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Ecologists & Environmental Services

Report on the terrestrial ecological assessment for the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen, Eastern Cape Province.

April 2026

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DECLARATION OF INDEPENDENCE

DPR Ecologists and Environmental Services is an independent company and has no financial, personal or other interest in the proposed project, apart from fair remuneration for work performed in the delivery of ecological services. There are no circumstances that compromise the objectivity of the study.

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Executive Summary

The proposed rock quarry, for which a mining permit will be obtained, is situated approximately 20 km west of the small town of Aberdeen (Appendix A: Map 1). The site is situated adjacent to the R61 tarred road, while access to it will be obtained via a 270 m long new access road. The footprint of the mining area will be 5 hectares in total, consisting of a hard rock quarry (2 hectares) and a separate stockpiling/crushing area (2.5 hectares). The site and surroundings are largely still natural, although a historical quarry borders the site to the west and does cause significant disturbance of the immediate area. The site itself is however natural, with limited disturbances caused by a few dirt tracks. The site forms part of an arid region and watercourses are consequently limited, with only one prominent ephemeral stream system situated approximately 550 metres to the east of the site.

Tracks and signs of mammals are present on and around the site, but an abundance of animal activities is absent. As indicated (Section 4.1), the area is largely still natural and consequently the mammal population should also largely still be intact. However, the area is utilised for stock farming, which will undoubtedly have an impact on the mammal population in the area. This has, over centuries, resulted in the removal of large ungulates and most carnivores from the area, while the use of jackal-proof fencing and control of smaller carnivores have also modified the mammal population in the area. It may however still be possible for species of conservational importance to be present in the area. The mammal population is therefore anticipated to be modified, likely with some decrease in the capacity provided by the natural habitat, though species of conservation value may still be present. However, the footprint of the proposed mining operations (5 hectares) is not anticipated to have a large impact on the mammal population, when seen in context of the extensive natural areas which are present in the surroundings, providing adequate habitat for the local mammal population, thus resulting in the anticipated impact remaining moderate, which is however dependent on mitigation being successfully implemented.

From the description of the vegetation on the site, including the rock quarry, stockpiling area and access road, it consists of natural vegetation which is still in a fairly good condition (Appendix A: Map 1). Areas of disturbance are present but are indicative of only low levels of disturbance. The species diversity is moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). The site therefore still contains elements of significant conservation value, which consist of protected plant species (Appendix A: Map 3). Furthermore, a small portion of the site is considered as forming part of a larger Critical Biodiversity Area 2 (CBA 2) (Appendix A: Map 2). However, no rare or endangered species were observed within this area in order to substantiate it being considered to be of high conservation value. Furthermore, the loss of such a small area, the extent of 0.6 hectares, given that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it. Significant mitigation will however have to be implemented to ensure that the impact on these elements of significant conservation value is decreased. In addition, the vegetation type in this area, Eastern Lower Karoo, is still widespread and listed as being of Least Concern (LC), with a relatively low conservation value (Appendix A: Map 1). A moderate sensitivity for the site is therefore maintained and the impact of the loss of vegetation and species diversity is therefore considered to be moderate (Appendix A: Map 3).

Mitigation as indicated in the previous paragraph should include the following (Appendix A: Map 1 - 3):

- As indicated, several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). Where the development will affect any of these, the necessary permits will have to be obtained. Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed. However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. These succulent species are easily transplanted with a high success rate.
- In addition, the area already contains a minor infestation by the invasive succulent, *Opuntia ficus-indica*. Furthermore, disturbance caused by mining is highly likely to leave disturbed areas vulnerable to further infestation. The proposed mining operations will therefore have to implement a comprehensive monitoring and eradication programme to ensure that invasive plant species (particularly *Opuntia ficus-indica*) are removed from the area and prevented from re-establishing.

The impact significance has been determined and should mining take place without mitigation, some impacts may be high, such as the impact of the loss of protected species (Appendix A: Map 1 - 3). The majority of impacts will however be moderate. However, should adequate mitigation be implemented as described, all impacts can be reduced to being moderate. This is however subject to the mining area implementing mitigation to ensure that protected plant species are transplanted, limiting the impact on fauna by implementing suitable mitigation, implementing a comprehensive monitoring and eradication programme to address weeds and invasive species, and undertaking comprehensive rehabilitation.

Table of contents

Terrestrial ecological and biodiversity assessment

Declaration of independence

Executive summary

1. Introduction	6
1.1 Background	
1.2 The value of biodiversity	
1.3 Details and expertise of specialist	
2. Scope and limitations	9
2.1 Vegetation	
2.2 Fauna	
2.3 Limitations	
3. Methodology	11
3.1 Desktop study	
3.2 Site sensitivity verification	
3.3 Survey	
3.4 Criteria used to assess sites	
3.5 Biodiversity sensitivity rating (BSR)	
4. Ecological overview of the site	18
4.1 Overview of ecology and vegetation types	18
4.2 Overview of fauna	25
5. Site Ecological Importance (SEI)	30
6. Anticipated impacts	31
7. Site specific results	35
8. Biodiversity sensitivity rating (BSR) interpretation	37
9. Discussion and conclusions	38
10. Recommendations	41
11. References	43
Appendix A: Maps	46
Appendix B: Species list	50
Appendix C: Impact methodology	52

Terrestrial ecological and biodiversity assessment

1. INTRODUCTION

1.1 Background

Natural vegetation is an important component of ecosystems. Some of the vegetation units in a region can be more sensitive than others, usually as a result of a variety of environmental factors and species composition. These units are often associated with water bodies, water transferring bodies or moisture sinks. These systems are always connected to each other through a complex pattern. Degradation of a link in this larger system, e.g. tributary, pan or wetland, usually leads to the degradation of the larger system. Therefore, degradation of such a water related system should be prevented.

Though vegetation may seem to be uniform and low in diversity, it may still contain species that are rare and endangered. The occurrence of such a species may render the development unviable. Should such a species be encountered, the development should be moved to another location or cease altogether.

South Africa has a large number of endemic species and in terms of plant diversity ranks third in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

South Africa's water resources have become a major concern in recent times. As a water scarce country, we need to manage our water resources sustainably in order to maintain a viable resource for the community, as well as to preserve the biodiversity of the system. Thus, it should be clear that we need to protect our water resources, so that we may be able to utilise this renewable resource sustainably. Areas that are regarded as crucial to maintain healthy water resources include wetlands, streams, as well as the overall catchment of a river system.

It is well known that quarry mining operations have several detrimental impacts on the environment. These impacts are numerous, but the most pronounced impacts are associated with the clearing of vegetation, excavation of large amounts of earth materials, the storage and disposal thereof and the subsequent modification of the environment.

The proposed rock quarry, for which a mining permit will be obtained, is situated approximately 20 km west of the small town of Aberdeen (Appendix A: Map 1). The site is situated adjacent to the R61 tarred road, while access to it will be obtained via a 270 m long new access road. The footprint of the mining area will be 5 hectares in total, consisting of a hard rock quarry (2 hectares) and a separate stockpiling/crushing area (2.5 hectares). The site and surroundings are largely still natural, although a historical quarry borders the site to the west and does cause significant disturbance of the immediate area. The site itself is however natural, with limited disturbances caused by a few dirt tracks. The site forms part of an arid region and watercourses are consequently limited, with only one prominent ephemeral stream system situated approximately 550 metres to the east of the site.

A site visit was conducted on 24 March 2026. The entire footprint of the Mining Permit (MP) and immediate surroundings were surveyed. A detailed survey of the terrestrial vegetation on and around the site which will be affected by the MP was undertaken. The survey was conducted during early autumn after recent rainfall and the plant identification on the site was

considered sufficient, though given the arid climate of the region, it is likely that several plant species were overlooked.

For the above reasons it is necessary to conduct an ecological and wetland assessment of the area proposed for the MP.

The report together with its recommendations and mitigation measures should be used to minimise the impact of the proposed development.

1.2 The value of biodiversity

The diversity of life forms and their interaction with each other and the environment has made Earth a uniquely habitable place for humans. Biodiversity sustains human livelihoods and life itself. Although our dependence on biodiversity has become less tangible and apparent, it remains critically important.

The balancing of atmospheric gases through photosynthesis and carbon sequestration is reliant on biodiversity, while an estimated 40% of the global economy is based on biological products and processes.

Biodiversity is the basis of innumerable environmental services that keep us and the natural environment alive. These services range from the provision of clean water and watershed services to the recycling of nutrients and pollution. These ecosystem services include:

- Soil formation and maintenance of soil fertility.
- Primary production through photosynthesis as the supportive foundation for all life.
- Provision of food, fuel and fibre.
- Provision of shelter and building materials.
- Regulation of water flows and the maintenance of water quality.
- Regulation and purification of atmospheric gases.
- Moderation of climate and weather.
- Detoxification and decomposition of wastes.
- Pollination of plants, including many crops.
- Control of pests and diseases.
- Maintenance of genetic resources.

1.3 Details and expertise of specialist

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South African Council for Natural Scientific Professions No. (400284/13) (Ecological Science).

Membership with relevant societies and associations:

- South African Society of Aquatic Scientists (SASAQS0091)
- South African Association of Botanists
- South African Wetlands Society (3SLY4IG4)

Expertise:

- Qualifications: B.Sc. (Hons) Botany (2008), M.Sc. in Vegetation Ecology (2012) with focus on ephemeral watercourses.
- Vegetation ecologist with over 10 years of experience in conducting ecological assessments. Founded DPR Ecologists & Environmental Services (Pty.) Ltd. in 2016.
- Has conducted over 200 ecological and wetland assessments for various developments.
- Regularly attends conferences and courses in order to stay up to date with current methods and trends:

2017: Kimberley Biodiversity Symposium.

2018: South African Association of Botanists annual conference.

2018: National Wetland Indaba Conference.

2019: SASS5 Aquatic Biomonitoring Training.

2019: Society for Ecological Restoration World Congress 2019.

2019: Wetland rehabilitation: SER 2019 training course.

2020: Tools For Wetlands (TFW) training course.

2022: National Wetland Indaba Conference.

2025: National Wetland Indaba Conference.

2. SCOPE AND LIMITATIONS

- To evaluate the present state of the vegetation and ecological functioning of the area proposed for the MP.
- To identify possible negative impacts that could be caused by the proposed clearing of vegetation and construction of the rock quarry.
 - Severity relates to the nature of the event, aspect or impact to the environment and describes how severely the aspects may impact on the ecosystem.
 - Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.
 - Extent refers to the spatial influence of an impact.
 - Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.
 - Probability refers to how often the activity/event or aspect may have an impact on the environment.

2.1 Vegetation

Aspects of the vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the proposed site.
- The overall status of the vegetation on site.
- Species composition with the emphasis on dominant-, rare- and endangered species.

The amount of disturbance present on the site assessed according to:

- The number of grazing impacts.
- Disturbance caused by human impacts.
- Other disturbances.

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species, as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.).
- The overall condition of the habitat.
- A list of species that may occur in the region (desktop study).

2.3 Limitations, assumptions, gaps and uncertainties

- Some geophytic or succulent species may have been overlooked due to a specific flowering time or cryptic nature.
- Given the aridity of the region, dormancy in many plant species limits identification and it is possible that species of conservation importance were overlooked or absent at the time of the survey.
- Although a comprehensive survey of the site was done, it is still likely that several species were overlooked.

- Some animal species may not have been observed as a result of their nocturnal and/or shy habits.

3. METHODOLOGY

3.1 Several reference works were used for additional information.

General ecology:

- Red Data List (Raymondo *et al.* 2009).
- Vegetation types (Mucina & Rutherford 2006).
- NBA 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE).
- NBA 2018 Technical Report: Inland Aquatic (Freshwater) Realm.
- NBA 2018 Technical Report Volume 1: Terrestrial Realm.
- National Freshwater Ecosystem Priority Areas 2011 (NFEPA).
- Strategic Water Source Areas 2018 (SWSA).
- SANBI (2011): List of threatened ecosystems.
- NEM:BA: List of threatened ecosystems and Threatened Or Protected Species (TOPS).
- Eastern Cape Environmental Conservation Act Nr. 13 of 2003.
- Eastern Cape Biodiversity Conservation Plan (2019).

Vegetation:

- Red Data List (Raymondo *et al.* 2009).
- Vegetation types (Mucina & Rutherford 2006).
- Field guides used for species identification (Adams 1976, Bromilow 1995, 2010, Bruyns 2005, Court 2010, Coates-Palgrave 2002, Fish *et al.* 2015, Gerber *et al.* 2004, Gibbs-Russell *et al.* 1990, Gledhill 1981, Griffiths & Picker 2015, Hartmann 2017, Manning 2009, Moller & Becker 2019, Roberts & Fourie 1975, Shearing & Van Heerden 2008, Smith *et al.* 1998, Smith & Crouch 2009, Smith & Van Wyk 2003, Van Ginkel & Cilliers 2020, Van Ginkel *et al.* 2011, Van Oudtshoorn 2004).

Terrestrial fauna:

- Field guides for species identification (Smithers 1983, Child *et al.* 2016, Cillié 2018).

3.2 Site Sensitivity Verification

EIA Screening Tool: The EIA Screening Tool which provides a general indication of elements of sensitivity that may occur in a development area was utilised during the assessment for the following aspects:

- Animal species – A moderate sensitivity is indicated for Karoo padloper (*Chersobius boulengeri*). The Karoo padloper is a rare species, with high conservation value and although the habitat appears to be more suitable, none were observed in the area and therefore a Moderate sensitivity remains (Refer to Sections 4.1 and 4.2 for a discussion of the habitat conditions and overview of the presence of species of high conservation value).
- Plant species – A medium sensitivity is indicated for endangered plant species occurring on the site. These include *Peersia frithii*, *Tridentea virescens*, Sensitive Species 1039 and 1212. None of these were identified during the survey. However, the site survey has indicated the presence of numerous protected plant species, with some also clearly being uncommon species, although none are currently listed as threatened

or endangered, consequently confirming a medium level of sensitivity for the site (See Section 4.1) (Appendix B).

- Terrestrial biodiversity – The development area is listed as having a Very High Sensitivity. The value of Very High Sensitivity is afforded to a small portion (Approximately 0.6 hectares) of the site being regarded as a Critical Biodiversity Area 2 (CBA 2). The area therefore retains a Very High Sensitivity, though the extent of transformation and loss of the CBA (0.6 hectares) are unlikely to compromise it and the level of verification is therefore unlikely to exceed a moderate impact. (See Section 4.1) (Appendix A: Map 1 - 3).

3.3 Survey

The site was assessed by means of transects and sample plots. Observation w.r.t. the general ecology of the area includes:

- Noted species include rare and dominant species.
- The broad vegetation types present at the site were determined.
- The state of the environment was assessed in terms of condition, grazing impacts, disturbance by humans, erosion and presence of invader and exotic species.
- The state of the habitat was also assessed.

Ecological aspects surveyed and recorded include:

- The overall ecology of the area, including the diversity of species, uniformity or diversity of habitats and different vegetation communities.
- Identification and delineation of distinct vegetation communities and habitats and the ecological drivers responsible for these distinct communities, i.e. soil, geology, topography, aspect, etc.
- A comprehensive plant species survey, including the identification of protected, rare or threatened species.
- Any ecological process or function which is important to the ecosystem, including ecological drivers, such as fire, frost, grazing, browsing, etc. and any changes to these processes.

Animal species were also noted, as well as the probability of other species occurring on or near the site according to their distribution areas and habitat requirements.

The state of the habitat was also assessed.

In order to provide a visually representative overview of the results obtained from the survey, site sensitivity mapping will also be done. This should indicate the relative importance of different ecological elements on the site as obtained from the survey. In general, these levels of sensitivity will include:

- Low Sensitivity – normally confined to areas that are completely transformed from the natural condition or degraded to such an extent that they are no longer representative of the natural ecosystem. Such areas will also no longer contain any ecological processes of importance relative to the surrounding areas. However, in some instances, such as watercourses which are completely transformed but still provide important ecological functions, a low level of sensitivity will not apply.

- Moderate Sensitivity – normally applicable to areas that are still natural and therefore do still have some ecological importance, but which do not contain elements of high conservation value and are not essential to the continued functioning of surrounding areas. Areas of Moderate Sensitivity usually require some mitigation but can be developed without resulting in high impacts.
- High Sensitivity – areas of high sensitivity contain one or more ecological elements which are considered of high conservation value. Such areas are normally preferred to be excluded from a development but where this is not possible, will require comprehensive mitigation and are also likely to result in high impacts.
- Very High Sensitivity – these areas are critical to the continued functioning of the ecosystem on and around the site. Development of such areas normally represent a fatal flaw and should be excluded from development. No manner of mitigation is able to decrease the anticipated impact in these areas.

3.4 Criteria used to assess sites

The following criteria are also applied during the site survey to further inform the general sensitivity and conservation value of the site or specific elements on the site. These criteria are used to assess the site and determine the overall status of the environment.

3.4.1 Site Ecological Importance (SEI)

The SEI is an expression of the relative sensitivity of a site, based on the Biodiversity Importance (BI) of the receptor, being the habitat, the species composition or a particular element of high conservation value and its resilience to impacts (Receptor Resilience) (SANBI 2020).

The following simplified equation can be used to determine the SEI:

$$SEI = BI + RR$$

BI in turn is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:

$$BI = CI + FI$$

Conservation importance (CI) is evaluated in accordance with recognised established internationally acceptable principles and criteria for the determination of biodiversity-related values, including the IUCN Red List of Species, Red List of Ecosystems and Key Biodiversity Areas.

Table 1: Conservation importance (CI) criteria.

Conservation importance	Fulfilling criteria
Very high	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km². • Any area of natural habitat of a CR ecosystem type or large area (> 0.1%) of the total

	<p>ecosystem type extent of natural habitat of EN ecosystem type.</p> <ul style="list-style-type: none"> • Globally significant populations of congregatory species (> 10% of global population).
High	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km². IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. • Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. • Presence of Rare species. • Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	<ul style="list-style-type: none"> • Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. • Any area of natural habitat of threatened ecosystem type with status of VU. • Presence of range-restricted species. • > 50% of receptor contains natural habitat with potential to support SCC.
Low	<ul style="list-style-type: none"> • No confirmed or highly likely populations of SCC. • No confirmed or highly likely populations of range-restricted species. • < 50% of receptor contains natural habitat with limited potential to support SCC. • Very low No confirmed and highly unlikely populations of SCC. • No confirmed and highly unlikely populations of range-restricted species. • No natural habitat remaining.

Functional integrity (FI) of the receptor (e.g. the vegetation/fauna community or habitat type) is defined here as the receptor's current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions.

Table 2: Functional integrity (FI) criteria.

Functional integrity	Fulfilling criteria
Very high	<ul style="list-style-type: none"> • Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. • No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	<ul style="list-style-type: none"> • Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. • Only minor current negative ecological impacts (e.g. few livestock utilising areas) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.
Medium	<ul style="list-style-type: none"> • Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. • Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy road network between intact habitat patches. • Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. • Moderate rehabilitation potential.
Low	<ul style="list-style-type: none"> • Small (> 1 ha but < 5 ha) area. • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy road network surrounding the area. Low rehabilitation potential. • Several minor and major current negative ecological impacts.

Very low	<ul style="list-style-type: none"> • Very small (< 1 ha) area. • No habitat connectivity except for flying species or flora with wind-dispersed seeds. • Several major current negative ecological impacts.
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Receptor resilience (RR) is the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.

Table 3: Resilience criteria.

Resilience	Fulfilling criteria
Very high	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

Site ecological importance	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure designed to limit the amount of habitat impacts; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities

3.4.2 Vegetation characteristics

Characteristics of the vegetation in its current state. The diversity of species, sensitivity of habitats and importance of the ecology as a whole.

Habitat diversity and species richness: normally a function of locality, habitat diversity and climatic conditions.

Scoring: Wide variety of species occupying a variety of niches – 1, Variety of species occupying a single niche – 2, Single species dominance over a large area containing a low diversity of species – 3.

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas may however vary significantly e.g. wetlands, drainage lines, ecotones, etc.

Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

Degree of rarity/conservation value:

Scoring: Very rare and/or in pristine condition – 1, Fair to good condition and/or relatively rare – 2, Not rare, degraded and/or poorly conserved – 3.

3.4.3 Vegetation condition

The sites are compared to a benchmark site in a good to excellent condition. Vegetation management practices (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of the vegetation.

Percentage ground cover: Ground cover is under normal and natural conditions a function of climate and biophysical characteristics. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.

Scoring: Good to excellent – 1, Fair – 2, Poor – 3.

Vegetation structure: This is the ratio between trees, shrubs, sub-shrubs and grass layers. The ratio could be affected by grazing and browsing by animals.

Scoring: All layers still intact and showing specimens of all age classes – 1, Sub-shrubs and/or grass layers highly grazed, while tree layer still fairly intact (bush partly opened up) – 2, Mono-layered structure often dominated by a few unpalatable species (presence of barren patches notable) – 3.

Infestation with exotic weeds and invader plants or encroachers:

Scoring: No or very slight infestation levels by weeds and invaders – 1, Medium infestation by one or more species – 2, Several weed and invader species present and high occurrence of one or more species – 3.

Degree of grazing/browsing impact:

Scoring: No or very slight notable signs of browsing and/or grazing – 1, Some browse lines evident, shrubs show signs of browsing, grass layer grazed, though still intact – 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent – 3.

Signs of erosion: The formation of erosion scars can often give an indication of the severity and/or duration of vegetation degradation.

Scoring: No or very little sign of soil erosion – 1, Small erosion gullies present and/or evidence of slight sheet erosion – 2, Gully erosion well developed (medium to large dongas) and/or sheet erosion removed the topsoil over large areas – 3.

3.4.4 Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role in the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

3.5 Biodiversity sensitivity rating (BSR)

The total scores for the criteria discussed in section 3.3 were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, five different classes are described to assess the biodiversity of the study area. The different classes are described in Table 5:

Table 5: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Totally Transformed (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low.	29 – 30
Advanced Degraded (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low.	26 – 28
Degraded (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low.	21 – 25
Good Condition (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance.	11 – 20
Sensitive/Pristine (1)	The vegetation is in a pristine or near pristine condition. Very few signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high.	0 - 10

4. ECOLOGICAL OVERVIEW OF THE SITE

4.1 Overview of ecology and vegetation types

Refer to Appendix B for the list of species encountered on the site.

According to Mucina & Rutherford (2006) and utilising current mapping resources (National Biodiversity Assessment 2018), the site falls within Eastern Lower Karoo (NKL 2) (Appendix A: Map 1). This vegetation type contains a varied topography with undulating plains, ridges, hills and uneven, rocky terrain, incised by a high number of small watercourses. This vegetation type is currently listed as being of Least Concern (LC) within the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Appendix A: Map 1). The vegetation type is not under sufficient development pressures to be considered a threatened ecosystem. This will also decrease the conservation value of remaining natural vegetation.

The Eastern Cape Biodiversity Management Plan (2019) has been published and has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e., Critical Biodiversity Areas. The majority of the area is regarded as an Ecological Support Area 1 (ESA 1), as it forms part of an important ecological corridor (Appendix A: Map 2). Due to the small extent of the proposed mining area (5 hectares), it is unlikely to compromise this functioning, as long as adequate rehabilitation is undertaken, and the site is able to be re-incorporated into the landscape. A small portion of the proposed site (0.6 hectares) encroaches into a Critical Biodiversity Area 2 (CBA 2). This is considered as essential for meeting conservation targets. However, the loss of such a small area, the extent of 0.6 hectares, provided that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it.

The proposed rock quarry, for which a mining permit will be obtained, is situated approximately 20 km west of the small town of Aberdeen (Appendix A: Map 1). The site is situated adjacent to the R61 tarred road, while access to it will be obtained via a 270 m long new access road. The footprint of the mining area will be 5 hectares in total, consisting of a hard rock quarry (2 hectares) and a separate stockpiling/crushing area (2.5 hectares). The site and surroundings are largely still natural, although a historical quarry borders the site to the west and does cause significant disturbance of the immediate area. The site itself is however natural, with limited disturbances caused by a few dirt tracks. The site forms part of an arid region and watercourses are consequently limited, with only one prominent ephemeral stream system situated approximately 550 metres to the east of the site.



Figure 1: View of the proposed Mining Permit (MP) indicated in red (Google Earth 2023), consisting of an access road, stockpile area and hard rock quarry. The area clearly consists of natural vegetation, though a historical quarry is visible to the west of the site.

The footprint of the proposed MP is clearly completely natural, with very few disturbances present. However, a historical quarry is situated immediately to the west of the site, causing some local transformation of the area. This has also been confirmed by the current survey, as well as the National Biodiversity Assessment (2018), which indicates natural vegetation on the site, while the historical quarry to the west is considered as a localised transformed area (Appendix A: Map 1). This has most probably resulted in a low-level infestation by invasive species, spreading into surrounding natural areas. The area is dominated by an undulating landscape, with plains dominating, while low ridges are also present. This results in a moderate diversity of habitat which includes low ridges, rocky and sandy habitats and drainage lines supporting a low but dense riparian vegetation layer. As a result of the moderate habitat diversity, the area also contains a moderate species diversity, which includes scant dwarf karroid shrubs, grasses, succulents and geophytic species.



Figure 2: The site and surroundings are largely still natural, with the landscape being dominated by a low karroid shrub vegetation, with scant grass component.

As indicated, the site and surroundings are largely still natural, though a few localised disturbances and transformations are present. These modifications and disturbances include:

- The main impact in the area is a historical quarry immediately to the west of the site, which has resulted in the permanent transformation of approximately 1 hectare.
- The R61 tarred road to the south of the site results in localised transformation, which will also affect surface water drainage patterns and the movement of fauna.
- A small dirt track is present on the site and will have a limited, localised impact in terms of disturbance.
- Grazing by domestic livestock is present, but not considered to exceed moderate values and will also have a limited impact in terms of trampling and overgrazing.



Figure 3: A few small dirt tracks result in limited, localised disturbances.



Figure 4: A historical quarry borders the site to the west and has resulted in permanent but localised transformation of the area.

As previously indicated, the topography of the site consists of an undulating terrain, with low ridges and ephemeral drainage systems in the lower lying areas. The site itself is situated on a low ridge, with a gentle slope to the east. Runoff generated on the site drains to the east, where a significant ephemeral stream system is situated approximately 400 metres to the east of the site. The site will therefore not have any direct impact on any surrounding watercourses (Appendix A: Map 1). The topography of the area is largely still natural, although the historical quarry to the west of the site, does lead to significant modification of the surface topography of the surrounding area.

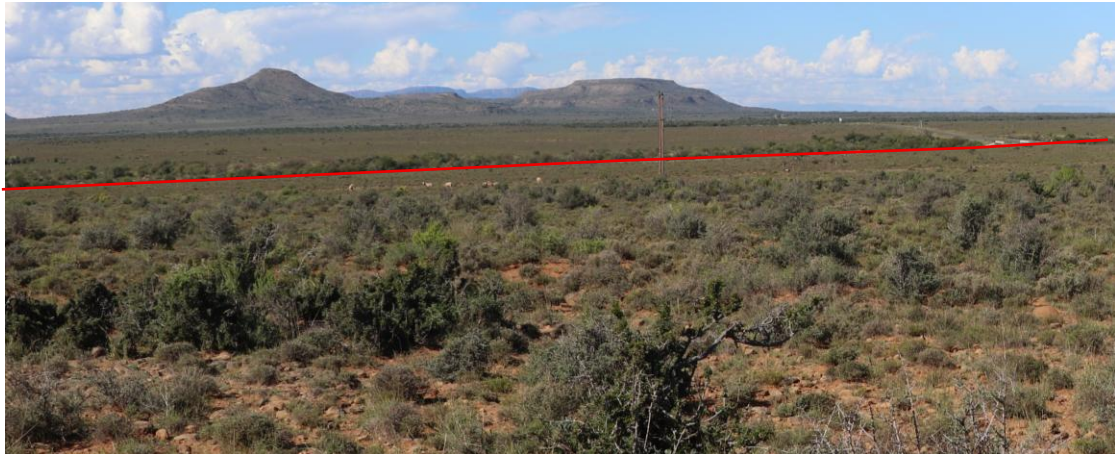


Figure 5: Topography of the area consists of a low ridge, with gentle slope toward the east, where an ephemeral stream system (red), forms the lowest point in the landscape.

The site is located in the foothills of the Sneeuwberg Mountain Range. The area is geologically dominated by Jurassic dolerite sills, dykes, basins, belljar intrusions, laccoliths and inclined sheets that have intruded into the older Beaufort Group sandstones and mudstones of the Karoo Supergroup. Climatically, the area is located on a tension zone between the moist east and arid west and is also transitional between the autumn and summer maximum rainfall areas. The region receives the edge of all major weather systems in Southern Africa. The plains areas, which also includes the development site, has a much lower annual rainfall, ranging between 310 to 360 mm per year (Clark, Barker & Mucina 2009), than the mountains.



Figure 6: The landscape is dominated by vast plains with prominent mesas. The area can be regarded as a typical inselberg landscape.

In order to provide a comprehensive description of the proposed MP site, a detailed description of the vegetation will be provided. This will also aim to provide the condition of the terrestrial ecology at the site, while also indicating the presence of elements of conservation value where this will be relevant to the proposed MP (Appendix A: Map 1 - 3).

The development will consist of a hard rock quarry site, a stockpiling and crushing area and a new access road connecting these areas to the R61 tarred road. The vegetation communities in these areas are all fairly similar, being dominated by a sparse grass layer and an abundance of dwarf karroid shrubs, though some differences are evident and will be indicated in the discussion below. The access road and stockpile area are situated on the lower lying areas,

containing somewhat deeper soils, while the quarry will be situated on the low ridge, containing much shallower soil and a higher degree of surface rock. However, the overall habitat remains fairly uniform across the site. The grass component is sparse and consists of only a few species which include *Aristida congesta*, *Aristida diffusa*, *Tragus keolerioides*, *Digitaria eriantha*, *Sporobolus fimbriatus*, *Eragrostis obtusa* and *Eragrostis lehmanniana*. In areas with much shallower, rocky soils, the dwarf grass species, *Oropetium capensis* is much more abundant. The dwarf karroid shrub component is dominant throughout the area and is diagnostic of this vegetation type. Such species include *Eriocephalus ericoides*, *Rosenia oppositifolia*, *Pentzia incana*, *Nenax microphylla*, *Pegolettia retrofracta*, *Asparagus burcehllii*, *Aspragaus striatus*, *Helichrysum rosom* var. *arcuatum*, *Jamesbrittenia tysoniiz*, *Hermannia cuneifolia*, *Lasiosiphon deserticola* and *Chrysocoma ciliata*. This is only a portion of the dwarf shrubs (shorter than 40 cm) present on the site which contains a significant species diversity (Appendix B). Taller shrubs and even small trees are also scattered on and around the site and include *Rhigozum obovatum*, *Carissa haematocarpa*, *Diospyros scabrida*, *Searsia longsipina*, *Grewia robusta* and *Boscia oleoides*. Species diversity on the site is significant due to a variety of micro-habitats, though is still considered as moderate. As a result, a variety of different growth forms are present, which include herbaceous species such as *Aptosimum indivisum*, *Chaenostoma caeruleum*, *Blepharis mitrata*, *dianthus micropetalus* and *Hypertelis salsoides*, while a few geophytic species (plants with underground storage organs) are also present and include *Drimia anomala*, *Kedrostis africana* and *Albuca setosa*. Given the arid climate, shallow soils and surface rock, succulent species are also abundant and include *Ruschia intricata*, *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Sarcostemma veminale*, *Trichodiadema setuliferum*, *Euphorbia ferox*, *Crassula capitella*, *Crassula muscosa*, *Anacampseros albidiflora*, *Delosperma multiforum*, *Aloe longistyla*, *Sansevieria aethiopica*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum*, *Curio radicans* and *Piaranthus comptus*. The majority of these are listed as protected within the Eastern Cape, while some are also considered to be uncommon, which therefore also hold a high conservation value and will require significant mitigation.

As indicated, several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). These include *Ruschia intricata*, *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Sarcostemma veminale*, *Trichodiadema setuliferum*, *Anacampseros albidiflora*, *Delosperma multiforum*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piaranthus comptus*. Where the development will affect any of these, the necessary permits will have to be obtained. Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed. However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piaranthus comptus*. These succulent species are easily transplanted with a high success rate. Though these are all listed as protected, are uncommon and considered of high conservation value, none are listed as threatened or endangered and therefore do not entail a fatal flaw for the development.

From the description of the vegetation composition, the proposed site, including rock quarry, stockpile area and access road, still consists of natural vegetation, in good condition with a significant species diversity, including protected plant species of significant conservation value (Appendix A: Map 1). Only limited disturbances are present which are not considered sufficient to affect the vegetation composition or the condition of the habitat. The species diversity is

moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). However, no threatened or endangered species are present, while the vegetation type is also widespread, and no unique habitats are present on the site. The site would therefore still entail at least a Moderate Sensitivity (Appendix A: Map 3).



Figure 7: The vegetation on the site is largely dominated by a prominent dwarf karroid shrub vegetation layer, with scant grass component.



Figure 8: Areas with a high percentage rock cover are common on the site, especially on the low ridge where the rock quarry will be situated. This provides suitable habitat for a range of dwarf succulents.



Figure 9: Within the vegetation on and around the site, scattered shrubs and small trees are also present.



Figure 10: Protected species occurring on the site which are considered to have a higher conservation value include, clockwise from top left: *Aloe longistyla*, *Anacampteros albidiflora*, *Chasmatophyllum stanleyi*, *Pachypodium succulentum*, *Monsonia camdeboensis*, *Faucaria bosscheana*.

Conclusions

From the description of the vegetation on the site, including the rock quarry, stockpiling area and access road, it consists of natural vegetation which is still in a fairly good condition (Appendix A: Map 1). Areas of disturbance are present but are indicative of only low levels of disturbance. The species diversity is moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). The site therefore still contains elements of significant conservation value, which consist of protected plant species (Appendix A: Map 3). Furthermore, a small portion of the site is considered as forming part of a larger Critical Biodiversity Area 2 (CBA 2) (Appendix A: Map 2 & 3). However, no rare or endangered species were observed within this area in order to substantiate it being considered to be of high conservation value. Furthermore, the loss of such a small area, the extent of 0.6 hectares, given that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it. Significant mitigation will however have to be implemented to ensure that the impact on these elements of significant conservation value is decreased.

Mitigation as indicated in the previous paragraph should include the following (Appendix A: Map 1 - 3):

- As indicated, several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). Where the development will affect any of these, the necessary permits will have to be obtained. Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed. However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. These succulent species are easily transplanted with a high success rate.
- In addition, the area already contains a minor infestation by the invasive succulent, *Opuntia ficus-indica*. Furthermore, disturbance caused by mining is highly likely to leave disturbed areas vulnerable to further infestation. The proposed mining operations will therefore have to implement a comprehensive monitoring and eradication programme to ensure that invasive plant species (particularly *Opuntia ficus-indica*) are removed from the area and prevented from re-establishing.

4.2 Overview of terrestrial fauna (actual & possible)

Tracks and signs of mammals are present on and around the site, but an abundance of animal activities is absent. As indicated (Section 4.1), the area is largely still natural and consequently the mammal population should also largely still be intact. However, the area is utilised for stock farming, which will undoubtedly have an impact on the mammal population in the area. This has, over centuries, resulted in the removal of large ungulates and most carnivores from the area, while the use of jackal-proof fencing and control of smaller carnivores have also modified the mammal population in the area. It may however still be possible for species of conservational importance to be present in the area. The mammal population is therefore anticipated to be modified, likely with some decrease in the capacity provided by the natural habitat, though species of conservation value may still be present. However, the footprint of the proposed mining operations (5 hectares) is not anticipated to have a large impact on the mammal population, when seen in context of the extensive natural areas which are present in the surroundings, providing adequate habitat for the local mammal population, thus resulting in the anticipated impact remaining moderate.

The mammal and faunal survey of the site was conducted by means of active searching and recording any tracks or signs of mammals, other faunal species and actual observations of fauna. It is also considered likely that the area will contain several other faunal species, but these were not observed on the site. From the survey, the following actual observations of mammals and other fauna were recorded:

- Droppings of a small antelope, most likely Steenbok (*Raphicerus campestris*) or Common Duiker (*Sylvicapra grimmia*) were observed on the site. These are small antelopes, that are common in natural areas and not dependent on pristine habitat.
- Porcupines (*Hystrix africae australis*) are common on the site and visible through scat and excavations. It is a very common species anticipated to occur in this region.
- Reptiles are also common in the area, which include observations of the Angulate Tortoise (*Chersina angulata*) and the Spotted Sand Lizard (*Meroles suborbitalis*), both which are widespread and common and anticipated to occur in this area.

These species identified on the site indicate a significant diversity, which although dominated by widespread and generalist species, may also still contain species of higher conservation value. This also indicates that although the mammal population may be somewhat modified, it remains likely that other species of high conservation value may still be present.

It is also considered likely that several mammal species were overlooked during the survey, and it may also be likely that other rare and endangered species may be present in the area.

Mammal species likely to occur on the site have been determined by means of FitzPatrick Institute of African Ornithology (2021).

Table 6: Red Listed mammals previously recorded in the surrounding region (Child *et al.* 2016 & Patel *et al.* 2025).

Scientific name	Common name	Status
<i>Aonyx capensis</i>	African clawless otter	Near Threatened
<i>Diceros bicornis</i>	Black rhinoceros	Endangered
<i>Miniopterus natalensis schreibersii</i>	Schreiber's long-fingered bat	Near Threatened
<i>Orycteropus afer</i>	Aardvark	Near Threatened
<i>Redunca fulvorufula</i>	Mountain reedbuck	Endangered
<i>Pelea capreolus</i>	Vaal rhebok	Near Threatened
<i>Bunolagus monticularis</i>	Riverine rabbit	Critically Endangered
<i>Hyaena brunnea</i>	Brown hyena	Near Threatened
<i>Felis nigripes</i>	Black-footed cat	Vulnerable

The survey and available literature (Table 3) have indicated that the mammal population in the area will largely consist of widespread, generalist species. There is however still some likelihood that species of conservation value may occur in the surroundings. Especially smaller mammals (Black-footed cat, Riverine rabbit) and far roaming mammals (Brown hyena, Mountain reedbuck, Vaal rhebok) are still likely to be present. Habitat suitability excludes the possibility of the Riverine rabbit occurring here, while the Vaal rhebok and Mountain reedbuck require mountainous habitat which is absent from the site, though the Black-footed cat and Brown hyena may still be present in the area. The extent of the proposed development (5 hectares) seen in context of the extensive natural areas, will limit the anticipated impact to a moderate impact.

A note should also be made of the following faunal species of high conservation value which are known to occur in the region and may be affected by the proposed development:

- Riverine rabbit (*Bunolagus monticularis*), possibly the most endangered mammal in the country, is known to occur in the area, but is a habitat specialist, completely confined to dense riparian vegetation occurring along the larger rivers in the area. This habitat type is completely absent from the site and immediate surroundings, and the species is therefore not anticipated to occur near or be affected by the development.
- Karoo padloper (*Chersobius boulengeri*) is a rare and endangered tortoise associated with rocky ridges and hills and is known to occur in this region. It is therefore possible that the species may occur in this area, but was not recorded during the survey. Should the species indeed occur in the area, the impact of the proposed development is not anticipated to exceed moderate values. This is due to the extent of the

development remaining small (5 hectares), which when considered in comparison to the extensive natural surroundings, cannot be considered as significant in terms of the loss of habitat. Any subsequent direct impacts on the species can be limited by implementing adequate rehabilitation.

The impact that the proposed development will have, is mainly concerned with the loss of habitat and fragmentation of available habitat due to the development. Transformation of the natural vegetation on the site will result in a decrease in the population size as available habitat decreases. However, extensive natural areas still occur in the surrounding area and any fauna on the site are likely to vacate the site into these adjacent areas, should development take place. The site was also found to contain no obvious mammal burrows, probably a consequence of shallow soils, which will further decrease the direct impact. Furthermore, the extent of the proposed development is small and the associated impact that it would have on fauna would accordingly also be relatively low. The anticipated impact is therefore not anticipated to exceed a moderate value, but is however dependent on the following mitigation being successfully implemented:

- In order to prevent any direct impact to the fauna on the site, the hunting, capturing or trapping of fauna should be strictly prohibited during operation of the mining development. This includes, but is not limited to, mammals, reptiles and birds.
- Open excavations may act as pitfall traps to mammals, reptiles and amphibians and trenches should be monitored daily for trapped animals which should promptly be removed.
- In the event of poisonous snakes or other dangerous animals encountered on the site, an experienced and certified snake handler or zoologist must remove these animals from the site and re-locate them to a suitable area.
- After cessation of mining activities, the area should be completely rehabilitated, which is particularly applicable to the stockpile area and rock quarry. However, the quarry will make use of 10 x 10 m benching which will increase the impact and entail a safety hazard to fauna. In order to decrease this impact, adequate fencing will have to be erected around the quarry, which will have to consist of sturdy, stock-proof fencing, with buried barriers to prevent animals from burrowing underneath the fence. Furthermore, the quarry access ramp should be retained in order to provide an escape route, should any animals manage to fall in.

Table 7: Likely mammal species in the region (Mammalmap 2023).

Common name	Scientific name	Status
Grant's rock mouse	<i>Aethomys granti</i>	Least Concern
Namaqua rock mouse	<i>Aethomys namaquensis</i>	Least Concern
Red hartebeest	<i>Alcelaphus buselaphus</i>	Least Concern
Springbok	<i>Antidorcas marsupialis</i>	Least Concern
African clawless otter	<i>Aonyx capensis</i>	Near Threatened
Water mongoose	<i>Atilax paludinosus</i>	Least Concern
Riverine rabbit	<i>Bunolagus monticularis</i>	Critically Endangered
Caracal	<i>Caracal caracal</i>	Least Concern
Vervet monkey	<i>Chlorocebus pygerythrus</i>	Least Concern
Lesser red musk shrew	<i>Crocidura hirta</i>	Least Concern
Common mole rat	<i>Cryptomys hottentotus</i>	Least Concern
Yellow mongoose	<i>Cynictis penicillata</i>	Least Concern

Brant's climbing mouse	<i>Dendromus mesomelas</i>	Least Concern
Cape short-eared gerbil	<i>Desmodillus auricularis</i>	Least Concern
Black rhinoceros	<i>Diceros bicornis</i>	Endangered
Cape elephant shrew	<i>Elephantulus edwardii</i>	Least Concern
Cape serotine bat	<i>Eptesicus capensis</i>	Least Concern
Burchell's zebra	<i>Equus burchelli</i>	Least Concern
Cape mountain zebra	<i>Equus zebra zebra</i>	Least Concern
African wild cat	<i>Felis lybica</i>	Least Concern
Black-footed cat	<i>Felis nigripes</i>	Vulnerable
Cape grey mongoose	<i>Galerella pulverulenta</i>	Least Concern
Small spotted genet	<i>Genetta genetta</i>	Least Concern
Hairy-footed gerbil	<i>Gerbillurus paeba</i>	Least Concern
Spectacled dormouse	<i>Graphiurus ocellaris</i>	Least Concern
Brown hyena	<i>Hyaena brunnea</i>	Near Threatened
Cape porcupine	<i>Hystrix africaeaustralis</i>	Least Concern
Striped polecat	<i>Ictonyx striatus</i>	Least Concern
Cape hare	<i>Lepus capensis</i>	Least Concern
Scrub hare	<i>Lepus saxatilis</i>	Least Concern
Round-eared elephant shrew	<i>Macroscelides proboscideus</i>	Least Concern
Natal multimammate mouse	<i>Mastomys natalensis</i>	Least Concern
Schreiber's long-fingered bat	<i>Miniopterus schreibersii natalensis</i>	Near Threatened
African pygmy mouse	<i>Mus minutoides</i>	Least Concern
Forest shrew	<i>Myosorex varius</i>	Least Concern
Melck's serotine bat	<i>Neoromicia melckorum</i>	Least Concern
Egyptian slit-faced bat	<i>Nycteris thebaica</i>	Least Concern
Klipspringer	<i>Oreotragus oreotragus</i>	Least Concern
Aardvark	<i>Orycteropus afer</i>	Near Threatened
Gemsbok	<i>Oryx gazella</i>	Least Concern
Bat-eared fox	<i>Otocyon megalotis</i>	Least Concern
Saunders's vlei rat	<i>Otomys saundersiae</i>	Least Concern
Bush karoo rat	<i>Otomys unisulcatus</i>	Least Concern
Lion	<i>Panthera leo</i>	Least Concern
Leopard	<i>Panthera pardus</i>	Vulnerable
Chacma baboon	<i>Papio ursinus</i>	Least Concern
Grey rhebok	<i>Pelea capreolus</i>	Near Threatened
Rock hyrax	<i>Procavia capensis</i>	Least Concern
Smith's red rock hare	<i>Pronolagus rupestris</i>	Least Concern
Aardwolf	<i>Proteles cristata</i>	Least Concern
Steenbok	<i>Raphicerus campestris</i>	Least Concern
Mountain reedbuck	<i>Redunca fulvorufula</i>	Endangered
Striped mouse	<i>Rhabdomys pumilio</i>	Least Concern
Geoffroy's horseshoe bat	<i>Rhinolophus clivosus</i>	Least Concern
Pouched mouse	<i>Saccostomus campestris</i>	Least Concern
Lesser dwarf shrew	<i>Suncus varilla</i>	Least Concern
Meerkat	<i>Suricata suricatta</i>	Least Concern
Common duiker	<i>Sylvicapra grimmia</i>	Least Concern
Eland	<i>Taurotragus oryx</i>	Least Concern

Kudu	<i>Tragelaphus strepsiceros</i>	Least Concern
Cape fox	<i>Vulpes chama</i>	Least Concern



Figure 11: Tracks and signs of fauna identified on and around the site include, clockwise from top left: excavations by Porcupine (*Hystrix africaeaustralis*), droppings of a small antelope, observation of Spotted sand lizard (*Meroles suborbitalis*) and Angulate tortoise (*Chersina angulata*).

5. SITE ECOLOGICAL IMPORTANCE

The determination of the Site Ecological Importance (SEI) based on terrestrial ecology, vegetation and mammal population is based on the following:

Site Ecological Importance (SEI)

Conservation Importance (CI) - Medium	The site is not situated within a Threatened Ecosystem, consisting of Eastern Lower Karoo which is listed as being of Least Concern (Appendix A: Map 1). The site also does not contain any confirmed endangered or rare species. The site therefore does not qualify for a High CI. However, it does contain many protected plant species, of which several are considered to be range restricted, retaining a significant conservation value (Appendix B). The CI for the site is therefore considered to be Medium.
Functional Integrity (FI) - Medium	The site is not situated within a Threatened Ecosystem and the extent of the development will not exceed 5 hectares. The site remains largely natural, with most ecosystem functions being intact and requiring little rehabilitation, the adjacent historical quarry being the only significant impact in the surroundings. Overall, the FI is therefore regarded as being Medium.
Consequent Biodiversity Importance (BI) of the site is therefore Medium.	
Receptor Resilience (RR) - Medium	Arid ecosystems are characterised by slower ecological processes, whereby vegetation succession, recovery and rehabilitation take longer periods to reach the climax stage. As a result, the habitat may be able to recover to an advanced stage, more than 75% recovery, but will take a long time to do so (more than 15 years). The RR is therefore regarded as being Medium.
Site Ecological Importance (SEI) - Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.

The overall sensitivity of the site is considered as Moderate. The site does not contain a threatened vegetation type and forms part of the Eastern Lower Karoo, which is listed as being of Least Concern (Appendix A: Map 1). The site also does not contain any confirmed endangered or rare species, though does contain a large number of protected plant species (Appendix B). A moderate likelihood remains that fauna of conservation importance may occur in the area, though given the limited extent of the development, it is unlikely to have a significant impact on these fauna, or the local faunal population in general. However, elements of significant conservation value are still present and will require suitable mitigation in order to limit the impact that the development will have. This should include a search-and-rescue operation in order to transplant a significant proportion of protected plant species as indicated.

6. ANTICIPATED IMPACTS

Anticipated impacts that the development will have, are primarily concerned with the loss of habitat and species diversity on and adjacent to the site (Appendix A: Map 1 - 3). The development consists of the proposed mining permit, including hard rock quarry, stockpiling/crushing area and access road, and it is therefore anticipated that impacts will be similar during both the construction and operational phases.

The following impacts on the ecosystem, ecology and biodiversity will be assessed:

- Loss of vegetation and consequently loss of habitat and species diversity.
- Loss of protected, rare or threatened plant species.
- Impacts on watercourses, wetlands or the general catchment.
- The impact that the development will have on exotic weeds and invasive species, both current and anticipated conditions.
- Impacts resulting on the faunal population on and around the site.
- Any significant cumulative impacts that the development will contribute towards.

As indicated in previous sections, the proposed site completely consists of natural vegetation in a good condition with limited disturbances present (Appendix A: Map 1). The proposed development will therefore result in the loss of habitat and vegetation. In terms of species diversity, species composition and uniqueness of the habitat, the site is considered to have a moderate conservation value. The overall loss of these aspects is therefore expected to have moderate values.

Loss of vegetation, habitat and species diversity

From the description of the vegetation on the site, including the rock quarry, stockpiling area and access road, it consists of natural vegetation which is still in a fairly good condition (Appendix A: Map 1). Areas of disturbance are present but are indicative of only low levels of disturbance. The species diversity is moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). The site therefore still contains elements of significant conservation value, which consist of protected plant species (Appendix A: Map 3). Furthermore, a small portion of the site is considered as forming part of a larger Critical Biodiversity Area 2 (CBA 2) (Appendix A: Map 2). However, no rare or endangered species were observed within this area in order to substantiate it being considered to be of high conservation value. Furthermore, the loss of such a small area, the extent of 0.6 hectares, given that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it. Significant mitigation will however have to be implemented to ensure that the impact on these elements of significant conservation value is decreased. In addition, the vegetation type in this area, Eastern Lower Karoo, is still widespread and listed as being of Least Concern (LC), with a relatively low conservation value (Appendix A: Map 1). A moderate sensitivity for the site is therefore maintained and the impact of the loss of vegetation and species diversity is therefore considered to be moderate (Appendix A: Map 3).

Loss of protected plant species

As indicated, several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). These include *Ruschia intricata*, *Faucaria*

bosscheana, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Sarcostemma veminale*, *Trichodiadema setuliferum*, *Anacampseros albidiflora*, *Delosperma multiflorum*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. Where the development will affect any of these, the necessary permits will have to be obtained. Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed. However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. These succulent species are easily transplanted with a high success rate. Though these are all listed as protected, are uncommon and considered of high conservation value, none are listed as threatened or endangered and therefore do not entail a fatal flaw for the development. Significant mitigation will however have to be implemented to ensure the impact on these elements of significant conservation value is decreased. The impact of the loss of vegetation and species diversity is therefore considered to be moderate.

Impacts on drainage systems and watercourses

No watercourses or wetlands form part of the rock quarry, stockpiling area or access road (Appendix A: Map 1). A significant ephemeral stream is situated approximately 400 metres to the east of the site. The site will therefore not have any direct impact on any surrounding watercourses. Residual impacts in terms of sediment runoff and erosion are only likely to have a low impact on the watercourses. Provided that adequate storm water management is implemented at the site, the impact is likely to remain low.

Impact of increased weed and invasive species establishment

Due to the removal of vegetation and disturbance of the soil surface, the proposed mining operations will further increase the susceptibility to the establishment of weeds and invasive species. The area already contains a minor infestation by the invasive succulent, *Opuntia ficus-indica*. Furthermore, disturbance caused by mining is highly likely to leave disturbed areas vulnerable to further infestation. The proposed mining operations will therefore have to implement a comprehensive monitoring and eradication programme to ensure that invasive plant species (particularly *Opuntia ficus-indica*) are removed from the area and prevented from re-establishing. Monitoring of weed establishment should form a prominent part of management of the mining operations. Where category 1 and 2 weeds occur, they require removal by the property owner according to the Conservation of Agricultural Resources Act, No. 43 of 1983 and National Environmental Management: Biodiversity Act, No. 10 of 2004. Unmitigated this is anticipated to be at least a moderate impact, though should be easily decreased through adequate weed control.

Impact on mammal population

The impact that the proposed development will have, is mainly concerned with the loss of habitat and fragmentation of available habitat due to the development. Transformation of the natural vegetation on the site will result in a decrease in the population size as available habitat decreases. However, extensive natural areas still occur in the surrounding area and any fauna on the site are likely to vacate the site into these adjacent areas, should development take place. The site was also found to contain no obvious mammal burrows, probably a

consequence of shallow soils, which will further decrease the direct impact. Furthermore, the extent of the proposed development is small and the associated impact that it would have on fauna would accordingly also be relatively low. The anticipated impact is therefore not anticipated to exceed a moderate value, but is however dependent on mitigation being successfully implemented.

Cumulative Impact

As previously indicated, the proposed mining permit development will be situated in an area that is currently still natural, containing extensive natural vegetation. The cumulative impact of the proposed mining permit (5 hectares) would therefore seem to be fairly low. However, the area has increasingly become exposed to development pressures, mostly due to wind farm developments and potential shale fracking exploration (unknown for the immediate area) and taking this into account, the cumulative impact of the development is considered to be moderate. This cumulative impact can be marginally decreased if comprehensive and successful rehabilitation of the site is undertaken after mining, enabling the site to be re-integrated into the surroundings to some degree.

Conclusion

The impact significance has been determined and should mining take place without mitigation, some impacts may be high, such as the impact of the loss of protected species (Appendix A: Map 1 - 3). The majority of impacts will however be moderate. However, should adequate mitigation be implemented as described, all impacts can be reduced to being moderate. This is however subject to the mining area implementing mitigation to ensure that protected plant species are transplanted, limiting the impact on fauna by implementing suitable mitigation, implementing a comprehensive monitoring and eradication programme to address weeds and invasive species, and undertaking comprehensive rehabilitation.

Please refer to Appendix C for the impact methodology.

Significance of the impact:

Impact	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Before Mitigation								
Loss of vegetation type and clearing of vegetation	3	5	2	3.3	5	3	4	13.2
Loss of protected species	4	5	2	3.6	5	4	4.5	16.2
Impact on watercourses	1	5	1	2.3	2	2	2	4.6
Infestation with weeds and invaders	3	4	3	3.3	5	3	4	13.2
Impact on terrestrial fauna	5	4	2	3.6	5	3	4	14.4
Cumulative impact	3	4	2	3	4	3	3.5	10.5
After Mitigation								

Loss of vegetation type and clearing of vegetation	3	5	2	3.3	5	3	4	13.2
Loss of protected species	2	5	2	3	4	3	3.5	10.5
Impact on watercourses	1	5	1	2.3	1	1	1	2.3
Infestation with weeds and invaders	2	4	2	2.6	3	3	3	7.8
Impact on terrestrial fauna	5	4	2	3.6	5	3	4	14.4
Cumulative impact	2	4	2	2.6	4	3	3.5	9.1

7. BIODIVERSITY SENSITIVITY RATING (BSR)

Habitat diversity and species richness:

Habitat diversity at and around the site can be considered as moderate. The area is dominated by an undulating landscape, with plains dominating, while low ridges are also present. This results in a moderate diversity of habitat which includes low ridges, rocky and sandy habitats and drainage lines supporting a low but dense riparian vegetation layer. As a result of the moderate habitat diversity, the area also contains a moderate species diversity, which includes scant dwarf karroid shrubs, grasses, succulents and geophytic species.

Presence of rare and endangered species:

The site and surroundings contain a high number of protected species with several also being considered uncommon and of high conservation value. Several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). These include *Ruschia intricata*, *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Sarcostemma veminale*, *Trichodiadema setuliferum*, *Anacampseros albidiflora*, *Delosperma multiflorum*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. Though these are all listed as protected, are uncommon and considered of high conservation value, none are listed as threatened or endangered and therefore do not entail a fatal flaw for the development.

Ecological function:

The site functions as habitat for a variety of fauna, supports a specific vegetation type and also functions as part of the catchment of a significant ephemeral stream to the east of the site. As indicated in previous descriptions (See Section 4.1), the site and surroundings are still intact, natural and in fairly good condition and as a result, all of these ecological functions are still intact.

Degree of rarity/conservation value:

From the description of the vegetation on the site, including the rock quarry, stockpiling area and access road, it consists of natural vegetation which is still in a fairly good condition (Appendix A: Map 1). Areas of disturbance are present but are indicative of only low levels of disturbance. The species diversity is moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). The site therefore still contains elements of significant conservation value, which consist of protected plant species (Appendix A: Map 3). Furthermore, a small portion of the site is considered as forming part of a larger Critical Biodiversity Area 2 (CBA 2) (Appendix A: Map 2). However, no rare or endangered species were observed within this area in order to substantiate it being considered to be of high conservation value. Furthermore, the loss of such a small area, the extent of 0.6 hectares, given that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it. Significant mitigation will however have to be implemented to ensure that the impact on these elements of significant conservation value is decreased. In addition, the vegetation type in this area, Eastern Lower Karoo, is still widespread and listed as being of Least Concern (LC), with a relatively low conservation value. A moderate sensitivity for the site is therefore maintained.

Percentage ground cover:

Percentage ground cover is low, which is natural for this arid region and the area is therefore considered as unmodified and intact.

Vegetation structure:

The vegetation communities in these areas are all fairly similar, being dominated by a sparse grass layer and an abundance of dwarf karroid shrubs. The vegetation structure may vary to some degree, depending on the soil depth and degree of surface rock coverage. This enables vegetation to vary from very sparse coverage, dominated by succulent species, to areas with an abundance of dwarf karroid shrubs and also scattered larger shrubs and even small trees. The mining permit footprint consists of natural vegetation, with low levels of disturbance and being intact, the vegetation is therefore considered as unmodified to a significant degree.

Infestation with exotic weeds and invader plants:

Despite the natural condition of the site, a low-level infestation by the invasive succulent, *Opuntia ficus-indica* is present. This may also be associated with the adjacent historical quarry, which results in localised transformation, resulting in a disturbed area allowing for the establishment and spreading of invasive species.

Degree of grazing/browsing impact:

The site is being utilised for grazing by domestic livestock, which is still regarded to only result in a moderate degree of overgrazing and trampling.

Signs of erosion:

Given the gentle slope of the site, it being also almost completely natural, without any significant impacts, at least on the site itself, erosion is considered to be largely absent.

Terrestrial animals:

Tracks and signs of mammals are present on and around the site, but an abundance of animal activities is absent. As indicated (Section 4.1), the area is largely still natural and consequently the mammal population should also largely still be intact. However, the area is utilised for stock farming, which will undoubtedly have an impact on the mammal population in the area. This has, over centuries, resulted in the removal of large ungulates and most carnivores from the area, while the use of jackal-proof fencing and control of smaller carnivores have also modified the mammal population in the area. It may however still be possible for species of conservational importance to be present in the area. The mammal population is therefore anticipated to be modified, likely with some decrease in the capacity provided by the natural habitat, though species of conservation value may still be present. However, the footprint of the proposed mining operations (5 hectares) is not anticipated to have a large impact on the mammal population, when seen in context of the extensive natural areas which are present in the surroundings, providing adequate habitat for the local mammal population, thus resulting in the anticipated impact remaining moderate.

Table 8: Biodiversity Sensitivity Rating for the proposed mining permit development.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species			1
Ecological function			1
Uniqueness/conservation value		2	
Vegetation condition			
Percentage ground cover			1
Vegetation structure			1
Infestation with exotic weeds and invader plants or encroachers		2	
Degree of grazing/browsing impact		2	
Signs of erosion			1
Terrestrial animal characteristics			
Presence of rare and endangered species		2	
Subtotal	0	10	5
Total		15	

8. BIODIVERSITY SENSITIVITY RATING (BSR) INTERPRETATION

Table 9: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Perseverance mining permit	15	Good Condition	2

9. DISCUSSION AND CONCLUSION (Appendix A: Map 1 - 3)

The proposed mining permit area is considered to be in a Good Condition (See Section 7). The site consists of natural vegetation, with few impacts and disturbances and is therefore regarded to be in a good condition. However, although some elements of significant conservation value (protected plant species, fauna of conservation value) are present on the site, no elements, species or habitats or species of exceptional conservation value are present (endangered vegetation or fauna), which would then have entailed a pristine condition.

The proposed rock quarry, for which a mining permit will be obtained, is situated approximately 20 km west of the small town of Aberdeen (Appendix A: Map 1). The site is situated adjacent to the R61 tarred road, while access to it will be obtained via a 270 m long new access road. The footprint of the mining area will be 5 hectares in total, consisting of a hard rock quarry (2 hectares) and a separate stockpiling/crushing area (2.5 hectares). The site and surroundings are largely still natural, although a historical quarry borders the site to the west and does cause significant disturbance of the immediate area. The site itself is however natural, with limited disturbances caused by a few dirt tracks. The site forms part of an arid region and consequently watercourses are limited, with only one prominent ephemeral stream system situated approximately 550 metres to the east of the site.

According to Mucina & Rutherford (2006) and utilising current mapping resources (National Biodiversity Assessment 2018), the site falls within Eastern Lower Karoo (NKL 2) (Appendix A: Map 1). This vegetation type contains a varied topography with undulating plains, ridges, hills and uneven, rocky terrain, incised by a high number of small watercourses. This vegetation type is currently listed as being of Least Concern (LC) within the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Appendix A: Map 1). The vegetation type is not under sufficient development pressures to be considered a threatened ecosystem. This will also decrease the conservation value of remaining natural vegetation.

The Eastern Cape Biodiversity Management Plan (2019) has been published and has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e., Critical Biodiversity Areas. The majority of the area is regarded as an Ecological Support Area 1 (ESA 1), as it forms part of an important ecological corridor (Appendix A: Map 2). Due to the small extent of the proposed mining area (5 hectares), it is unlikely to compromise this functioning, as long as adequate rehabilitation is undertaken, and the site is able to be re-incorporated into the landscape. A small portion of the proposed site (0.6 hectares) encroaches into a Critical Biodiversity Area 2 (CBA 2). This is considered as essential for meeting conservation targets. However, the loss of such a small area, the extent of 0.6 hectares, provided that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it.

The footprint of the proposed MP is clearly completely natural, with very few disturbances present. However, a historical quarry is situated immediately to the west of the site, causing some local transformation of the area. This has also been confirmed by the current survey, as well as the National Biodiversity Assessment (2018), which indicates natural vegetation on the site, while the historical quarry to the west is considered as a localised transformed area (Appendix A: Map 1). This has most probably resulted in a low-level infestation by invasive species, spreading into surrounding natural areas. The area is dominated by an undulating landscape, with plains dominating, while low ridges are also present. This results in a moderate

diversity of habitat which includes low ridges, rocky and sandy habitats and drainage lines supporting a low but dense riparian vegetation layer. As a result of the moderate habitat diversity, the area also contains a moderate species diversity, which includes scant dwarf karroid shrubs, grasses, succulents and geophytic species.

Tracks and signs of mammals are present on and around the site, but an abundance of animal activities is absent. As indicated (Section 4.1), the area is largely still natural and consequently the mammal population should also largely still be intact. However, the area is utilised for stock farming, which will undoubtedly have an impact on the mammal population in the area. This has, over centuries, resulted in the removal of large ungulates and most carnivores from the area, while the use of jackal-proof fencing and control of smaller carnivores have also modified the mammal population in the area. It may however still be possible for species of conservational importance to be present in the area. The mammal population is therefore anticipated to be modified, likely with some decrease in the capacity provided by the natural habitat though species of conservation value may still be present. However, the footprint of the proposed mining operations (5 hectares) is not anticipated to have a large impact on the mammal population, when seen in context of the extensive natural areas which are present in the surroundings, providing adequate habitat for the local mammal population, thus resulting in the anticipated impact remaining moderate, which is however dependent on mitigation being successfully implemented.

From the description of the vegetation on the site, including the rock quarry, stockpiling area and access road, it consists of natural vegetation which is still in a fairly good condition (Appendix A: Map 1). Areas of disturbance are present but are indicative of only low levels of disturbance. The species diversity is moderate, although the area does contain a significant number of protected plant species which will contribute towards its conservation value (Appendix B). The site therefore still contains elements of significant conservation value, which consist of protected plant species (Appendix A: Map 3). Furthermore, a small portion of the site is considered as forming part of a larger Critical Biodiversity Area 2 (CBA 2) (Appendix A: Map 2). However, no rare or endangered species were observed within this area in order to substantiate it being considered to be of high conservation value. Furthermore, the loss of such a small area, the extent of 0.6 hectares, given that other elements of conservation importance are absent, is unlikely to significantly compromise the CBA or have a high impact on it. Significant mitigation will however have to be implemented to ensure that the impact on these elements of significant conservation value is decreased. In addition, the vegetation type in this area, Eastern Lower Karoo, is still widespread and listed as being of Least Concern (LC), with a relatively low conservation value (Appendix A: Map 1). A moderate sensitivity for the site is therefore maintained and the impact of the loss of vegetation and species diversity is therefore considered to be moderate (Appendix A: Map 3).

Mitigation as indicated in the previous paragraph should include the following (Appendix A: Map 1 - 3):

- As indicated, several of the succulent species occurring on the site are regarded as protected within the Eastern Cape Province (Appendix B). Where the development will affect any of these, the necessary permits will have to be obtained. Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed. However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia*

camdeboensis, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. These succulent species are easily transplanted with a high success rate.

- In addition, the area already contains a minor infestation by the invasive succulent, *Opuntia ficus-indica*. Furthermore, disturbance caused by mining is highly likely to leave disturbed areas vulnerable to further infestation. The proposed mining operations will therefore have to implement a comprehensive monitoring and eradication programme to ensure that invasive plant species (particularly *Opuntia ficus-indica*) are removed from the area and prevented from re-establishing.

The impact significance has been determined and should mining take place without mitigation, some impacts may be high, such as the impact of the loss of protected species (Appendix A: Map 1 - 3). The majority of impacts will however be moderate. However, should adequate mitigation be implemented as described, all impacts can be reduced to being moderate. This is however subject to the mining area implementing mitigation to ensure that protected plant species are transplanted, limiting the impact on fauna by implementing suitable mitigation, implementing a comprehensive monitoring and eradication programme to address weeds and invasive species, and undertaking comprehensive rehabilitation.

10. RECOMMENDATIONS

- Where mining operations occur, it is important that comprehensive rehabilitation and monitoring of the rehabilitation take place. Rehabilitation of the quarry should endeavour to integrate it into the surrounding topography as well as is feasible.
- Correct topsoil and seedbank management will be paramount to successful rehabilitation. Where disturbance or excavation will occur, the upper 30 cm, or topsoil, should be removed, together with the vegetation, and stored on the site. Even where very shallow soils occur and topsoil may be perceived to be absent, the soil surface, including any residual soils, stone and gravel, will contain a seedbank, together with any vegetation material, which will be crucial to rehabilitation. The topsoil, together with the seedbank and any vegetation material, should then be placed on top of the rehabilitated soil surface. Subsoil should be used as backfilling and not as top dressing. Only removed topsoil should be utilised to rehabilitate the disturbed surface. The rehabilitated quarry and stockpile areas should be incorporated into the surrounding landscape as far as possible.
- The proposed quarry should incorporate adequate storm water management principles, divert clean runoff around the site and retain dirty storm water within it.
- Monitoring of erosion should take place and should any erosion be noted, this must be remedied.
- The exotic species occurring on the site must be eradicated as mining progresses (Appendix B). It is also recommended that the eradication of exotic species be rigidly maintained and form part of the management of the mining process.
- Adequate monitoring of weed establishment and its continued eradication must be maintained (Appendix B). Where category 1 and 2 weeds occur, they require removal by the property owner according to the Conservation of Agricultural Resources Act, No. 43 of 1983 and National Environmental Management: Biodiversity Act, No. 10 of 2004.
- The area proposed for the mining operations contains numerous protected species which have significant conservation value and will require mitigation (Appendix B):
 - Many of the affected protected species are cryptic and inconspicuous and it is recommended that a walkthrough survey be conducted prior to the site being cleared. This should include identification and marking of all protected plants on the site and should be performed by an ecologist or botanist.
 - These protected species include *Ruschia intricata*, *Faucaria bosscheana*, *Monsonia camdeboensis*, *Pachypodium succulentum*, *Sarcostemma veminale*, *Trichodiadema setuliferum*, *Anacampseros albidiflora*, *Delosperma multiflorum*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. Where the development will affect any of these, the necessary permits will have to be obtained.
 - Many of these species are fairly common, widespread and abundant and, with the necessary permits, can simply be removed.
 - However, several are uncommon, localised species and at least a fair portion of affected plants should be transplanted to adjacent areas where they will remain unaffected. These species include *Faucaria bosscheana*, *Monsonia*

camdeboensis, *Pachypodium succulentum*, *Anacampseros albidiflora*, *Aloe longistyla*, *Chasmatophyllum stanleyi*, *Mestoklema tuberosum* and *Piранthus comptus*. These geophytic and succulent species are easily transplanted with a high success rate.

- Protected plants occurring on the site are listed as such within the Eastern Cape Environmental Conservation Act Nr. 13 of 2003.

- Mining activities may affect the faunal population and care should therefore be taken to ensure none of the faunal species on site are harmed. The following mitigation should be implemented to reduce the anticipated impact on fauna:
 - In order to prevent any direct impacts to the fauna on the site, the hunting, capturing or trapping of fauna should be strictly prohibited during operation of the mining development. This includes, but is not limited to, mammals, reptiles and birds.
 - Open excavations may act as pitfall traps to mammals, reptiles and amphibians and trenches should be monitored daily for trapped animals which should promptly be removed.
 - In the event of poisonous snakes or other dangerous animals encountered on the site, an experienced and certified snake handler or zoologist must remove these animals from the site and re-locate them to a suitable area.
 - After cessation of mining activities, the area should be completely rehabilitated, which is particularly applicable to the stockpile area and rock quarry. However, the quarry will make use of 10 x 10 m benching which will increase the impact and entail a safety hazard to fauna. In order to decrease this impact, adequate fencing will have to be erected around the quarry, which will have to consist of sturdy, stock-proof fencing, with buried barriers to prevent animals from burrowing underneath the fence. Furthermore, the quarry access ramp should be retained in order to provide an escape route, should any animals manage to fall in.

- No littering must be allowed and all litter must be removed from the site.

- Monitoring of mining operations and compliance with recommended mitigation measures must take place.

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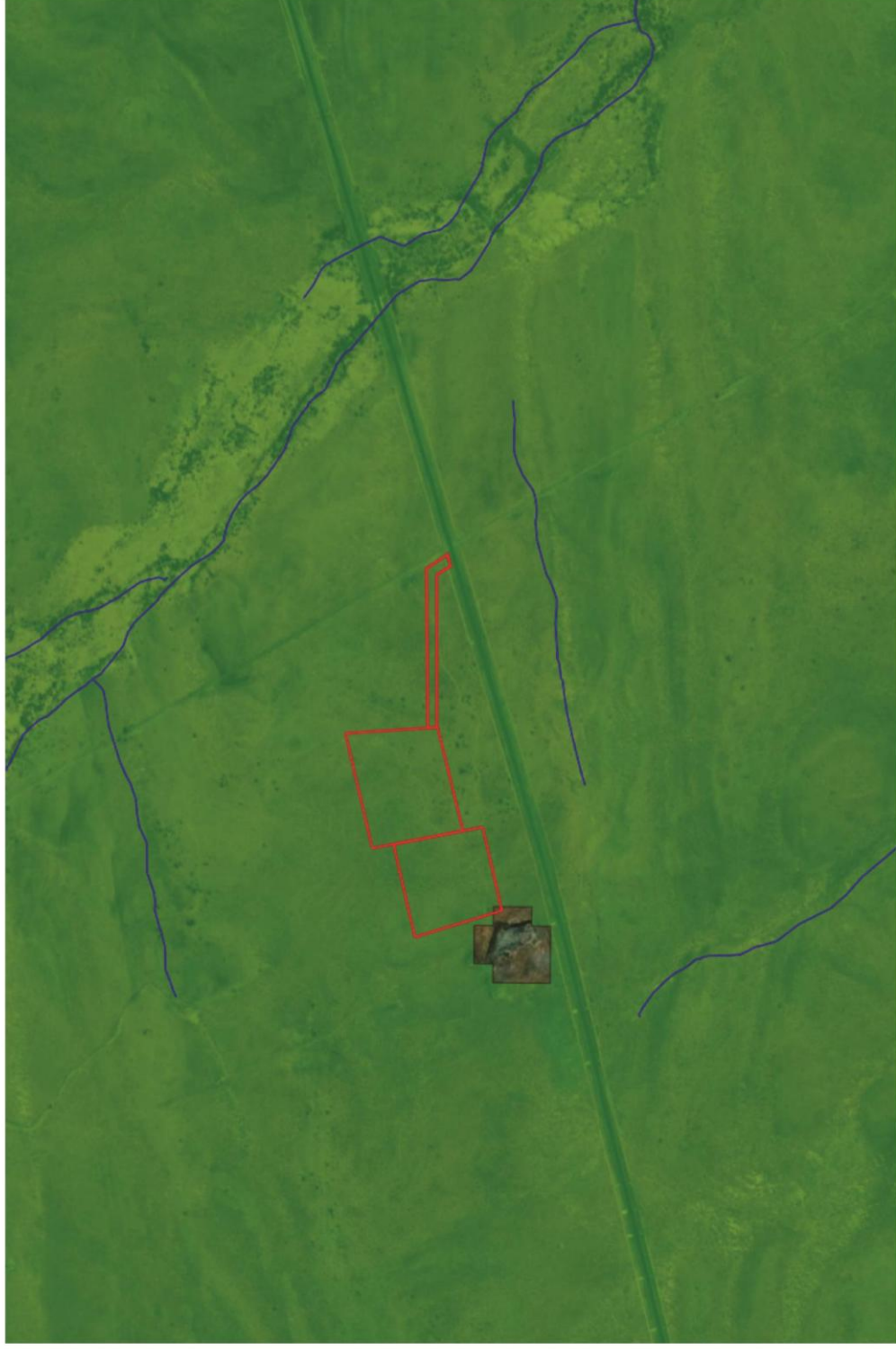
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Appendix A: Maps



Locality and general ecology map for the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen, Eastern Cape Province.







Map 1: Locality and general ecology map of the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen. Remaining natural vegetation in the area is indicated, which confirms the area containing extensive natural vegetation. Note the historical quarry to the west of the site being the only significant transformation in the area. The development will consist of a new access road, quarry area and stockpile/crushing area. Note also the presence of a significant ephemeral stream situated to the east of the site, but which is unlikely to be directly affected by the development.



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Greenmined Environmental
De Beers Avenue
Somerset West
7130

Legend:

-  Study area
-  Watercourses
-  Wetlands and impoundments
-  Eastern Eastern Karoo

Map Information

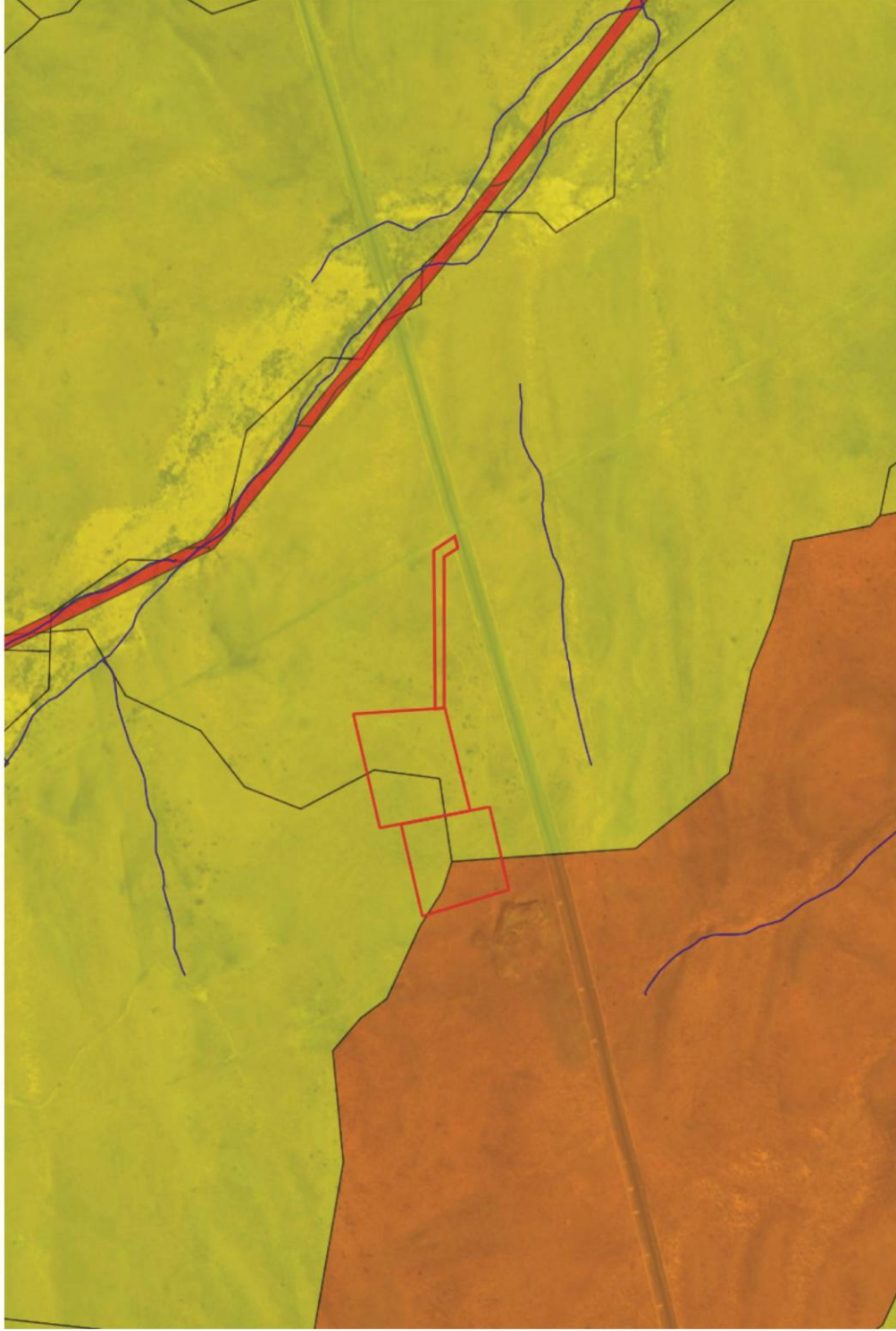
Spheroid: WGS 84
Quantum GIS
Scale: 1:10 000

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Eastern Cape Biodiversity Management Plan map for the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen, Eastern Cape Province.



Map 2: Eastern Cape Biodiversity Management Plan map of the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen. The site itself is largely situated within an Ecological Support Area 1 as it forms part of a natural ecological corridor. The development is unlikely to compromise this functioning, as long as adequate and successful rehabilitation is undertaken. In addition, the western border of the site encroaches into a Critical Biodiversity Area 2 (CBA), though given the absence of elements of high conservation value and the small extent of the CBA loss, this is unlikely to compromise the integrity of the CBA. It is also notable that the historical quarry is also situated within the CBA.



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Legend:

- Study area
- Watercourses
- Wetlands and impoundments
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- Ecological Support Area 1
- Ecological Support Area 2
- Other Natural Area
- Protected Area

Map Information

Spheroid: WGS 84
Quantum GIS
Scale: 1:10 000

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Sensitivity map for the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen, Eastern Cape Province.



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De Beers Avenue
Somerset West
71130

Legend:

- Study area
- Watercourses
- Wetlands and impoundments
- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity

Map Information

Spheroid: WGS 84
Quantum GIS
Scale: 1:10 000

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Map 3: Sensitivity map of the proposed rock quarry on the farm Perseverance 94 situated near Aberdeen. The site itself does not contain any rare or endangered species, or other elements of high conservation value. The site does however still consist of natural vegetation in fairly good condition and contains several protected plant species and as a result is still regarded as having at least a Moderate Sensitivity. Where the western border of the site encroaches into a Critical Biodiversity Area 2 (CBA), this increases the sensitivity to a High level, though given the small extent of this loss of a CBA, is not regarded as a large impact. The historical quarry adjacent to the site is completely transformed and regarded as a Low sensitivity area.

Appendix B: Species list

Species indicated with an * are exotic.

Protected species are coloured orange and Red Listed species red.

Species	Growth form
* <i>Opuntia ficus-indica</i>	Succulent
<i>Albuca setosa</i>	Geophyte
<i>Aloe longistyla</i>	Succulent
<i>Anacampseros albidiflora</i>	Succulent
<i>Aptosimum indivisum</i>	Herb
<i>Aristida congesta</i>	Grass
<i>Aristida diffusa</i>	Grass
<i>Asparagus burchellii</i>	Dwarf shrub
<i>Asparagus mucronatus</i>	Dwarf shrub
<i>Asparagus striatus</i>	Dwarf shrub
<i>Blepharis mitrata</i>	Herb
<i>Boscia oleoides</i>	Tree
<i>Bulbine frutescens</i>	Succulent
<i>Carissa haematocarpa</i>	Shrub
<i>Chaenostoma caeruleum</i>	Herb
<i>Chasmatophyllym stanleyi</i>	Succulent
<i>Chrysocoma ciliata</i>	Dwarf shrub
<i>Crassula capitella</i>	Succulent
<i>Crassula muscosa</i>	Succulent
<i>Curio radicans</i>	Succulent
<i>Cyperus uitenhagensis</i>	Sedge
<i>Delosperma multiflorum</i>	Succulent
<i>Dianthus micropetalus</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros scabrida</i>	Shrub
<i>Drimia anomala</i>	Geophyte
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis obtusa</i>	Grass
<i>Eriocephalus ericoides</i>	Dwarf shrub
<i>Euphorbia ferox</i>	Succulent
<i>Faucaria bosscheana</i>	Succulent
<i>Gazania krebsiana</i>	Herb
<i>Grewia robusta</i>	Shrub
<i>Helichrysum lucilioides</i>	Dwarf shrub
<i>Helichrysum rosium</i> var. <i>arcuatum</i>	Dwarf shrub
<i>Hermannia cuneifolia</i>	Dwarf shrub
<i>Hermannia filifolia</i>	Dwarf shrub
<i>Hypertelis salsoloides</i>	Herb
<i>Jamesbrittenia tysonii</i>	Herb
<i>Kedrostis africana</i>	Geophyte

<i>Kyllinga erecta</i>	Sedge
<i>Lasiosiphon deserticola</i>	Dwarf shrub
<i>Lycium schizocalyx</i>	Dwarf shrub
<i>Mestoklema tuberosum</i>	Succulent
<i>Monsonia camdeboensis</i>	Succulent
<i>Nenax microphylla</i>	Dwarf shrub
<i>Oropetium capense</i>	Grass
<i>Pachypodium succulentum</i>	Succulent
<i>Pegolettia retrofracta</i>	Dwarf shrub
<i>Pentzia incana</i>	Dwarf shrub
<i>Piaranthus comptus</i>	Succulent
<i>Pteronia sp.</i>	Dwarf shrub
<i>Rhigozum obovatum</i>	Shrub
<i>Rossenian oppositifolia</i>	Dwarf shrub
<i>Ruschia intricata</i>	Succulent
<i>Saersia longispina</i>	Shrub
<i>Sansevieria aethiopica</i>	Succulent
<i>Sarcostemma veminale</i>	Succulent
<i>Selago geniculata</i>	Herb
<i>Sporobolus fimbriatus</i>	Grass
<i>Tragus koeleroides</i>	Grass
<i>Trichodiadema setuliferum</i>	Succulent
<i>Viscum capense</i>	Parasite

Appendix C: Impact methodology

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence x Overall Likelihood

Determination of Consequence

Consequence analysis is a mixture of quantitative and qualitative information, and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: **Severity/Intensity, Duration and Extent/Spatial Scale**. Each factor is assigned a rating of 1 to 5, as described below and in tables 10, 11, 12 and 13.

Determination of Severity

Severity relates to the nature of the event, aspect or impact to the environment and describes how severely the aspects may impact on the biophysical and socio-economic environment.

Table 10 will be used to obtain an overall rating for severity, taking into consideration the various criteria.

Table 10: Rating of severity

Type of criteria	Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous/ Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact/ Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of Duration

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 11: Rating of Duration

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Determination of Extent/Spatial Scale

Extent refers to whether the spatial influence of an impact be local (extending only as far as the activity, or will be limited to the site and its immediate surroundings), regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

Table 12: Rating of Extent / Spatial Scale

Rating	Description
1: Low	Immediate, fully contained area
2: Low-Medium	Surrounding area
3: Medium	Within Business Unit area of responsibility
4: Medium-High	Within Mining Boundary area
5: High	Regional, National, International

Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarised below, and then dividing the sum by 4.

Table 13: Example of calculating Overall Consequence

Consequence	Rating
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	10
TOTAL CONSEQUENCE:(Subtotal divided by 4)	3.3

Likelihood

The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below and in Table 14 and Table 15.

Determination of Frequency

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Table 14: Rating of frequency

Rating	Description
1: Low	Once a year or once/more during operation/LOM
2: Low-Medium	Once/more in 6 Months
3: Medium	Once/more a Month
4: Medium-High	Once/more a Week
5: High	Daily

Determination of Probability

Probability refers to how often the activity/event or aspect will have an impact on the environment.

Table 15: Rating of probability

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Table 16: Example of calculating the overall likelihood

Consequence	Rating
Frequency	Example 4
Probability	Example 2
SUBTOTAL	6
TOTAL LIKELIHOOD (Subtotal divided by 2)	3

Determination of Overall Environmental Significance

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of LOW, LOW-MEDIUM, MEDIUM, MEDIUM-HIGH or HIGH, as shown in the table below.

Table 17: Determination of overall environmental significance

Significance or Risk	Low	Low-Moderate	Moderate	Moderate-High	High
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 - 19.9	20 - 25

Qualitative description or magnitude of Environmental Significance

This description is qualitative and is an indication of the nature or magnitude of the Environmental Significance. It also guides the prioritisations and decision making process associated with this event, aspect or impact.

Table 18: Description of the environmental significance and the related action required.

Significance	Low	Low-Moderate	Moderate	Moderate-High	High
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to the company.	Impact is real and substantial in relation to other impacts. Poses a risk to the company. Unacceptable.	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management measures. Where possible, improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible, improve.	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.