Proposed expansion of an existing rock quarry on the farm Driefontein 243, Mossel Bay district, Western Cape Province

Botanical Impact Assessment Report

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ABSTRACT

The appointed Environmental Assessment Practitioner, EnviroNiche Consulting, undertook a botanical impact assessment to determine the impacts which may be triggered by the proposed development. This study details the ecological characteristics of the site and provides an opinion on the sensitivity of the vegetation and an assessment of likely ecological impacts associated with mining and crushing of rock at the existing quarry.

The project site is on the farm Driefontein 243, Mossel Bay district, Western Cape Province. Although a quarry and stock pile area already exist and were highly impacted by transformation, the surrounding area contains some features of high sensitivity with intact areas of natural vegetation.

Provided that the natural vegetation remain intact during the mining and expansion of the quarry impact on the vegetation and fauna would and there would be no impacts of high concern associated with the mining of rock at this quarry.

RECOMMENDATIONS

The following is recommended:

General

- An Environmental Control Officer (ECO) must be appointed to oversee that the aspects stipulated in the Environmental Permit be carried out properly;
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to;
- The areas to be cleared as well as the stock pile area must be clearly demarcated;
- All construction vehicles should adhere to clearly defined and demarcated roads;
- Dust suppression and erosion management should be an integrated component of the construction approach;
- No dumping of building waste or spoil material from the operation should take place on areas other than a licenced landfill site;
- All hazardous materials should be stored appropriately to prevent contamination of the project site. Any accidental chemical, fuel and oil spills that occur at the project site should be cleaned up appropriately as related to the nature of the spill;

Flora

- Weed control measures must be applied to eradicate any noxious weeds (category 1a &1b species) on disturbed areas.
- There should be a preconstruction walk-through of the development footprint/project site in order to locate individuals of plant species of conservation concern. Any translocatable protected species must be relocated to a suitable and similar habitat where these plants can grow without any disturbance;

Fauna

- Any fauna threatened by the operation activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- No poaching or hunting of animals (e.g. Steenbok, hares) may take place
- All construction vehicles should adhere to a low speed limit (<30km/h) to avoid collisions with susceptible species such as snakes and tortoises.
- Trenches and deep excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are exposed should contain soil ramps allowing fauna to escape the trench.

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1. INTRODUCTION

EnviroNiche Consulting has been appointed by **Greenmined (Pty) Ltd** to conduct a botanical impact assessment of the project site as part of a process to obtain a mining permit for the mining of rock on the farm Driefontein 243, Mossel Bay district, Western Cape Province.

1.2. Objectives of the report

The following was to be provided / undertaken:

- A brief discussion, using available literature, on the vegetation type in which the broader study area and project site is situated in order to place the study in context.
- A broad-scale map of the vegetation and land cover of the project site using available aerial photography. A description of the dominant and characteristic species within the broad-scale plant communities comprising each of these units was to be provided. This was to cover the entire project site.
- List of all plant species recorded during the survey.
- A list of Red List plant species previously recorded within the quarter degree grids in which the study area and project site is situated, obtained from the relevant authorities.
- List of naturalised plant species recorded on the project site, indicating which are declared weeds or alien invasive species, according to the *National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014*.
- Identification of sensitive habitats and plant communities. A map of sensitive areas within the project site was to be provided.

A detailed investigation into the status of the vegetation located within the project site was undertaken, including:

- Assessment of the natural vegetation;
- General floristic diversity;
- Habitat suitability for Red Data flora species;
- Potential presence of Red Data flora species;
- Potential presence of sensitive ecosystems

1.3. Legislative framework

Acts such as those listed below (Table 1); ensure the protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment. It also ensures the protection of the environment against disturbance, deterioration, defacement or destruction as a result of man-made structures, installations, processes or products or human activities.

Table 1.3.1: List of relevant legislation

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
Constitution of the Republic of South Africa (Act 108 of 1996)	The Bill of Rights, in the Constitution of South Africa (No. 108 of 1996), states that everyone has a right to a non-threatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in NEMA and given further expression.	Department of Environmental Affairs (DEA)	1996
National Environmental Management Act, No. 107 of 1998 (NEMA), as amended & NEMA EIA Regulations, 2014: GN544, published in Government Gazette 33306 in 2014	A Full Environmental Impact Assessment report (EIA) is required for this project	Department of Environmental Affairs (DEA)	1998
National Environmental Management: Biodiversity Act (10/2004): Amendments, 2014	Protected species may occur on site	Department of economic, small business development, Tourism and Environmental Affairs (DESTEA)	2014
Conservation of Agricultural Resources Act 43 of 1983	The conservation of soil, water resources and vegetation is promoted.	Department of Agriculture, Fisheries & Forestry (DAFF)	1983
Convention on Biological Diversity, 1995	International legally binding treaty with three main goals; conserve biological diversity (or biodiversity); ensure sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources.	Department of Environmental Affairs (DEA)	1995

Convention on International Trade in Endangered Species of Wild Life and Fauna	International agreement between governments, drafted because of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 species of animals and plants.	Department of Environmental Affairs (DEA)	1963
Mineral and Petroleum Resources Development Act (Act No.28 of 2002) (MPRDA**)**	Compilation of Environmental Impact Assessment (EIA) and Environmental Management Programme (Reports) (EMPR).	Department of Minerals and Energy	2002
National Veld & Forest Act Fire Act (Act No. 101 of 1998)	To prevent and combat veld, forest and mountain fires throughout the Republic, to provide for a variety of institutions, methods and practices for achieving the purpose.	Department of Agriculture, Forestry and Fisheries (DAFF)	1998
National Forests Act (Act 84 of 1998)	Protected trees could occur on the proposed sites	Department of Agriculture, Forestry and Fisheries (DAFF)	1998
National Water Act, No. 36 of 1998	The proposed development may trigger a section 21(C and/or i) water use.	Department of Water and Sanitation (DWS)	1998
Western Cape Nature Conservation Ordinance (No 19 of 1974) and its amendments	Protected species could occur on the proposed sites	Cape Nature & Department of Environment Affairs and Development Planning (EAPD)	2009

1.4. STUDY APPROACH AND METHODOLOGY

1.4.1 Desktop delineation

Use was made of 1:50 000 topographic maps, and geo-referenced Google Earth images to generate digital base maps of the project site onto which the wetland boundaries and other sensitive systems were delineated. A desktop delineation of suspected wetland areas was undertaken by identifying rivers and wetness signatures from the digital base maps. All identified areas suspected to be sensitive were then further investigated in the field.

1.4.2 Site assessment

The project site was traversed by foot and road to determine the presence of any sensitive areas. Notes were made of the broad ecological condition of the project site and any signs indicating the presence of a wetland or other sensitive systems as well as visual observations/identifications of plant species and signs of animal activity were noted.

1.4.3 Vegetation survey

Date of fieldwork: November 2019.

Satellite imagery (Google Earth photos) and 1:50 000 topographic maps were used to find features within the project site.

Quantitative data was collected in each quadrat by undertaking vegetation sampling according to the Braun-Blanquet approach (Mueller-Dombois & Ellenberg 1974; Westhoff & van der Maarel 1978). In each sample site the following data was collected:

Habitat data:

- amount of bare soil;
- rock cover;
- slope;
- aspect in degrees;
- latitude and longitude position (from GPS) in decimal degrees;
- presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Vegetation data

- species present;
- cover estimation of each species according to the Braun-Blanquet scale;
- vegetation height.

Data analysis

- The plant communities that were identified were described using the vegetation sample data.

- Additional checklists of plant species were compiled by traversing the project site on foot and recording species as they were encountered. Plant names follow those of POSA (2015).
- All exotic species categorised as alien invaders or weeds as listed in the *National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014* were also recorded.

Due to the brief duration of the survey, the species list provided for the project site cannot be regarded as comprehensive, but is nevertheless likely to include the majority of the dominant and common species present.

1.4.4 Red Data species

Animal and plant species were listed and categorised as per the Red Data Species List and Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014.

1.4.5 Impact rating methodology

Direct, indirect and cumulative impacts of the issues identified in the EIA phase must be assessed in terms of the following criteria:

The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential environmental impacts.

Table 1.4.1: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of negative impact (at the indicated spatial scale)	**10 - Very high: Bio-physical and/or social functions and/or processes might be *severely* altered.** **8 - High: Bio-physical and/or social functions and/or processes might be *considerably* altered.** **6 - Medium: Bio-physical and/or social functions and/or processes might be *notably* altered.** **4 - Low : Bio-physical and/or social functions and/or processes might be *slightly* altered.** **2 - Very Low: Bio-physical and/or social functions and/or processes might be *negligibly* altered.** **0 - Zero: Bio-physical and/or social functions and/or processes will remain *unaltered.***
	10 - Very high (positive): Bio-physical and/or social functions and/or processes might be *substantially* enhanced.

MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**8 - High (positive): Bio-physical and/or social functions and/or processes might be *considerably* enhanced.** **6 - Medium (positive): Bio-physical and/or social functions and/or processes might be *notably* enhanced.** **4 - Low (positive): Bio-physical and/or social functions and/or processes might be *slightly* enhanced.** **2 - Very Low (positive): Bio-physical and/or social functions and/or processes might be *negligibly* enhanced.** **0 - Zero (positive): Bio-physical and/or social functions and/or processes will remain *unaltered.***
DURATION	**5 - Permanent** **4 - Long term: Impact ceases after operational phase/life of the activity > 60 years.** **3 - Medium term: Impact might occur during the operational phase/life of the activity – 60 years.** **2 - Short term: Impact might occur during the construction phase - < 3 years.** **1 - Immediate**
EXTENT (or spatial scale/influence of impact)	**5 - International: Beyond National boundaries.** **4 - National: Beyond Provincial boundaries and within National boundaries.** **3 - Regional: Beyond 5 km of the proposed development and within Provincial boundaries.** **2 - Local: Within 5 km of the proposed development.** **1 - Site-specific: On site or within 100 m of the site boundary.** **0 - None**
IRREPLACEABLE loss of resources	**5 – Definite loss of irreplaceable resources.** **4 – High potential for loss of irreplaceable resources.** **3 – Moderate potential for loss of irreplaceable resources.** **2 – Low potential for loss of irreplaceable resources.** **1 – Very low potential for loss of irreplaceable resources.** **0 - None**
REVERSIBILITY of impact	**5 – Impact cannot be reversed.** **4 – Low potential that impact might be reversed.** **3 – Moderate potential that impact might be reversed.** **2 – High potential that impact might be reversed.** **1 – Impact will be reversible.** **0 – No impact.**
PROBABILITY (of occurrence)	**5 - Definite: >95% chance of the potential impact occurring.** **4 - High probability: 75% - 95% chance of the potential impact occurring.**

	3 - Medium probability: 25% - 75% chance of the potential impact occurring **2 - Low probability: 5% - 25% chance of the potential impact occurring.** **1 - Improbable: <5% chance of the potential impact occurring.**
Evaluation Component	**Rating Scale and Description/criteria**
CUMULATIVE impacts	**High: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.** **Medium: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern.** **Low: The activity is localised and might have a negligible cumulative impact.** **None: No cumulative impact on the environment.**

Once the Environmental Risk Ratings have been evaluated for each potential environmental impact, the Significance Score of each potential environmental impact is calculated by using the following formula:

- SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential environmental impact as per the table below. The Environmental Significance rating process is completed for all identified potential environmental impacts both before and after implementation of the recommended mitigation measures.

Table 1.4.2: Scale used for the evaluation of the Environmental Significance Ratings

Significance Score	Environmental Significance	Description/criteria
125 – 150	**Very high (VH)**	**An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.**
100 – 124	**High (H)**	**An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.**
75 – 99	**Medium-high (MH)**	**If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.**
40 – 74	**Medium (M)**	**If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.**
<40	**Low (L)**	**An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.**
+	**Positive impact (+)**	**A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.**

1.5. ASSUMPTIONS

- The biodiversity at the project site is in a degraded state because of human impacts;
- The biodiversity at the project site will be destroyed during the mining operations.

1.6 LIMITATIONS

- None

2. DESCRIPTION OF THE PROJECT

Some mining activities already occurred on this site. There are also a flattened area which was used as stock pile area.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Description of the broader study area and project site

3.1.1 Location

The project site is on the farm Driefontein 243, Mossel Bay district, Western Cape Province (Figures 3.1, 3.2 and 3.3). The project site falls within the quarter degree square **3421BB**.

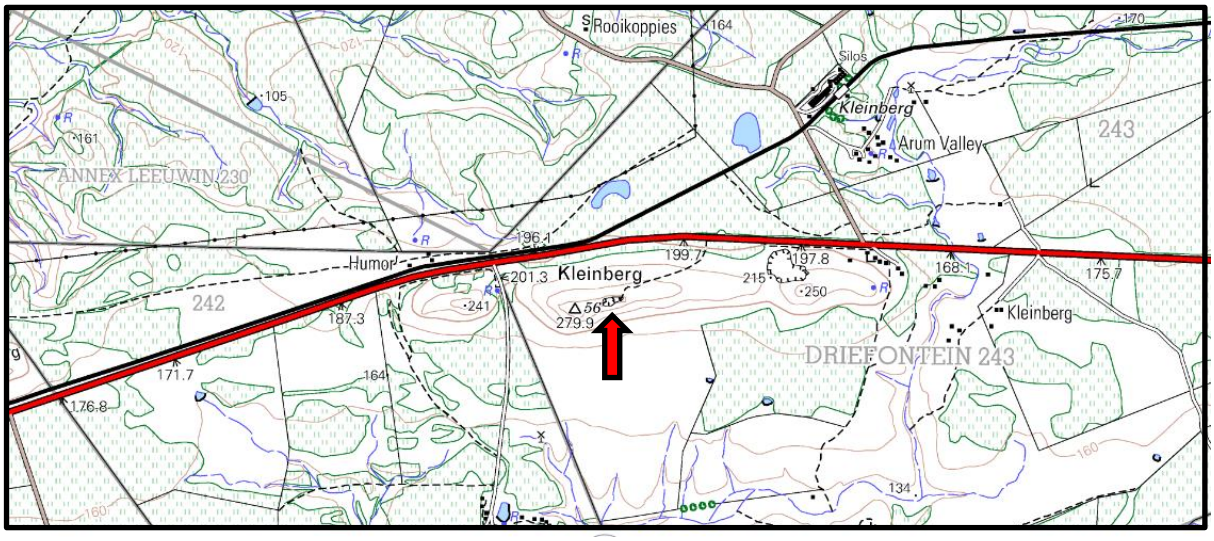


Figure 3.1: A topographic map of project sites (red arrow).

Figure 3.2: A satellite image of the project site (yellow polygon) (Google Earth).

3.1.2 Topography

The topography of the landscape is undulating flats of shale and a number of scattered quartzite hill and ridges.

3.1.3 Geology & soils

The geology consists of layers of acidic lithosol soils derived from Ordivician sandstones of the Table Mountain Group. The soils vary from deep aeolian sand deposits to shallow rocky form of Mispah and Glenrosa (MacVicar *et al.* 1974).

3.1.4 Climate (Rainfall & temperatures)

The area receives summer rainfall and is approximately 581 mm per annum. The mean annual temperature is 14.7°C (Mucina & Rutherford, 2006).

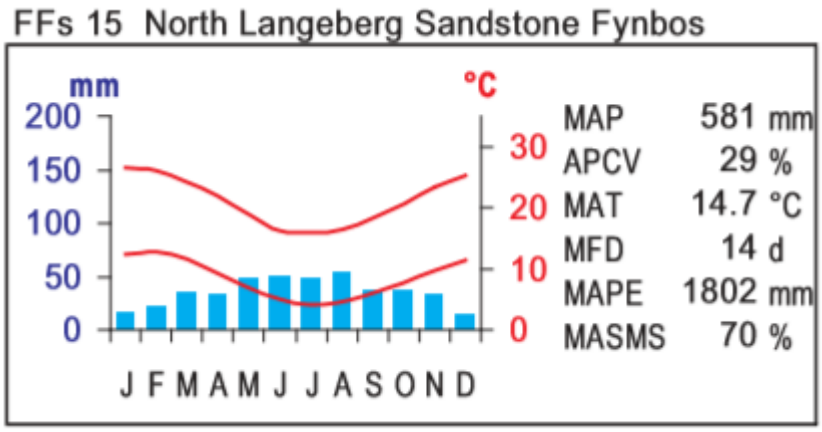


Figure 3.3: A climate-diagram of the Northern Langeberg Sandstone Fynbos vegetation type (Mucina & Rutherford, 2006).

3.1.5 Land use & land cover

The project site is situated in an agricultural area. Large portions of the region, especially the undulating plains, have been transformed. Most of the arable land is used for wheat and oats production. The natural veld is used for cattle, game and sheep farming.

3.1.6 Vegetation, biogeography and conservation value

The most recent description of the broader study area's vegetation is the general description by Mucina & Rutherford (2006) relating to the vegetation which is considered to be the "Vegetation of South Africa, Lesotho and Swaziland" as well as its accompanying map of the country by (Mucina *et al.*, 2005). This memoir contains species information and a comprehensive conservation assessment of all vegetation types.

According to the Western Cape Biodiversity Sector Plan (2015) the project site is surrounded by a Critical Biodiversity Area (CBA1) where the vegetation type is the Albertinia Sand Fynbos (FFd 9). The project site is situated on the rocky outcrop of Table Mountain Sandstone and the vegetation belongs to Northern Langeberg Sandstone Fynbos vegetation type (FFs 15) which has a conservation status of least concerned. The quarry site is not situated in any national threatened ecosystem.

4. RESULTS

4.1 Vegetation overview

4.1.1 Broad vegetation types

The most recent description of the broader study area's vegetation is the general description by Mucina & Rutherford (2006) relating to the vegetation which is considered to be the "Vegetation of South Africa, Lesotho and Swaziland" as well as its accompanying map of the country by (Mucina *et al.*, 2005). This memoir contains species information and a comprehensive conservation assessment of all vegetation types.

The project site is situated on deep sandy soil and the vegetation belongs to the Kimberley Thornveld vegetation type (SVk 4) which has a conservation status of least concerned.

Figure 4.1: The official vegetation map of the study area (yellow polygon) and the surrounding area. The purple area represents the Albertinia Sand Fynbos (FFd 9). The site itself is situated on an Table Mountain sandstone outcrop which is covered by vegetation with an affinity to the Northern Langberg Sandstone Fynbos (FFs 15)(Mucina & Rutherford, 2006).

4.1.1.1 Conservation status of broad vegetation types

The vegetation types of South Africa have been classified according to their conservation status which is, in turn, assessed according to the degree of transformation and rates of conservation. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. On a national scale these thresholds are as depicted in the table below, as determined by best available scientific approaches (Driver *et al.* 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al.* 2005).

Table 4.1: Determining ecosystem status (from Driver *et al.* 2005). *BT = biodiversity target (the minimum conservation requirement.

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Threatened ecosystems which are in need of protection (GN1002 of 2011), was published under the National Environment Management: Biodiversity Act (Act No. 10 of 2004). It lists national vegetation types that are afforded protection on the basis of rates of transformation. The threshold for listing in this legislation is higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature.

Table 4.2: Conservation status of the vegetation type occurring in and around the study area.

Vegetation Type	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Conservation Status**	
				Driver et al., 2005; Mucina & Rutherford, 2006	National Ecosystem List (NEM:BA)
Northern Langberg Sandstone Fynbos (FFs 15)	30%	13 + 45%	8%	Least threatened	Not listed

The Northern Langberg Sandstone Fynbos (FFs 15) vegetation type is not a threatened ecosystem.

4.1.2 Fine- scale vegetation description

The list of species noted during the actual field survey appears in Annexure B. A species list from POSA (http://posa.sanbi.org, Grid reference **3421BB** of the area was obtained. POSA generated species lists also contain updated Red Data species status according to the Red List of South African Plants published by SANBI in *Strelitzia* 25 (Raimondo *et al.* 2009, updated 2013). A list of species collected in the region of the study area have been listed under results (Annexure C).

4.1.2.1 Terrestrial vegetation

The Northern Langberg Sandstone Fynbos (FFs 15) vegetation type (Fig 8.1) dominates the vegetation of the project site. The northern mid and footslope slope of the Kleinberg ridge is covered by a renosterveld type of vegetation. It is dominated by species such as *Dicerothamnus rinocerotis, Bobartia robusta, Helichrysum rutilans.* Along the crest larger shrubs occur among the renosterveld species namely the exotic *Acacia cyclops, A. longifolia*, the indigenous *Searsia laevigata, S. glauca, Erica densifolia*, and *Aspalathus hirta*.

In the old quarry is a stand of *Erica densifolia, Psoralea azurea* and *Aspalathus hirta.*

The rocky outcrop and cliff-face on the southern side of the quarry is dominated by *Aloe arborescens, Searsia laevigata, Ficus burtt-davey, Pterocelastrus tricuspidatus* and *Diospyros dichrophylla*

See Annexure B for a list of plant species noted at the site as well as in the vicinity of the study area.

Ecosystem function

- The ecosystem is in most areas is in a pristine condition except for the disturbed area around the quarry;
- Cliffs, large boulders and shrubs provide nesting areas for avifauna and occasional shelter for terrestrial fauna;
- Niche habitats for fauna – providing sheltered burrows and nesting sites;
- Micro-climate is created by the shrubs and trees housing species sensitive to direct sunlight or frost.

4.1.2.2 Seasonal streams & wetland communities

There is a small earth-walled dam between the old stockpile area and the N2. Its catchment is small and after extensive rains it becomes filled with rain water and an aquatic plant community were found. Bulrush (*Typha capensis*) occurs in the dam.

Ecosystem function

- Niche habitats for fauna – providing sheltered burrows and nesting sites;

4.1.2.3 Alien Invasive Plants (AIPs) confirmed during the survey

Due to the agricultural and mining activities the natural vegetation has been largely destroyed in places. As mentioned before some alien species and pioneer species were noted. *Acacia cyclops, and Acacia longifolia* are exotic species present.

4.2. CRITICAL BIODIVERSITY AREAS AND BROAD–SCALE ECOLOGICAL PROCESSES

4.2.1 Definitions and descriptions of Critical Biodiversity Areas

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. These form the key output of a systematic conservation assessment and are the biodiversity sectors inputs into multi-sectoral planning and decision making tools. The use of CBAs within the province follows the definition laid out in the guideline for publishing bioregional plans (Anon, 2008).

The identification and mapping of CBAs forms part of the biodiversity assessment of the province which will be used to inform the development of the Provincial Biodiversity Sector plans, bioregional plans, and also be used to inform Spatial Development Frameworks (SDFs), Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and in the Environmental Impact Assessment (EIA) process in the province.

Simply put, the purpose of the CBA is to indicate spatially the location of critical or important areas for biodiversity in the landscape. The CBA, through the underlying land management objectives that define the CBA, prescribes the desired ecological state in which the province would like to keep this biodiversity. Therefore, the desired ecological state or land management objective determines which land-use activities are compatible with each CBA category based on the perceived impact of each activity on biodiversity pattern and process.

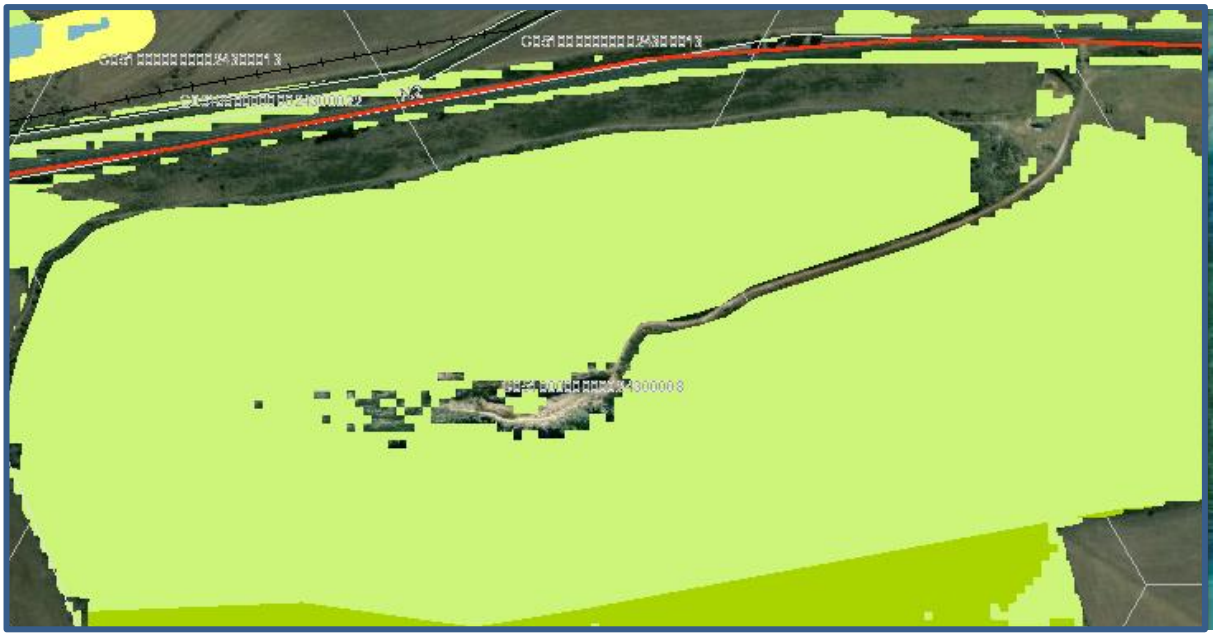
According to the guidelines for bioregional plans, three basic CBA categories can be identified based on three high-level and management objectives (Table 4.8).

Table 4.8: Definitions and framework for linking CBAs to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives (Adapted from the guidelines for bioregional plans (Anon 2008)).

CBA category	**Land Management Objective**
Critical Biodiversity Areas (CBAs) Definition: CBAs are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.	
Protected Areas (PA) & CBA 1	**Natural landscapes:** Ecosystems and species are fully intact and undisturbed. These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met. These are landscapes that are at or past their limits of acceptable change.
CBA 2	**Near-natural landscapes:** Ecosystems and species are largely intact and undisturbed. Areas with intermediate irreplaceability or some flexibility in terms of the area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve targets. These are landscapes that are approaching but have not passed their limits of acceptable change.
Ecological Support Areas (ESAs) Definition: ESAs are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and / or in delivering ecosystem services that support socio-economic development, such as water provision, food mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.	
ESA	**Functional landscapes:**

	Ecosystem is moderately to significantly disturb but still able to maintain basic functionality. Individual species or other biodiversity indicators may be severely disturbed or reduced. These are areas with a low irreplaceability with respect to biodiversity pattern targets only.
ONA (Other Natural Areas) and Transformed	Production landscapes: Manage land to optimise sustainable utilisation of natural resources.

According to the Western Cape Province Biodiversity Sector plan (2017) the project site is not classified as a CBA or ESA but the quarry is surrounded by a CBA (Fig 4.2)



4.3. ECOLOGICAL SENSITIVITY ANALYSIS

The sensitivity assessment identifies those parts of the project site that will a have a medium to high conservation value or that will be sensitive to disturbance. Areas containing untransformed natural vegetation, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to have a low sensitivity. The habitat sensitivity assessment was done according to the rules provided in the "Sensitivity mapping rules for biodiversity assessments". There are features within the project site or just outside of the project site that may be considered to have a medium conservation value, as follows:

4.3.1 Sensitive vegetation: **(Fig 4.2)**

The quarry and stockpile area are disturbed areas. The southern cliff-face and the northern slope of the Kleinberg ridge are sensitive areas.

- **Potential impacts:** Pollutants from the mining phase of the mining project might end up in the environment.

Destruction and fragmentation of the habitats

- **Mitigation measures**: Care must be taken not to spill and pollutants such as oil, diesel or petrol.
  Rehabilitation must take place after mining has ceased

4.3.2 Threatened and protected plant species:

There are protected species present on the project site. Stands of *Erica densifolia* occur on the quarry area

- **Potential impacts:** Destruction and fragmentation of the habitats might take place.
- **Mitigation measures**: Care must be taken not to destroy the vegetation beyond the existing disturbed area

5. SITE ASSESSMENT OF IMPACTS

5.1 Overview of the most significant effects of the proposed development

Possible impacts of the proposed mining activities

TABLE 4.9 IMPACT RATINGS FOR THE PROPOSED MINING OF THE QUARRY

PROJECT ALTERNATIVE / activity	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE																		MITIGATION summary
		BEFORE MITIGATION									AFTER MITIGATION									
		Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	**CUMULATIVE**	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	**CUMULATIVE**	
Potential Impacts on Surrounding Vegetation																				
Project activity:	**Mining Phase**																			
Habitat destruction during mining phase	Removal of indigenous plant species on site	2	1	3	1	4	5	55	M	-	2	1	1	1	1	5	30	L	-	Rehabilitation of the disturbed areas are important to prevent erosion damage and to restore the sites biodiversity.

PROJECT ALTERNATIVE / activity	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE																	MITIGATION summary
		BEFORE MITIGATION									AFTER MITIGATION								
		Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	
Disturbance of vegetation could trigger erosion damage	Transport and excavation related activities will disturb immediate and surrounding vegetation.	2	1	2	1	2	5	35	L	-									-	Minimal disturbance due to the easy accessibility of the site and somewhat transformed nature of the surrounding environment due to previous mining operation.
	Vehicles and materials brought onto site may lead to introduction of new alien invasive plant species	2	1	3	1	4	4	40	M	-	2	1	1	1	2	3	21	L	-	Ensure routine follow ups throughout the development footprint to detect any new invasives. If detected, invasives should be

PROJECT ALTERNATIVE / activity	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE																	MITIGATION summary
		BEFORE MITIGATION									AFTER MITIGATION								
		Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	
																			removed immediately to prevent spreading to other areas.
Active fire suppression	In case of a veld fire within the surrounding transformed environment, it would be exterminated as it would pose a safety risk for onsite construction crew.	2	1	6	1	4	5	70	M	-	2	1	2	1	2	5	35	L	-	Safety precautions should be taken on site to prevent the spreading of any sparks or precautions should be taken when working with flammable materials on site. Fire retardant materials should also be used as part of

PROJECT ALTERNATIVE / activity	POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL SIGNIFICANCE																		MITIGATION summary
		BEFORE MITIGATION									AFTER MITIGATION									
		Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	Duration	Extent	Irreplaceability	Reversibility	Magnitude	Probability	TOTAL (SP)	Significance	CUMULATIVE	
																				the development to reduce the risk of fires spreading on site.
Loss of biodiversity	Disturbance and poaching of plants and animals	2	1	3	1	2	5	45	M	-	2	1	2	1	1	5	35	L	-	The shooting, collection and removal of any plant or animal is strictly forbidden
Project activity:	**Operational Phase**																			

a) Impacts on vegetation and protected plant species

The mining activities will have a relative low impact on the vegetation at the site because of the existing disturbance in the quarry areas as well as stockpile area.

- **Mining phase**

The quarry and stock pile sites are already in a degraded state. Natural vegetation in quarry has largely been removed by excavators, trucks, graders etc.

On un-transformed areas the proposed development will lead to a further direct loss of vegetation.

Consequences of the impact occurring may include:

- general loss of habitat for plant and animal species;
- general reduction in biodiversity;
- disturbance to processes maintaining biodiversity and ecosystem goods and services; and
- loss of ecosystem goods and services: Loss of connectivity and habitat fragmentation happened already because it is a transformed area situated on a mine site
- Erosion risk may result due to the loss of plant cover and soil disturbance created during the construction phase.
- Presence and operation of mining machinery on site. On mine sites are constant physical impacts and the impacts by construction machinery would not be new. These machinery will generate dust and noise pollution and other forms of disturbance on site
- Major factors contributing to an invasion by alien invader plants includes habitat disturbance and associated destruction of indigenous vegetation. Consequences of this may include:
    - further loss and displacement of indigenous vegetation;
    - change in vegetation structure leading to change in various habitat characteristics;
    - change in plant species composition;
    - change in soil chemistry properties;
    - loss of sensitive habitats;
    - loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
    - fragmentation of sensitive habitats;
    - change in flammability of vegetation, depending on alien species;
    - hydrological impacts due to increased transpiration and runoff; and
    - impairment of wetland function.

From a vegetation perspective the existing vegetation on the site is a reflection of the disturbance present on site. The local impact on the vegetation within the project site will not be significant on a larger scale.

Soil erosion is a risk, associated with activities where vegetation clearing and disturbance is taking place. Equipment & service roads, will generate an increase in runoff during intense rainfall events and may potentially exaggerate the effects of erosion. These eroded materials may enter the nearby water bodies and may potentially impact these systems through siltation and change in chemistry and turbidity of the water. With effective mitigation measures in place, including regular monitoring, the occurrence, spread and potential effects of erosion may be limited to an absolute minimum.

In terms of impacts on Critical Biodiversity Areas and Broad-Scale Ecological Processes it is applicable if natural vegetation will be removed for mining activities.

- **De-commissioning phase**

The demolishing of the site could create disturbed areas and erosion and dust pollution may occur

- Erosion may occur after rain storms. Eroded areas may occur on exposed areas on slopes. Care must be taken that rehabilitation of disturbed area must be done.
- Regular monitoring of these areas must take place to ensure successful rehabilitation.

- **Cumulative impacts**

As the development is proposed to be located within the mine property it can be expected that more development might be taking place on the project site in future. Future developments will also require the removal of vegetation which will have an impact. The impact will be high in the untransformed areas.

It is recommended that efforts on invasive species management, erosion control and rehabilitation is coordinated with the mine to avoid negative effects of one development on the environmental state on and around the other.

6. DISCUSSION AND CONCLUSION

The quarry has been mined since the first half of the previous century. The impacts to the natural vegetation are largely limited to the quarry and stockpile areas as well as the access road. The mine area is excluded from the CBA compiled by the Western Cape Biodiversity Sector plan (2017)

Mining must not take place closer to the N2 or the southern cliff-face. The is an opportunity to mine down into the existing quarry. This would limit the disturbance of the surrounding vegetation. With the careful implementation of mitigating measures by the project manager and operational staff, the severity of the mining impacts can be minimised and reduced to acceptable levels. The impact on fauna is expected to be small to low due to the existing disturbance and human activities.

No-go Option

The No-Go Option means that the status quo in terms of ecosystem functioning and the existence of protected species remains on the project site as the proposed project site will not be developed nor rehabilitated.

However, if the no-go option is applied then the economic benefits and potential growth of the greater region will not be released and it will be considered as a lost opportunity for progress in the region.

Therefore, due to the acceptability of the project site for the development and the overall sensitivity of the project site the no-go option is not considered as being feasible and will therefore not be implemented.

7. RECOMMENDATIONS

The following is recommended:

General

- An Environmental Control Officer (ECO) must be appointed to oversee that the aspects stipulated in the Environmental Permit be carried out properly;
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to;
- The areas to be cleared as well as the construction area should be clearly demarcated;
- All construction vehicles should adhere to clearly defined and demarcated roads;
- Dust suppression and erosion management should be an integrated component of the construction approach;
- No dumping of building waste or spoil material from the development should take place on areas other than a licenced landfill site;
- All hazardous materials should be stored appropriately to prevent contamination of the project site. Any accidental chemical, fuel and oil spills that occur at the project site should be cleaned up appropriately as related to the nature of the spill;

Flora

- Weed control measures must be applied to eradicate any noxious weeds (category 1a &1b species) on disturbed areas.
- There should be a preconstruction walk-through of the development footprint/project site in order to locate individuals of plant species of conservation concern. Any translocatable protected species must be relocated to a suitable and similar habitat where these plants can grow without any disturbance;

Fauna

- Any fauna threatened by the construction and operation activities should be removed to safety by the ECO or appropriately qualified environmental officer.

- No poaching or hunting of animals (e.g. Steenbok, hares) may take place
- All construction vehicles should adhere to a low speed limit (<30km/h) to avoid collisions with susceptible species such as snakes and tortoises.
- Trenches and deep excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are exposed should contain soil ramps allowing fauna to escape the trench.

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ANNEXURE A:

Photos of the project site:

Figure A1: View of the existing quarry. Note the cellphone mast

Figure A2: View of the quarry toward the east

Figure A3: Part of the access road into the quarry

Figure A4: The old stockpile area

Figure A5: The arrow indicates a small earth-walled dam close to the N2

Figure A6: *Ficus burtt-davy*

Figure A7: *Erica densifolia*

Figure A8: *Psoralea azurea*.

Figure A9: *Crassula perfoliata and Crassula culturata*.

Figure A10: *Crassula orbiculatis*

Figure A11: *Carpobrotus edulis*

Figure A12: *Diospyros glabra*

ANNEXURE B: Preliminary checklist of plant species recorded in the region.

Yellow-marked species are protected species. (* indicates exotics)

Family	Genus	Sp1	Rank1	Sp2	Ecology
Aizoaceae	Delosperma	neethlingiae			Indigenous; Endemic
Aizoaceae	Drosanthemum	candens			Indigenous; Endemic
Aizoaceae	Drosanthemum	praecultum			Indigenous; Endemic
Aizoaceae	Galenia	pubescens			Indigenous; Endemic
Aizoaceae	Mesembryanthemum	parviflorum			Indigenous; Endemic
Aizoaceae	Mesembryanthemum	aitonis			Indigenous; Endemic
Aizoaceae	Mesembryanthemum	sp.			
Aizoaceae	Ruschia	sp.			
Aizoaceae	Ruschia	tenella			Indigenous; Endemic
Amaryllidaceae	Cyrtanthus	fergusoniae			Indigenous; Endemic
Anacardiaceae	Searsia	crenata			Indigenous; Endemic
Anacardiaceae	Searsia	longispina			Indigenous; Endemic
Anacardiaceae	Searsia	glauca			Indigenous; Endemic
Anacardiaceae	Searsia	laevigata	var.	villosa	Indigenous; Endemic
Apocynaceae	Carissa	bispinosa			Indigenous
Apocynaceae	Cynanchum	obtusifolium			Indigenous
Asparagaceae	Asparagus	scandens			Indigenous; Endemic
Asparagaceae	Asparagus	suaveolens			Indigenous
Asphodelaceae	Aloe	ferox			Indigenous
Asphodelaceae	Bulbine	frutescens			Indigenous
Asphodelaceae	Haworthia	chloracantha	var.	denticulifera	Indigenous; Endemic
Asphodelaceae	Haworthia	chloracantha	var.	subglauca	Indigenous; Endemic
Asteraceae	Arctotheca	populifolia			Indigenous
Asteraceae	Athanasia	vestita			Indigenous; Endemic

Asteraceae	Cotula	nigellifolia	var.	nigellifolia	Indigenous; Endemic
Asteraceae	Dicerothamnus	rhinocerotis			Indigenous; Endemic
Asteraceae	Helichrysum	patulum			Indigenous; Endemic
Asteraceae	Helichrysum	rutilans			Indigenous; Endemic
Asteraceae	Metalasia	sp.			
Asteraceae	Metalasia	acuta			Indigenous; Endemic
Asteraceae	Oedera	imbricata			Indigenous; Endemic
Asteraceae	Oedera	genistifolia			Indigenous; Endemic
Asteraceae	Osteospermum	moniliferum	subsp.	pisiferum	Indigenous; Endemic
Asteraceae	Plecostachys	serpyllifolia			Indigenous; Endemic
Asteraceae	Senecio	rosmarinifolius			Indigenous; Endemic
Asteraceae	Ursinia	discolor			Indigenous; Endemic
Asteraceae	Ursinia	paleacea			Indigenous; Endemic
Brassicaceae	Heliophila	subulata			Indigenous; Endemic
Brassicaceae	Heliophila	africana			Indigenous; Endemic
Calypogeiaceae	Calypogeia	fissa			Indigenous
Campanulaceae	Wahlenbergia	desmantha			Indigenous; Endemic
Capparaceae	Cadaba	aphylla			Indigenous
Celastraceae	Mystroxylon	aethiopicum	subsp.	aethiopicum	Indigenous; Endemic
Celastraceae	Pterocelastrus	tricuspidatus			Indigenous; Endemic
Celastraceae	Putterlickia	pyracantha			Indigenous; Endemic
Crassulaceae	Crassula	expansa	subsp.	expansa	Indigenous
Crassulaceae	Crassula	atropurpurea	var.	atropurpurea	Indigenous; Endemic
Cucurbitaceae	Kedrostis	nana	var.	nana	Indigenous; Endemic
Ericaceae	Erica	imbricata			Indigenous; Endemic
Ericaceae	Erica	dispar			Indigenous; Endemic
Ericaceae	Erica	unicolor	subsp.	mutica	Indigenous; Endemic
Euphorbiaceae	Acalypha	capensis			Indigenous
Euphorbiaceae	Euphorbia	procumbens			Indigenous; Endemic

Euphorbiaceae	Euphorbia	mauritanica			Indigenous
Fabaceae	Aspalathus	laricifolia	subsp.	laricifolia	Indigenous; Endemic
Fabaceae	Aspalathus	obtusifolia			Indigenous; Endemic
Fabaceae	Aspalathus	hirta	subsp.	hirta	Indigenous; Endemic
Fabaceae	Dolichos	hastaeformis			Indigenous; Endemic
Fabaceae	Indigofera	alternans	var.	alternans	Indigenous
Fabaceae	Indigofera	nigromontana			Indigenous
Fabaceae	Indigofera	denudata			Indigenous; Endemic
Fabaceae	Rhynchosia	atropurpurea			Indigenous
Fabaceae	Schotia	afra	var.	afra	Indigenous; Endemic
Fabaceae	Tephrosia	capensis			Indigenous
Fabaceae	Tephrosia	capensis	var.	capensis	Indigenous
Fabaceae	Virgilia	divaricata			Indigenous; Endemic
Geraniaceae	Pelargonium	parvirostre			Indigenous; Endemic
Geraniaceae	Pelargonium	fruticosum			Indigenous; Endemic
Goodeniaceae	Scaevola	plumieri			Indigenous
Hyacinthaceae	Drimia	capensis			Indigenous; Endemic
Hyacinthaceae	Ornithogalum	juncifolium	var.	juncifolium	Indigenous
Iridaceae	Bobartia	robusta			Indigenous; Endemic
Iridaceae	Gladiolus	gueinzii			Indigenous; Endemic
Iridaceae	Tritoniopsis	antholyza			Indigenous; Endemic
Lamiaceae	Volkameria	glabra			Indigenous
Lobeliaceae	Lobelia	coronopifolia			Indigenous; Endemic
Lobeliaceae	Monopsis	lutea			Indigenous; Endemic
Lobeliaceae	Monopsis	simplex			Indigenous; Endemic
Malvaceae	Abutilon	sonneratianum			Indigenous
Malvaceae	Anisodontea	scabrosa			Indigenous; Endemic
Malvaceae	Hermannia	salviifolia	var.	oblonga	Indigenous; Endemic
Malvaceae	Hermannia	holosericea			Indigenous; Endemic

Malvaceae	Hermannia	sp.			
Malvaceae	Hermannia	velutina			Indigenous
Malvaceae	Hermannia	flammula			Indigenous; Endemic
Myricaceae	Morella	quercifolia			Indigenous; Endemic
Orchidaceae	Eulophia	speciosa			Indigenous
Orchidaceae	Satyrium	coriifolium			Indigenous; Endemic
Plumbaginaceae	Limonium	decumbens			Indigenous; Endemic
Polygalaceae	Muraltia	depressa			Indigenous; Endemic
Polygalaceae	Muraltia	empleuridioides	var.	empleuridioides	Indigenous; Endemic
Polygalaceae	Polygala	myrtifolia	var.	myrtifolia	Indigenous
Pottiaceae	Trichostomum	brachydontium			Indigenous
Proteaceae	Aulax	umbellata			Indigenous; Endemic
Proteaceae	Leucadendron	eucalyptifolium			Indigenous; Endemic
Proteaceae	Leucadendron	galpinii			Indigenous; Endemic
Proteaceae	Leucospermum	praecox			Indigenous; Endemic
Proteaceae	Leucospermum	cuneiforme			Indigenous; Endemic
Proteaceae	Protea	welwitschii			Indigenous
Rhamnaceae	Phylica	axillaris	var.	densifolia	Indigenous; Endemic
Rhamnaceae	Phylica	axillaris	var.	maritima	Indigenous; Endemic
Rhamnaceae	Phylica	sp.			
Rosaceae	Cliffortia	cervicornu			Indigenous; Endemic
Rutaceae	Agathosma	scaberula			Indigenous; Endemic
Rutaceae	Agathosma	riversdalensis			Indigenous; Endemic
Rutaceae	Agathosma	muirii			Indigenous; Endemic
Rutaceae	Agathosma	apiculata			Indigenous; Endemic
Rutaceae	Clausena	anisata	var.	anisata	Indigenous
Salicaceae	Scolopia	zeyheri			Indigenous
Salvadoraceae	Azima	tetracantha			Indigenous
Santalaceae	Colpoon	compressum			Indigenous

Santalaceae	Thesium	galioides			Indigenous; Endemic
Sapotaceae	Sideroxylon	inerme	subsp.	inerme	Indigenous
Scrophulariaceae	Jamesbrittenia	argentea			Indigenous; Endemic
Solanaceae	Lycium	tenue			Indigenous; Endemic
Solanaceae	Solanum	africanum			Indigenous; Endemic
Thymelaeaceae	Gnidia	caniflora			Indigenous; Endemic
Thymelaeaceae	Gnidia	laxa			Indigenous; Endemic
Thymelaeaceae	Gnidia	squarrosa			Indigenous
Thymelaeaceae	Passerina	corymbosa			Indigenous; Endemic
Thymelaeaceae	Struthiola	striata			Indigenous; Endemic
Thymelaeaceae	Struthiola	argentea			Indigenous; Endemic
Vitaceae	Rhoicissus	tridentata	subsp.	tridentata	Indigenous; Endemic
Vitaceae	Rhoicissus	digitata			Indigenous