Robyn Thomson
Email: rthomsom@srk.co.za

Terms of Reference

To conduct a survey of possible archaeological heritage sites, features and material remains within the area of the proposed road upgrade between Centane and Qholora and Kei River Mouth, Mnquma Local Municipality, Amathole District Municipality, Eastern Cape Province. The survey was conducted to establish the range and importance of the exposed and *in situ* archaeological heritage features, the potential impact of the development and, to make recommendations

Brief legislative requirements

Parts of sections 35(4), 36(3) and 38(1) (8) of the National Heritage Resources Act 25 of 1999 apply:

Archaeology, palaeontology and meteorites

35 (4) No person may, without a permit issued by the responsible heritage resources authority—
(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves

36. (3) (a) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—
(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as –
(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of the site –
(i) exceeding 5000m^2 in extent, or
(ii) involving three or more erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
(d) the re-zoning of a site exceeding 10 000m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must as 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.

BRIEF ARCHAEOLOGICAL BACKGROUND

Little is known about the archaeology of the immediate area proposed for the upgrade and tarring of the road because no systematic field research has been conducted there. Notwithstanding, there are a number of reports, references and accessioned material in museums of the region and nationally which provide us with an archaeological background. This information was compiled R.M. Derricourt during the early 1970's and published in his book, *Prehistoric Man in the Ciskei and Transkei* in 1977. The part of the coast between East London and the Great Kei River is rich in archaeological sites and material.

From the archival information and limited fieldwork, it is evident that the area has an interesting and complex archaeological past. Earlier Stone Age (ESA) handaxes, cleavers and other stone tools, dating to approximately a million or more years old, were mainly documented in the inland areas such as within the districts of Middledrift, Centane, Butterworth, Idutywa and Lusikiki to name a few.

Middle Stone Age (MSA) stone artefacts dating between 200 000 and 30 000 years old can be observed throughout the region, but carry little information because they are not associated with any other archaeological material. Later Stone Age (LSA) open sites, dating to the past 20 000 years are also widely scattered throughout the area as well as the occurrence of shell middens that shows evidence of occupation along the coast.

The most common archaeological sites are shell middens (large piles of marine shell) found usually concentrated opposite rocky coasts (generally referred to as 'Strandloper middens'). These were campsites of San, Khoisan and first-farming communities who lived along the immediate coast and collected marine foods. Mixed with the shell are other food

remains and cultural material, human remains also occur within the shell middens. These middens date from the past 8 000 years.

Although no evidence of Early Iron Age (EIA) (first farming communities) sites or material from the Kei River area have been documented, it is possible that such settlements may be present in the wider region (Maggs 1973, Feely 1987). Evidence in the form of thick-walled well-decorated pot sherds are present along other parts of the Transkei coast (Rudner 1968) as is evident from sites that were excavated at Mpame River Mouth (Cronin 1982) and just west of East London (Nongwaza 1994). Research in the Great Kei River Valley indicates that the first mixed farmers were already settled in the Eastern Cape between A.D. 600 -700 (Binneman 1994).

References

Binneman, J. 1994. Preliminary report on the investigations at Kulubele, an Early Iron Age farming settlement in the Great Kei River Valley, Eastern Cape. *Southern African Field Archaeology* 5:28-35.

Cronin, Radiocarbon dates for the Early Iron Age in the Transkei. *South African Journal of Science* 78: 38-39.

Derricourt, R.M. 1977*. Prehistoric Man in the Ciskei and Transkei*. Cape Town: C. Struik.

Feely, J.M. 1987. The Early Farmers of the Transkei, southern Africa. *BAR International Series* No. 378.

Maggs, T. 1973. The NC3 Iron Age tradition. *South African Journal Science* 69:325-326.

Mostert, N. 1992*. Frontiers: the epic of South Africa's creation and the tragedy of the Xhosa people*. London: Pimlico.

Rudner, J. 1968. Strandloper pottery from South and South West Africa. *Annals of the South African Museum* 49:441-663.

Museum/University databases and collections

The Albany Museum in Grahamstown houses some collections and information from the region.

Relevant impact assessments

Binneman, J. 2011. A Phase 1 Archaeological Impact Assessment for the proposed

Low Cost Housing Development at iCwili Settlement near Kei River Mouth Town, Gret Kei River Local Municipality, Amathole District Municipality, Eastern Cape Province. Prepared for Ages (Pty) Ltd, East London.

Binneman, J. & Booth, C. 2008. A Phase 1 Archaeological Impact Assessment: the proposed Kei Beach Hotel and Apartment Development, Erven 160, 161, 162 and 163, Kei River, Amathole District Municipality, Eastern Cape Province. Prepared for Arcus Gibb Engineering and Science, East London.

DESCRIPTION OF THE PROPERTY

Area Surveyed

Map

1:50 000 CB & CD Kei Mouth (Map 1)

Location Data

The proposed road upgrade is situated between the villages of Centane and Qholora and the Kei River Mouth, Mnquma Local Municipality, Amathole District Municipality, Eastern Cape Province, which stretches between the coast and 20km inland. Eight out of the eleven existing borrow pits are situated on the road between Centane and the turn-off to the Pont at the Kei River Mouth, the three remaining borrow pits are situated along the road from the turn-off to the Pont at the Kei River Mouth and the Kei River Mouth.

ARCHAEOLOGICAL INVESTIGATION

Methodology

The area was surveyed by three people conducting spot checks from a vehicle and then investigating the surrounding area of the road proposed for the upgrade and tarring as well the areas surrounding the existing borrow pits to be extended and used as materials for the proposed development. GPS readings were taken using a Garmin Oregon 550 and plotted on to a Google Earth map (Map 2). Most of the area adjacent to the road has in the past been heavily disturbed by the construction and continuing maintenance of the current gravel road, the construction of houses, fences, underground pipes, telephone and electricity poles, and water drainage areas adjacent to the road (Figs 1-6).

Figs 1-6. Various examples of disturbances occurring along the proposed road for upgrade and tarring.

Most of the proposed area is covered in thick dense grass vegetation and within some area thick indigenous bush adjacent to the road. This made archaeological visibility difficult, although the open, exposed and disturbed areas were investigated for possible archaeological remains (Figs 7-8).

Figs 7-8. Thick dense vegetation occurring adjacent to the road proposed for upgrading and tarring.

Two stone-packed features resembling *isisivane* were observed near Borrow Pit 2 (BP2).The first one was situated behind BP2 in the undisturbed area and the second feature was situated about 50m to the south-east of BP2 and approximately 10m from the road proposed for upgrading and tarring (Figs 9-10). The stones used to make up these features have been taken from the existing BP2. It is, however, unlikely that these stone features may be archaeological and are rocks that have been collected from the borrow pits and stacked.

Figs 9-10. Examples of the packed rocks collected from the nearby borrow pit.

Borrow pits 1-8 are situated adjacent to or close to the proposed road for upgrade and tarring between Centane and the turn-off to the Pont at Kei River Mouth. Borrow pits 9-11 are situated adjacent to the road between the turn-off and the Pont at Kei River Mouth.
The areas within and surrounding the existing borrow pits were investigated for possible archaeological remains and features; however no archaeological sites features and remains were encountered. Borrow pits 9-11 are situated with the 5km sensitive coastal zone where it is generally considered that a higher occurrence of shell middens with archaeological debris may occur. However, no fragments or dense accumulations of marine shell were encountered within or surrounding the areas of the existing borrow pits 9-11.

No archaeological sites, features or material remains were encountered within the area proposed for the road upgrade and extension of the eleven existing borrow pits. Therefore, development may proceed as planned.

RECOMMENDATIONS

The area is of a low cultural sensitivity and development may proceed as planned, although the following recommendation must be considered:

1. Although the area has been disturbed it is possible that human remains may be uncovered during construction. If human remains and concentrations of archaeological

heritage material are uncovered during construction, all work must cease immediately and be reported to the Albany Museum and/or the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken by a professional archaeologist.

GENERAL REMARKS AND CONDITION

Note: This report is a phase 1 archaeological impact assessment/investigation **only** and does **not** include or exempt other required heritage impact assessments (see below).

The National Heritage Resources Act No. 25 of 1999, section 35, requires a full Heritage Impact Assessment (HIA) in order that all heritage resources, that is , all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance are protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage , historical settlements, landscapes, geological sites, palaeontological sites and objects.

It must be emphasized that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not, therefore, reflect the true state of affairs. Many sites/features may be covered by soil and vegetation and will only be located once this has been removed. In the event of such finds being uncovered, (during any phase of construction work), archaeologists must be informed immediately so that they can investigate the importance of the sites and excavate or collect material before it is destroyed. The *onus* is on the developer to ensure that this agreement is honoured in accordance with the National Heritage Resources Act No. 25 of 1999.

It must also be clear that Archaeological Specialist Reports (AIA's) will be assessed by the relevant heritage resources authority. The final decision rests with the heritage resources authority, which should give a permit or a formal letter of permission for the destruction of any cultural sites.

APPENDIX A: IDENTIFICATION OF ARCHAEOLOGICAL FEATURES AND MATERIAL FROM THE SURROUNDING COASTAL AND INLAND AREAS: guidelines and procedures for developers

1. Identification of Iron Age archaeological features and material

- Upper and lower grindstones, broken or complete. Upper grindstone/rubber will be pitted.
- Circular hollows –sunken soil, would indicate storage pits and often associated with grindstones.
- Ash heaps, called middens with cultural remains and food waste such as bone.
- Khaki green soils would indicate kraal areas.
- Baked clay/soil blocks with or without pole impressions marks indicate hut structures.
- Decorated and undecorated pots sherds.
- Iron slag and/or blowpipes indicate iron working.
- Human remains may also be associated with khaki green soils.
- Metal objects and ornaments.

2. Shell middens

Shell middens can be defined as an accumulation of marine shell deposited by human agents rather than the result of marine activity. The shells are concentrated in a specific locality above the high-water mark and frequently contain stone tools, pottery, bone and occasionally also human remains. Shell middens may be of various sizes and depths, but an accumulation which exceeds 1 m^2 in extent, should be reported to an archaeologist.

3. Human skeletal material

Human remains, whether the complete remains of an individual buried during the past, or scattered human remains resulting from disturbance of the grave, should be reported. In general the remains are buried in a flexed position on their sides, but are also found buried in a sitting position with a flat stone capping or in ceramic pots. Developers are requested to be on alert for these features and remains.

4. Fossil bone

Fossil bones may be found embedded in deposits at the sites. Any concentrations of bones, whether fossilized or not, should be reported.

5. Stone artefacts

These are difficult for the layman to identify. However, large accumulations of flaked stones which do not appear to have been disturbed naturally should be reported. If the stone tools are associated with bone remains, development should be halted immediately and archaeologist notified.

6. Stone features and platforms

These occur in different forms and sizes, but easily identifiable. The most common are an accumulation of roughly circular fire cracked stones tightly spaced and filled in with charcoal and marine shell. They are usually 1-2m in diameter and may represent cooking platforms for shell fish. Others may resemble circular single row cobble stone markers. These occur in different sizes and may be the remains of wind breaks or cooking shelters.

7. Large stone cairns

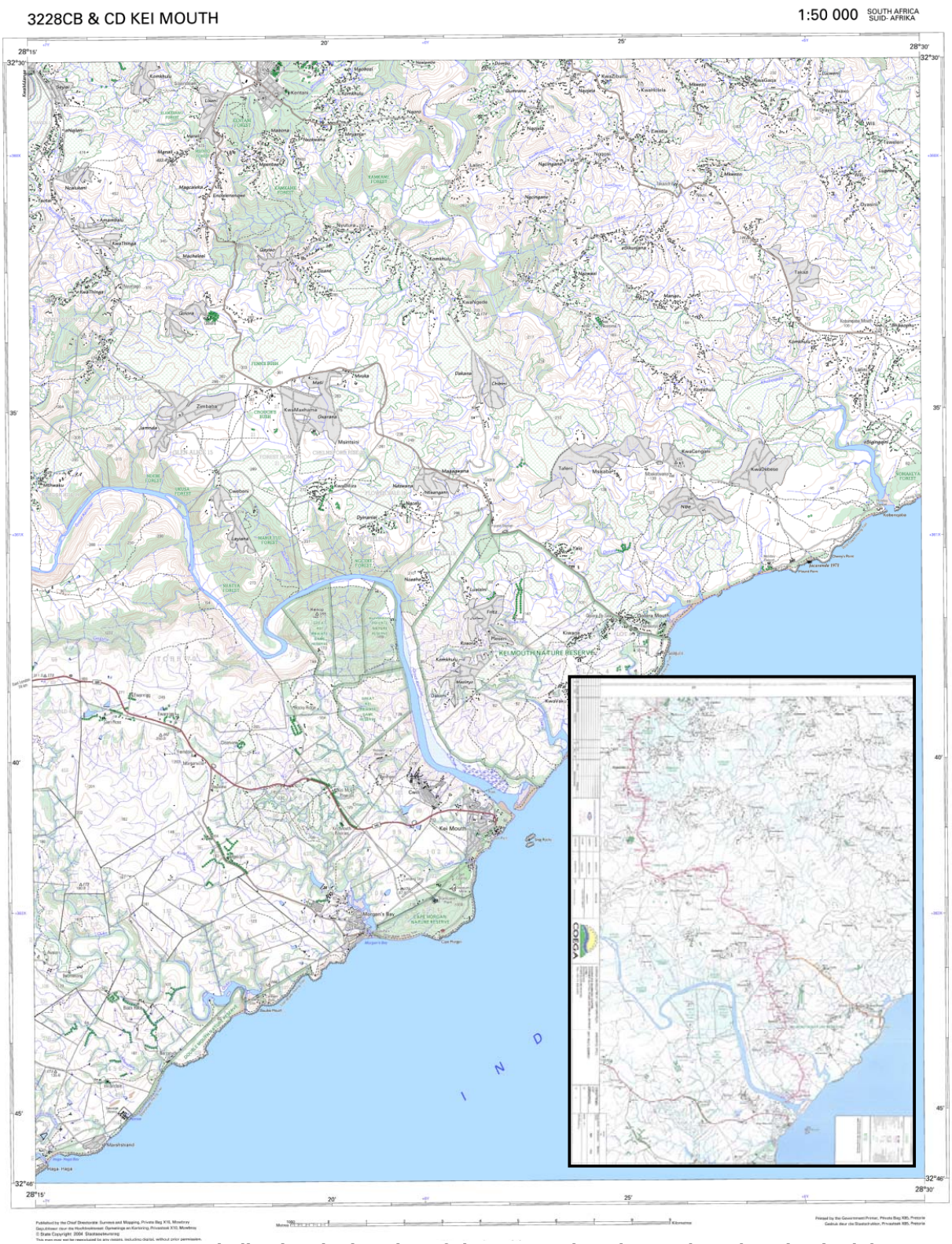
The most common cairns consist of large piles of stones of different sizes and heights are known as *isisivane*. They are usually near river and mountain crossings. Their purpose and meaning is not fully understood, however, some are thought to represent burial cairns while others may have symbolic value.

8. Historical artefacts or features

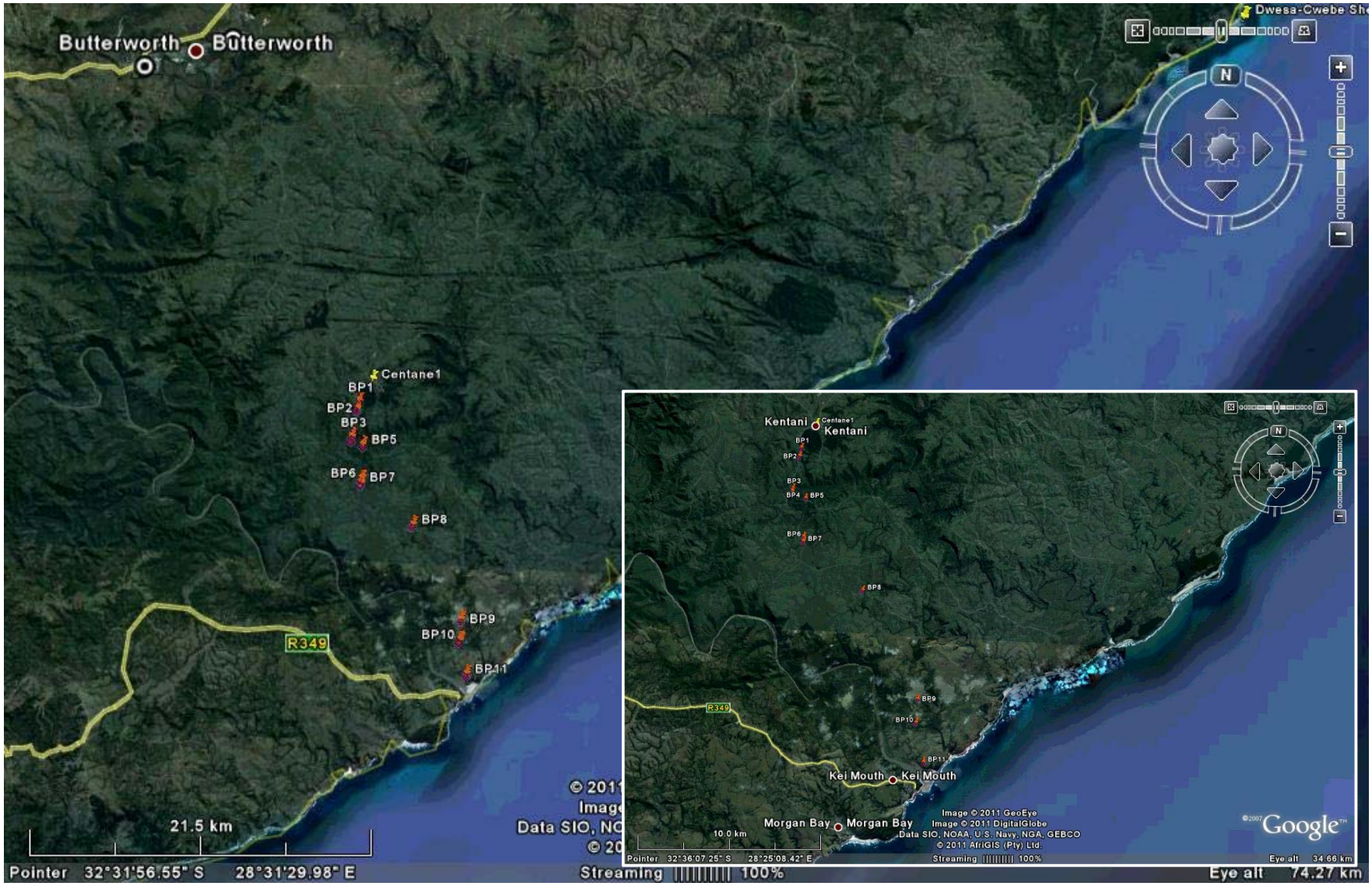
These are easy to identify and include foundations of buildings or other construction features and items from domestic and military activities.

Table 1. GPS Co-ordinates for the proposed Centane to Qholora and Kei River Mouths.

Reference	Description	Co-ordinates
Centane 1	General Reading	32°30'21.06"S; 28°18'45.30"E
Borrow Pit 1 (BP1)	Position of BP1	32°31'06.00"S; 28°18'14.94"E
Borrow Pit 2 (BP2)	Position of BP2	32°31'21.30"S; 28°18'11.70"E
Borrow Pit 3 (BP3)	Position of BP3	32°32'18.36"S; 28°18'01.08"E
Borrow Pit 4 (BP4)	Position of BP4	32°32'22.98"S; 28°17'59.58"E
Borrow Pit 5 (BP5)	Position of BP5	32°32'35.10"S; 28°18'28.38"E
Borrow Pit 6 (BP6)	Position of BP6	32°33'43.50"S; 28°18'28.02"E
Borrow Pit 7 (BP7)	Position of BP7	32°33'51.78"S; 28°18'27.96"E
Borrow Pit 8 (BP8)	Position of BP8	32°35'13.02"S; 28°20'37.56"E
Borrow Pit 9 (BP9)	Position of BP9	32°38'21.06"S; 28°22'43.08"E
Borrow Pit 10 (BP10)	Position of BP10	32°39'03.12"S; 28°22'42.36"E
Borrow Pit 11 (BP11)	Position of BP11	32°40'12.24"S; 28°23'01.38"E



Map 1. 1:50 000 map indicating the location of the proposed road upgrade and tarring (red dots: archaeological shell midden sites) (Insert map courtesy from SRK Consulting).



Map 2. Aerial view of the location of the proposed road upgrade and tarring (red dots: archaeological shell midden sites).

Appendix G – 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 upgrade regardless of any mitigation measures;
- **Moderate significance**: where the impact should influence the decision to upgrade 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 upgrading of the road.

Appendix H – Letter Confirming Financial Provision for Rehabilitation

Appendix I – Undertaking

Province of the
EASTERN CAPE
ROADS & PUBLIC WORKS

Roads Infrastructure
Roads & Public Works – Stellenbosch Park – KWT – Eastern Cape - Private Bag X0023 – Bisho 5605 – Republic of South Africa - Tel: 073 9438 096 – Fax: - 086 5060 129 E-mail: sandile.booi@dpw.ecape.gov.za - Website: www.dpw.gov.za

Date: 30th September 2011

The Office Manager
Department of Minerals and Energy
Private Bag X6076
Port Elizabeth
6000

RE: UPGRADING OF THE KEI MOUTH TO CENTANE ROAD (DR08366 & PORTION OF DR18048) TO A SURFACED STANDARD

Ourselves as the Department of Roads and Public Works hereby confirms that we would ensure that the Environmental Management Plan for the proposed mining sites to be used for the upgrading of the Kei Mouth to Centane road project with a total length of 39km is strictly adhered to by the successful contractor/s for the entire duration of the contract/s.

Further, we also confirm that financial provision would be made available in all construction phases of the project for the rehabilitation of all relevant quarries and borrow pits upon completion of the works

Should you require further information with regards to this matter, please, do not hesitate to contact our Sandile Booi.

Yours faithfully

SANDILE BOOI
General Manager: Roads Design

C.I.D.P
EXPANDED PUBLIC WORKS PROGRAMME
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Mr JF Majiba	EC DR&PW	3	14/11/2011	R Gardiner
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