DME 12

the dme

Department:
Minerals and Energy
REPUBLIC OF SOUTH AFRICA

Private Bag X6076, Port Elizabeth 6000,
Tel: (041) 396 3900
Fax: (041) 396 3946
Cnr.Diaz and Mount Roads
Mount Croix
Port Elizabeth,6001

Enquiries: D.A. Watkins
E-mail: deidre.watkins@dme.gov.za

Reference: (EC)30/5/1/3/3/2/1(0363)EM
Date: 30 September 2009

South African Heritage Resources Agency
P.O. Box 758
GRAHAMSTOWN
5200

SA HERITAGE RESOURCES AGENCY
RECEIVED
18 MAY 2010

ALREADY ON SAHRIS
CASE ID: 1986

ATTENTION: MR. T. LUNGILE

Sir

CONSULTATION IN TERMS OF SECTION 40 OF THE MPRDA OF 2002: ENVIRONMENTAL MANAGEMENT PLAN IN SUPPORT OF AN APPLICATION TO MINE GRAVEL ON PORTION 3 OF FARM 860, DIVISION OF EAST LONDON, EASTERN CAPE

1. Vaduba Investments cc has applied for a mining permit on the above-mentioned area.
2. Attached is the EMP for your comment.
3. Please forward any written comments or requirements your department may have on this application, to this office no later than 27 November 2009. Failure to do so will lead to the assumption that your Department has no objection(s) or comments with regards to the application.
4. Consultation on this application has been initiated with other relevant State Departments.
5. Kindly quote the relevant file reference number in all correspondence.

Sincerely,

REGIONAL MANAGER
EASTERN CAPE

File number:.....

DEPARTMENT OF MINERALS AND ENERGY

ENVIRONMENTAL MANAGEMENT PLAN

Submitted in support of application for a MINING RIGHT
Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002)

Application for a	MINING PERMIT:	X

Applicant: VADUBA INVESTMENTS CC

Farm: PORTION 3 OF THE FARM 860

District: EAST LONDON

Mineral: WEATHERED DOLERITE

Date: SEPTEMBER 2009

A.4 USE OF THE DOCUMENT

This document is designed for use by non-professionals and newcomers to the environmental management industry and it incorporates a very simple Environmental Impact Assessment (EIA). The EIA is contained in Section C of this document and was designed specifically with the target sectors of the mining industry (described in A.2 above) in mind.

The **aim** is ultimately to:

(a) gather information from applicants themselves;
(b) to assess the impact of the operation based on that information and then
(c) to guide the applicant to mitigate environmental impacts to limit damage to the environment.

Section B of the document contains **demographic** information about the applicant. **Section C** contains the information that will be used in the **Environmental Impact Assessment (EIA)**. The applicant must complete the relevant sections of this document, but the regional office of the DME will do the scoring of these for the **Impact Assessment Rating** in **Section D**.

Section F (the Environmental Management Plan) of the document **is prescriptive** and provides guidance to the miner or prospector on how to limit the damage of the operation on the environment. The regional manager of the DME, who has the prerogative to decide whether this Environmental Management Plan will adequately address the environmental impacts expected from the operation or whether additional requirements for proper environmental management need to be set, may add requirements to this section. Where these **additional requirements** are set, they will appear in **Section G** of this document. The Environmental Management Plan (Section F) of the document is legally binding once approved and, in the **undertaking** contained in **Section H**, the applicant effectively agrees to implement all the measures outlined in this Environmental Management Plan.

A.5 LEGISLATION/ REGULATIONS

The relevant sections of Mineral and Petroleum Resources Development Act and its supporting Regulations are summarised below. The onus is on the applicant to familiarise himself/herself with the provisions of the full version of the Mineral and Petroleum Resources Development Act 2002 (Act 28 of 2002)(MPRDA) and its Regulations.

Table 1: Relevant sections of Mineral and Petroleum Resources Development Act

Section of Act	Legislated Activity/ Instruction/ Responsibility or failure to comply	Penalty in terms of Section 99
5(4)	No person may prospect, mine, or undertake reconnaissance operations or any other activity without an approved EMP, right, permit or permission or without notifying the land owner.	R 100 000.00 or two years imprisonment or both.
19	The holder of a Prospecting right must: lodge the right with the Mining Titles Office within 30 days; commence with prospecting within 120 days, comply with terms and conditions of the prospecting right, continuously and actively conduct prospecting operations; comply with the requirements of the approved EMP, pay prospecting fees and royalties.	R 100 000.00 or two years imprisonment or both.
20(2)	The holder of a prospecting right must obtain the Minister's permission to remove any mineral or bulk samples.	R 100 000.00 or two years imprisonment or both.
26(3)	A person who intends to beneficiate any mineral mined within SA outside the borders of SA may only do so after notifying the Minister in writing and after consultation with the Minister.	R 500 000.00 for each day of contravention.
28	The holder of a mining right or permit must keep records of operations including financial records AND must submit to the DG: monthly returns, annual financial report and a report detailing compliance with the social & labour plan and charter.	R 100 000.00 or two years imprisonment or both.
29	The minister may direct the owner of land or the holder/applicant of a permit/right to submit data or information.	R 10 000.00
38(1)©	The holder of a permit/right MUST manage environmental impacts according to the EMP as an ongoing part of the operations.	R 500 000.00 or ten years imprisonment or both.
42(1)	Residue stockpiles must be managed in a prescribed manner on a site demarcated in the EMP.	A fine or imprisonment of up to six months or both
42(2)	No person may temporarily or permanently deposit residue on any other site than that demarcated and indicated in the EMP.	A fine or imprisonment of up to six months or both.
44	When any permit/right lapses, the holder may not remove or demolish buildings, which may not be demolished in terms of any other law, which have been identified by the Minister or which are to be retained by agreement with the landowner.	Penalty that may be imposed by Magistrate's Court for similar offence.
92	Authorised persons may enter mining sites and require the holder of a permit to produce documents/reports or any material deemed necessary for inspection.	Penalty as may be imposed for perjury.
94	No person may obstruct or hinder an authorised person in the performance of their duties or powers under the Act.	Penalty as may be imposed for perjury.
95	The holder of a permit/right may not subject employees to occupational detriment on account of employee disclosing evidence or information to authorised person (official).	Penalty as may be imposed for perjury.
All sections	Inaccurate, incorrect or misleading information.	A fine or imprisonment of up to six months or both.
All sections	Failure to comply with any directive, notice, suspension, order, instruction, or condition issued.	A fine or imprisonment of up to six months or both.

A.6 OTHER RELEVANT LEGISLATION

Compliance with the provisions of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) and its Regulations does not necessarily guarantee that the applicant is in compliance with other regulations and legislation. Other legislation that may be applicable includes, but are not limited to:

Table 2: Acts and Regulations

TITLE	ABBREVIATION	COMMENT/S
South African Constitution Act 108 of 1996	"The Constitution"	National, provincial and local government are obliged to introduce legislative and other measures to prevent ecological degradation; promote conservation; and, secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development.
National Environmental Management Act, 1998 (Act 107 of 1998)	NEMA	DE A& DP. Principles in NEMA include amongst other (a) that disturbance of ecosystems and loss of biological diversity are to be avoided, or, where they cannot be altogether avoided, are minimized and remedied; and, (b) that sensitive, vulnerable, highly dynamic or stressed ecosystems require specific management and planning, especially where they are subject to significant human resource usage and development pressure.
National Environmental Management: Biodiversity Act, 2004(Act No. 10 of 2004)	Biodiversity Act	DE A& DP. This draft legislation effectively takes a section on biodiversity from NEMA (107 of 1998) and expands it greatly. Defining biodiversity in the broadest terms, this Act will protect our incredible natural diversity while promoting sustainable utilization and *"fair and equitable sharing of benefits arising from the commercialization through bio-prospecting of traditional uses and knowledge of genetic resources"*.
National Environmental Management: Protected Areas Act Act 57 of 2003	Protected Areas Act	*"Provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes"*.
Environmental Conservation Act, 1989 Act 73 of 1989	ECA	Provides for the Environmental Impact Assessment regulations (promulgated in 1997), which seek to ensure sustainable development in both urban and rural contexts.
		Control of littering, pollution, activities which may have a detrimental effect on the environment, combating of noise, control and licensing of waste disposal (landfill) sites, preparation and contents of environmental impact reports. The Act also provides for the declaration and management of any property in private ownership as a Protected *Natural Enviorment (PNE)*, the control of environmental pollution and for imposing penalties where any provision of the Act is contravened.
Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965)		Air Emissions
National Water Act Act 36 of 1998	NWA	The NWA is revolutionary in its broad approach to biodiversity conservation, protecting aquatic ecosystems in order to ensure ecologically sustainable development and use of the water resource. Activities, which impact negatively on wetlands, such as draining or cultivating them, or allowing livestock to graze on them, are now controlled by this Act and in most cases will require licensing.
National Water Act (Act 36 of 1998)		This Act provides for the reform and repeal of the Water Act, 1956 (Act 54 of 1956) As well as a number of other existing laws relating to water resources. In so doing, It reviews current practices and institutional arrangements for water management in the country.
National Veldt and Forest Fire Act (Act 101 of 1998)		The Act provides for a variety of institutions, methods and practices for achieving the combating of veldt, forest and mountain fires. The Act regulates the establishment, registration, duties and functioning of fire protection associations, which must deal with all aspects of veldt fire prevention and fire fighting. It also provides for the prevention of veldt fires through a fire danger rating system and places a duty on owners to prepare and maintain firebreaks.
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Conservation of Agricultural Resources Act Act 43 of 1983	CARA	Regulations promulgated under section 29 of this Act include a listing of, and requirements for the control of, various categories and types of declared invasive and weeds in both urban and rural areas.
Draft Sustainable Utilization Of Agricultural Resources Bill 2003		Draft legislation that will replace the Conservation of Agricultural Resources Act (43 of 1983).
Mountain Catchment Areas Act Act 63 of 1970		Provides for the establishment of fire protection committees and preparation of fire protection plans. This Act provides for the conservation, use, management and control of land situated in mountain catchment areas. In terms of the Act any area of which the water yield is of great importance may be declared a Mountain Catchment Area. Mountain Catchment Areas are managed by means of management guidelines relating to conservation, use and control of land and vegetation.
National Heritage Resources Act (Act 25 of 1999)		The purpose of this Act, which is administered by the South African Heritage Resources Agency is to preserve and protect the historical and cultural heritage of this country, which includes natural and human-made assets. This Act provides for the proclamation of National *Monuments and* the designation of Conservation *Areas*, on the grounds of their historic, aesthetic or scientific interest. The Act stipulates that the Council must be consulted with respect to the planning of a Conservation Area.
National Veldt and Forest Fire Act Act 101 of 1998	Veldt fire Act	Imposes a duty on landowners to prepare and maintain firebreaks (that do not cause soil erosion and are free of inflammable material that reasonably prevent or allow control of a veldt fire.
National Forests Act Act 84 of 1998	NFA	Protects indigenous forests and woodlands as well as specified tree species.
Nature Conservation Ordinance Ordinance 19 of 1974	The Ordinance	Read in conjunction with the Western Cape Nature Conservation Board Act (1998) and the Western Cape Nature Conservation Laws Amendment Act (2000). This Ordinance is applicable in the Western and Eastern Cape and protects the natural (indigenous) flora and fauna at a Provincial level.
National Heritage Resources Act Act 25 of 1999	NHRA	The NHRA promotes an integrated and interactive system for natural heritage resource management and to promote good governance at all levels. South African Heritage Resources Agency (SAHRA) – manages Archaeological, cultural, historical and other resources
Local Government Transition Act (Act 209 of 1993)		This Act provides for interim measures for the restructuring of local government. The Local Government Transition Act requires all local authorities to draw up IDPs, i.e. a plan pertaining to the integrated development and management of the area of jurisdiction of the local authority concerned. The IDP is to be prepared in accordance with the general *principles* as well as LDOs contained in the Development Facilitation Act, 1995.

White Paper on Agriculture (Department of Agriculture, 1995)		The White Paper (Department of Agriculture, 1995) mandates an agricultural secto characterized by a range of farm sizes that are market directed, with access to agricultural land being broadened through land reform and supported by the provision of appropriate services. Agricultural production is to be based on the sustainable use of natural agricultural and water resources. Of particular to the formulation of the SDF, is the following: a) Productive agricultural land should be retained for agricultural use. b) All farmers are to be made aware of and be accountable for the sustainable utilization o natural agricultural resources. c) The land-user's responsibility towards the land will include the rehabilitation of mismanaged natural agricultural relevance resources.
Physical Planning Act (Act 125 of 1991)		This Act sets out South Africa's planning framework, i.e. regulates the levels at which plan operate, the responsibility for their drafting and implementation and their contents. I terms of this Act, policy and structure plans (SDFs) should promote the orderly development c the area to which they relate for the benefit of all its inhabitants.
National Parks Act, 1976 (Act 57 of 1976)		This Act provides for the establishment of National Parks in the Republic. National Park status establishes the strongest claim to permanent protection that is possible. South African National Parks is charged with the control, management and maintenance of National Parks. The Act also provides for the declaration of private land as part of a National Park, i.e. Contractual National Park. In such a case, an agreement and a Management Plan are drawn up for the management of the property by S.A. National Parks. .
Conservation of Agricultural Resources Act (Act 43 of 1983)		This Act provides for control over the use of natural agricultural resources in order to promote the conservation of soil, water resources and vegetation and the combating of weeds and invader plants. Regulations were promulgated in Government Gazette 9238 of 25 May 1984, which provides, *inter alia,* for the use, control and protection of virgin soil, indigenous vegetation, wetlands or vlei areas, marshes, water sponges and water-courses.
National Monuments Act, 1969 (Act 28 of 1969).		Replaced by SARHA
Mine Safety and Health Act, 1996 (Act 29 of 1996)		

A.7 WORD DEFINITIONS

In this document, unless otherwise indicated, the following words will have the meanings as indicated here:

Act (The Act)	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
Borehole	A hole drilled for the purposes of prospecting i.e. extracting a sample of soil or rock chips by pneumatic, reverse air circulation percussion drilling, or any other type of probe entering the surface of the soil.
CARA	The Conservation of Agricultural Resources Act
EIA	An Environmental Impact Assessment as contemplated in Section 38(1) (b) of the Act
EMP	An Environmental Management Plan as contemplated in Section 39 of the Act
Fauna	All living biological creatures, usually capable of motion, including insects and predominantly of protein-based consistency.
Flora	All living plants, grasses, shrubs, trees, etc., usually incapable of easy natural motion and capable of photosynthesis.
Fence	A physical barrier in the form of posts and barbed wire and/or "Silex" or any other concrete construction, ("palisade"- type fencing included), constructed with the purpose of keeping humans and animals within or out of defined boundaries.
House	Any residential dwelling of any type, style or description that is used as a residence by any human being.
NDA	National Department of Agriculture
NWA	National Water Act, Act 36 of 1998
Pit	Any open excavation.
"Porrel"	The term used for the sludge created at alluvial diamond diggings where the alluvial gravels are washed and the diamonds separated in a water-and-resource medium.
Topsoil	The layer of soil covering the earth which- (a) Provides a suitable environment for the germination of seed; (b) Allows the penetration of water; (c) Is a source of micro-organisms, plant nutrients and in some cases seed; and (d) Is not of a depth of more than 0,5 meters or such depth as the Minister may prescribe for a specific prospecting or exploration area or mining area.
Trench	A type of excavation usually made by digging in a line towards a mechanical excavator and not pivoting the boom – a large, U-shaped hole in the ground, with vertical sides and about 6 – 8 meters in length. Also a prospecting trench.
Vegetation	Any and all forms of plants see also Fauna.
DWAF	The Department of Water Affairs and Forestry – both national office and their various regional offices, which are divided across the country on the basis of water catchment areas.
MPRDA	The Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002).
EMPlan	An Environmental Management Plan as contemplated in Regulation 52 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) – this document.

MPRDA – Mineral and Petroleum Resource Development Act
DME - Department of Minerals and Energy
IAPs - Interested and Affected Parties
GOs - Government Organizations
NGOs - Non- Governmental Organizations
ABET Adult Basic Education and Training
ADT Average Daily Traffic
BAFOs Best and Final Offers
BAP Biodiversity Action Plan
B:C Benefit:Cost Ratio
BID Background Information Document
BOT Build-Operate-Transfer
BSAP Biodiversity Strategy and Action Plan

CBD Central Business District
CCA CCA Environmental (Pty) Ltd
CPI Consumer Price Index
DAEA KwaZulu-Natal Provincial Department of Agriculture and Environmental Affairs
DBSA Development Bank of Southern Africa
DEAET Eastern Cape Provincial Department of Economic Affairs, Environment and Tourism
DEAT Department of Environmental Affairs and Tourism
DM District Municipality
DME Department of Minerals and Energy Affairs
DSR Draft Scoping Report
EC Eastern Cape
ECA Environment Conservation Act (Act No. 73 of 1989), as amended
EIA Environmental Impact Assessment
EIR Environmental Impact Report
EMP Environmental Management Plan
FSR Final Scoping Report
GCS Groundwater Consulting Services
GDP Gross Domestic Product
GGP Gross Geographic Product
HDI Historically Disadvantaged Individual
I&AP Interested and Affected Party
IDP Integrated Development Plan
NMA Nomi Muthialu & Associates (Pty) Ltd
NPV Net Present Value
PCE Pondoland Centre of Endemism
PV Present Value
RoD Record of Decision
SA RDB South African Red Data Book
SAHRA South African Heritage Resources Agency
SANRAL South African National Roads Agency Limited
SAPS South African Police Services
SDI Spatial Development Initiative
SDF Spatial Development Framework
SEA Strategic Environmental Assessment
SED Socio-Economic Development
SMMEs Small, Medium and Micro Enterprises
TEM TransWorld Energy and Mineral Resources (S.A.) Pty Ltd
UDM Ugu District Municipality
UNDP-GEF United Nations Development Programme's Global Environment Facility
VOC Vehicle Operating Cost
WCSDF Wild Coast Spatial Development Framework
CCA Environmental (Pty) Ltd March 2007 xlv ii Table of Contents CCA Environmental (Pty) Ltd March 2007 xlv iii

Sabunga: Dolerite is mined throughout the area both as hard rock source for concrete ; road base course and surfacing; and in its weathered state as gravel wearing course for road where it is known colloquially as sabunga.

BACKGROUND TO THE APPLICATION

This is a new application and arose from the demand for material required for projects in the IDZ. The weathered dolerite was noted when machinery rented out to the farmer to excavated a shallow dam showed the presence of the material. Because of the need for the material existing in the area and the resource being available, a mining permit application was submitted on the property. The landowner sees this as an opportunity to help him with the development or layout of his land and the applicant and landowner decided on the best place to take the material out of a borrow pit.

The application for a mining right is made in accordance with the requirements of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA) and all the procedures and processes are therefore as required by this legislation. Vaduba Investments CC adhere to the requirements of the Mineral and Petroleum Resource Development Act, Act No. 28 of 2002 and also to the requirements of the Mining Charter by making provision for Black Economical Empowerment (BEE).

Mining provided material suitable as road construction material and in certain circumstances also for use in concrete and mortar. The volume of material on the site occurs to a depth and in adequate volumes to supply the needed material for some of the IDZ projects. The quality of the material is also suitable for the purpose it is required and high enough above the groundwater table not to impact thereon.

Part of the site remains zoned for agricultural use. After mining the use of the land will again be agriculture or activities associated with agriculture.

With regards to the limitation of this study, the impact of the mining will mostly be assessed local and although future or residual impacts will be considered, it is not possible to determine what the future impacts will be.

B. APPLICANT, PROPERTY, PROJECT AND OWNERSHIP DETAILS

B.1 BIOGRAPHIC DETAILS OF THE APPLICANT	
B.1.1 Full name (and surname) of person or company applying for permit or right	VADUBA INVESTMENTS CC
B.1.2 ID number of person or company/ CC registration number	**1999/025661/23**
B.1.3 Postal address	PO Box 78
	GONUBIE
	5256
E-mail address	blaire@riegers.co.za
B.1.4 Physical/ residential address	Vaduba Investments cc
	Off Main Road
	GONUBIE
B.1.5 Applicant's telephone and fax number	Tel: 043 – 732 1464; Fax: 043 – 732 1021
B.1.6 Applicant's cellular phone number	082 874 2306
B.1.7 Alternative contact's name	Blaire Rieger
B.1.8 Alternative contact's telephone/cell phone numbers	Mr. Gary Rieger

B.2 DETAILS OF THE PROPERTY	
B.2.1 Full name of the property on which mining/ prospecting operations will be conducted	Portion 3of the Farm 860, District East London
B.2.2 Name of the subdivision	Bon Ami Farm
B.2.3 Approximate center of mining/prospecting area:	See Attached Documentation for coordinates
B.2.4 Magisterial district	

(Website details)

Main Place Name	Local Municipal Code	Local Municipal Name	District Municipal Name	District Municipal Code	Province Name
Mount Coke, East London		East London	Buffalo City		Eastern Cape

B.2.5 Name of the registered owner of the property	Mr. Johan Ewers
B.2.6 His/her Telephone number	Tel: 043 – 736 9207 1464; 084 5606 285

B.2.7 His/ her Postal address	P.O. Box 5138
	Greenfields

B.2.8 Current uses of the site and surrounding areas

A shallow water pit is currently being dug and the rest of the mine is either used for grazing or crop cultivation.

B.2.9 Are there any other, existing land uses that impact on the environment in the proposed mining/ prospecting area?

Agriculture, residential

B.2.10 What is the name of the nearest town?

Town	Direction
East London	South-east

See the locality map.

Developments or residential developments in the immediate vicinity are limited to homesteads and outbuildings on the farms and industry is limited to farming.

B.2.10 Locality

The area is not located directly to the coast but slightly more to the hinterland coastal plateau. The sites lie between 275 – 290 meters above sea level. Buffalo City's natural environment coupled with its attractive and expansive landscape, form a valuable base for quality of life.

Locality map.

The map Figure 1 indicates:

(a) The location of the mine
(b) The position of the mine in relation to the farm border
(c) The topography on and around the area is also indicated.

Figure 1. Locality map

The proposed mine site(s) is located on Portion 3 of the Farm 860 Gonubie located in the East London District.

B.2.11 REGULATION 2.2 MAP/PLAN

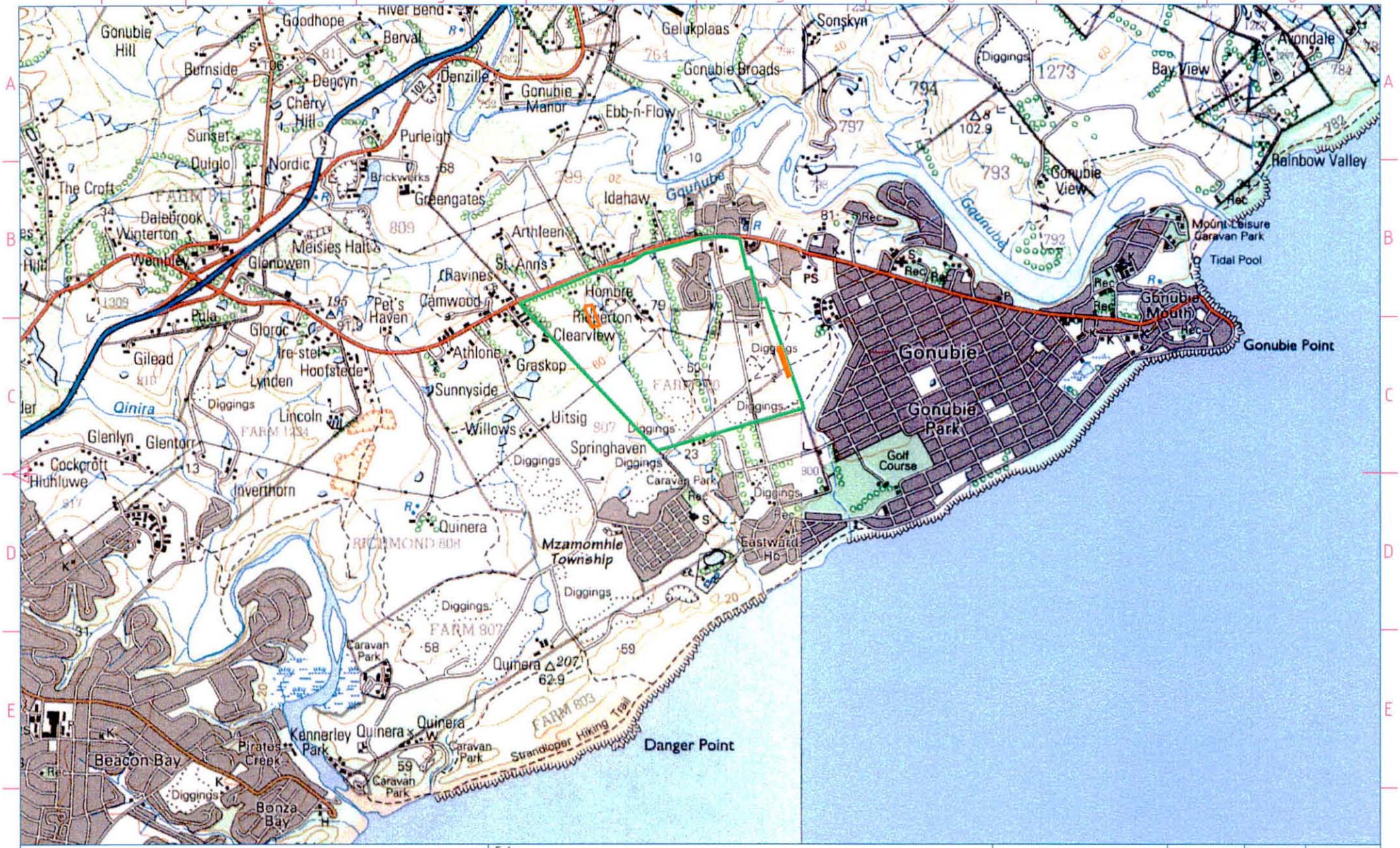
See Figure 2 for Regulation 2.2 plan/map

The Map includes:

- A north point
- The size of the area
- The name of the mine
- The description of the property
- The name of the applicant
- The signature of the applicant
- A space for the signature of the DME
- The coordinates

The topography

Figure 2 (a) and 2(b). Layout of the mine



Mine border

Border Prn 1 of Farm 800

Erf Portion 1 of Farm 800, East London		Topographical map	Area 1.43 Ha	Date 2009-07-24	System WG27
Signature	Name of Mine Reigerton	Name of Applicant Vaduba Investments cc	File Name Vaduba Investments_ 800_FINAL.dwg		Map reference 3227DD20
	1000 500 0 1000 2000 3000 metres				Figure

B.2.12 Details of Portion 3 of the Farm 860, East London

The annexed Diagram marked A.B.C.D.E.F.G. and bordered green represents One Thousand nine hundred and Eighty seven acres and seven hundredths of an acre of ground being

FARM No. 43

situate in the East London District, Territories of British Kaffraria

bounded North by Vacant Land,
South East by Farm No. 77 and the Tsenjana River,
South by Farm No. 74,
West by the Gooloo River
North West by Farm No. 41.

Copied from General Plan
framed by Mr. Surveyor Merriman
by me
(Sgd.) Wm. Percival Oak.
3rd Ck. Sur. Genls. office

Copied from diagram relating to
D/G E.L.Q.3-26

for Surveyor-General.

Date :

SHEET BQ-2AB

FOR ENDORSEMENTS . . . C
SEE BACK OF DGM.

DC

Figure 3 (a). Surveyor General details

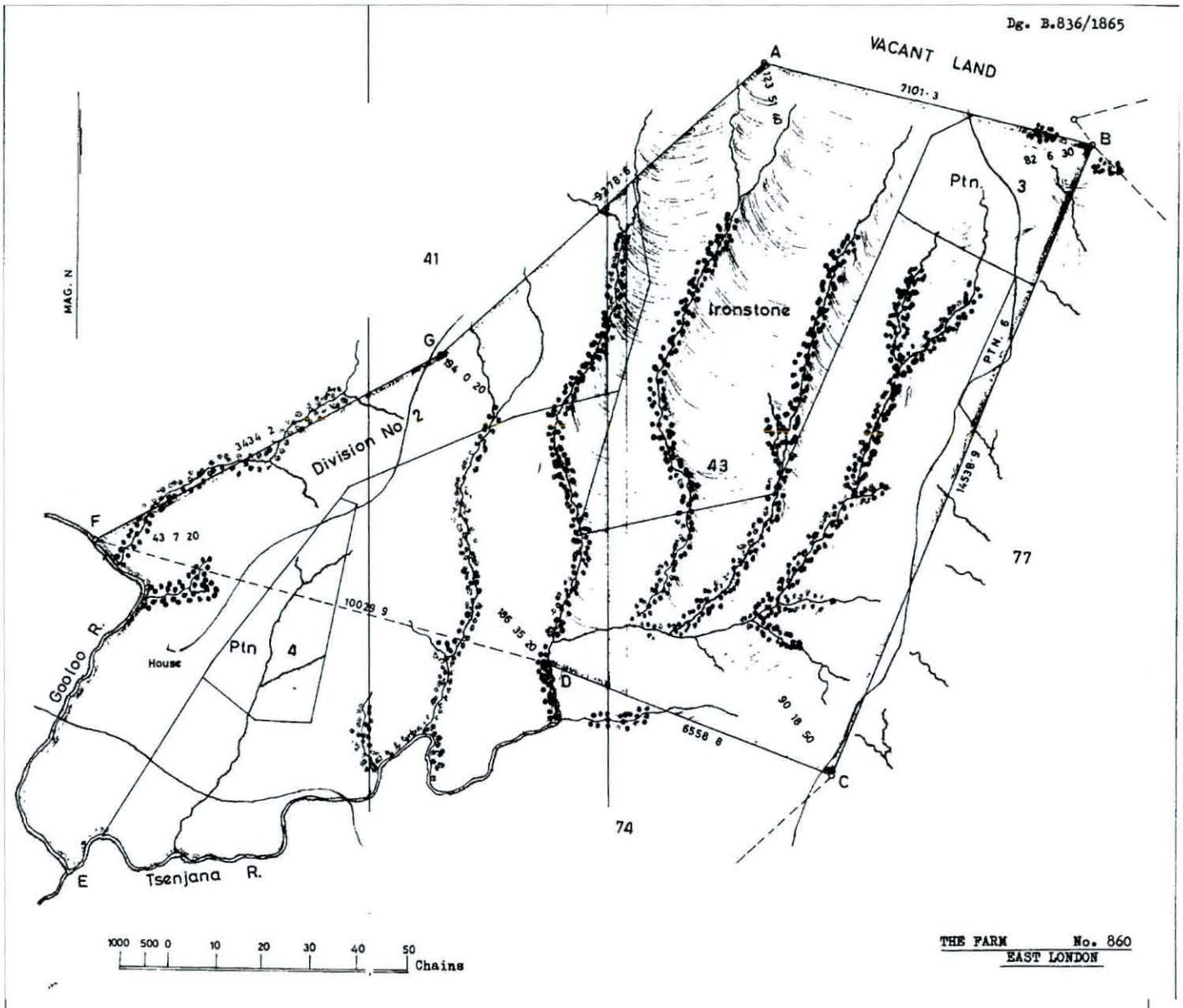


Figure 3 (b). Surveyor General diagram

B.2.12 What mineral will be mined?

Weathered dolerite (sabunga) and resource will be mined. The sabunga resource to be mined is the available range of the dolerite aggregate products. The weathered dolerite is currently used for fill on road surfaces and forms the layer just below the sub-base.

B 2.13 Regional Setting

The site referred from this point onwards as the Mount Coke Site is located to the west of the more northern section of East London and falls within the Buffalo City Municipal area. The area comprises a coastal plane and a hinterland coastal plateau and lies between 300 and 500 meters above sea level. The sites are located between 275 m and 290 m contour. Buffalo City's natural environment coupled with its attractive and expansive landscape, and coastal planes, form a valuable base for quality of life. Due to its close proximity to the sea, the mine area is associated with descriptions related to the coastal plans.

B 2.14 Surface Infrastructure and presence of servitudes

Presence of servitudes on the Farm 860

(a) A Road Service Servitude
(b) Electrical Power Transmission Servitude
(c) A telephone line Servitude

There are also roads that cross the farm and an access road from the main road to the mine areas.

B.2.13 Climate

B.2.12.1 Local climate

Climate data

Buffalo City's climate is mild and temperate with temperatures ranging from 10 degrees in June to 26 degrees in January. The average hours of sunshine are in excess of 200 hours per month. The region experiences dry periods in mid-summer and mid-winter, and pronounced spring rainfall over the region when predominant south-easterly winds bring rain to the coastal areas - the average annual rainfall is 889mm (450 mm inland in the south-west to 900 mm in the north-east) and decreases slightly from the coast inland. Main rainy months are March and October/November. The region boasts a healthy climate: warm summers and mild, crisp-clear winters. There is little variation in temperature from season to season. This weather is suitable for outdoor adventure activities and for other activities that can be done out in nature. Winters are usually mild, although snow falls on the mountain ranges of the Cape and Natal and occasionally in the lower-lying areas. Consult the chart below for an indication of the monthly variation of average minimum daily temperatures. In summer the predominant wind is south-easterly and in winter, south-western and north-westerly. The picture and table below is from the South African Weather Service.

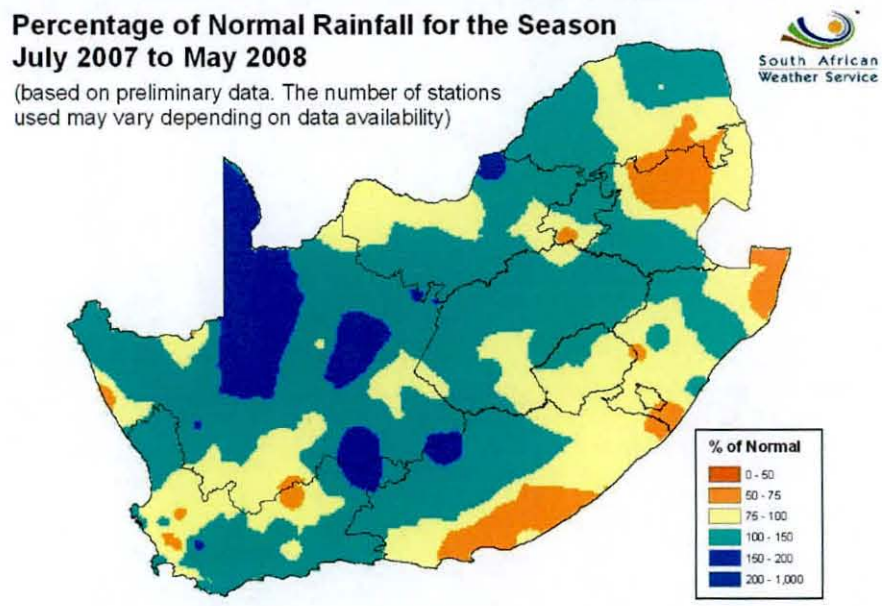


Figure 4: Rainfall map from the South African Weather Service website

B.3 DESCRIPTION OF THE PROPOSED MINING ACTIVITY

B.3.1 General background to mining and the resource available

The mine will be an opencast mine using a front-end loader or excavator to mine the sabunga. This is a basic load-and-haul operation with no screening, crushing or processing of the material on site. Large areas will not be exposed and vegetation and topsoil will only be removed from the areas where mining occurs at a specific point in time and.

B3.1.1 *Estimated reserves and extent of the mine site (Details of proven, indicated and inferred reserves/resources)*

Determining the extent of the reserve is greatly dependent on, amongst others, the following factors (each discussed in Section 2 of this document):

- The depth of the resource below ground level
- The ground water table level
- The proposed end use of the area.
- The mining method
- Topography and whether an excavation and be landscaped so that it merge in with the surrounding areas.

B.3.1.2 Planned production rate

The estimated production rate can range between 2 500 m^3 sabunga per month saleable product depending on the market demand. Unless the declining economy affects the demand, the annual consumption will most likely be as estimated 30 000 m^3 annum sabunga per month. Compaction factor is about 1:1.25. The price is quality dependent, and on this mine the price ranges between is about R75/m^3 within 5 km and R120/m^3 + at 5+ km and the applicant price for material without transport cost is R60/m^3.

B.3.1.3 Planned life of the mine

Based on the current mining rate, it will take between 2 years to mine the site optimally. Should the market demand decline or be less than anticipated, then period of two years will not be sufficient to complete mining on the proposed site within two years and application for an extension would be required. Should the demand be more than projected, mining will be completed before the two-year period had passed. Because the demand can vary, application is made for the entire 1.5 Ha in order to make allowance for the changes that can occur.

B.3.2 Depth of the mineral below the surface

The first 1.5 to 2 m of material (darker material containing organic material) is the topsoil there is no overburden in this area. In most of the area the saleable sabunga is present from directly below the topsoil.

Table 3. Reserves: Size of the deposit for this application

TOPSOIL AND OVERBURDEN ON SITE A			
Description of the soil	**Size of the area in m^2 (0.5 Ha)**	**Depth of the topsoil in mm**	**Volume of topsoil (in m^3) to be removed and stored**
Topsoil of 0.5 m	5000 m^2	0.5 mm	2500 m^3

Overburden – poor quality sabunga is about 1 m	5000 m^2	1.0 m	5000 m^3

TOPSOIL AND OVERBURDEN ON SITE B			
Description of the soil	**Size of the area in 1 Ha (10000** m^2)	**Depth of the overburden**	**Volume of overburden (in m^3) to be removed and stored**
Topsoil of 1 m deep	10 000 m^2	0.5 mm	5000 m^3
Overburden – poor quality Sabunga is about 1 m	10000 m^2	1.0 m	10000 m^3

Table 4. Total saleable reserves

SITE A: SEBUNGA (Saleable)				
Description of the soil	**Size of the area in m^3**	**Depth of the resource**	**Total volume in m^3**	**Volume mined per month**
Weathered dolerite for filling and Pi-grading	5 000 m^2	15 m	75 000 m^3	50 000 m^3

SITE B: SEBUNGA (Saleable)				
Description of the soil	**Size of the area in m^2**	**Depth of the resource**	**Total volume in** m^3	**Volume mined per month**
Weathered dolerite for filling and G-grading	10 000 m^2	15 m	150 000 m^3	50 000 m^3

B.3.3 Mining and Rehabilitation Plan

B.3.3.1 Pre-mining preparation

Mining and rehabilitation activities and methodology

The following are anticipated for the proposed mining operation:

- Topsoil management plan
  - Determine the quantity of topsoil to be removed and stored. Determine the height and surface area required for the storage of the topsoil.
  - Plan and Manage the design, profile, maintenance and reclaiming of the topsoil.

- Strip and stockpile in allocated areas.
- Preparation of the mined areas and replacement of the topsoil over prepared areas.

- Mine surface layout

  See attached layout plan
- Mine plan
  - Mine in phases according to mine plan and schedule discussed in the document
  - Obtain co-ordinates of the mine area and the blocks.
  - Rehabilitation according to the plan and schedule provided in the document
  - Provide contours if necessary to control water drainage down the slopes
  - Address noise issues.
  - Manage dust.
- Excavation or Dozing of topsoil: removal and later replacement
  - Removal of topsoil.
  - Replacement of topsoil after mining
- Benching
  - Use mine method described to form benches.
  - The excavator or front-end loader loads the material onto tippers.
  - Except for the top of the borrow pit, the benches faces are 10 m high and the step or bench surface is 10 m wide.
- Loading
  - Loading of Sabunga from the mine area.
  - Loading resources from stockpiles onto tippers.
- Hauling
  - Hauling of topsoil to the stockpile.
  - Hauling of Sabunga to the stockpile or directly to client
  - Hauling of topsoil to replace back over the mined area.
  - Management of dust on the access road during hauling.
  - Management of noise during hauling.
  - Address danger of trucks on public roads during hauling.
- Slope stability
  - Management of slope according to planning and legal requirements.
  - Managing slope safety.
  - Managing surface water drainage away from mine sites – trenching to divert water away from the mine into the drainage channels – if and when necessary.
- Maintenance of topsoil stockpiles
  - Designing of stockpiles.
  - Surveying of stockpiles (positioning on annual mine plan).
  - Profiling of stockpiles to ensure safe and manageable slope angle.
  - Contouring of stockpiles where required to prevent loss of material
  - Maintenance of stockpiles – where topsoil sags to mostly lie on the toe of the stockpile where it can be trampled, the soil must be pushed back up onto the stockpile
  - Clearing topsoil ahead of advancing mine activity.
  - Dust control on stockpiles where required.
- Grade control
  - Apart from the topsoil and the material regarded as the overburden, the quality of the rest of the material is suitable for selling.
  - In between the weathered sabunga are rocks and allowance is made for about a 50% waste.
- Road maintenance and dust control
  - Maintenance of haul and access roads.

- Conduct erosion control and management on the roads
- Dust control on roads where required.

❑ Pollution control
- Provide a mobile chemical toilet if there are no permanent facilities available. The chemical toilet must be cleaned and remove it regularly (before it is full).
- Provide a bin with a lid for domestic waste collection.
- Removal of petroleum product spills to the depth of penetration and placement in a bin with a lid.
- Removal of bins when they are full and dispose of at appropriated landfill sites.
- Prevent siltation of watercourses and channels – put preventative measures in place.

❑ Storm water control
- Design, construction and maintenance of storm water control measures on the mine (contours after mining and trenches during mining to divert surface water from the site).
- Design and build trenches above borrow pit area to divert water away from some of the slopes (where and if needed to prevent erosion)
- Design trenches above areas on the site where stockpiles are.

❑ Auditing and Monitoring
- Ambient dust monitoring at the perimeter of the mining area if required by the DME.
- Noise monitoring if required by DME
- Measuring the depth of the topsoil replaced

Rehabilitation and Decommissioning Phase:

❑ Final slope and bench design and construction or backfilling.
- Slope stability and construction for safety and most effective rehabilitation.

❑ Levelling of for instance the floor area and slopes that are backfilled.

❑ Contouring
- Cut contours across the /backfilled leveled areas (not areas where benches remain).

❑ Depth of contours about 500 mm at least every 50 m.
- Replacement of topsoil
- Replace topsoil to a depth of at least 500 mm.

❑ Seeding with an annual seed mix as a mother crop or annual grasses to allow initially binding of the soil and to provide nutrients for re-vegetation.
- Phases and method of rehabilitation as discussed below.
- Seeding with an annual crop, to initially bind and stabilize the soil.
- Seeding before rain season – irrigation will not be supplied.

❑ Road construction, maintenance and decommissioning
- Remove and store topsoil adjacent to the construction path of the haul roads on site.
- Repair and maintain all haul and access roads.
- At decommissioning rip haul roads and replace stored topsoil
- Upgrade the existing access road (which will remain for the use by the farmer as is currently the case).
- Spread stored topsoil (if available) over ripped road areas.

❑ General site clean-up
- Removal of all scrap metal and tyres.
- Removal of all waste on site.

B.3.3.2 Mining preparation: Weathered dolerite

The mining process on site will consist of the following:

(a) Excavation of 15 m deep over Site A – 0.5 m and Site B of 1.5 m

❑ Topsoil will be removed and stored.

- Topsoil is removed i.e. pushed back about 10 m – 20 m where it is stored.
- The top 2 – 3 m under the topsoil is sloped at a 1:2 angle to form the top step of the bench system.
- The overburden is also been removed and stored.
- The borrow pit is excavated from the starting at a high point and the site is then deepened and benched as the borrow pit becomes deeper.
- The borrow pit is deepened until the final depth of 15 m is reached.
- The next low bench is also into the overburden (poor quality weathered dolerite).
- The remaining overburden is removed and stored for adjacent (sides, in front of behind) to the topsoil.
- Below the poor quality weathered dolerite is the decomposed/weathered dolerite with suitable P.I. The resource will be loaded directly onto the trucks and sold directly to the clients or can be stockpiled for later sale and delivery. The next bench will be a 3 m face on a 3 m bench unless the high 10 m bench can be made.
- Excavation of the weathered dolerite (after removing of the overburden) occurs so as to construct 1 final bench with a 10 m face high to final average batters of 45 degrees (10 m face on 10 m bench).
- Benching:
  - Mining and benching is from the top down.
  - There will be a shallow bench (2 – 3 m high faces with 3 m wide benches) and a 10 m high faces on 10 m wide benches. The latter bench width can be reduced.
  - Bench formation:

Table 5. Bench formation

Bench number from top	Bench face height	Bench width	Total width removed to form the following bench (bench below) that will eventually result in the series of benches.
1	1 - 2 m	Top of the borrow pit	Top of the borrow pit sloped backed
2	3 m	3 m	2 + 3
3	10 m	10 m	2 + 3 + 10

(b) Stockpiling

- The resource (full range of road and concrete aggregates – G-series and fill) stockpiled separately or together.
- Stockpile of materials for despatch

© Despatch

- Despatch will be with tippers (dumper trucks).
- The tippers access to and from the mine is via the R346. Existing accesses are used
- Dispatch – the weight of the load carried by the truck will be controlled by a weigh bridge

(d) Other processing

Future processing: Ready Mix Plant (a change in the Mining Work Programme must first be amended).

B.3.3.3 Rehabilitation

(a) The aim of rehabilitation:

- To manage the site and conduct orderly housekeeping of the site in such as way as to not unnecessarily disturb the surrounding natural vegetation, streams or other special features. Also do not cause unnecessary visual or other impacts
- Conduct those rehabilitation measures possible during the life of the mine so as to minimize the post-mining cost and effort to restore the site.

- To conduct final rehabilitation of the site in order that leaves as little visual scarring as possible
- Based on the site characteristics, dust and erosion will require special attention.
- The site is mostly covered with grass and vegetation on the site has already been disturbed through previous bush clearing. Alien vegetation (including Black Wattle and Sesbania) occurs in the area. These vegetation types are likely to infest disturbed areas. There is also indigenous vegetation remaining on the farm and site.
- Once the subsoil is removed from the pit, the area is levelled, the faces between the mined and the unmined areas sloped and the topsoil replaced.
- Once the topsoil has been replaced, the surface area is again levelled to remove all depressions. The topsoil is also spread over the sloped areas.

B.3.3.4 On-going site maintenance and rehabilitation

B.3.3.4.1 Site maintenance

- General housekeeping of the roadways, traffic signposting and restriction of vehicle to roadways in order to minimize unnecessary disturbance of natural vegetation
- Continued eradication of alien vegetation.
- Containment of oil polluted run-off from workshop area through the installation of oil collection (if used) in workshop areas.

B.3.3.4.2 Storm water control

- Construction of cut-off drains around the excavation perimeter and stockpiles to limit the erosion of these edges and avoid siltation of the stream and borrow pit floor.
- Proper maintenance of storm water control

B.3.3.4.3 Topsoil and overburden handling

- All topsoil (500 mm) to be removed from the excavation site and stockpile in the designated areas.
- All topsoil and overburden to be stockpiled separately from the topsoil in designated areas.
- All topsoil and overburden stockpiles stored for a long period (exceeding a year) is to be to be grass seeded with Rhodes grass seed for summer planting and Italian Rye for winter planting to a seed rate of 200 grams per 100 m^2. Alternatively indigenous grasses and plants will be allowed to naturally settle on the stockpile.

B.3.3.4.4. Bench trimming and rehabilitation planting

- As soon as any upper benches reach the final borrow pit perimeter such bench should be trimmed, backfilled and planted.

B.3.3.4.5 Screen planting

- There is currently vegetation along the R346 that will initially screen the activity from the road, b but should it be required, further screen planting can occur. Once the borrow pit is developed, perimeter planting as part of good housekeeping could occur should it be required.

3.4 Post-mining rehabilitation

The following rehabilitation measures must be undertaken either the permanent early cessation of mining or on completion of long term mining as contemplated in this plan:

- Complete bench trimming, soil backfilling and upper bench planting
- On the resource pit area the topsoil must be replaced and re-vegetation must occur.
- Remove all structures, foundations and product stockpiles.
- Rotovate all hardened surface and roadways to expose topsoil or replace topsoil where removed.
- Grass seed all rotovated areas using a indigenous grass mix.
- Collect all oversized boulders and stack these in an attempt to backfill some of the excavated area.

3.5 End use

The proposed end use is a borrow pit to the NW of the house and will be allowed to collect water (must be less than 50 000 m^3) while the borrow pit to the east will be backfilled as far as possible or alternatively the benches will be topsoiled and planted.

3.6 Topsoil management

- Remove the topsoil from the areas to be mined.
- All available topsoil has been removed from the area of Borrow pit that is currently being mined and topsoil will be removed from any area where mining must still take place before mining commences. The removed topsoil is and will be stored for later replacement.
- Topsoil will be stored separately from the overburden. Topsoil is first removed before the overburden, but is replaced after the overburden when rehabilitated (roll-over method).
- Topsoil will only be removed from the specific areas that will be mined during a time and not from the entire mine area at once to retain the viability of the topsoil as long as possible. Keeping the topsoil and vegetation on the site also prevents, or at least reduces, the potential for wind and water erosion.
- Topsoil will not be used for filling, building or for road construction or maintenance. Topsoil will only be used to cover the rehabilitated areas to allow re-vegetation to occur.
- Topsoil stockpiling will be managed so that it is not washed away by surface water run-off. If necessary a diversion trench will be made on the topside of the topsoil stockpile to divert water away from the stockpile.
- Either a trench or a cut-off berm can be topside as protection against erosion and drainage protection.
- The height of the topsoil stockpile will not exceed 5 m where possible.
- The trampling of the topsoil in the stockpile and on the rehabilitated areas will not occur. To ensure this, topsoil replacement and seeding will only occur where mining and movement over mined areas has been completed or where the areas will not be used for the placement of stockpiles or for other mining activities.
- Replacement of topsoil over a mined surface can only occur once mining or moving over the areas has seized.
- The topsoil can be enriched prior to or during replacement and before seeding.
- Ripping or grading of the topsoil after it had been replaced will be required if the topsoil was compacted during the replacement process.
- Re-vegetation will prevent the blowing away or washing away of topsoil.

3.6 Technology to be used

Mining will involve removing the *in situ* resource as well as the loose weathered Sabunga. The *in situ* material is removed and directly loaded onto the trucks, but can also be placed in stockpiles when necessary.

- Excavator
- Bulldozer
- Tipper/Dump trucks
- Front-end loader can be used to load the material onto the stockpile or from the stockpile onto the trucks.

Table 5. Bench information

Bench number from top	Bench face height	Bench width	Total width removed to form the following bench (bench below) that will eventually result in the series of benches.
1	2 m	Top of the borrow pit	Top of the borrow pit sloped backed
2	3 m	3 m	2 + 3
3	3 m	3 m	2 + 3 + 3
4	10 m	10 m	2 + 3 + 3 + 10
5	10 m	10 m	2 + 3 + 3 + 10 + 10

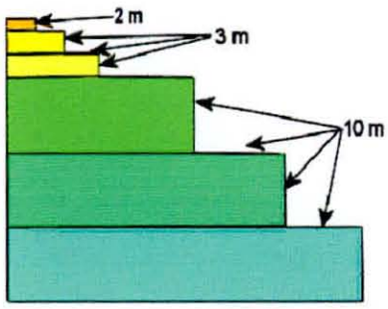


Figure 4. Layout of the bench formation

Mining and Operational Phase

The Mining starts on the first block at the southern border of the site and proceeds along the east – west axis until the northern border is reached. This procedure is repeated with all blocks to be mined.

- The direction of mining is as indicated in Figure 5. The numbering of the blocks indicates the direction of mining.
- An excavator will be used to mine the resource, but if and when necessary a front-end loader can also be used.
- The current planning of the mining operation is described as follows: After removal of the topsoil from a block, the topsoil is stored on the eastern side of the block, and mining of the subsoil commences.
- No more than one block will be mined at a time.
- Mining will not extend into the clay, gravel or where loam material is found. Loam soil (not found by the soil scientist in the profile holes) will not be removed.
- To prevent wind and water erosion, the topsoil is replaced as soon as possible so that re-vegetation can take place.
- Access and haul roads are made between the blocks so that the rehabilitated areas are not disturbed or trampled on. An access road to the mine area will be properly constructed and will be reinforced.
- Mining will occur so that the natural slope gradient is maintained and drainage is not impeded. Depressions are removed to prevent damming up of water on the site.
- The trenches made to control water runoff must preferably be vegetated. As an interim measure, straw bales or sandbags can be placed across the furrows (ditches or trenches) to slow the movement of water. This will also prevent any soil that can help vegetation establish being washed away. Sods can be laid down within the diversion ditches/trenches, as these require moisture to thrive.
-

The following can be done to place the sods:

- Trim the area to be grassed
- When laying the sods, the soil must be moist to a depth of 150 mm before placing them.
- Rake or spike the area to provide a loose surface to a depth of 100 mm.
- Starting at the lowest point of the trench/ditch lay the sods in a straight line (if possible).
- Place the next row adjacent and tightly against the previous row with the joints staggered and cover the rest of the area in this way. The sods must not be stretched or overlap. Fill spaces in between with parts of sods.
- If the slope is steep, stakes (wood, 300 mm in length) can be used to secure them
- The ditches and trenches in this area would be suitable for sodding because of the continual drainage of water down the slope of the mountain and irrigation will in all probability not be required.
- Alternative and suitable plants can also be used.

Rehabilitation

- After mining of a block, the topsoil is replaced.
- After replacement of the topsoil the slope gradient must be retained to facilitate drainage.
- If topsoil had been compressed during the replacement thereof, the surface must be ripped to facilitated water drainage into the soil as well as ensure the optimal root penetration of the roots.
- Construct contours where necessary to prevent potential erosion.
- The rehabilitation continues with the reinstatement of vegetation. After the replacement of the topsoil, the area is seeded with a cover crop (70 – 100 kg/ha) after which grasses cover the surface (normally natural re-establishment) so that grazing can occur.
- Seeding will occur prior to the rain season and if mining of a block is completed outside the planting season the area can be covered with the straw or bark to reduce dust blowing until the area is re-vegetation.
-

B.3.2.3 Scheduling of Mining and Rehabilitation activities

(a) Phases of mining and rehabilitation

The measurements for the calculations of the phases were taken from the schematics considering the volume of the material as indicated in the profile holes. As far as possible, the area was divided into phases that will take the same duration to mine. Phases of mining are used to propose a sequence of mining and rehabilitation. This assists with the managing the planning and scheduling of mining and rehabilitation. Profile holes give an indication of where the material is located and how much material is available in the particular area. Since the market demand also varies, the figures given are calculated estimate. Should more or less material be available than anticipated or the demand for the material increases or decreases, there could be variations in the time required to mine the site.

Rehabilitation takes place concurrently with mining. Topsoil removed from one block is placed over the block that was mined previously. The schedule of mining, therefore, also reflects the schedule of rehabilitation.

(b) Phases of mining

(Scheduling and planning of the various construction and implementation phases from the planning up to the commencement of full production.)

Mining and rehabilitation will occur in phases. Mining will occur in phases moving backwards in a bench format over the mining period.

- Trim the area to be grassed
- When laying the sods, the soil must be moist to a depth of 150 mm before placing them.
- Rake or spike the area to provide a loose surface to a depth of 100 mm.
- Starting at the lowest point of the trench/ditch lay the sods in a straight line (if possible).
- Place the next row adjacent and tightly against the previous row with the joints staggered and cover the rest of the area in this way. The sods must not be stretched or overlap. Fill spaces in between with parts of sods.
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Mining and rehabilitation will occur in phases. Mining will occur in phases moving backwards in a bench format over the mining period.

C. ENVIRONMENTAL IMPACT ASSESSMENT

Scheduling and planning of the various construction and implementation phases from the planning up to the commencement of full production and the ultimate rehabilitation. In the case of this mine a phase will be the formation of a series of benches ending in a 9 m high face and 9m wide step.

C.1 DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE AFFECTED BY PROPOSED PROSPECTING/MINING OPERATIONS: (REGULATION 52(2)(a))

The information provided in this section will enable officials to determine how serious the impact of the prospecting/mining operation will be.

ENVIRONMENTAL ELEMENT/ IMPACTOR	VALUE	TICK	OFFICE USE
C.1.1 What does the landscape surrounding the proposed operation look like? (Open veldt/ valley/ flowing landscape/ steep slopes)			
Topography and general description of the area			

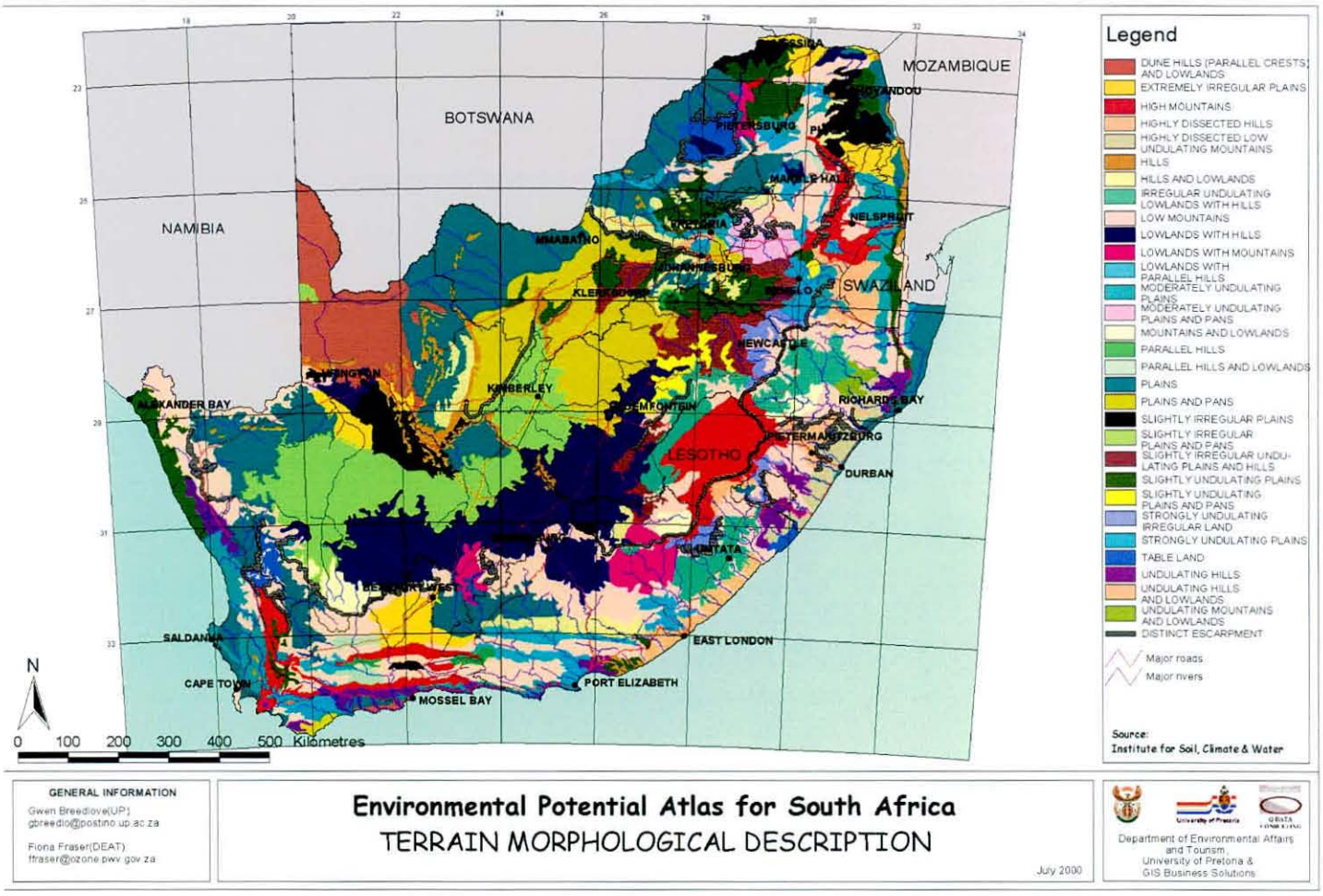


Figure 5. Map of the Terrain Morphology

Table 6. Mining and rehabilitation schedule

SABUNGA BORROW PIT		
Series of steps No. (move each step back over the same distance as the initial series of steps)	**Phases –**	**Duration**
1	Phase 1 (0.5 ha – existing borrow pit floor lowered)	Year 1. Rate depend on the demand
2	Phase 2 (0.5 ha – Further mining of the western section of the borrow pit)	Year 2. Rate depend on the demand

The region comprises a coastal plane and a hinterland coastal plateau and lies between 300 and 500 meters above sea level. Buffalo City's natural environment coupled with its attractive and expansive landscape, and coastal planes, form a valuable base for quality of life. Topography of the area is generally undulating hills and plains.

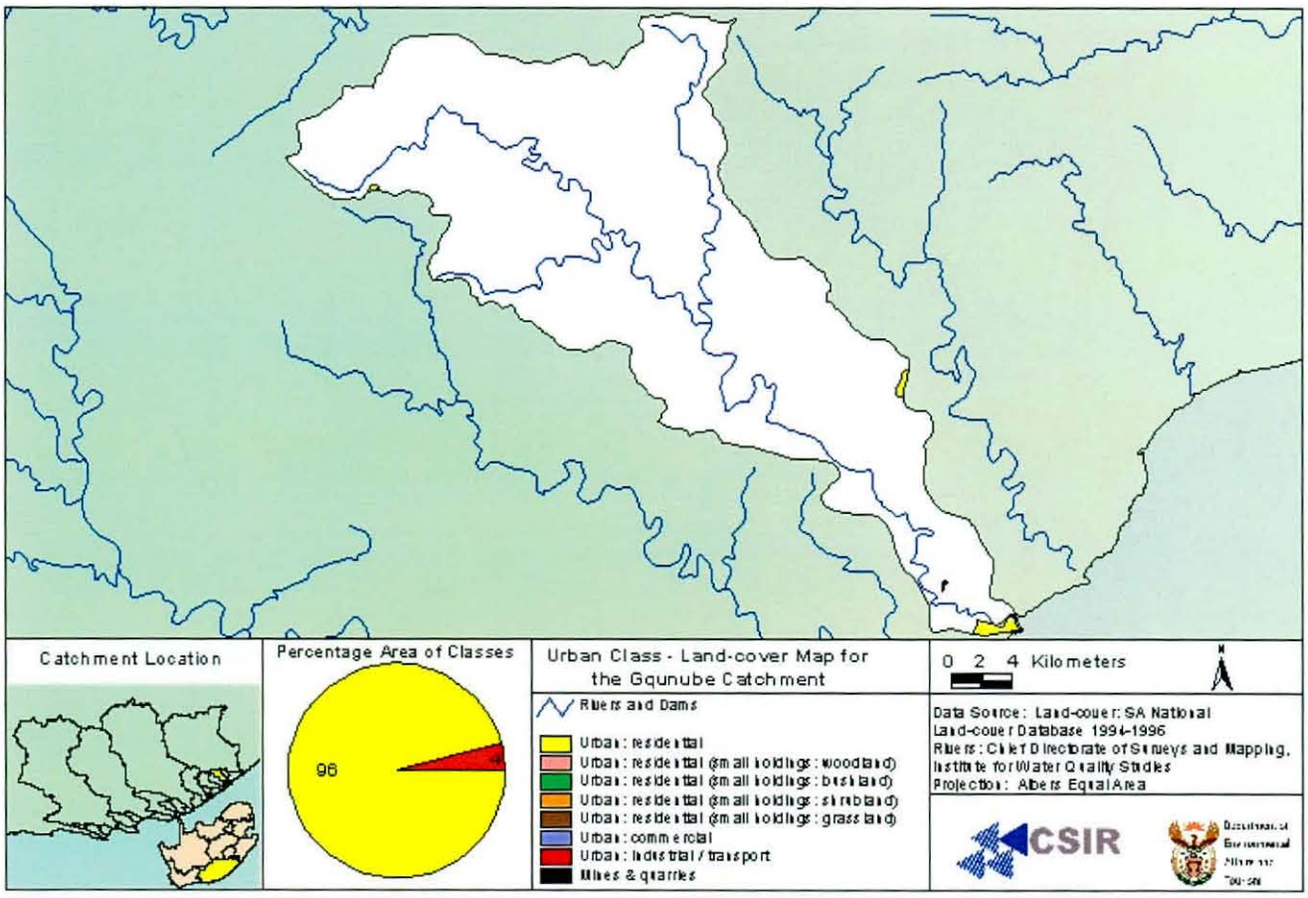


Figure 6: Map showing the urban areas in the Nahoon estuary

C.1.2 Describe the type of soil found on the surface of the site	VALUE	TICK	OFFICE USE
	0 – 300mm		8
	300 – 600mm		4
	600mm +	X	2

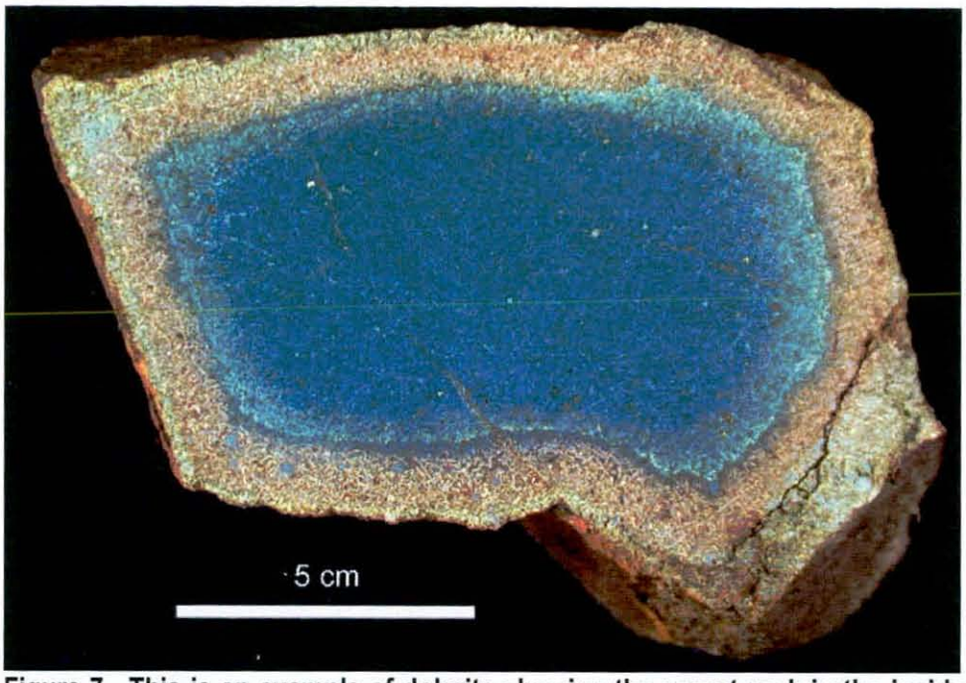


Figure 7. This is an example of dolerite showing the parent rock in the inside (blue) and the weathering on the outside (brown).

Figure 8. This is an example of sabunga from one of the profile holes showing the weathered material

Geology (see geological map attached Figure 6)

General geology

(a) Introduction

Based on the vegetation that previously existed on the site (Albany Coastal Belt: Mucina and Rutherford, 2006), the geology is complex and includes Beauford Group mudstone and resource stone in the northeast, Nanaga Formation arenite and sand in the west and Bokkeveld, Wittenberg and Ecca sand stone and shale in between and also a thin strip of Quaternary resource along the coast. The pure grasslands are limited to the Nanaga formation and Quaternary resources where as the thornveld is prominent on the more finely textured soil derived from the Beauford and Bokkeveld mudstone, arenite and shale. The most important land types include Db, Fa and Ae.
(Details below from the Council for Geoscience).

(b) Bedrock geology

The evolution of the landscape in the Eastern Cape can be traced from the Late Proterozoic to the present (Toerien and Hill, 1989). This section provides a brief overview of the bedrock geology and the historical development of the various landforms, and outlines the geo-hazards prevalent in the study area, identifying areas potentially susceptible to slope failure and high erosion risk.

The oldest sequence of rocks in the area belongs to the Palaeozoic Cape Supergroup, which in turn can be divided into the Table Mountain, Bokkeveld and Witteberg Groups of decreasing age. These sediments are overlain by the Karoo Sequence, which is comprised of the Ecca and Beaufort Groups. The Dwyka Formation separates the Cape Supergroup and the Karoo Sequence. These sediments underlie the Uitenhage Group and Tertiary to Recent deposits associated with pedogenic and marine processes. Pelitic rocks with subordinate sand stones and quartzites of the Cape Supergroup, within an eroded anticline, form the resistant spine of the Zuurberg Range. These sediments are separated from the more recent Jurassic and Cretaceous sediments of the Uitenhage Group by the Jurassic basalts, tuffs and breccias of the Zuurberg Group. The sediments of the Uitenhage Group decrease in age towards the coast. The geology of the area consists mostly of sandstone and mudstone of the Beaufort Group interspersed with dykes and sills of dolerite of the Post Karoo age. The proposed site lies within the upper and middle zone of a large dolerite sill. Structure geological investigations have confirmed the presence of medium grained dolerite on the proposed site. The study of the surface geology also revealed a reserve of "brown sugar textured" sabunga (decomposed dolerite), which forms a saleable overburden. The non-saleable overburden overlying the previous varies in depth between 1 – 2 m.

Unlike the mineral rich provinces in the rest of South Africa, the Eastern Cape does not have large deposits of valuable minerals. This is largely a function of the geology of the province. In particular the age of the rocks and strata are much younger than in provinces to the north. Not-withstanding, several mineral deposits are located in the province, but these remain largely undeveloped and unexploited. Most of these are not precious metal deposits, but are rather industrial-type minerals. Mineral deposits that show promise are: stone mining (for export), industrial minerals related to the building industry, such as resource, aggregate, limestone and heavy mineral resources.

Igneous rock formed below the Earth's surface, a form of basalt, containing relatively little silica (mafic in composition). Dolerite is a medium-grained (hypabyssal) basalt and forms in shallow intrusions, such as dykes, which cut across the rock strata, and sills, which push between beds of sedimentary rock. When exposed at the surface, dolerite weathers into spherical lumps as is the case on this site.

Dolerite intrusive are also common in the low-grade coal seams that occur in the province coal, forming ~30% of the surface area in the Molteno - Dordrecht -Indwe region. Dykes are typically 5-10 m in width and rarely exceed 10 km along strike; dips are vertical to sub-vertical. Dolerite sills and sheets are extensive and may approach 200 m in thickness, causing updoming of the strata in some localities.

Dolerite sills extensively intrude the sediments of the Karoo basin and where thick have formed a medium grained melano-gabbro. This product is referred to as "black granite" in the dimension stone trade and further potential should exist in this province. The close proximity to the sea and coastal ports will be a favourable factor. Numerous small quarries have mined stone aggregate for construction purposes in the Port Elizabeth, Cradock, Aliwal North, Cathcart, Humansdorp, Stutterheim and Cambridge areas. The source of material is usually either dolerite intrusives or quartzites.

(c) Seismicity

The area in which the study area falls is dominated by the topographic expression of the Cape Fold Belt (CFB), a Permian to Triassic orogenic event (Toerien and Hill, 1989). Axial planes dip towards the south-west, with the intensity of the folding decreasing northwards. Thrusts are present in places and show displacement of up to 4,5 km on the Baviaanskloof Thrust (Toerien and Hill, 1989). Normal faults subsequently developed south of the CFB due to tensional stresses, which accompanied the break-up of Gondwana. These faults now form the boundary along which the half-graben Algoa Basin developed, becoming filled with sediments of the terrestrial and marine Late Mesozoic Uitenhage Group (Toerien and Hill, 1989). Evidence of epeirogenic tectonic activity during the Cenozoic, and the Quaternary has recently been found, although of much less magnitude than that described above (Partridge and Maud, 1987; De Klerk and Read, 1988; Hill, 1988; Toerien and Hill, 1989; Andreoli *et al.*, 1996). Fernandez and Guzman (1979a) have suggested that Modified Mercalli Scale Intensities (MMI) are unlikely to exceed VI every 100 years or VII every 500 years.

(d) Type, erodability and depth of Topsoil and Subsoil

The soil types are largely determined by the underlying geological formations, with those derived from intrusive dolerite differing markedly from those associated with the Beaufort sedimentary rocks. Red dolerite clays occur predominantly on the northern, north-western and western parts were it is hotter and are seldom found in valley beds or moist soils. The black dolerite clays, which are confined to the proximity of dolerite intrusions, occur mainly on the cooler, southern and eastern parts, on poorly drained areas and the valley floor.

Grey resource loams are derived from Beaufort sandstone and shales where dolerite is absent and differ noticeably in colour from the doleritic soils. Climate appears to have less differentiating influence on pedogenesis within the soil type and the soils are slightly better developed on the southern and western aspects than elsewhere. The sandy loams occur discontinuously along the coastal strip where Aeolian has not overlain them or calcareous Tertiary deposits.

Hartman (1988) describes the soils of the East London coastal belt as being weakly developed and occurring on rocks interspersed with black and brownish-black clay loams. They are derived predominantly from the argilla sediments or the Balfour and Middleton formation of the Beaufort group and the dominant associated soil series are Williamson, Kanonkop, Mispah and Rhutherglen. The topsoil associated with dolerite is strongly structured and are characterized by Msinsini, Mayo and Glengazi series. The soils in the catchment area are described by Reddering and Estruysen (1986) as being solonetzic and prone to erosion with lithosol occurring closer to the coast.

(e) Type, erodability and depth of topsoil:

The topsoil is a maximum of about 1.5 – 2.0 meter in depth and is easily recognizable due to the dark brown to charcoal (almost black) colouring. The dark colour is mostly from the higher organic content compared to the reddish-brown or orange colour of the underlying sabunga and lighter coloured resource.

Figure 9. Geological Map

STRUCTURE SYMBOLS

- Diatreme
- Kimberlite pipe
- Vertical bed
- Fault, observed
- Horizontal bed
- Thrust fault
- Dip, 30° and less
- Shear zone
- Dip, 31° to 60°
- Linear feature, undifferentiated
- Dip, 61° to 90°
- Syncline
- Overturned dip
- Anticline

TOPOGRAPHIC DATA

- Freeway
- Arterial road
- Main road
- International boundary
- Provincial boundary
- Railway
- River
- Dam, lake, pan
- National park

Mine location

Erf Portion 1 of Farm 800, East London		Geological map	Area 1.43 Ha	Date 2009-07-24	System WG27
Signature	Name of Mine Reigerton	Name of Applicant Vaduba Investments cc	File Name Vaduba Investments_800_FINAL.dwg		Map reference 3227DD20
					Figure

5000 0 5000 10000 15000 20000
metres

Figure 10. Sample area showing the topsoil and the saleable sabunga directly below the topsoil.

The topsoil is well drained because of the higher organic content, lower clay content and also because the soil component has medium to coarse grains. Although erosion of the topsoil was not observed in the borrow pit or areas where mining took place, the topsoil could erode if the drainage during storage and after replacement is not addressed and large areas are unnecessarily exposed (vegetation removed). Removing vegetation from the site exposes the soil and makes it susceptible to wind and water erosion even it there is clay embedded in the soil.

The topsoil in the area where the resource will be excavated is sandy of nature with relatively high clay content. The soil is darker in colour than the underlying subsoil.

(f) Composition, erodability and depth of subsoil:

Directly under the topsoil lies the saleable sabunga, which is the weathered dolerite. The overburden material will be the rocks and stones, which are partially or unweathered dolerite. No crushing will be required, but the option to screen could be required if the material has too many unweathered material in between the weathered material.

Although erosion was not prevalent on the farm, the material could erode if the drainage is not addressed and large areas on the top of the borrow pit are unnecessarily exposed (vegetation removed). Removing vegetation from the site exposes the soil and makes it susceptible to wind and water erosion.

(g) Signs of misuse and/or soil erosion

Erosion in the area and associated with the soil is very low to moderate. However, where the slopes are

relatively steep, proper drainage will be required and vegetation must only be taken off in areas where mining will actually take place (keep the exposed areas as small as possible) so that erosion can be prevented as far as possible. The precautionary measures should also be adopted to ensure runoff water and drainage is managed as far as possible. This aspect will be addressed in detail in the Environmental Management Programme report (EMPr)., which includes the Environmental Impact Assessment.

Erosion potential and sedimentation is aggravated by the variable characteristics of the regional climate and in particular, the periodic drought and floods of the region. Generally, reducing or removing vegetation cover as a result of the physical removal of the topsoil, intensive grazing and the poor inherent absorption capacity or low moisture percolation capacity of the clayey soils will also increase the potential for erosion. The soil in this area is not clayey and this increases the absorption capacity and reduces the potential for erosion.

(h) Land capability before commencing with mining activity

The land is zoned agriculture and suitable for grazing. A small section of the vegetation will be removed form the approved 1.5 ha.

(i) Land use before mining

Domestic livestock farming, mostly cattle, is the most important agricultural activity in the Eastern Cape. About two thirds of the cattle farmed are for their beef and the remaining third is dairy. Other livestock is sheep (mainly for their wool), goats, pigs and poultry. The Nahoon catchment area has little in the way of forest covering and there are no forests in close proximity to the mine area. The particular site are either not actively utilized or if used for grazing.

(j) Historical agriculture production

The farm is zoned agriculture and is either used for grazing or crop cultivation. To a lesser extent pineapple farming occurs on irrigated land.

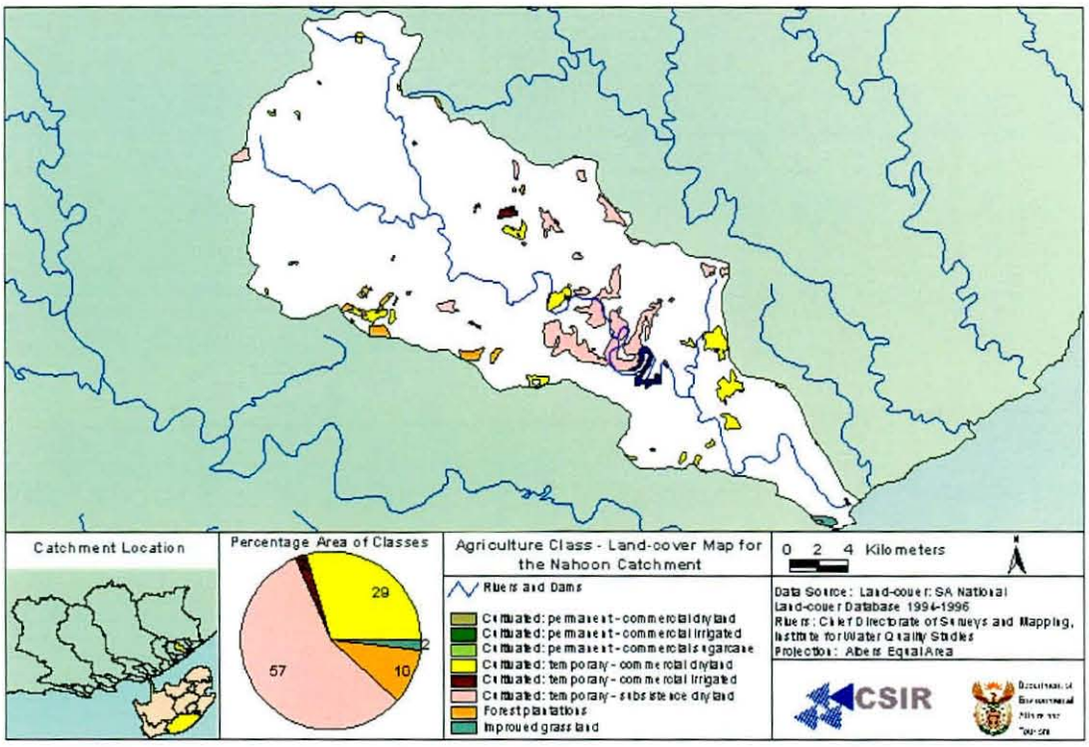


Figure 11. Agriculture class map

C.1.3 What *plants, trees and grasses* grow naturally in the area around the site?

Flora of the region including the site

The Eastern Cape has a fairly high provincial veldt degradation index, with commercial farming areas amongst the worst affected.

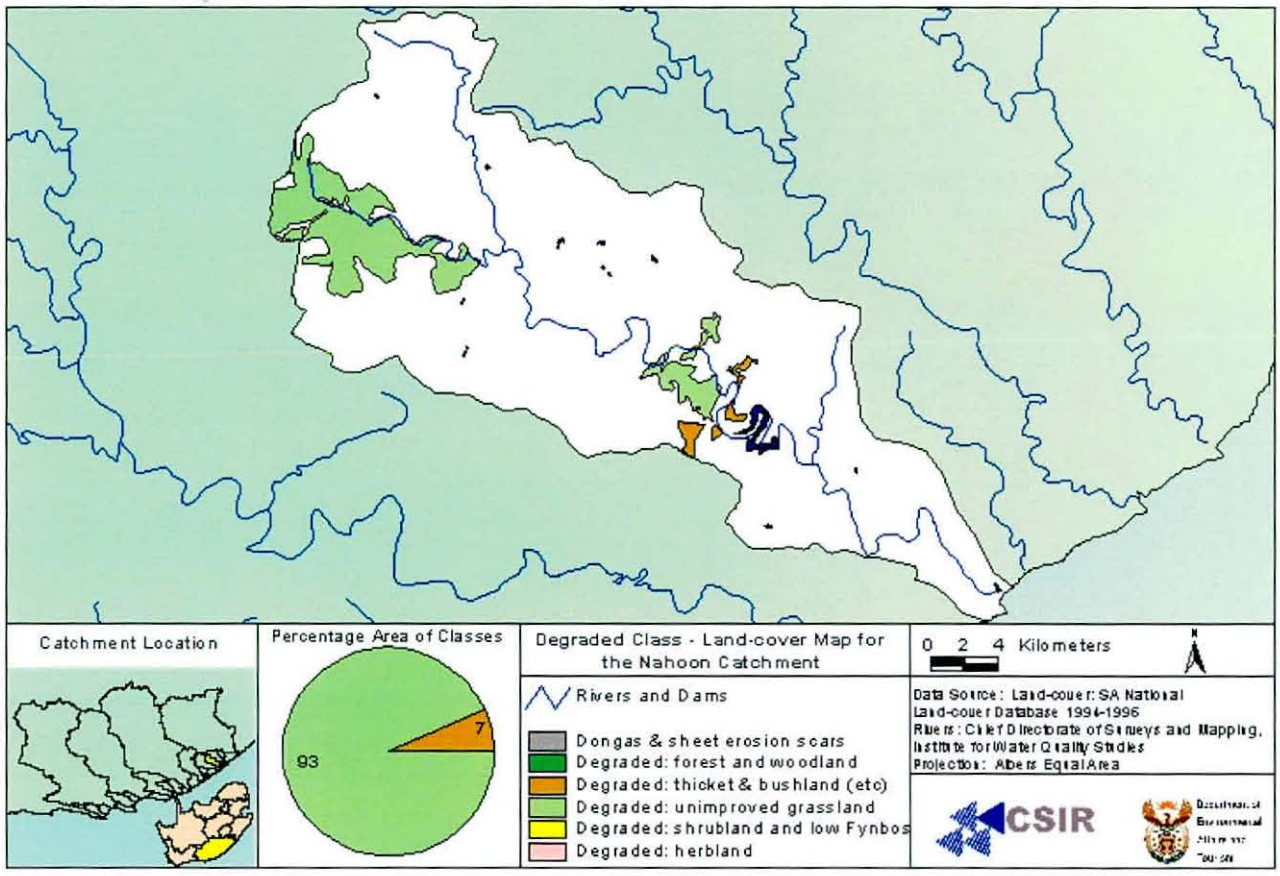


Figure 12. Degradation of the vegetation for the Nahoon catchment

Bush encroachment, change in species composition and alien plant invasions are the most serious veldt degradation problems that occur in commercial farming areas. Agriculturally important alien species include black wattle, prosopis, prickly pear and nasella tussock. In communal areas where mixed herds of cattle and goats limit bush encroachment, deforestation and loss of plant cover due to overgrazing are of greater concern.

To best protect remaining natural or sensitive vegetation, there is a need to approach conservation with sincerity and to link the coastal zone with the hinterland. This is necessary because the majority of formal conservation areas are along the coast have no natural links to the inland areas. To achieve this it is important to establishment biodiversity corridors giving more meaning to the protection of the areas. The proposed mine sites on the farm is in a relative degraded condition and is not regarded as of conservation value judged on the status thereof.

No conservation areas are present in the proposed mining area.

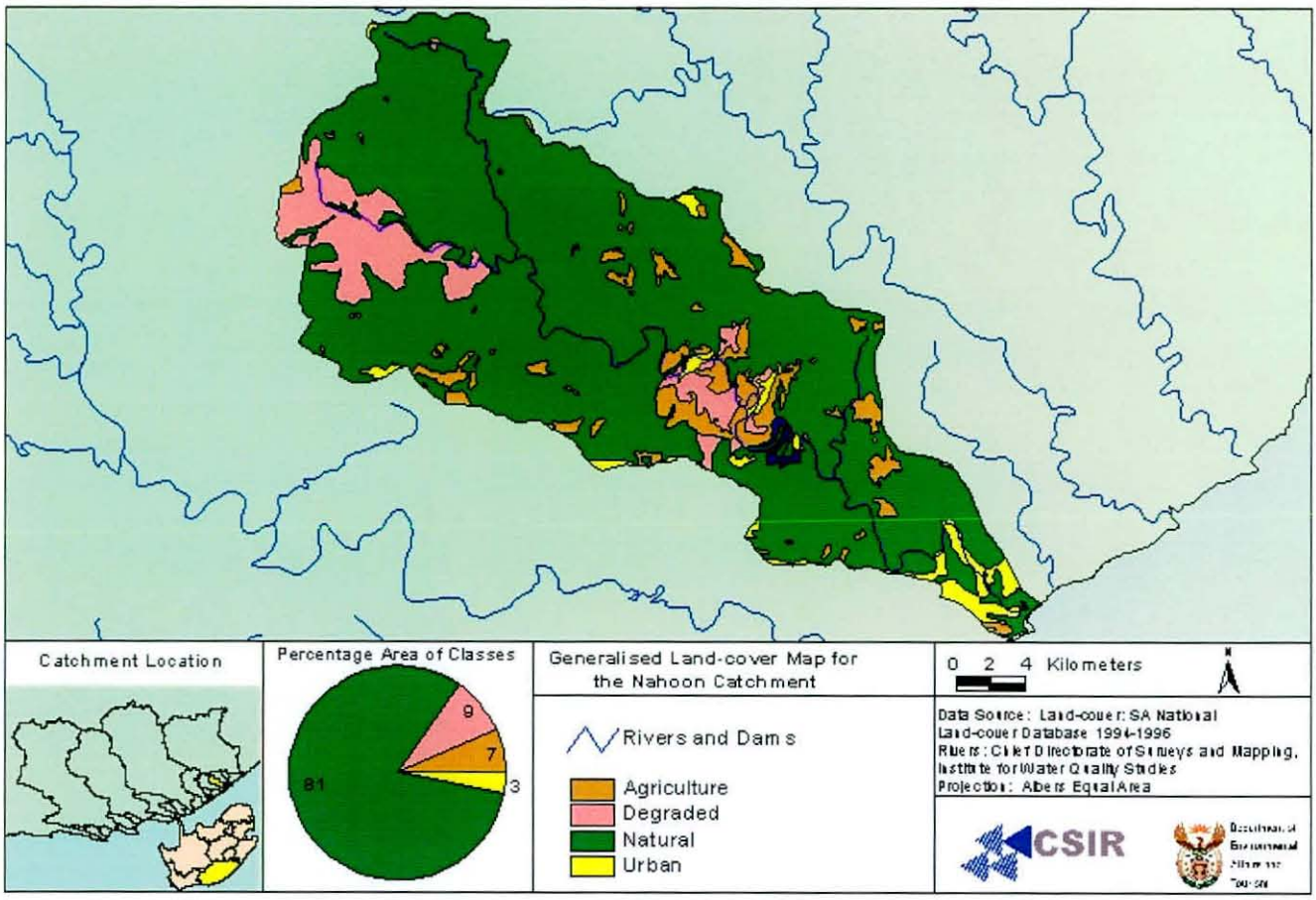


Figure 13. Land cover by vegetation of the Nahoon catchment

Vegetation description

Please note that the following map, legend and description (3.2.3.1 – 3.2.3.3) of the vegetation is extracted from Mucina and Rutherford, 2006

Some of the vegetation is from:
AT 9 Albany Coastal Belt

(a) Distribution: Eastern Cape Province
- Within 15 km (sometimes up to 30 km) of the Indian Ocean coastline, from Kei Mouth to the Sundays River, interrupted by many valleys.
- Altitude at which the vegetation occurs is10-400 m.

(b) Vegetation & Landscape Features
On the gently to moderately undulating landscapes and dissected hilltop slopes close to the coast, dominated by short grasslands punctuated by scattered bush clumps or solitary *Acacia natalitia* trees.

(c) Geology & Soils associated with the vegetation
The area covered by this unit is geologically complex and includes Beaufort Group mudstone and sandstone in the northeast, Nanaga Formation arenite and resource in the west and Bokkeveld, Witteberg and Ecca sandstone and shale in between, and a thin strip of Quaternary resource along the coast. The pure grasslands are limited to the Nanaga and Quaternary sans, whereas thornveld is prominent on the more finely textured soils derived from the Beaufort and Bokkeveld mudstone, arenite and shale. The most important land types include Db, Fa and Ae.

(d) Important Taxa
- Tall Tree: *Erythrina caffra.*
- Succulent Tree: *Euphorbia triangularis.*
  Small Trees: *Acacia natalitia* (d),

Brachylaena elliptica,
Canthium spinosum,
Cussonia spicata,
Ficus sur,
Ochna arborea,
Sideroxylon inerme,
Zanthoxylum capense.

- Tall Shrubs: *Clausena anisata,*
  Clerodendrum glabrum,
  Coddia rudis,
  Croton rivularis,
  Diospyros villosa var. *parvifolia,*
  Grewia occidentalis,
  Gymnosporia heterophylla,
  Hippobromus pauciflorus,
  Mystroxylon aethiopicum,
  Pavetta lanceolata,
  Psydrax obovata,
  Pterocelastrus tricuspidatus,
  Rhus lucida,
  Scutia myrtina,
  Tarchonanthus camphorates,
  Turraea obtusifolia.
- Low Shrubs: *Rhynchosia ciliata* (d),
  Carissa bispinosa subsp. *bispinosa,*
  Chaetacanthus setiger,
  Helichrysum asperum var.*albidulum,*
  Pelargonium alchemilloides,
  Phyllanthus maderaspatensis,
  Selago corymbosa,
  Senecio pterophorus,
  Tephrosia capensis var. *acutifolia.*
  Semiparasitic
- Epiphytic Shrub: *Viscum obscurum.*
- Woody Succulent Climbers: *Crassula pellucida* subsp. *marginalis,*
  Sarcostemma viminale.
- Woody Climbers: *Asparagus aethiopicus,*
  A. racemosus,
  Capparis sepiaria var. *citrifolia,*
  Clematis brachiata,
  Rhoiacarpos capensis,
  Rhoicissus digitata,
  R. tridentata,
  Secamone alpini,
  Tecoma capensis.
- Herbaceous Climbers: *Rhynchosia caribaea,*
  R. totta,
  Thunbergia capensis,
  Zehneria scabra.
- Graminoids: *Brachiaria serrata* (d),
  Cynodon dactylon (d),
  Dactyloctenium australe (d),
  Digitaria natalensis (d),
  Ehrharta calycina (d),
  Eragrostis capensis (d),
  E. curvula (d),
  E. plana (d),
  Heteropogon contortus (d),
  Panicum deustum (d),
  P. miximum (d),
  Setaria sphacelata (d),

Sporobolus africanus (d),
Themeda triandra (d),
Tristachya leucothrix (d),
Cymbopogon marginatus,
Ehrharta erecta,
Elionurus muticus,
Melica racemosa,
Setaria megaphylla,
Trachypogon spicatus.

- Succulent Herb: *Plectranthus verticillatus* (d).
- Geophytic herb: *Cheilanthes hirta, Moraea pallida,*
  Oxalis smithiana,
  Sansevieria hyacinthoides,
  Strelitzia reginae.
- Herbs: *Chamaecrista mimosoides* (d),
  Abutilon sonneratianum,
  Acalypha ecklonii,
  Centella asiatica,
  Commelina africana,
  C. benghalensis,
  Cynoglossum hispidum,
  Eriosema squarrosum,
  Lactuca inermis,
  Lobelia erinus,
  Monsonia emarginata,
  Phyllopodium cuneifolium,
  Senecio burchellii,
  Sonchus dregeanus.

(e) Endemic Taxa

- Succulent Shrub: *Bergeranthus concavus.*
- Succulent Herbs: *Brachystelma franksiae* var. *grandiflorum,*
  Bulbine frutescens var. nov. (*'chalumnensis'* Baijnathined.),
  Faucaria subintegra,
  Haworthia coarctata var. *tenuis,*
  H. cooperi var. *venusta,*
  H. reinwardtii var. *reinwardtii f. chalumnensis,*
  Stapelia praetermissa var. *luteola,*
  S. praetermissa var. *praetermissa.*
- Geophytic Herbs: *Bobartia gracillis,*
  Apodolirion amyanum,
  Aspidoglossum flanaganii,
  Drimia chalumnensis.
- Low Shrub: *Acmedenia kiwanensis.*
- Herb: *Monsonia galpinii.*

(e) Conservation

- Least threatened. Target 19%.
- Only 1% of this vegetation unit is protected in 20 local-authority and provincial nature reserves as well as in the Greater Addo Elephant National Park (including Alexandria Coast Reserve West) as well as in number of private conservation areas.
- About 12% of the Albany Coastal Belt has recently been altered by cultivation, 1% by plantation forestry and 4% by urbanization.
- According to land-cover data, at least 7% consists of degraded veget5ation.
- It is difficult, however, to determine the proportion of the vegetation that is in a secondary state, since land-cover data do not distinguish between primary and secondary vegetation.
- Erosion is very low to moderate.

(f) Remarks

- The seaboard region that contains this unit is a mosaic of a wide variety of structural vegetation types, ranging from grassland to forest. This variation reflects post-disturbance succession gradients as well as natural variation in geology, soil patterns and distribution of water in the landscape. The forests of the region have been mapped as different vegetation units. Admittedly, this vegetation unit exemplifies a deviation from our mapping philosophy by featuring current-state rather than potential vegetation. We assume that the current vegetation mosaic so typical of the Albany Coastal Belt is a creation of man and the original (pre-settlement) vegetation was dominated by non-seasonal, dense thicket. The area of this unit was prime agricultural land, which attracted early settlers who, presumably, cleared the dense thicket cloak for pastures.

Some of the vegetation is
AT 12 Buffels Thicket
Which consists of:

- VT1 Coastal Forest and Thornveld (40%),
- VT 23 Valley Bushveld (39%) (Acocks 1953).
- LR 48 Coastal Grassland (31%),
- LR 5 Valley Thicket (30%) (Low & Rebelo 1996).
- STEP Mountcoke Grassland Thicket (45%),
- STEP Buffels Thicket (32%) (Vlock & Euston-Brown 2002).

(a) Distribution

Eastern Cape Province: In river valleys centered around East London, including the Tyolomnqa River, Buffalo River, Nahoon River, Gqunube River, Kwelera River and stretching between 40 and 50 km inland (including some areas around King William's Town and Komga), and a small area in the Great Kei River Valley between about 10 and 20 km from the coast. It also occurs in the valley bottom in Keiskammashoek north of Dimbaza. Altitude 0-700 m.

(b) Vegetation & Landscape Features

The vegetation occurs on steep slopes of river valleys in highly dissected hills and moderately undulating plains, where short, dense and tangled thicket stands reach up to 10 m. At the edges of the valley slopes the dense thicket grades into more open, shorter thornveld.

(c) Geology & Soils

Mudstones and sandstones derived from the Beaufort Group of the Karoo Supergroup as well as Jurassic Dolerite Suite intrusions. The shallow soils (Glenrosa and Mispah) derived from these rocks are fine-grained, nutrient-poor silts, but the presence of forests leads to the development of humus-rich, deep soils. Half of the area is classified as Fa land type, while Fb and Bd are of subordinate importance.

(d) Important Taxa

- **Succulent Trees:** *Euphorbia triangularis* (d),
  Aloe ferox,
  Euphorbia grandidens.
- **Small Trees:** *Acacia natalitia,*
  Apodytes dimidiata,
  Brachylaena ilicifolia,
  Calodendrum capense,
  Canthium ciliatum,
  C. mundianum,
  Cussonia spicata,
  C. thyrsiflora,
  Dombeya tiliacea,
  Elaeodendron croceum,
  Eugenia zeyheri,
  Harpephyllum caffrum,
  Heteromorpha arborescens,

Ochna arborea, Pappea capensis,
Ptaeroxylon obliquum,
Schotia afra var. *afra,*
S. latifolia,
Sideroxylon inerme,
Trimeria trinervis,
Vepris lanceolata,
Zanthoxylum capense,
Ziziphus mucronata.

- **Tall shrubs:** *Allophylus decipiens* (d),
  Azima tetracantha (d),
  Scutia myrtina (d),
  Suregada africana (d),
  Acalypha glabrata,
  Acokanthera oppositifolia,
  Allophylus melanocarpus,
  Buddleja dysophylla,
  Carissa bispinosa subsp. *bispinosa,*
  Chaetacme aristata,
  Chrysanthemoides monilifera,
  Clerodendrum glabrum,
  Coddia rudis,
  Croton rivularis,
  Diospyros scabrida var. *cordata,*
  D. simii,
  D. villosa var. *parvifolia,*
  Ehretia rigida,
  Euclea natalensis,
  E. undulata,
  Grewia occidentalis,
  Gymnosporia buxifolia,
  G. heterophylla,
  G. nemorosa,
  Hippobromus pauciflorus,
  Maytenus acuminata,
  Mystroxylon eathiopicum,
  Olea europaea subsp. *africana,*
  Pavetta lanceolata,
  Putterlickia pyracantha,
  P. verrucosa,
  Rhus gueinzii,
  R. lucida,
  Scolopia zeyheri.
- **Low shrubs:** *Pavonia praemorsa* (d),
  Senecio pterophorus (d),
  Euphorbia kraussiana,
  Lauridia tetragona,
  Lippia javanica,
  Lycium cinereum,
  Rubus rigidus,
  Solanum regescens.
- **Succulent Shrubs**: *Aptenia cordifolia* (d),
  Exomis microphylla var. *axyriodes,*
  Senecio oxyodontus.

Woody **Succulent**

- **Climbers:** *Cyphostemma quinatum.*

Sarcostemma viminale.

- **Woody Climbers:** *Rhoicissus digitata* (d)
  Asparagus aethiopicus,
  A. racemosus,
  Capparis sepiaria var. *citrifolia,*
  Dalbergia obovata,
  Jaminum angulare,
  Plumbago auriculata,
  Rhoicissus tomentosa,
  R. tridentate,
  Secamone alpini,
  Tecoma capensis,
  Uvaria caffra.
- Graminoids: *Cynodon dactylon* (d),
  Cyperus albostriatus (d),
  C. textilis (d),
  Digitaria argyrograpta (d)
  D. natalensis (d),
  Ehrharta erecta (d),
  Microchloa caffra (d),
  Panicum deustum (d),
  P. maximum (d),
  Schoenoxiphium sparteum (d),
  Setaria megaphylla (d),
  S sphacelata (d),
  Paspalum dilatatum.
- **Herbaceous Climbers:** *Senecio deltoideus* (d),
  Coccinia quinqueloba,
  Cynanchum ellipticum,
  Helinus integrifolius.
- **Succulent Herbs:** *Sansevieria hyacinthoides* (d),
  Plectranthus grandidentatus.
- **Geophytic Herbs:** *Moaea pallida,*
  Ornithogalum longibracteatum,
  Cheilanthes hirta.
- **Herbs:** *Commelina benghalensis* (d),
  Conyza scabrida (d),
  Galopina circaeoides (d),
  Hypoestes aristata (d)
  Abutilon sonneratianum,
  Sida ternata.

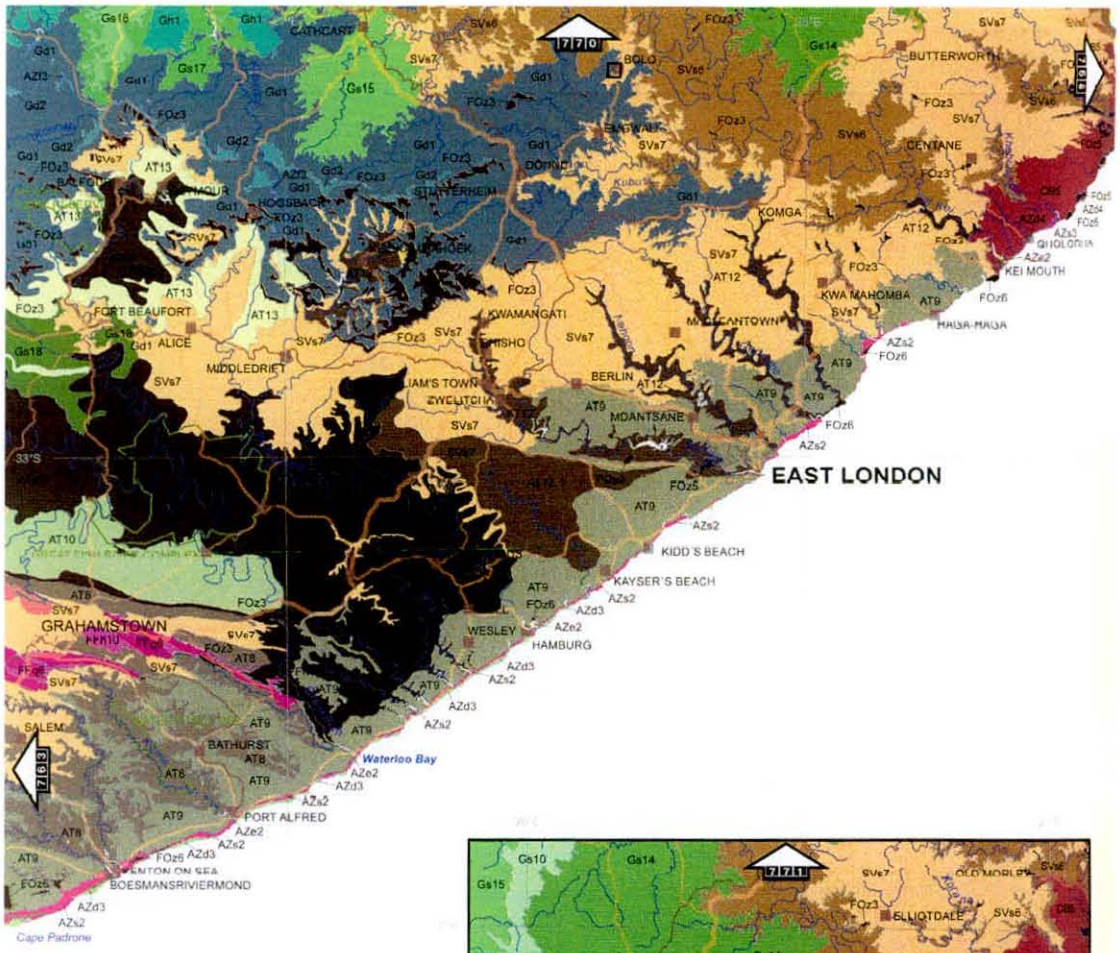
(e) Endemic Taxon

Woody Succulent Climber: *Ceropegia radicans* subsp. *smithii.*

(f) Conservation

- Vulnerable. Target 19%. About 1% is protected in statutory reserves (Umtiza, Bridle Drift, Fort Pato, Nahoon, Bluebend, King William's Town Nature Reserves) and in addition 0.7% in private nature conservation areas.
- Transformation 21%, mainly by cultivation, urban and built up areas, and plantations.
- t least 15% consists of vegetation in a degraded state.

Erosion is very low to moderate."



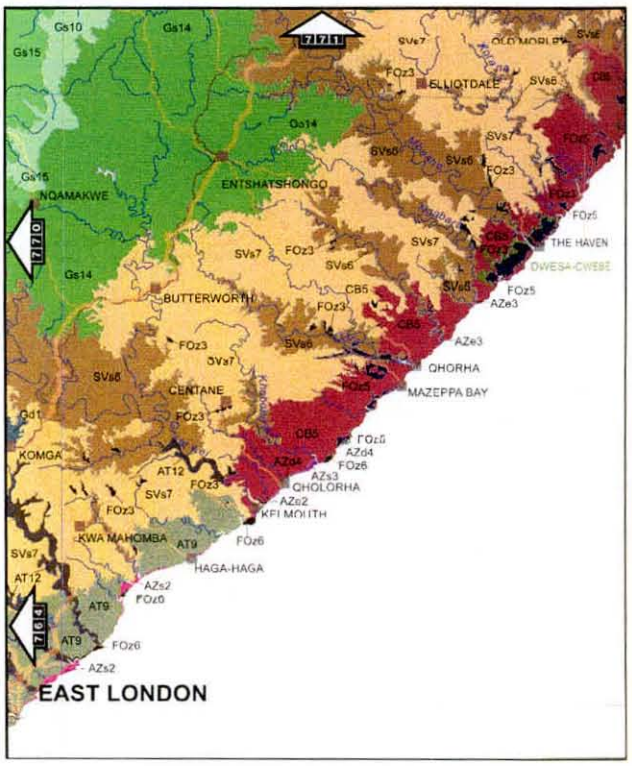


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Figure 14. Vegetation map From Mucina and Rutherford, 2006

STRELITZIA 19 (2006)

SVk 13 Olifantshoek Plains Thornveld
SVk 14 Postmasburg Thornveld
SVk 15 Koranna-Langeberg Mountain Bushveld
SVk 16 Gordonia Plains Shrubland

Kalahari Duneveld Bioregion

SVkd 1 Gordonia Duneveld
SVkd 2 Gordonia Kameeldoring Bushveld
SVkd 3 Auob Duneveld
SVkd 4 Nossob Bushveld

ALBANY THICKET BIOME

AT 1 Southern Cape Valley Thicket
AT 2 Gamka Thicket
AT 3 Groot Thicket
AT 4 Gamtoos Thicket
AT 5 Sundays Noorsveld
AT 6 Sundays Thicket
AT 7 Coega Bontveld
AT 8 Kowie Thicket
AT 9 Albany Coastal Belt
AT 10 Great Fish Noorsveld
AT 11 Great Fish Thicket
AT 12 Buffels Thicket
AT 13 Eastern Cape Escarpment Thicket
AT 14 Camdebo Escarpment Thicket

INDIAN OCEAN COASTAL BELT

CB 1 Maputaland Coastal Belt
CB 2 Maputaland Wooded Grassland
CB 3 KwaZulu-Natal Coastal Belt
CB 4 Pondoland-Ugu Sandstone Coastal Sourveld
CB 5 Transkei Coastal Belt

Figure 15. Legend for vegetation map From Mucina and Rutherford, 2006

3.2.4 Invader or exotic species

The alien plant species that are well established in the area are *Lantana camara*, *Sesbanea punicea*, *Acacia mearnsii* (black wattle), *Acacia saligna* (Port Jackson), *Acacia cyclops* (rooikrans), *Cestrum laevigatum* (ink berry), *Pereskia aculeate*, *Circium vulgare* (Scotch thistle), *Psidium guajava* (guava) and *Ricinus communis* (caster oil plant).

Degraded veldt

The vegetation is degraded over certain areas identified in the figure below. Areas further from the estuary are also degraded.

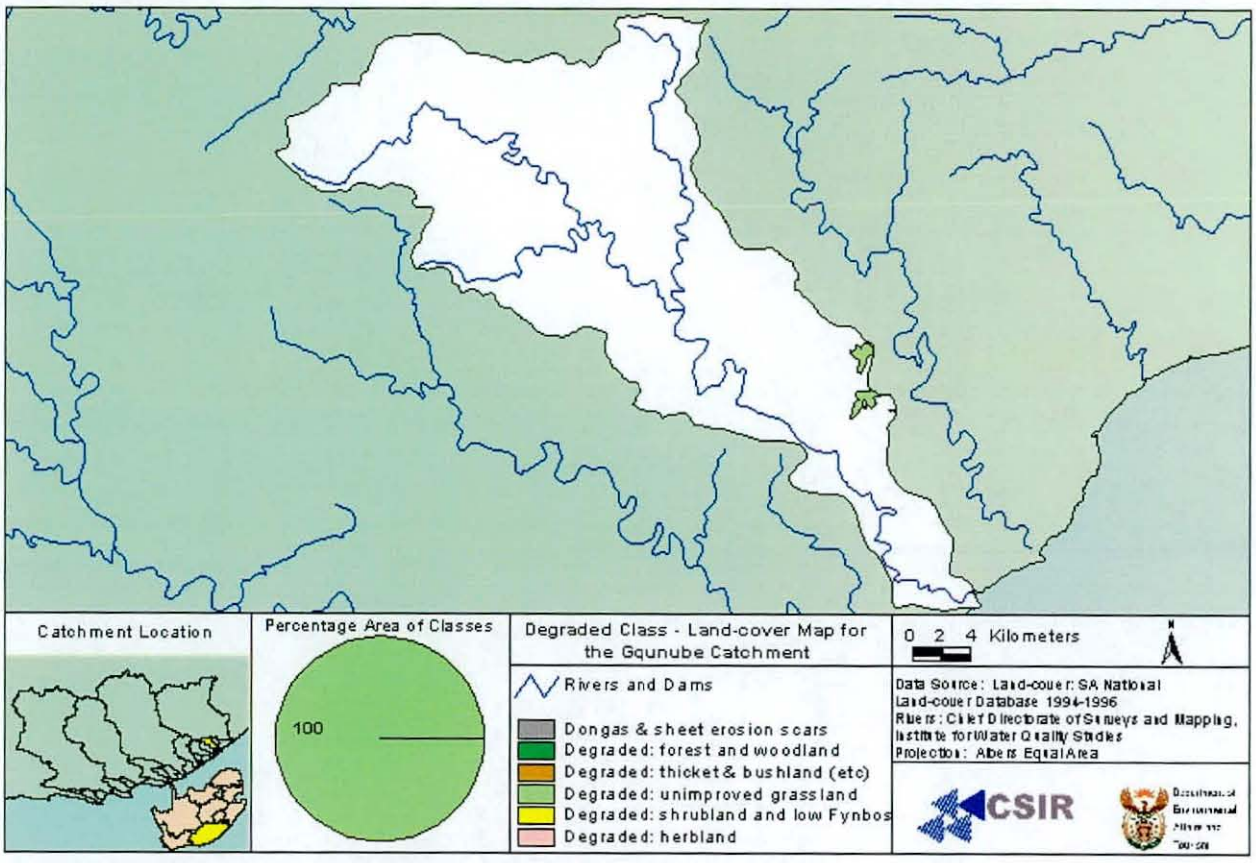

Figure 16. Degraded class. Land cover map for Nahoon catchment

Standard proposed invasive plant control: Method of alien vegetation control and eradication

A standard invasive plant eradication program has been complied with the assistance of a botanist, Dr Mark Berry, to provide a plan for the eradication of the invasive plants on mine sites (as well as other sites). The details are as follows:

All plants except those considered indigenous to the area are considered alien or invasive, but the eradication of the trees is especially important. Alien plants pose a threat to the valuable indigenous vegetation in the area. Alien plants require ongoing control for a period of time as they readily produce large quantities of seeds, which remain dormant in the soil for long periods. The following is suggested:

- Continuously control the existing seed bank in the rehabilitated areas as well as on the topsoil stockpile by removing alien seedlings at least bi-annually (check site specific requirements).
- Alien seedlings should preferably be pulled out by hand as soon as they are seen or as soon as possible. If they are left to grow it becomes increasingly difficult and costly to remove. Seedlings must preferably not be allowed to grow to a size that requires mechanical or chemical removal.
- Seedling removal is most effective after the rainy season (September to October) when seeds have germinated. One-year old seedlings can be hand-pulled, preferably when the soil is wet after a rainfall.

- Large alien
- Plants should be cut as close as possible to the ground level to prevent re-sprouting. Tree poppers can be used for removing small trees.
- When required, stumps will need to be treated with herbicides to prevent re-sprouting. Herbicide is to be painted rather than sprayed onto the stumps, to prevent adjacent areas from being affected. As an added precaution, stumps may be split with an axe.
- If physical removal is not practical, re-growth of alien vegetation is to be chemically controlled (see table below), and this must be done under strictly monitored application techniques.
- When spraying herbicides, use nozzle cones to limit areas affected by the herbicide. Harmful herbicides, such as Garlon, may not be used in depressions or wet areas. Keep a strict record of herbicides used, date, method of application, and area treated. Also record climatic conditions.
- Integrate above clearing methods with bio-control methods, such as insects and diseases. Contact Tony Gordon at the ARC Plant Protection Research Institute (tel: 021-887 4690) for advice in this regard.
- All alien plant material removed from the site is to be disposed of at a licensed waste disposal site. Burning of this material as a means of disposal should not occur on site, but can be dumped with the other garden waste. Alternatively, dried alien plants could be used for stabilization of cleared areas to prevent erosion if the seeds are removed.
- Alien plant control is to be undertaken by a suitably trained and experienced contractor, especially when the handling of herbicides is required.
- Develop a monitoring protocol to assess the success of alien plant control. Make adjustments to the clearing program if required.

Table 7. Invasive plants: Chemical control method

Chemical control method (should be checked with a specialist to ensure it is suitable for the species to be eradicated)
• Spray foliage of seedlings, saplings and young trees with 0.75% Garlon or Touchdown • Large tree stumps are treated with 3% Timbrel
• Spray foliage of seedlings with 0.5% Garlon for less resilient plants

The recommendations with regards to alien vegetation control are as follows:
At all possible, do not use heavy machinery to remove the invasive plants as it encourages further infestation.

- Use the DWAF approved alien vegetation clearing methodology.
- The methods include painting of all cut stumps with suitable dye tinted herbicides within 5 minutes of cutting. If not painted within 5 minutes, the absorption or penetration of the herbicide would be restricted to a great extent.
- The cut branches must be stacked in piles and the botanist recommends that because the site is relatively small the majority of the cut vegetation be removed to a safe area to reduce the burnable material in the area thereby preventing hot burning fires (fuel build-up). Removing the alien vegetation will also reduce the build-up of seeds.

Trained personnel must be used (even current staff or personnel that are trained will be acceptable rather than persons with no training).

C.1.4 What animals naturally occur in the area?

C.1.4.1 Fauna before commencing with mining

(a) Introduction

With certain area characteristics such as vegetation, geology and topography, water availability, temperature (etc.) certain species have a high likelihood of occurring. Unlike in the case of a development where a site is permanently inaccessible to animals during and once the development is completed, with mining the habitat may be altered but is neither permanently sterilised nor unavailable to animals. If only sections of the site are being worked or disturbed at a time the remainder of the site and the rehabilitated areas are available to fauna. If concurrent mining and rehabilitation occur the impact on the fauna is not permanent or irreversible as long as the animals are not hunted, trapped, snared or killed and are generally kept away from the mine site when the equipment is functional. To ensure this, the workers on site must receive environmental awareness training to ensure they understand and adhere to the policy that no animals may be killed, harmed or destroyed. There must also be management strategies in place to minimize and mitigate the impact the mining will have on the fauna as well as to manage the staff and monitor their actions or activities on site.

Location of development in relation to fauna and flora

Normally a site location is planned with the sensitivity and rarity of fauna and flora in mind, while considering the proposed land-end use as well as the mobility of the animals on the site. Development or mining near water including the wetlands, river, coastal area, estuary or the sea should receive special attention. For instance, development should not isolate sensitive and rare collection of organisms (plants and animals) so that there can be migration from one area to the next. The mining is located on the periphery of the property adjacent to a road that has made migration difficult already. However, the mining per se will not isolate the movement of fauna. The area size is spread out over two areas in all is 1.5 hectare in size. Besides this, the mining changes the surface area, such as the topography, but will not alter the state of the land so that animals cannot travel over it.

(b) Threats to biodiversity

Possible harm to fauna on the site has been identified as follows:

The decline in forest and coastal resources is enhanced by the exploitation of animals as well as other influences and this can have an effect of the biodiversity of fauna. The following points are regarded as having an impact and were considered as low in significance to the particular site:

- *Hunting.* According to the report by W.R. Branch (2002) hunting has been poorly managed and is unsustainable even over the short term. According to the report, the effect was compounded by the fact that the remaining small forest fragments are not viable to maintain large to medium sized mammals over the long term. The report states that target species have declined and the remaining populations of indigenous mammals are seriously threatened. Hunting does not take place on the particular site. The site is 1.5 hectare in size and as the location adjacent to a tarred road that is used regularly; the site cannot be regarded as particularly sensitive.
- *Pests.* Wild animals such as monkeys, raptors and small carnivores such as jackals, caracal and even crowned cranes were and are often branded as pests because of they apparently impact on the farming of livestock and cause damage to crops. Alternatives to killing the animals are seldom considered. According to the landowner, animals are not trapped or killed on the farm and the applicant is adamant that no animals will be trapped or killed on the particular sites.
- *Predation.* Domestic animals prey on some of the small vertebrates in the area. With residential areas close to the site this is more likely to occur. This is possible, but the degree to what it occurs within the area, with all the residential properties, is not known. Domestic predators, such as dogs, normally avoid mine sites during operational hours. However, what happens on the site (which can also happen anywhere else) after dark to nocturnal animals have very little to do with the mining activity itself.
- *Road-kill.* The increase in traffic on the roads affects animals in two ways. They either contribute directly to (a) an increase in the mortality and decline of animals in the area, or (b) traffic can disturb the animals (such as during breeding or causing them to leave the area), which has an indirect impact on the decline

in the animal populations. Working in the mine with earthmoving machinery as well as the trucks and other vehicles (bakkies) could harm the animals in their way. However, animals (even insects where it is possible for them) would rather avoid the area. The animals will flee to a safer area with the advantage that the potential for harm to them will be negligible.

(a) Mortality.

- Animals are killed when they cross the roads as part of their normal roaming (e.g. snakes and hedgehogs). Road kill is often seen on busy roads. However, it is not the size of the vehicle that causes the destruction, but rather the volume of traffic and the time of day they travel. Nocturnal animals are more likely killed during early morning or late after noon as well as specifically during the dark. Many of the animals found dead as result of road-kill are nocturnal. Snakes and other animals seeking out the road surface as an external heat source or to travel to look for food during the day are also likely to be killed. During holiday season the potential for road-kill should increase significantly due to the increase of traffic on the road. There will be more trucks on the road as a result of the mining operation and management and mitigation measures are proposed later in the document to address the increase in traffic. The time of operation from sunrise to sunset also limits the time the trucks travel on the roads (especially with regards to nocturnal road-kill incidents).
- Animals migrate when they need to find food or a suitable habitat. Again, the migration is particularly dangerous during holiday seasons when there is an increase of vehicles on the road.
- During annual breeding migrations when animals migrate to locate a mate (e.g. frogs, tortoises). These animals might migrate over the mine site, especially if there is water in the borrow pit. During seasonal migration for example migrate to areas where the weather is better such as in the case of birds or short-lived explosive breeders where there is mass migration. With all the activity on the site, the birds will not nest in or in very close proximity of the excavation, but the workings on the mine will also not deter them necessarily from breeding in areas that are in close proximity to the activities as long as these areas are not visited regularly by people or their pets.
- Also where there is well defined and long established breeding sites (e.g. in the case of many amphibians). This is specifically relevant where the road is close to a wetland when for instance local populations of, for instance amphibians, can be wiped out. There are no wetlands or any river or streams on the sites.
- Animals are attracted to roads for heat (cold-blooded animals such as snakes and lizards) especially during cold winter months. Snakes are especially vulnerable and some people purposely drive over these animals when they see them. This is, however, not a behaviour linked to the mining of resource, but rather as a result of the attitude of drivers of light vehicles (cars) as heavy vehicles such as delivery trucks (of all kinds), etc. It is important that environmental awareness of the workers on the mine occur. An environmental awareness programme is proposed in this document which the applicant can use (in part or as a whole) as it suits the workers or the operation.
- In the case of vultures, crows and carnivores the potential deaths of these animals increase when they feed on road-kill. Again this is not linked or limited to the mining *per se* but truckers are also not excluded from killing them. However, it is more likely the faster moving vehicles that can catch these animals unaware. Care to avoid animals on the roads are included in the environmental awareness programme/plan.
- Small granivorous passerines and rodents follow wind-blown seeds that are visible on the roads. As above, an increase in traffic in general will increase the potential for road kill and truckers should be taught to avoid animals on the road as far as is practicable and safe.

(b) Disturbances

- Vehicle traffic is noisy and the lights from the vehicles as well as road lamp light in urban or suburban areas also contribute to light pollution during the night. Different animals have a different tolerance level to, for instance for, light and noise pollution. Sensitive birds and large

mammals may become depressed and in particular large birds do not tolerate continuous disturbances and disturbances can also impact on breeding colonies of threatened bird species (in particular vultures).
Large mammals normally avoid mining activities and are not harmed as a result. Because these animals are large, they are easy to avoid. Sensitive birds are also not known to occur in borrow pits. With the vegetation removed there is little shelter or food and the habitat offered by the borrow pit will not be preferred on the site and no breeding sites for large birds will occur within the borrow pit; especially not during operation.

Trucks normally travel from sunrise to sunset, but should they travel in winter they will possible require their headlamps to be on and the impact would be the same as for other vehicles that travel during that time of the day. Mining does not occur in the dark and there is no lighting on site. There are no floodlights or similar other large lights. Therefore, light pollution specifically related to mining or even the dumping of the waste will be small to negligible. Some animals are known to be "caught" in the bright lights of vehicles. Should it ever be necessary to travel in the dark with headlamps on, such animals must be given the opportunity to escape (dim lights or quickly put light on and off).

- Vibrations. Increased noise and vibrations near to wetlands can impact on the breeding of amphibians but the impact will be localized and apparently the amphibians are rather tolerant to vehicle noises, but are less tolerant to increases light be it either as a result of the duration or continuous lighting or the intensity (levels). There will be no mining activity within 25 m from a wetland and existing roads will be used to transport the material making sure that the activity remains as is and the new application will not cause an additional burden to the wetlands where they occur. There are no water sources or water sources on or in close proximity to the proposed sites and breeding of amphibians in areas where there are sources can be disturbed by other trucks, farm operations, etc..
- Different habitats have different carrying capacities and/or biodiversity than others and the impact of disturbances and mortalities will have will vary accordingly. A portion of the farm that was not suitable for crop cultivation at this stage, next to the road and with the least amount of vegetation was selected for the mining activity. The area has been previously disturbed and is 1.5 hectares only. However, mining and loading will affect the biodiversity even of this local spot, but rehabilitation will be possible to a degree.

(d) Chemical pollution and the effect on fauna

The impact is regarded as mostly local and is as a result of exhaust fumes, oil spillage and accumulation of solid or domestic waste (or sewage if toilets facilities are not provided). The latter is most unlikely on the proposed site. The document deals with the mitigation and management of oil, fuel and lubricant spills to ensure it is not a problem on the site, especially if runoff water will collect in the lower portion of the borrow pit. Exhaust emissions from the many petrol and diesel vehicles that exist is one of the major causes of pollution to the atmosphere. Near towns and built=up areas or along busy roads the impact increases locally. Exhaust fumes are not specific to mine vehicles since most large trucks (even delivery trucks to shopping centres, etc) are now diesel driven. Some fuel-types still contain lead and smaller terrestrial animals are sensitive to lead, which can collect along roadsides or in depressions created by excavations.

Mining will result in the disturbance of runoff since a large depression is formed and special care must be taken to plan and manage drainage as well as control and manage pollution of the site especially where it is associated with runoff water (surface and ground water is discussed below).

C.1.4.2 Mammals

The mammals are diverse in the general region where the site is located, but this does not mean they necessarily occur on the particular site. Animals comprise insectivores, bats, primates, lagomorphs, rodents, carnivores, antbear, hyrax, bush pig and small antelope. However, much of the large and medium-sized mammal fauna that previously occurred in the area is either locally extinct or occurs in a small fragmented populations, usually in isolated forests (none are close to the sites). Species endemic to the area are the golden mole (*Chlorotalpa duthiae*) and a pygmy hairy-footed gerbil (*Gerbillurus paeba exilis*), none necessarily on the site.

In general mammals are can include Blue Duiker and Vervet monkey are still observed in dune bush and forest area whereas animals such as the bush pig, bushbuck, and grysbok are less common. The tree dassie may still occur in riparian forest along the Estuary. The small Hottentot golden mole is also often seen (or their mounds are) in locations where it is possible for them to dig. These animals are often the prey of domestic animals or road-kill. In the valley bushveld only populations of antbear and porcupine still occur. The antbear holes are large and if the animals were present evidence of them on the site would have been visible. No evidence of antbear holes were seen on the proposed site If they do cross the site from time to time, the mining activity will not affect them as most of their activities occur nocturnally. Animals such as genets, water mongoose and Cape grey mongoose and grey duiker are apparently scarce and apart from the Cape mongoose that could theoretically occur near residential areas, are not expected on the site while there are people and especially while mining operations occur. The most common occurring animal in the valley bushveld that could occur in the coastal region is the rock dassie but is found mainly on cliffs (mountains) in crags, in storm water drains and sometimes on the roofs of houses.

In addition to the abovementioned animals, the cane rat also occurs in grassland area. The cane rat is still found in wet areas, but due to development and urbanization, their habitat is rapidly decreasing. The proposed site lies within a reasonable distance from the estuary and the river. Transitional coastal forest, valley thicket, eastern thorn bushveld, eastern dune thicket and coastal grassland still provide shelter to the leopard, blue duiker, giant golden mole, tree dassies, Cape parrots, crowned eagles, the Knysna lourie and the narina trogon. Some of these animals can theoretically occur on or in close proximity of the site.

Mammals occurring in the vicinity of the Nahoon, Qinira and Gqunube estuaries
(Source: C.J. Vernon, East London Museum)

The order and nomenclature follow that of Smithers (1983). Species listed in brackets may occur, or once did occur in the area but are now extirpated. The evidence supporting inclusion in this list is based on the following:

A. Museum specimen for the study area.
B. Known through observation to live in the study area.
C. Known from museum specimens to occur in the catchment of the three rivers and so could be found in the study area.
D. Known from observation to occur in the catchment and so could be found in the study area.
E. Evidence based on skeletal material in owl pellets.
F. Study area falls within the distribution of the species as reported by Smithers (1983).
G. Reported by McLachlan (1986).

Table 8. Common mammals that could occur

Order Family Scientific Name	Common Name	Evidence