

Ecological Management Services Ecological Management Services

TERRESTRIAL BIODIVERSITY ASSESSMENT REPORT FOR THE PROPOSED PV DEVELOPMENT ON REDSTONE CSP NORTHERN CAPE

Prepared by Dr N. Birch *Pri.Sci.Nat*
Ecological Management Services
P.O. Box 110470
Hadison Park
Kimberley
8306

For
EIMS

June 2026

DECLARATION OF CONSULTANT

I Natalie Birch declare that I –

- ☐ act as the independent specialist in this study;
- ☐ do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations 2014 amended, 2017;
- ☐ do not have and will not have any vested interest in the activity proceeding;
- ☐ have no, and will not engage in, conflicting interests in the undertaking of the activity;
- ☐ undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations 2014 amended 2017;
- ☐ will provide the competent authority with access to all information at my disposal regarding the study.



Natalie Birch Pr. Sci. Nat 400117/05

June 2026

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ABBREVIATIONS

ADE	Aquifer Dependent Ecosystems
BGIS	Biodiversity Geographical Information System
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species
DAFF	The Department of Agriculture, Forestry and Fisheries
DAERL	Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
EWI	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Areas
GPS	Global Positioning System
GWC	Griqualand West Centre of Endemism
IUCN	International Union for Conservation of Nature
NCNCA	Northern Cape Nature Conservation Act
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas assessment
NPAES	National Protected Areas Expansion Strategy
PESEIS	Present Ecological State, Ecological Importance & Ecological Sensitivity
QDS	Quarter Degree Squares
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SARCA	Southern African Reptile Conservation Assessment
SIBIS	SANBI's Integrated Biodiversity Information System
TOPS	Threatened or Protected Species

1. INTRODUCTION

The intention is to set up a small solar development adjacent to the existing Redstone CSP development. In order to establish the required solar panels natural vegetation will have to be cleared the total development footprint will be 19.5 ha within this approximately 40 ha portion of land adjacent to the Redstone CSP facility, therefore less than half of the area assessed will be cleared for the development of the PV facility.

A Basic Assessment process is required for this development; part of this process requires that a specialist biodiversity assessment of the site is undertaken. This report comprises the specialist biodiversity assessment for the site

The report was compiled by Dr N.V. Birch Pr. Sci Nat. (reg no 400117/05). Details of the specialist are attached in Appendix 3.

1.1. TERMS OF REFERENCE & SCOPE OF WORK

The scope of work for this study includes

Biodiversity assessment

- ☐ Review available information and documentation relating to the proposed development;
- ☐ A comprehensive investigation to identify potential floral species of special concern, this includes all IUCN listed species, TOPS listed species and species listed in schedule 1 and 2 of the NCNCA. These will be identified through the SANBI POSA database as well as other available literature and confirmed on site.
- ☐ A single field survey and literature review of the property to determine vegetation type and distribution. The survey will be undertaken to identify potential floral species of special concern.
- ☐ A single field survey and literature review to determine what red data faunal species could potentially occur within the study site. The habitat requirements of each red data species that could potentially occur on-site will be compared with the vegetation description. No onsite trapping of faunal species will be undertaken.
- ☐ Once the overall potential for occurrence of each red data species has been identified, each habitat type (based on the vegetation description and any factors identified as relevant to fauna) will be ranked in terms of conservation importance, as well as ecological sensitivity.
- ☐ The site's importance in terms of regional sensitivity will also be assessed
- ☐ The report and survey will comply with the assessment protocols.

1.2. DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following;

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (South African National Biodiversity Institute, 2006-2018)).
- Information on plant species recorded for the Quarter Degree Squares (QDS), was extracted from the POSA database hosted by SANBI. This is a much larger extent than the study area, but the data was extracted from a larger area to account for the fact that the area has probably not been well sampled in the past.
- The IUCN conservation status of the species in the list (Table 1.1) was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2020).
- Threatened Ecosystem data was extracted from the NBA Threat Status and Protection Level list (SANBI 2018).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2016 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU Atlas, and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) *Bates et al.* (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Bird species lists for the area were extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:
 - **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
 - **Medium:** The habitat is broadly suitable or marginal and the species may occur at the site.
 - **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
 - **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.

- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2021-1) (See Table 1.1) and where species have not been assessed under these criteria, the CITES status is reported where possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Table 1. The IUCN Red List Categories for fauna and flora. Species that fall within the categories in red and orange below are of conservation concern.

IUCN Red List Category
Critically Endangered (CR)
Endangered (EN)
Vulnerable (VU)
Near Threatened (NT)
Critically Rare
Rare
Declining
Data Deficient - Insufficient Information (DDD)
Data Deficient - Taxonomically Problematic (DDT)
Least Concern

The report layout is as follows in accordance with the assessment protocols 2020

Section	Requirements/Protocol	Position in Report
1	A specialist report prepared in terms of these Regulations must contain—	
(a)	Details of -	
	(i) the specialist who prepared the report; and	Cover page
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 3
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Page 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment; an indication of the quality and age of base data used for the specialist report;	Section 1.3 & 3 Section 1.3 & 3

	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 6
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.2 & 3
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4 and Section 5
(g)	an identification of any areas to be avoided, including buffers;	Section 5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Section 5
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6 and 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 7
(l)	any conditions for inclusion in the environmental authorization;	Section 7
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 & 7
(n)	a reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorized; (ii) regarding the acceptability of the proposed activity or activities; and (iii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	See EIA comments and response report
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See EIA comments and response report,
(q)	any other information requested by the competent authority.	See EIA comments and response report

1.3. LIMITATIONS AND ASSUMPTIONS

Generally a potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due

to time and cost constraints and therefore these surveys usually represent a "moment in time" survey. However this area has been surveyed numerous time during the various stages of the project and therefore there is a relatively good database that has been collected over a number of years, which can be used to augment the current survey information. This survey represents a wet season survey as it was conducted in May nearing the end of particularly wet summer and autumn rainfall season . A plant species list was compiled for the site from the site visit, this was augmented by a list of species which are known from other studies to occur in the immediate surrounds of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

2. REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- ☐ That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- ☐ That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- ☐ Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004):

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or

removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: *"no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated"*. A permit is required for the destruction or transplant or transport of any protected tree species.

National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

Conservation of Agricultural Resources Act (Act 43 of 1983):

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural

Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

Northern Cape Nature Conservation Act, No. 9 of 2009: (NCNCA)

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences 19. No Person may –

(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2. A permit obtainable from the DAERL permit office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.

National Water Act, No 36 of 1998

This Act imposes 'duty of care' on all landowners, to ensure that water resources are not polluted. The following Clause in terms of the National Water Act is applicable in this case:

It stipulates that, "An owner of land, a person in control of land or a person who occupies or uses the land on which (a) any activity or process is or was performed or undertaken; which causes, has caused or likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring"

3. METHODOLOGY

A site survey, was undertaken 21 May 2026. The assessment area comprised a 40ha area, the development footprint will only constitute approximately 19.5ha of the 40 ha area surveyed. During this site visit information obtained from previous surveys was ratified and the different biodiversity features, habitat, vegetation and landscape units present at the site were inspected in the field. A Walk-through-survey was conducted across the site and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

Flora

Satellite images were used to identify homogenous vegetation/habitat units within the study area. These were then sampled on the ground with the aid of a GPS to navigate in order to characterise the species composition. The following quantitative data was collected:

- ☐ species composition,
- ☐ cover estimation of each species according to the Braun-Blanquet scale,
- ☐ vegetation height,
- ☐ amount of bare soil and rock cover,
- ☐ slope, aspect
- ☐ presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Additional checklists of plant species were compiled by traversing a linear route and recording species as they were encountered. Searches for listed and protected plant species at the site were conducted and all listed plant species observed were recorded.

Fauna

The faunal study was undertaken as a desktop / literature survey combined with a field survey. The tasks included in each are given below.

Desktop/literature survey:

A desktop survey was undertaken to determine the red data reptile, amphibian, mammalian and bird species occurring in the quarter degree square in which the study area falls. The likelihood of red data species occurring on-site has been determined using the i) distribution maps in reference books and ii) a comparison of the habitat described from the field survey.

Field survey:

The habitats on-site were assessed to compare with habitat requirements of red data species determined during the literature survey. During the site visit the presence and identification of bird and mammal species was determined using the following methods / techniques:

- ☐ Identification by visual observation.
- ☐ Identification of bird and mammal calls.
- ☐ Identification of spoor.
- ☐ Identification of faeces.
- ☐ Presence of burrows and / or nests.

Criteria used in the assessment of impacts

The methodology used in the assessment of the identified impacts is provided in appendix 4

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The study area is located approximately 26km east of Postmasburg and approximately 23km south west of Danielskuil along the R385 in the Northern Cape. It is situated adjacent to the existing Redstone CSP facility.

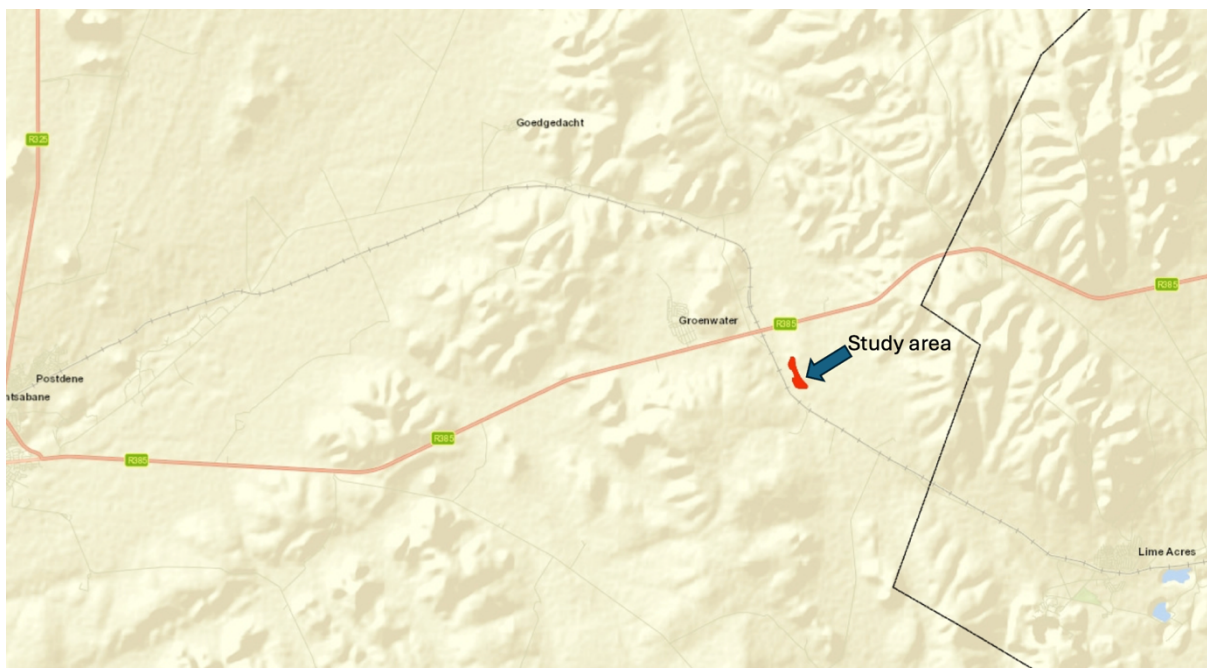


Figure 1 The location of the study area (red polygon) within the Tsantsabane Local Municipality and within the ZF Mgcawu District Municipality the Northern Cape.

4.1. BROAD-SCALE VEGETATION PATTERNS & PROCESSES

The study area falls within the Olifantshoek Plains Thornveld, which typically is found on plains with an open tree and shrub layer, and is formed by species such as *Vachellia luederitzii*, *Bosica albitrunca* and *Searsia tenuinervis*. The grass layer is usually sparse with species such as *Schmidtia pappophoroides*,



Figure 2 The study are (red polygon) in relation to the Redstone CSP.

Stipagrostis uniplumis and *Aristida congesta*. The Olifantshoek Plains Thornveld is classified as Least Concern, however the eastern part of the Northern Cape is under higher land transformation pressures than indicated, in the National Biodiversity Assessment report (2025), Mucina & Rutherford (2006). The DAERL spatial analysis has indicated that the areas of highest pressures include the Postmasburg (Beeshoek) to Daniëlskuil areas. Furthermore, the Olifantshoek Plains Thornveld is part of the top 5 vegetation types, currently under the most pressure within the eastern part of the province. Olifantshoek Plains Thornveld is listed as 'Poorly Protected' in the NBA (SANBI 2025) and is devoid of any areas identified in current national or provincial protection strategies. Although it is listed as Least Concern its actual threat status is likely higher.



Figure 3 Critical Biodiversity Areas that occur within the vicinity of the study area

No Critical Biodiversity Areas are present within the proposed development area, however some CBAs occur to the north and east of the study area.

The whole area however does fall within a River FEPA. River FEPAs achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species, and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources.

For river FEPAs the whole sub-quaternary catchment is shown in dark green, **although FEPA status applies only to the actual river reach** within such a sub-quaternary catchment. The shading of the whole sub-quaternary catchment indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition (A or B ecological category) of the river reach.

The proposed development site falls within a strategic ground water area known as the Southern Ghaap Plateau SWA. SWA (Strategic Water Areas) are considered to be strategically important at the national level for water and economic security for South Africa. Ground water strategic source areas have high groundwater recharge, protecting the capture zone, the recharge area and the integrity of the aquifers is essential in maintaining ecosystem services and functionality, especially with respect to ensuring the sustainability of aquifer dependent ecosystems.

The site does not fall within an important bird area, nor does it fall within a NPAES focus area and is not directly adjacent to any protected area.

The study area falls within the Griqualand West Centre of Endemism (GWC) (described in van Wyk & Smith 2001). Centre's of endemism are extremely vulnerable; relatively small disturbances in a centre of endemism may easily pose a serious threat to its many range-restricted species (Van Wyk & Smith 2001). The GWC of plant endemism, is recognized for over 23 endemic plant species. These endemics represent 1.4% of the region's flora (Frisby, 2016), with the Postmasburg region being predominantly the core of the centre. The greater Project area is positioned directly within the core and the Southern Kalahari and Langeberge sub-centre which is the area of the highest number of endemic records. The Southern Kalahari and Langeberge sub-centre contains three restricted endemics, namely *Amphiglossa tecta*, *Brachiaria dura* var. *pilosa* and *Lithops bromfieldii*. In addition, a total of 15 GWC endemics are present in this sub- centre.

4.2. PLANT COMMUNITY DESCRIPTION

The vegetation within the study area is uniform across the proposed development site. The vegetation type is well represented in the surrounding region and occurs on stony/ rocky soils, situated on slightly elevated areas from nearby grassland and drainage habitat types. The physiognomy is dominated by shrubs that developed because of the rockiness of the substrate. Prominent woody species include *Senegalia mellifera*, *Calobota cuspidosa*, *Ehretia rigida*, *Euclea undulata*, *Euryops asparagoides*, *Gymnosporia buxifolia*, *Olea europaea*, *Searsia ciliata*, *Tarchonanthus camphoratus* and *Ziziphus mucronata*. The grass layer is diverse and includes species such as *Aristida congesta* subsp. *barbicollis*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Elionurus muticus*, *Enneapogon scoparius*, *Eragrostis curvula*, *Fingerhuthia africana*, *Heteropogon contortus*, *Sporobolus nitens*, *Stipagrostis ciliata*, *Themeda triandra* and *Trichoneura grandiglumis*. Frequently observed herb species include *Aptosimum albomarginatum*, *Gazania krebsiana*, *Geigeria* species, *Gnidia* species, and *Walafrida densiflora*.

The southern section of the study site contains a small patch of open grassland. This area is flat and low lying and is mostly devoid of rocks. Grass species that occur within this unit include *Aristida congesta* subsp. *barbicollis*, *Aristida stipitata*, *Cymbopogon pospischilii*, *Eragrostis lehmanniana*, *Eragrostis obtusa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Microchloa caffra*, *Sporobolus nitens* and *Stipagrostis ciliata*. The herbaceous stratum is diverse and includes the dominant species *Arctotis arctotoides*, *Berkheya* species, *Boophane disticha*, *Brunsvigia radulosa*, *Felicia* species, *Gazania krebsiana*, *Geigeria* species and *Hermannia* species.



Figure 4 Typical example of the vegetation that occurs within the study area.

The site mostly consists of primary vegetation, however there are areas of historical disturbance, most notably some excavations. The property currently has some sheep and goats grazing.



Figure 5 One of the excavations present within the study area.

4.3. POPULATIONS OF SENSITIVE AND/OR THREATENED SPECIES

FLORA

Historical records of Red List plant species were consulted as well as previous floral surveys conducted by the author in and around the study site in order to determine the likelihood of any such species occurring in the study area and these were searched for in the field. Plant species observed as well as a list of threatened plant species previously recorded in the quarter degree grids in which the study area is

situated which was obtained from the South African National Biodiversity Institute, are listed in the table below

Table 1: Potential and recorded Protected Plant species on site

Species	Status	Permit/applicable Legislation	Record of occurrence
<i>Antimima lawsonii</i>	Rare	NCNCA schedule 2	Not recorded on site
<i>Pentzia oppositifolia</i>	Rare	National red list	Not recorded on site
<i>Drimia sanguinea</i>	Near Threatened	National red list	Not recorded on site
<i>Pelargonium dolomiticum</i>	Least Concerned	NCNCA schedule 1	Not recorded on site
<i>Lessertia frutescens</i>	Least Concerned	NCNCA schedule 1	Not recorded on site but recorded in surrounding area
<i>Pachypodium succulentum</i>	Vulnerable	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Boophane disticha</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Ammocharis coranica</i>	Least Concerned	NCNCA schedule 2	Recorded on site
<i>Olea europeae</i>	Least Concerned	NCNCA schedule 2	Recorded on site
<i>Aloe cf gradidentata</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Aloe hereroensis</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Bulbine narcissifloia</i>	Least Concerned	NCNCA schedule 2	Recorded on site
<i>Bulbine abyssinica</i>	Least Concerned	NCNCA schedule 2	Recorded on site
<i>Jamesbrittenia integririma</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Orbea cf lutea</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Anacampseros filamentosa</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Eulophia hereroensis</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Lithops aucampiae</i> L.Bolus subsp. <i>aucampiae</i>	Least Concerned	NCNCA schedule 2	Recorded on site
<i>Euphorbia patula</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Brunsvigia radulosa</i>	Least Concerned	NCNCA schedule 2	Recorded on site

<i>Crassula capitella</i>	Least Concerned	NCNCA schedule 2	Not recorded on site but recorded in surrounding area
<i>Vachellia erioloba</i>	Least Concerned	National Forestry Act	Not recorded
<i>Vachellia haematoxylon</i>	Least Concerned	National Forestry Act	Not recorded
<i>Boscia albitrunca</i>	Least Concerned	NFA & NCNCA schedule 2	Not recorded

It is recommended that prior to clearing an additional walk through is conducted to ensure that any of the species listed above but not recorded during the site survey are not precluded from the permit applications. In order to remove species listed in Schedule 1 & 2 of the NCNCA, an integrated permit application will have to be made to the DAERL to obtain the required permission to remove and/or translocate these species from site. Any tree species protected by the National Forestry Act (Act 84 of 1998) will need a license from DFFE before it can be removed.

FAUNA

The proposed development site is situated adjacent to the Redstone CSP, currently the landowner is running some sheep and goats as well as a small herd of springbok within this proposed development area. There was not a lot of other faunal activity noticeable, some evidence of other antelope species such as steenbok and duiker, and commonly occurring animals such as ground squirrels and hares. Very little bird activity was observed during the site survey. Disturbances that alter the natural environment have two effects namely, it may cause the loss of certain species due to the destruction of habitat. It may also cause the influx of other species previously unable to colonise an area owing to lack of suitable habitat or because they have been excluded through competition.

It was not possible to compile a complete list of species present on the property during the field survey owing to the limited time frame of the assessment. It is therefore important to note that many species that potentially occur on-site may not have been identified thus emphasis was placed on the habitat in order to determine potential occurrence of species. The potential of occurrence is also assessed for the immediate surrounding area as to establish the possibility of ecological linking corridors for certain species.

Reptiles Species of Conservation Concern

No red data terrapin, tortoises, snakes or lizards were identified as occurring in the quarter degree square, based on the distribution maps available in the South African Red Data Book for reptiles (Bates *et al.* 2014) and The Southern African Reptile Conservation Assessment (SARCA). The conservation status was cross checked on the IUCN website to determine most recent status listing for these species. Although none of the regionally occurring reptile species are Red-listed, two species are listed in the NCNCA as being Specially Protected in the Northern Cape. These species have the potential to occur in the greater area but were not observed within the proposed development site,. They are likely to be mostly

associated with the rocky outcrops and watercourses in the greater area where habitat structure, prey availability and vegetation cover is suitable.

Table 2: Potential and recorded Protected reptile species on site

Species	Common Name	Status	Permit/applicable Legislation	Record of occurrence
<i>Karusasaurus polyzonus</i>	Karoo Girdled Lizard	LC	NCNCA schedule 1	Not recorded on site but recorded in surrounding area
<i>Chamaeleo dilepis</i>	Common Flap-neck Chameleon	LC	NCNCA schedule 1	Not recorded on site but recorded in surrounding area

Amphibians of Conservation Concern

Only one red data amphibian is likely to occur in the quarter degree square, based on the distribution maps available in the South African Red Data Book for amphibians (Minter *et al.*, 2004) Du Preez and Carruthers (2009) and the South African Frog Atlas project, namely the Giant Bullfrog (*Pyxicephalus adspersus*). However, their prevalence in the area is low and the highly ephemeral nature of the pan means that breeding is unlikely and thus their presence is likely to be transitory at best. There are however some species that are protected in terms of the NCNCA that may occur in the area. Although the arid nature of the region and the general lack of seasonally to permanently inundated waterbodies (only highly temporary ephemeral washes) in the region severely limits the potential occurrence of these in the area.

Table 3: Potential and recorded Protected amphibians species on site

Species	Common Name	Status	Permit/applicable Legislation	Record of occurrence
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	TOPS	Not recorded
<i>Cacosternum boettgeri</i>	Common Caco	LC	NCNCA schedule 2	Not recorded
<i>Tomopterna cryptotis</i>	Tremolo sand frog	LC	NCNCA schedule 2	Not recorded

Birds of Conservation Concern

A list of all red data bird species occurring in the quarter degree square, was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7th edition (Hockey *et al.*, 2005). The IUCN 3.1. status is also presented in the table. No avifaunal SCC were observed within the proposed development site during the survey. Species that could potentially occur either on-site or within 500m of the property boundary is provided in Table 4 below.

Table 4: Potential Protected bird species on site

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements ¹
Blue Crane	<i>Anthropoides paradiseus</i>	Near Threatened Vulnerable	Grasslands, cultivated lands Karoo scrub and edges of vleis
Kori Bustard	<i>Ardeotis kori</i>	Near Threatened Near Threatened	Dry thornveld grassland, arid scrub requires the cover of some trees
Lanner Falcon	<i>Falco biarmicus</i>	Vulnerable Least Concerned	Lanner Falcons are generally a cliff nesting bird, but have adapted to using the disused nests of Black and Pied crows, situated either in trees or on power lines For foraging purposes, Lanner Falcons utilise a wide range of habitats, from semi desert to woodland, agricultural land and also occurs in cities, but appear to prefer open habitats
Secretary bird	<i>Asagittarius serpentarius</i>	Vulnerable Vulnerable	This species shows a preference for open country, mainly savannah, open woodland, grassland, dwarf shrubland, mountain slopes and man-made habitats such as grazing paddocks and fallow fields
African White backed Vulture	<i>Gyps africanus</i>	Critically endangered Critically endangered	Savannah and bushveld. Nest in tall trees (<i>Vachellia erioloba</i>).
Cape Vulture	<i>Gyps coprotheres</i>	Endangered Endangered	Widespread in southern Africa where it can be found in open grasslands and woodlands, from sea level to very high mountains provided there are high cliffs to breed on. They can, however, roost on trees and pylons far away from their breeding sites.
Martial Eagle	<i>Polemaetus bellicosus</i>	Endangered, Vulnerable	Woodland, savannah or grassland with clumps of large trees or power pylons for nest sites
Verreaux's Eagle	<i>Aquila verreauxii</i>	Vulnerable Least Concern	Verreaux's Eagle is a solitary nester that builds a massive stick structure on a rocky outcrop or cliff, or more rarely in a tree or on a power pylon
Tawny Eagle	<i>Aquila rapax</i>	Endangered, Vulnerable Protected (NEMBA)	Woodland and savanna to semi-arid savanna or grassland with scattered Acacia trees
Black stork	<i>Ciconia nigra</i>	Vulnerable Least Concern	Marshes, dams rivers and estuaries breeds in mountainous regions
Ludwig's Bustard	<i>Neotis ludwigii</i>	Endangered Endangered	Requires semi-arid dwarf shrublands, occasionally visiting the southern Kalahari.
Lappetfaced Vulture	<i>Torgos tracheliotos</i>	Endangered Endangered	Savannah; semi arid regions closely associated with <i>Vachellia</i> spp, <i>Bosica albitrunca</i> and <i>Terminalia pruniodes</i>

Mammals of Conservation Concern

A list of all red data mammal species occurring in the quarter degree squares, was extrapolated from the Red Data Book for Mammals (EWT, 2004) and the MammalMAP, the Mammal Atlas of Africa database. Based on an evaluation of the habitat requirements for these red data species (EWT, 2004; Skinner and Chimimba, 2005), Table 5 lists the regionally occurring, free-ranging species (excluding all managed game species) that owing to historical distribution records and habitat types could occur. During the survey no SCC were encountered.

¹ Habitat requirements determined using the following reference material: Harrison *et al.*, 1997a; Harrison *et al.*, 1997b; ; Hockey *et al.*, 2005

Table 5: Potential Protected mammal species on site

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS ²	SUITABLE HABITAT ON-SITE ³	POTENTIAL FOR OCCURRENCE ON-SITE AND SURROUNDING AREA
South African hedgehog	<i>Atelerix frontalis</i>	Near Threatened	The South African Hedgehog is a nocturnal species that has been recorded to occur in grassland, resting curled up under matted grass, in debris under the shade of bushes or in holes under the ground	High – Area has sufficient grassland and bushes thus suitable habitat is present.
Brown hyaena	<i>Hyaena brunnea</i>	Near Threatened	They occur in semi-desert scrub, open scrub and open woodland savannah. As they are nocturnal, cover in which to lie in during the day is essential, such as dense shade or holes in the ground. This species has been reported in the general vicinity of the site, and it is possible that this species may currently visit the site as a vagrant when feeding.	Low –the substantial amount of activity make it unlikely that this animal will occur in the area
Dent's Horseshoe Bat	<i>Rhinolophus denti</i>	Near threatened	Requires substantial cover such as caves and rock crevices.	Low – Roosting habitat in the form of rock crevices may be available in the old mining area adjacent to the site. However suitable roosting habitat is limited for this species, it is unlikely that this species would have colonised the study site.
Black-footed Cat	<i>Felis nigripes</i>	Vulnerable	Arid and mesic savanna and scrubland, prefer rocky areas	Moderate – limited suitable habitat
Temminck's ground pangolin	<i>Smutsia temminckii</i>	Vulnerable	Arid and mesic savanna and woodland with annual rainfall of 250-1,400 mm.	High – Suitable habitat within the study area.

² Status based on listing in the National Red List of Mammals 2016

³ Habitat requirements determined using the following reference material: Skinner and Smithers, 1990; EWT, 2004; Skinner and Chimimba, 2005

4.4. ALIEN/INVASIVE SPECIES

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harbouring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture. In addition, the Northern Cape Nature Conservation Act (Act 9 of 2009), Chapter 7 states that no person may import, export, transport, possess or trade in an invasive species and that the owner of land upon which an invasive species is found, must take the necessary steps to eradicate or destroy such species. Schedule 6 of this Act lists a number of species classified as invasive.

The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed IAPs are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016 as listed below:

□ **Category 1a (PROHIBITED): Listed Invasive Species**

A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

□ **Category 1b (PROHIBITED / Exempted if in Possession or Under control): Listed Invasive Species**

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

□ **Category 2 (PERMIT REQUIRED): Listed Invasive Species**

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ

of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

□ **Category 3 (PROHIBITED): Listed Invasive Species**

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

Table 6: Alien invasive species noted to occur within and surrounding the proposed development area

Botanical and Common Name	Category Under NEMBA
<i>Argemone Mexicana</i> (Yellow Mexican Poppy)	2
<i>Prosopis glandulosa</i> (Honey Mesquite)	1b
<i>Datura ferox</i> (fierce thornapple)	1b
<i>Xanthium spinosum</i> (Spiny cocklebur)	1b
<i>Cirsium vulgare</i> (Scotch thistle)	1b
<i>Nicotiana glauca</i> (tree tobacco)	1b
<i>Opuntia ficus indica</i> (Sweet Prickly Pear)	1b
<i>Argemone ochroleuca</i> (White Flowered Mexican Poppy)	1b
<i>Prosopis velutina</i> (Velvet Mesquite)	3
<i>Opuntia humifusa</i> (Creeping Prickly Pear)	1b

5. SITE SENSITIVITY

5.1 SITE SENSITIVITY VERIFICATION

The EIA screening tool listed the proposed development area as an Aquatic Biodiversity and Terrestrial Biodiversity very high sensitivity site, based on the presence of a FEPA sub catchment. The objective of site sensitivity verification is to confirm or refine the various sensitivities ascribed to the study area by the screening tool, through conducting a desk-based biodiversity assessment and supplemented by the findings of the ground-truthing field surveys.

Desktop analysis

The proposed site falls within the Lower Vaal Water Management Area and within the Molopo sub water management area. There are no NFEPA rivers that run through the site or immediately adjacent to the site, the Groenwaterspruit and the Klien Riet are located more than 10km north of the proposed site. These are both ephemeral rivers. There is a drainage line that is located approximately 200m from the proposed development area. The entire sub-quaternary sub-catchment is denoted as a FEPA although the status only applies to the **actual river reach**, which in this case is the Groenwaterspruit river, located more than 10km from the proposed development site. The drainage line was delineated and a 100m buffer zone was put in place for the original Redstone CSP EIA. All the infrastructure has been set back to accommodate the drainage line and any no-go areas associated with the drainage line.

The fact that the whole sub-quaternary catchment is denoted as an FEPA this has triggered the EIA screening tool to denote that the entire sub-quaternary is a high sensitivity area which according to the protocols then should trigger a full aquatic assessment. However these are very broadscale assessment tools and therefore the areas need to be ground truthed as it can be that the classification is too broadscale to be appropriate for the site being surveyed.

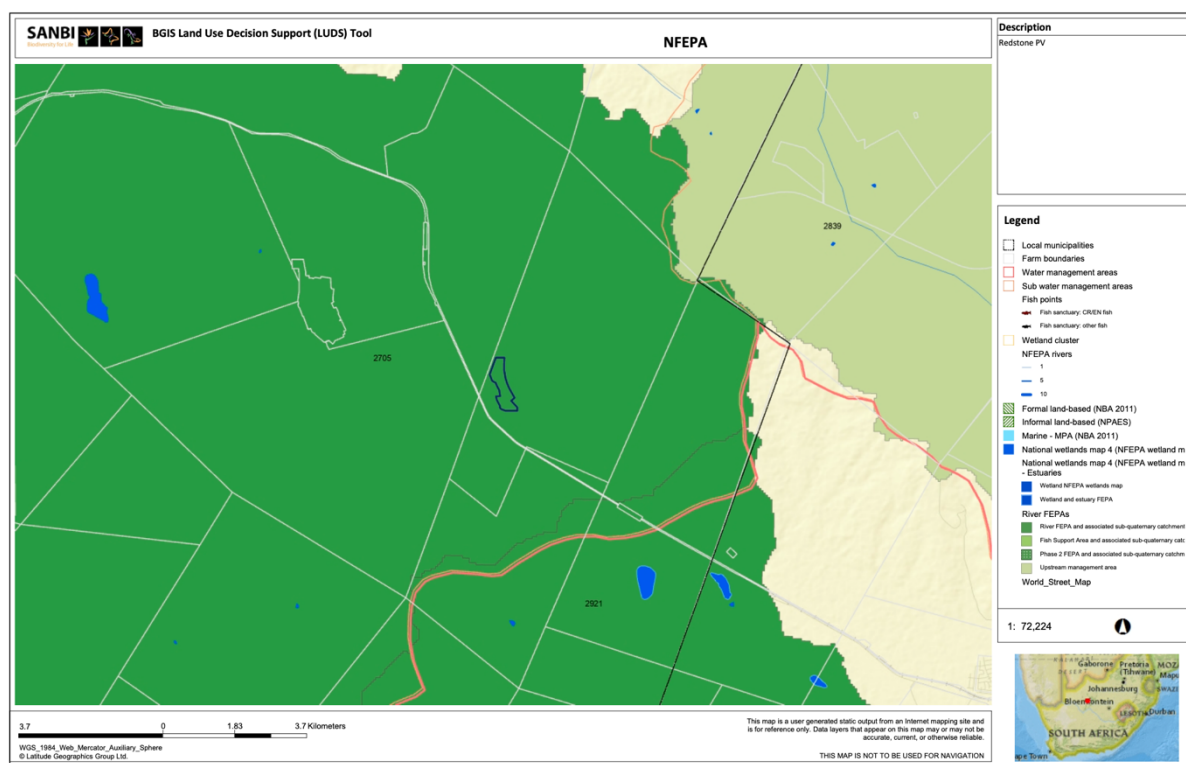


Figure 6 The NFEPA map showing the proposed development site in relation and the River and Wetlands NFEPA broadscale classifications

Site survey

During the site survey no wetlands or other water features were encountered within the proposed development site (within the 40ha area surveyed). As no aquatic features were located within the proposed development site no aquatic assessment could be undertaken within this area.

The drainage line is located approximately 200m from the boundary of the proposed development area. The drainage line has previously been delineated and a buffer-zone has been secured. Undertaking another aquatic assessment for this feature would therefore not be appropriate. The only other aquatic feature is the Groenwaterspruit River which is located more than 10km from site, and therefore an aquatic assessment for this site would also not be appropriate.

Although the EIA screening tool has indicated a high aquatic sensitivity, the results from the desktop research and the evidence collected on site during the field survey indicates that there are no aquatic features in the development area that would require a comprehensive aquatic impact assessment. Even though a comprehensive aquatic assessment in terms of establishing PES and EIS scoring is not required, the impact of development within a FEPA sub-quaternary catchment should still be assessed in terms of impact to freshwater ecosystems.

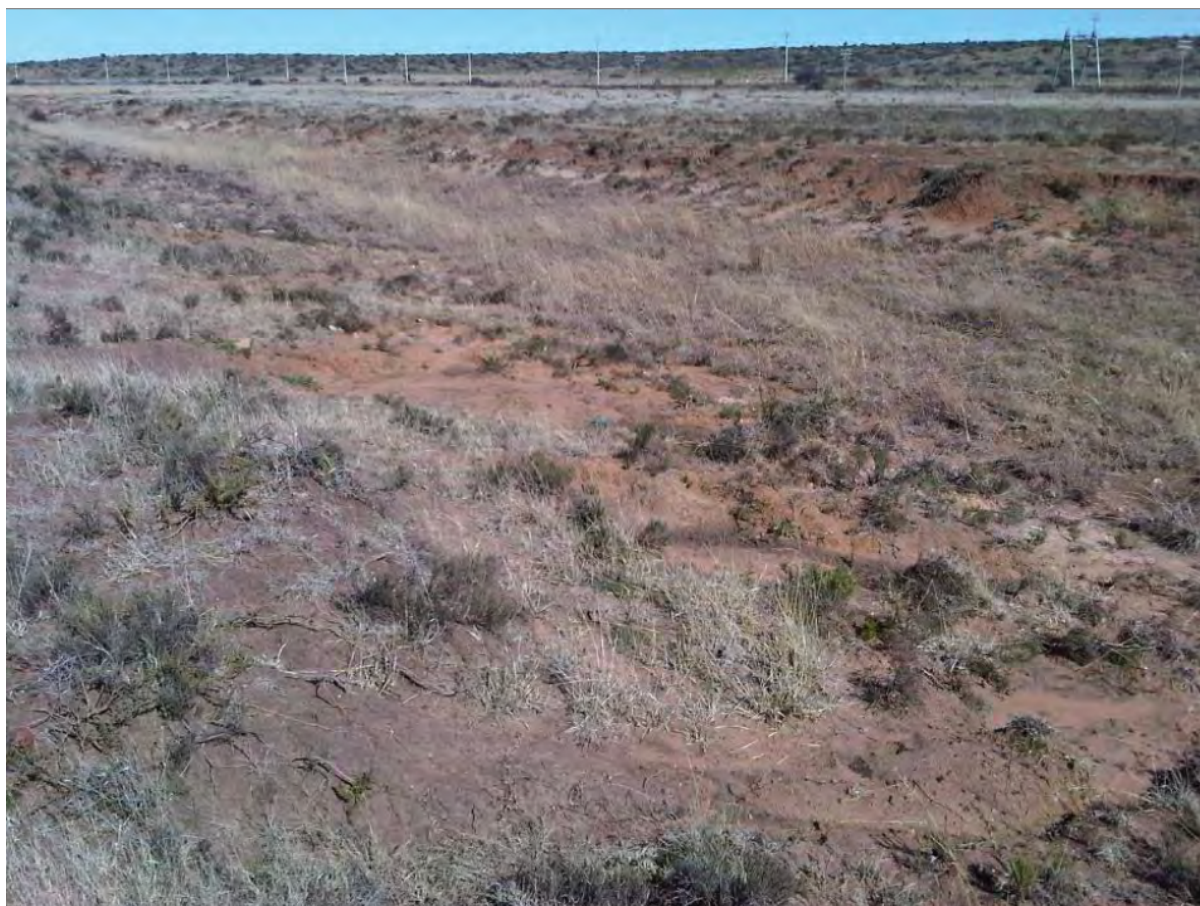


Figure 7 The drainage line located approximately 200m from the boundary of the development site.

5.2 SITE SENSITIVITY CLASSIFICATION

The classification of areas within the proposed development site into different sensitivity classes is based on information collected at various levels. This includes the national conservation status of the vegetation, the presence of species of special concern and the condition of the vegetation

Vegetation types can be categorised according to their conservation status, which is in turn, assessed according to the degree of the transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. Sensitivity of habitats and sites within the area can be assessed using a combination of criteria as follows:

	Criterion	Definition
1	Conservation status of untransformed habitats occurring in the study area	The extent of each vegetation type occurring within the study area that is conserved and/or

		transformed relative to a targeted amount required for conservation
2	Presence and number of Red Data species and other species of special concern	Presence or potential presence of Red Data species within habitats
3	Within-habitat species richness of flora and the between-habitat (beta) diversity of the site	Presence or potential presence of Red Data Species within habitats.
4	The type or nature of topography of the site, ie presence of ridges koppies etc	Steepness and/or nature of topography in the study area.
5	The type and nature of important ecological processes on site, especially hydrological processes, ie wetlands drainage lines etc.	Habitats and/or terrain features that represent ecological processes such as water-flow migration routes etc.

In order to advise the impact assessment and the proposed mitigation, a sensitivity map has been generated for the property using a number of criteria. In order to quantify and detail the sensitive areas in terms of the criteria used to assess sensitivity, the site was demarcated into a number of manageable blocks. A table was created to list each of the sensitivity criteria and a value assigned to each criteria. Each block was then assessed in terms of its relative sensitivity value. This produced a quantifiable sensitivity map. The criteria used to assess the sensitivity included;

Current state of degradation	1 = (80-100% degraded), Very degraded, highly transformed 2 = (60 -79% degraded), moderately transformed 3 = (40 – 59%) degraded, some transformation 4 = (20 -39% degraded, slightly transformed 5 = (0-19%) degraded Good condition
Slope & drainage	1 = Flat 2 = Gently undulating 3 = Slight slope 4 = Slope less than 5° 5 = Slope 5° or greater
Potential for erosion	1= Low 2 = Medium 3 = High
Presence of Red Data Species	0 = No 1 = Yes
Suitable habitat for RD species	0 = No 1 = Yes
Potential habitat fragmentation	1 = Low 2 = Low – moderate 3 = Moderate 4 = Moderate - high 5 = High
Importance to biodiversity& Ecosystem Functioning	1 = Low

- 2 = Low – moderate
- 3 = Moderate
- 4 = Moderate - high
- 5 = High

Areas have been classified as follows:

- **Low (0-9)** sensitivity areas are where disturbance has already taken place and further development will not have a significant environmental impact.
- **Medium (10-20)** sensitivity areas: The vegetation and habitats in these areas are well represented in the surrounding region. It may include some potential habitat for red data species or the presence of limited red data species. Development in these areas, would be subject to guidelines and the mitigation measures.
- **High (21-23)** sensitivity areas included confirmed occurrence of numerous red data species, and ideal red data species habitat. Any development in these areas would have a significant environmental impact. Development may be permitted under strict development guidelines, such as under guarantee that similar areas would be conserved thus reducing the risk of development.
- **No-go areas (24-25)** very sensitive areas no development permitted

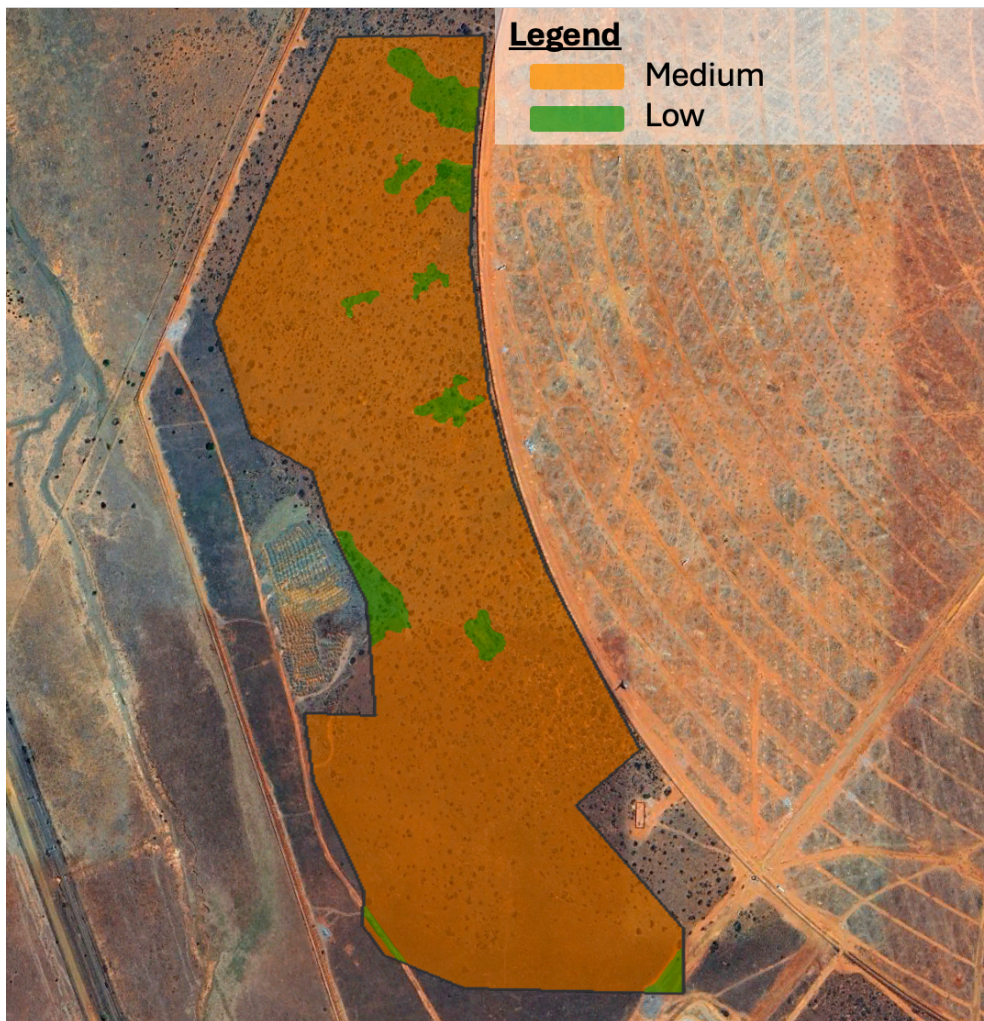


Figure 8 Site sensitivity map showing areas of sensitivity within the proposed development area.

Areas depicted as low sensitivity areas contain disturbance, with the presence of alien invasive species and/or a significant amount of naturalised exotic species such as *Tagetes minuta*, and *Bidens Pilosa*. Most of the study site has a moderate sensitivity classification as it contains natural vegetation in a good condition. SCC such as *Olea europaeae*, *Bulbine spp*, *Lithops aucampiae* and *Brunsvigia radulosa* were noted to occur. A targeted density survey would be required to accurately assess the number of *Olea* trees that would be affected by the proposed development but a cursory estimate is that the density would not be greater than 4- 6 trees per ha for the area.

There is a drainage line that occurs in the area. This drainage line was delineated as part of the original Redstone CSP development and was classified as a high sensitive area. The development edge was set back to allow for a buffer zone. These drainage line areas and associated vegetation host a more complex habitat structure, are more productive and provide local fauna with a much-needed source of cover, food and water they also serve as important corridors for faunal movement in the region. Many regionally occurring mammal species are likely to be associated with the watercourse habitats, most notable being the Vulnerable Black-footed Cat. Although this drainage line does not form part of the development footprint and is situated over 200m from the proposed development border it is important to consider this area when assessing the impacts.

6. POTENTIAL IMPACTS

Typically, a development is divided into the construction phase and the operational phase and if applicable a decommissioning phase. The construction phase of a PV solar development involves intensive, short-term physical disturbances driven by heavy machinery, including vegetation clearing, soil grading and compaction, and increased noise, dust, and human activity that directly destroy local habitats and displace sensitive wildlife.

The operational phase has a longer time span and introduces passive, long-term ecosystem shifts characterized by altered microclimates from panel shading, continuous barrier effects from perimeter fencing that blocks large animal migrations, and persistent bird collision risks from reflective surfaces.

1. Habitat fragmentation and Loss of Natural vegetation

Vegetation clearing will occur as a result of this development. This loss of natural vegetation will cause fragmentation and habitat disturbance in the landscape. Heavy machinery compacts soil, altering hydrological pathways, making it difficult for deep-rooted indigenous flora to re-establish.. The disturbance destroys primary vegetation. As primary vegetation is more functional in an ecosystem, this could irreversibly transform the vegetation characteristics and faunal populations in the area. Clearing of surface areas has the effect of creating unnatural open spaces through the vegetation and the matrix of the landscape. For the smaller species, it limits movement and restricts access to foraging sites. Security fencing and perimeter roads physically divide ecosystems, preventing the free movement of mammals,

reptiles, and amphibians across migration corridors. This results in reduced population density of prey species (invertebrates and / or smaller birds and / smaller mammals and / or herpetofauna) which then reduces the food availability for predators invertebrates and / or larger birds and / or larger mammals and / or herpetofauna).

Mitigation

Habitat fragmentation can be somewhat mitigated by allowing for wide, unfenced natural corridors between panel blocks to allow wildlife movement. Installing raised fences or include "mammal gates" (15–20 cm gaps at the bottom) for small animal passage. Plant low-growing, indigenous grasses and forbs beneath panels to boost pollinator populations.

2. Alien and Invasive species

Disturbance within natural systems makes them more prone to invasion of alien species. Invasive species affect our natural biodiversity in a number of ways. They may compete directly with natural species for food or space, may compete indirectly by changing the food web or physical environment, or hybridize with indigenous species. Rare species with limited ranges and restricted habitat requirements are often particularly vulnerable to the influence of these alien invaders. Invasive plants have claimed about 8 percent or 10 million hectares of land suitable for agricultural use in South Africa. These invasive alien plants steal about seven percent of South Africa's water bulk every year.

Mitigation

An comprehensive and active alien and invasive species removal program will help to contain the spread of these unwanted plants.

3. Loss of Species of Conservation Concern

None of the vegetation types within and around the proposed development are listed as threatened at present. However, there is a substantial amount of planned development within a 50km radius of the site as well as current mining activity. The Redstone development is located near a zone where South Africa's largest economically most important deposits of manganese and the principle deposits of iron ore are found, should these deposits all be mined the cumulative impact of habitat loss could result in a change of threat status for some of the vegetation units, flora and fauna within the area, particularly those that currently are not present in any protected area or are poorly protected. The cumulative impacts for the loss of SCC from this area is of importance. The clearing of vegetation for this development will result in the loss of some protected flora and the reduction in habitat for faunal SCC.

Mitigation:

*A search and rescue operation should be performed prior to clearing. Where possible floral SCC should be relocated (refuge areas can be created around infrastructure areas, which will avoid disturbing natural areas by replanting rescue plants) As it is not feasible to rescue larger trees species such as the *Olea europaea* saplings can be cultivated in these refuse areas . Avoid clearing vegetation during peak bird-nesting or animal-breeding seasons. Activity usually peaks between October and December, directly following the first seasonal rains when vegetation flushes and food becomes most abundant.*

However breeding activity is highly sensitive to rainfall. If drought conditions delay the wet season, nesting peaks may also shift. Dust suppression during construction - spray water regularly to prevent dust from coating and suffocating surrounding plants. Dust suppression requirements will vary according to season, if construction takes place during August – September when conditions are most dry and windy using standard water bowsers on unpaved surfaces near vegetation, spraying may be required 4 to 8 times per day. The frequency of dust suppression is dynamic and depends heavily on the local conditions and proximity to dust sources, constant visual monitoring will help establish requirements for dust suppression.

4. Anthropogenic Disturbances, Intentional and/or accidental killing of fauna

Anthropogenic disturbances include aspects such as, vibrations caused by machinery & vehicles. Continuous low-frequency hums from on-site substations, inverters, battery storage units and transformers can alter wildlife communication or habitat use. If placed close to roosts or tree lines, this noise can mask bat echolocation calls. Solar arrays feature smooth, hard, tilted surfaces that scatter or absorb acoustic signals. This creates "acoustic blind spots" or distorts echolocation cues, making navigation and tracking prey more difficult for bats. Birds and insects can mistake the reflective surface of solar panels for bodies of water (the "lake effect"), causing them to collide with panels. These anthropogenic disturbances also impact on the way invertebrates forage. For example; some invertebrates use vibrations caused by their prey to locate and catch them. Vibrations caused by the development will make this impossible. Smaller fauna will inevitably be killed during land clearing activities as these activities will destroy their habitat. In addition to unintentional killing of fauna, some faunal species, particularly herpetofaunal species, are often intentionally killed as they are thought to be dangerous.

Mitigation

There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. As a standard for such developments mitigation measures include recommending acoustic shielding by enclosing noisy inverters and transformers to prevent sound from disturbing sensitive wildlife as well as anti-reflective coatings are recommended to assist to reduce the lake effect, and prevent bird collisions. However as this development is adjacent to an existing CSP development these measures would only be effective if applied to the development as a whole, which is not feasible as a CSP is reflective by design. Therefore current mitigation measures employed for the CSP facility in this regard would need to be extended into the PV development.. A search and rescue can be conducted prior to clearing activities, for example animals such as tortoises should be moved out of harm's way. As negative impacts on herpetofauna often stem from a lack of awareness, proactive education can effectively mitigate these occurrences. Providing targeted conservation training to the workforce highlights the ecological importance of these species and promotes safer, more sustainable workplace practices.

5. Soil compaction, sedimentation and disruption of freshwater ecosystems

It is important to maintain good hydrological functioning within the area. Rare, episodic heavy downpours generate high-velocity sheetwash across the flat plains. The natural drainage lines capture, slow down, and channel this immense volume of water across the landscape, preventing widespread

erosion. Surface water in this region rapidly infiltrates through the drainage beds into the underlying dolomite and ironstone aquifers. This recharging mechanism is vital for maintaining the region's delicate groundwater balance, which is already heavily pressured by regional mining and agricultural pumping. Heavy machinery utilised during construction activities compacts soil, altering hydrological pathways. Solar panels act as completely impervious, angled surfaces that intercept rainfall before it hits the ground. This alters water distribution patterns. Water that cannot infiltrate the compressed soil gathers into high-velocity channels. This rapidly erodes topsoil, eroded sediment washes straight down the drainage lines into the larger system, smothering aquatic habitats miles away from the solar facility. These drainage lines comprise the aquatic network within a Freshwater Ecosystem Priority Areas (FEPA) catchment and these are legally designated to meet national biodiversity targets for river conservation. These drainage lines are also important faunal habitats and ecological corridors.

Mitigation

Enforce a strict buffer zone around all mapped⁴ drainage lines. Design and enforce a stormwater management plan for the development. Immediately reseed the site with deep-rooted, low-growing indigenous grasses. The roots function as a biological anchor that stabilizes the soil structure and facilitates water absorption.

⁴ The drainage line and wetland areas were delineated during the initial EIA process for the Redstone CSP development.

Table 7: Impact statement table

Number	Impact	Phase	Pre-Nature	Pre-Extent	Pre-Duration	Pre-Magnitude	Pre-Reversibility	Consequence	Pre-Probability	Pre-Mitigation Significance Score	Pre-Mitigation Significance	Post-Nature	Post-Extent	Post-Duration	Post-Magnitude	Post-Reversibility	Consequence2	Post-Probability	Post-mitigation Significance Score	Post-Mitigation Significance	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score	Final Significance
1	Habitat Fragmentation & loss of natural vegetation	Construction	-1	2	4	3	3	-3	4	-12	Medium to high -	-1	1	4	2	3	-2,5	3	-7,5	Medium to low -	High	2	1	1,13	-8,44	Medium to Low -
2	Alien and invasive species	Construction & Operation	-1	1	4	2	2	-2,25	3	-6,75	Medium to low -	-1	1	2	2	2	-1,75	2	-3,5	Low -	Medium	2	1	1,13	-3,94	Low -
3	Loss of species of conservation concern	Construction & Operation	-1	2	4	3	3	-3	4	-12	Medium to High -	-1	1	4	2	3	-2,75	3	-7,5	Medium to low -	High	2	1	1,13	-8,44	Medium to low -
4	Anthropogenic Disturbances, Intentional and/or accidental killing of fauna	Construction & Operation	-1	1	4	3	3	-2,75	3	-8,25	Medium to low -	-1	1	4	2	3	-2,5	3	-7,5	Medium to low -	High	1	1	1	-7,5	Medium to low -
5	Soil compaction, sedimentation and disruption of freshwater ecosystems	Construction & Operation	-1	2	4	2	2	-2,5	3	-7,5	Medium to low -	-1	1	3	2	2	-2	2	-4	Low -	Medium	1	1	1	-4	Low -

7. CONCLUSIONS & RECOMMENDATIONS

The area of the proposed development consists of mostly natural vegetation. The proposed development will have an impact on the biodiversity of the area, as there will be additional fragmentation of the habitat and the loss of additional species of conservation concern. However, this loss will not result in the loss of this resource, as they are represented in the surrounding areas. There is however increasing pressure of development within the region which then increases the effect of cumulative impacts on these species, their habitat and natural ecosystems.

Concentrating development into a single, high-density area is widely considered the most effective way to prevent habitat fragmentation. The existing Redstone CSP facility has already had an impact on the movement, distribution and occurrence of faunal species as well as the loss of floral species. It has also resulted in an edge effect impact on the area adjacent to the facility (this study area) which effectively reduces the study area's conservation value as it no longer has the same ecosystem function. While traditional edge effects deal primarily with population structures and biological communities, the edges adjacent to a Concentrated Solar Power (CSP) facility experience highly specific ecological disruptions. Because CSP facilities use vast fields mirrors (heliostats) to redirect and concentrate sunlight onto central receiver towers, they generate artificial edges characterized by severe thermal, visual, and hydrological gradients as well as disruptions to local food webs. CSP facilities generate a localized "heat island" effect that extends past the fence line into adjacent farms. The continuous operational noise from the Redstone CSP creates a persistent acoustic boundary. Ground-nesting birds (such as Korhaans and Bustards) and small fauna abandon the adjacent habitat edges because the noise prevents them from hearing the approach of predators, detecting prey or communicating alarms, this effectively shrinks the functional boundaries of the neighbouring natural habitat beyond the actual fence line of the CSP project.

As a result of this edge effect the severity of the impact rating for development immediately adjacent to the CSP is lower. Although some of these issues can be ameliorated by considering cumulative impact effects it does not always suitably compensate for the loss of ecological function inflicted by edge effects. Given these constraints, impacts to the biodiversity need to be considered in terms of the entire development and not as isolated subsequent phases.

If the initial development triggered the need for an biodiversity offset then subsequent phases need to be incorporated into the offset liability even if that phase would not trigger the need for an offset on its own. Similarly if the initial development did not trigger an offset the addition of subsequent phases should result in the project being re-assessed in its entirety (all phases) to determine if it would now be required.

The impact of this proposed development on the terrestrial biodiversity is considered to be medium-low to low and as such the development should be able to proceed as long as the mitigations measures are adhered to and that best practice measures for the operation are implemented. The planned

development will not alter the biodiversity and habitat significantly from the status quo of the surrounding area.

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APPENDIX 1

SPECIES LISTS

PLANT SPECIES CHECK LIST

Family		Ecology	IUCN	NCNCA	Forest Act
Aizoaceae	<i>Antimima lawsonii</i>	Indigenous endemic	Rare	Schedule 2	
Aizoaceae	<i>Lithops aucampiae</i>	Indigenous	LC	Schedule 2	
Amaranthaceae	<i>Salsola microtricha</i> Botsch.	Indigenous; Endemic	LC		
Amaryllidaceae	<i>Brunsvigia radulosa</i> Herb.	Indigenous	LC	Schedule 2	
Amaryllidaceae	<i>Boophone disticha</i> (L.f.) Herb.	Indigenous	LC	Schedule 2	
Amaryllidaceae	<i>Ammocharis coranica</i>	indigenous	LC	Schedule 2	
Anacampserotaceae	<i>Anacampseros filamentosa</i>	Indigenous	LC	Schedule 2	
Anacardiaceae	<i>Sersia ciliata</i> (Licht. Ex Schult.) A.J. Mill.	Indigenous	LC		
Apocynaceae	<i>Pachypodium succulentum</i>	Indigenous	V	Schedule 2	
Apocynaceae	<i>Orbea lutea</i>	Indigenous	LC	Schedule 2	
Asparagaceae	<i>Asparagus glaucus</i> Kies	Indigenous	LC		
Asphodelaceae	<i>Aloe hereroensis</i> Engl.	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Aloe grandidentata</i> Salm-Dyck	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Bulbine abyssinica</i> A. Rich	Indigenous	LC	Schedule 2	
Asphodelaceae	<i>Bulbine narcissifolia</i> Salm-Dyck	Indigenous	LC	Schedule 2	
Asteraceae	<i>Chrysocoma ciliata</i> L.	Indigenous	LC		
Asteraceae	<i>Helichrysum arenicola</i> M.D.Hend.	Indigenous	LC		
Asteraceae	<i>Euryops asparagoides</i> (Licht. ex Less.) DC.	Indigenous	LC		
Asteraceae	<i>Nolletia chrysocomoides</i> (Desf.) Cass. ex Less.	Indigenous	LC		
Asteraceae	<i>Pentzia oppositifolia</i> Magee	Indigenous endemic	Rare		
Asteraceae	<i>Tarchonanthus camphoratus</i> L.	Indigenous	LC		
Asteraceae	<i>Arctotis arctotoides</i> (L.F.) O. Hoffm	Indigenous	LC		
Asteraceae	<i>Felicia muricata</i> (Thunb) Nees	Indigenous	LC		
Asteraceae	<i>Berkheya spinosissima</i> (Thunb.) Willd	Indigenous	LC		
Asteraceae	<i>Gazania krebsiana</i> Less	Indigenous	LC		
Asteraceae	<i>Geigeria ornativa</i> O.Hoffm	Indigenous	LC		

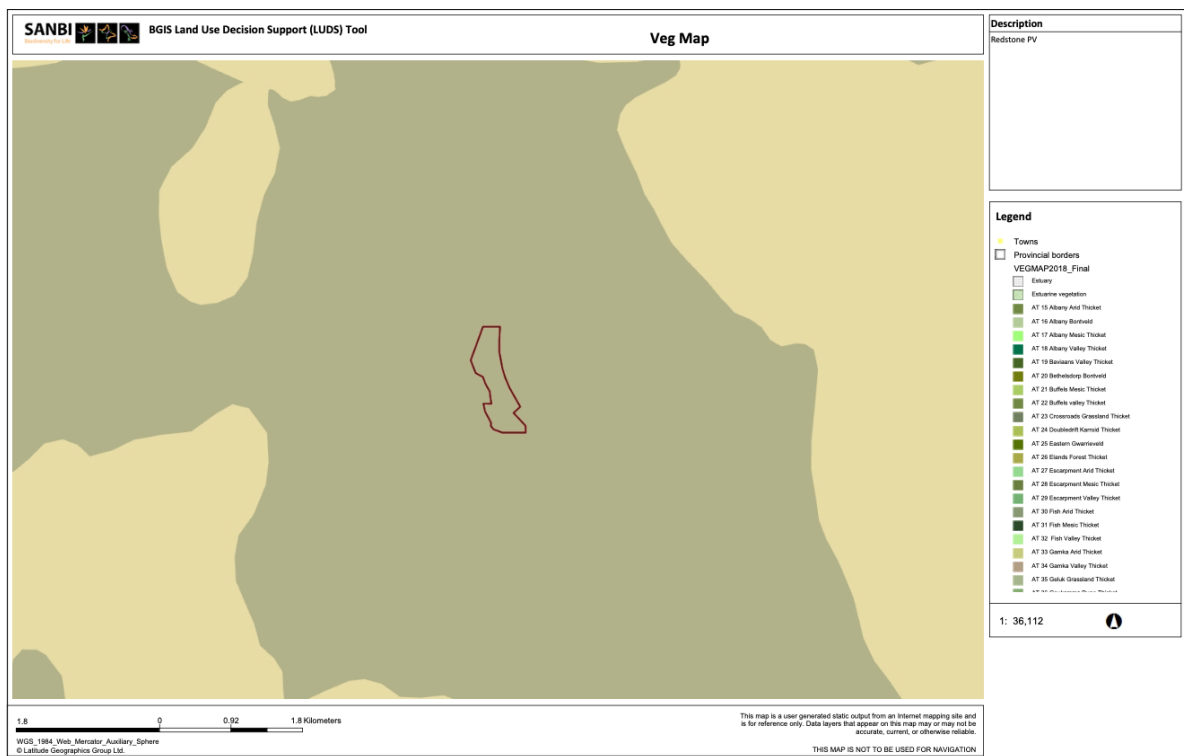
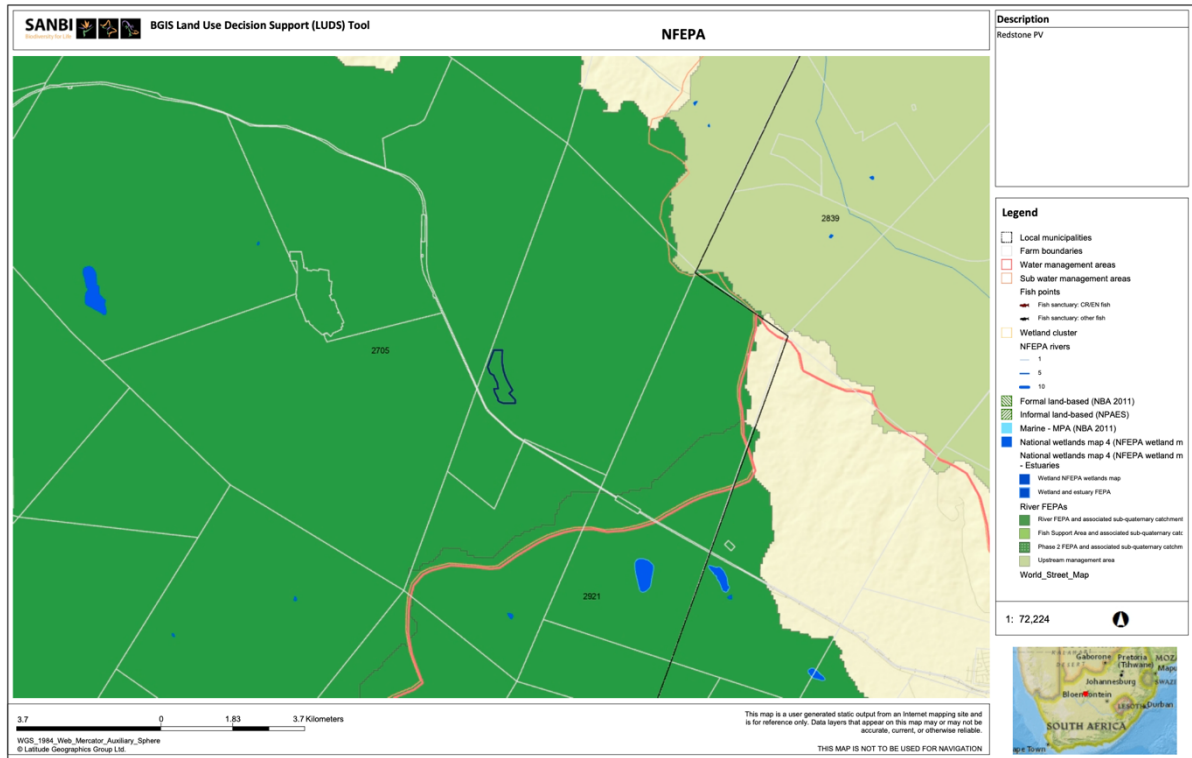
Boraginaceae	<i>Ehretia rigida</i> (Thunb.) Druce	Indigenous endemic	LC	
Brassicaceae	<i>Boscia albitrunca</i>	Indigenous	LC	Schedule 2
Brassicaceae	<i>Lepidium africanum</i> (Burm.f.) DC.	Indigenous	LC	
Brassicaceae	<i>Heliophila minima</i> (Stephens) Marais	Indigenous	LC	
Cactaceae	<i>Opuntia humifusa</i> (Raf.) Raf			
Celastraceae	<i>Gymnosporia buxifloia</i> (L.) Szyszyl.	Indigenous	LC	
Cleomaceae	<i>Cleome rubella</i> Burch.	Indigenous	LC	
Convolvulaceae	<i>Cuscuta appendiculata</i> Engelm.	Indigenous; Endemic	LC	
Crassulaceae	<i>Crassula capitella</i>	Indigenous endemic	LC	Schedule 2
Cucurbitaceae	<i>Kedrostis crassirostrata</i> Bremek.	Indigenous	LC	
Cucurbitaceae	<i>Acanthosicyos naudinianus</i> (Sond.) C.Jeffrey	Indigenous	LC	
Cyperaceae	<i>Pseudoschoenus inanis</i> (Thunb.) Oteng-Yeb.	Indigenous	LC	
Ebenaceae	<i>Diospyros lycioides</i> Desf.	Indigenous	LC	
Ebenaceae	<i>Euclea undulata</i> Thunb.	Indigenous	LC	
Euphorbiaceae	<i>Euphorbia patula</i>	Indigenous Endemic	LC	Schedule 2
Fabacea	<i>Calobota cuspidosa</i> (Burch.) Boatwr. & B.- E.van Wyk	Indigenous	LC	
Fabaceae	<i>Vachellia erioloba</i> (E.Mey.) P.J.H.Hurter	Indigenous	LC	Protected
Fabaceae	<i>Vachellia haematoxylon</i>	Indigenous	LC	Protected
Fabaceae	<i>Vachellia tortilis</i> (Forssk.) Gallaso & Banfi			
Fabaceae	<i>Pomaria burchellii</i> (DC.) B.B.Simpson & G.P.Lewis	Indigenous	LC	
Fabaceae	<i>Senegalia mellifera</i> (Vahl) Seigler & Ebinger subsp. <i>detinens</i> (Burch.) Kyal. & Boatwr.	Indigenous	LC	
Fabaceae	<i>Prosopis glandulosa</i> Torr. var. <i>glandulosa</i>			
Fabaceae	<i>Lessertia frutescens</i> (L.) Goldblatt & J.C.Manning subsp. <i>frutescens</i>	Indigenous	LC	Schedule 1
Gisekiaceae	<i>Gisekia pharnaceoides</i> L.	Indigenous	LC	
Geraniaceae	<i>Pelargonium dolomiticum</i> R. Knuth	Indigenous	LC	Schedule 1

Hyacinthaceae	<i>Albuca sp.</i>			
Hyacinthaceae	<i>Albuca prasina</i> (Ker Gawl.) J.C.Manning & Goldblatt	Indigenous		
Hyacinthaceae	<i>Drimia sanguinea</i> (Schinz) Jessop	Indigenous	NT	
Malvaceae	<i>Hermannia bryoniifolia</i> Burch.	Indigenous; Endemic	LC	
Malvaceae	<i>Melhania rehmannii</i> Szyszyl.	Indigenous	LC	
Malvaceae	<i>Hermannia pulchella</i> L.f.	Indigenous	LC	
Menispermaceae	<i>Antizoma angustifolia</i> (Burch.) Miers ex Harv.	Indigenous	LC	
Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.			
Oleaceae	<i>Olea europea</i> L. sunsp <i>cuspidata</i>	Indigenous	LC	Schedule 2
Ophioglossaceae	<i>Ophioglossum reticulatum</i> L.	Indigenous	LC	
Ophioglossaceae	<i>Ophioglossum polyphyllum</i> A.Braun	Indigenous	LC	
Orchidaceae	<i>Eulophia hereeoeensis</i>	Indigenous	LC	Schedule 2
Papaveraceae	<i>Argemone mexicana</i> L. forma <i>mexicana</i>	Naturalised		
Papaveraceae	<i>Argemone ochroleuca</i> Sweet subsp. <i>ochroleuca</i>	Naturalised		
Poaceae	<i>Digitaria eriantha</i> Steud.	Indigenous	LC	
Poaceae	<i>Eragrostis curvula</i> (Schrad.) Nees	Indigenous	LC	
Poaceae	<i>Elionurus muticus</i> (Spreng.) Kunth	Indigenous	LC	
Poaceae	<i>Centropodia glauca</i> (Nees) Cope	Indigenous	LC	
Poaceae	<i>Aristida congesta</i> Roem. & Schult.	Indigenous	LC	
Poaceae	<i>Cymbopogon pospischulii</i> (K.Schum.)EC Hubb.	Indigenous	LC	
Poaceae	<i>Fingerhuthia Africana</i> Lehm.	Indigenous	LC	
Poaceae	<i>Heteropogon contortus</i> (L.) Roem & Schult	Indigenous	LC	
Poaceae	<i>Stipagrostis ciliata</i> (Desf.) De Winter	Indigenous	LC	
Poaceae	<i>Stipagrostis hirtigluma</i> (Steud.) De Winter	Indigenous	LC	
Poaceae	<i>Themeda triandra</i> Forssk.	Indigenous	LC	

Poaceae	<i>Tricholaena monachne</i> (Trin.) Stapf & C.E.Hubb.	Indigenous	LC	
Poaceae	<i>Trichoneura grandiglumis</i> (Nees) Ekman	Indigenous	LC	
Poaceae	<i>Sporobolus nitens</i> Stent	Indigenous	LC	
Poaceae	<i>Enneapogon scoparius</i> Stapf	Indigenous	LC	
Poaceae	<i>Aristida stipitata</i> Hack.	Indigenous	LC	
Poaceae	<i>Eragrostis pseudobtusa</i> De Winter	Indigenous; Endemic	NE	
Poaceae	<i>Eragrostis lehmanniana</i>	Indigenous	LC	
Poaceae	<i>Eragrostis obtusa</i> Munro ex Ficalho & Hiern	Indigenous	LC	
Poaceae	<i>Microchloa caffra</i> Nees	Indigenous	LC	
Polygalaceae	<i>Polygala seminuda</i> Harv.	Indigenous	LC	
Rhamnaceae	<i>Ziziphus mucronata</i> Willd.	Indigenous	LC	
Ruscaceae	<i>Sansevieria aethiopica</i> Thunb.	Indigenous	LC	
Scrophulariaceae	<i>Selago mixta</i> Hilliard	Indigenous; Endemic	LC	
Scrophulariaceae	<i>Jamesbrittenia intgerrima</i>	Endemic Indigenous	LC	Schedule 2
Scrophulariaceae	<i>Apotosimum albomarginatum</i>	Indigenous	LC	
Solanaceae	<i>Lycium pilifolium</i> C.H.Wright	Indigenous	LC	
Solanaceae	<i>Lycium hirsutum</i> Dunal	Indigenous	LC	
Solanaceae	<i>Lycium arenicola</i> Miers	Indigenous	LC	
Thymelaeaceae	<i>Lasiosiphon polycephalus</i> (E.Mey. ex Meisn.) H.Pearson		LC	
Zygophyllaceae	<i>Roepera lichtensteiniana</i> (Cham.) Beier & Thulin	Indigenous		

APPENDIX 2

REGIONAL CONSERVATION PLANNING



APPENDIX 3

1.4. DETAILS OF SPECIALIST

ABRIDGED CURRICULUM VITA

NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

QUALIFICATIONS

BSc (Rhodes University) – Botany and Zoology
BSc (Hons) Wildlife Management, Pretoria University
PhD (Rhodes University)

PHD DISSERTATION

Vegetation potential of natural rangelands in the mid Fish River Valley. Towards a sustainable and acceptable management system.

RESEARCH INTERESTS

My academic interests cover various areas dealing with ecological functioning, and wildlife management, with a special interest in the functioning and management of arid and semi arid rangelands.

ACADEMIC AWARD

Awarded a medal in 2001 by the Grassland Society of Southern Africa for: Outstanding Student in Range and Forage Science

PROFESSIONAL EXPERIENCE

1999 – 2000	<u>Eastern Cape Parks Board</u>	Ecologist
2000 -2002	<u>Coastal & Environmental Services</u>	Consultant
2003 – present	<u>Ecological Management Services</u>	Owner/Consultant

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. Although we are based in Kimberley we cover most of South Africa and have projects in the Eastern Cape, Free State, North West Province, Northern Cape and Gauteng. We have undertaken impact assessments for various types of developments including urban and rural developments, agricultural developments, as well as

developments within the mining sector. We also provide specialist input to various types of projects and have formulated biodiversity offset studies required to offset impacts from large developments.

A selection of recent work is as follows:

- ☐ Department of Agriculture Northern Cape—Hopetown Piggery
- ☐ Department of Agriculture Northern Cape—Phillipstown Piggery
- ☐ Department of Agriculture Northern Cape—Chikiana Piggery
- ☐ Department of Agriculture Northern Cape—De Aar Hydroponics
- ☐ Sidi Parani—Fertilizer granulation plant in Christiana
- ☐ Tiva Enviro Services - Biodiversity study for De Aar Hospital
- ☐ Ghaap Ostrich Abattoir—Biodiversity Study
- ☐ Amakhala Nature Reserve—Development of lodge facilities
- ☐ IG van der Merwe Trust—Residential development, Douglas
- ☐ Valrena Trust—Residential development along Vaal River
- ☐ Idstone Pty Ltd—Development of irrigation ground for seed potatoes production
- ☐ Tiaan Trust—Development of irrigation ground
- ☐ C F Scholtz & Seuns - Development of irrigation ground for growing of crops
- ☐ Kosie Smith Trust - Development of irrigation ground for growing seed potatoes
- ☐ Bakgat Trust—Development of irrigation ground for growing of crops
- ☐ Mount Carmel (pty) Ltd—Development of irrigation ground for growing of crops
- ☐ Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production
- ☐ Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops
- ☐ Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production
- ☐ Valrena Trust—Development of irrigation ground for growing of crops
- ☐ Middledrift Dairy Trust—Establishment of Dairy
- ☐ Eliweni Wildlife (Pty) Ltd - Lodge Development on Amakhala Nature Reserve
- ☐ Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes
- ☐ Trisa Trust—Development of irrigation ground for the growing of seed potatoes
- ☐ GWK Pty Ltd—Development of irrigation pivots and vineyards
- ☐ Blair Athol Golf course development
- ☐ Rolfontein Nature Reserve lodge development
- ☐ SLR—Ecological Specialist survey for Kudumane Mine
- ☐ Biodiversity offset plan—UMK mine
- ☐ Biodiversity Action Plan for UMK mine
- ☐ Biodiversity offset Kudumane Mine
- ☐ IDC—Ecological Management & Business Plan: Siyancuma Women in Game Initiative
- ☐ Swanvest 123 Pty Ltd—Wolverfontein Breeding Facility
- ☐ De Beers—Ecological Evaluation and Management Plan for Kleinsee Game Farm
- ☐ Kalahari Oryx Game Reserve—Risk Assessment introduction of Lion
- ☐ Department of Land Affairs—Ecological Management and Business plan for Thwane Commonage
- ☐ Mauricedale Game Ranch—Paardefontein Specialist Vegetation Survey
- ☐ Santrosa Investments Pty Ltd—Olie Rivier Game Farm HA
- ☐ Manzi Safaris Habitat Assessment
- ☐ Thuru Lodge—Risk Assessment & Habitat Analysis
- ☐ Dugmore brothers—Habitat assessment Hartebeesthoek
- ☐ Schutte Boerdery Trust—Habitat Assessment Glenfrere
- ☐ F G. Taljaard—Habitat Assessment Namakwari Game Reserve
- ☐ Rivierfront Wild - Doornfontein Habitat Assessment
- ☐ Sijbbolet Trust—Hartsvally Habitat Assessment
- ☐ Raltefontein Habitat Assessment
- ☐ Kalahari Oryx Game Reserve—Specialist Vegetation survey

PROFESSIONAL ASSOCIATIONS

Grassland Society of Southern Africa

South African Council for Natural scientific Professions Registration number 400117/05

RESEARCH PUBLICATIONS

Evans, N.V., Avis, A.M. and Palmer, A.R. 1997. Changes to the vegetation of the mid-Fish River valley, Eastern Cape South Africa, in response to land-use, as revealed by a direct gradient analysis. *African Journal of Range & Forage science*, **14**(2): 68-74.

Birch N.V., Avis, A.M. and Palmer, A.R. (1999) The Effect Of Land-Use On The Vegetation Communities Along A Topo-Moisture Gradient In The Mid-Fish River Valley, South Africa. *African Journal of Range & Forage science*, **16**(1): 1-8

Birch, N.V., Avis, A.M. and Palmer, A.R. 1999. Changes to the vegetation communities of natural rangelands in response to land-use in the mid-Fish River valley, South Africa. *People and Rangelands Building the Future* (Eds D. Eldridge & D. Freudenberger) pp.319-320 vol 1. Proceeding of the VI International Rangeland Congress, Townsville, Queensland, Australia

APPENDIX 4

1.5. IMPACT ASSESSMENT METHODOLOGY

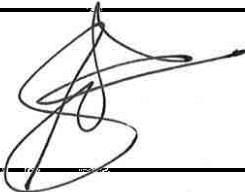
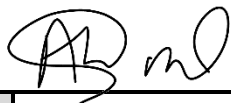
TITLE:

ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE



EIMS

ENVIRONMENTAL
IMPACT
MANAGEMENT
SERVICES

REV:	03	AUTHOR		APPROVED	
EFFECTIVE DATE:	NAME:	L. WHITLOW	NAME:	A. SMITH	
	DATE:	19 January 2026	DATE:	19 January 2026	
	SIGN:		SIGN:		
COPY / STATUS No:		MASTER COPY		DOCUMENT No:	PRO 106

TITLE:	ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE	DOC No:	PRO 106	REV:	03	Page 2 of 8
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1. Purpose

The purpose of this procedure is to guide the undertaking of an impact and risk assessment process, as required under the regulations promulgated under the National Environmental Management Act (Act 107 of 1998 - NEMA).

2. Scope

This procedure provides the methodology to be applied to environmental impacts and risks identified during the Environmental Impact Assessment Process. The methodology ensures that consistent impact assessment rating is carried out that is legally compliant and aligned with EIMS's objective of providing a quality service.

3. References

GNR. 982 National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment Regulations, 2014 – hereafter referred to as the Regulations.

4. Additional Guidelines and References

Guidelines and Reference Docs (not exhaustive – please verify with the applicable competent authority).	
Compulsory Compliance: GNR. 982 National Environmental Management Act (Act No. 107 of 1998 - NEMA): Environmental Impact Assessment Regulations, 2014.	National
Companion Guideline for Implementation: Environmental Management Assessment Regulations, 2010 - GN 805/2012 (NEMA)	National
DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria	National

5. Definitions and Abbreviations

Refer to Chapter 1 of the Regulations.

6. Procedure

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The approach may be altered or substituted on a case by case basis if the specific aspect being assessed requires such- such instances require prior EIMS Project Manager approval. The broad approach to the significance rating methodology is to determine the significance (S) of an environmental risk or impact by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relating this to the probability/ likelihood (P) of the impact occurring. The S is determined for the pre- and post-mitigation scenario. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the S to determine the overall final significance rating (FS). The impact assessment will be applied to all identified alternatives.

a. Determination of Significance

The final significance (FS) of an impact or risk is determined by applying a prioritisation factor (PF) to the post-mitigation environmental significance. The significance is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E + D + M + R) * N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 1 below.

TITLE:	ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE	DOC No:	PRO 106	REV:	03	Page 3 of 8
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Table 1: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. Highly localised, limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property or site boundary, or the area within a few hundred meters of the site)
	3	Local (i.e. beyond the site boundary within the Local administrative boundary (e.g. Local Municipality) or within consistent local geographical features, or the area within 5 km of the site)
	4	Regional (i.e. Far beyond the site boundary, beyond the Local administrative boundaries within the Regional administrative boundaries (e.g. District Municipality), or extends into different distinct geographical features, or extends between 5 and 50 km from the site).
	5	Provincial / National / International (i.e. extends into numerous distinct geographical features, or extends beyond 50 km from the site).
Duration	1	Immediate (<1 year, quickly reversible)
	2	Short term (1-5 years, less than project lifespan)
	3	Medium term (6-15 years)
	4	Long term (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction/ operation/ decommissioning).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected, or affected environmental components are already degraded)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; moderate improvement for +ve impacts; or where change affects area of potential conservation or other value, or use of resources).
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease; high improvement for +ve impacts; or where change affects high conservation value areas or species of conservation concern)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts; or disturbance to pristine areas of critical conservation value or critically endangered species)
Reversibility	1	Impact is reversible without any time and cost.

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	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring very high time and cost.
	5	Irreversible Impact.

INTERNAL NOTE: It is noted that whilst all reasonable attempts must be made to obtain quantitative and objective data to inform this assessment, the pre-emptive and predictive nature of an EIA often relies of application of best available information to inform a subjective determination. The significance assessment is therefore inherently a quantitative representation of a qualitative assessment. There will always be uncertainty in the assessment and the level of uncertainty must be clearly cited. Where gaps or uncertainties cannot reasonably be addressed through primary data collection, then caution is applied to the impact assessment process (i.e. the rating or ranking of risk/impact) and ultimate identification of mitigation and management measures (i.e. use cautious ratings and apply more stringent mitigation in instances where primary data is lacking).

Once the C has been determined, the significance is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 2.

It is noted that both environmental risks as well as environmental impacts should be identified and assessed. Environmental Risk can be regarded as the potential for something harmful to happen to the environment, and in many instances is not regarded as something that is expected to occur during normal operations or events (e.g. unplanned fuel or oil spills at a construction site). Probability and likelihood are key determinants or variables of environmental risk. Environmental Impact can be regarded as the actual effect or change that happens to the environment because of an activity and is typically an effect that is expected from normal operations or events (e.g. vegetation clearance from site development results in loss of species of concern). Typically the probability of an unmitigated environmental impact is regarded as highly likely or certain (management and mitigation measures would ideally aim to reduce this likelihood where possible). In summary, environmental risk is about what could happen, while environmental impact is about what does happen.

Table 2: Probability/ Likelihood Scoring

Probability	1	Improbable (Rare, the event may occur only in exceptional circumstances, the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <5% chance).
	2	Low probability (Unlikely, impact could occur but not realistically expected; >5% and <20% chance).
	3	Medium probability (Possible, the impact may occur; >20% and <50% chance).
	4	High probability (Likely, it is most probable that the impact will occur- > 50 and <90% chance).
	5	Definite (Almost certain, the impact is expected to, or will, occur, >90% chance).

The result is a qualitative representation of relative significance associated with the impact. Significance is therefore calculated as follows:

$$S = C \times P$$

Table 3: Determination of Significance

Cons	5- Very High ¹	5	10	15	20	25
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¹ In the event that an impact or risk has very high or catastrophic consequences, but the likelihood/ probability is low, then the resultant significance would be Low-medium. This does in certain instances detract from the relative important of this impact or risk and must consequently be flagged for further specific consideration, management, mitigation, or contingency planning.

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	4- High	4	8	12	16	20
	3- Medium	3	6	9	12	15
	2- Low	2	4	6	8	10
	1- Very low	1	2	3	4	5
		1- Improbable	2- Low	3- Medium/ Possible	4- High/ Probable	5- Highly likely/ Definite
	Probability					

The outcome of the significance assessment will result in a range of scores, ranging from 1 through to 25. These significance scores are then grouped into respective classes as described in Table 4.

Table 4: Significance Scores

S Score	Description
≤4.25	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
>4.25, ≤8.5	Low-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>8.5, ≤13.75	High-Medium (i.e. where the impact could have a significant environmental risk/ reward).
>13.75	High (i.e. where the impact will have a significant environmental risk/ reward).

The impact significance will be determined for each impact without relevant management and mitigation measures (pre-mitigation significance), as well as post implementation of relevant management and mitigation measures (post-mitigation significance). This allows for a prediction in the degree to which the impact can be managed/mitigated.

b. Impact Prioritization

Further to the assessment criteria presented in the section above, it is necessary to consider each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impacts' post-mitigation significance (post-mitigation). This prioritisation factor does not aim to detract from the significance ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the post-mitigation significance based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.

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	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$\text{Priority} = CI + LR$$

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to Table 6).

Table 6: Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	1.5

In order to determine the final impact significance (FS), the PF is multiplied by the post-mitigation significance scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a higher significance).

Table 7: Final Environmental Significance Rating

Significance Rating	Description
<-25	Very High (Impacts in this class are extremely significant and pose a very high environmental risk. In certain instances these may represent a fatal flaw. They are likely to have a major influence on the decision and may be difficult or impossible to mitigate. Offset's may be necessary.
<-13.75 to -25	High negative (These impacts are significant and must be carefully considered in the decision-making process. They have a high environmental risk or impact and require extensive mitigation measures).
-8.5 to -13.75	Medium-High negative (i.e. Impacts in this class are more substantial and could have a significant environmental risk. They may influence the decision to develop in the area and require more robust mitigation measures).

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Significance Rating	Description
<-4.25 to <-8.5	Medium- Low negative (i.e. These impacts are slightly more significant than low impacts but still do not pose a major environmental risk. They might require some mitigation measures but are generally manageable).
-1 to -4.25	Low negative (i.e. Impacts in this class are minor and unlikely to have a significant environmental risk. They do not influence the decision to develop in the area and are typically easily mitigated.
0	No impact
1 to 4.25	Low positive
>4.25 to <8.5	Medium-Low positive
8.5 to 13.75	Medium-High positive
>13.75	High positive

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

7. Responsibilities

It is the responsibility of each EIMS employee, and each external Specialist appointed by EIMS to ensure that this procedure is carried out as described. All the personnel within the organization have the responsibility to report any deviations/changes from the procedures to management. This is to ensure that the necessary changes are documented after approval.

It is the responsibility of the consultant (as applicable) assigned with the task of report compilation to ensure that this methodology/ procedure is strictly applied. It is the responsibility of the assigned Consultant or Quality Reviewer to review and verify that the procedure has been complied with, and such documented at the specified quality check intervals.

8. Records

RECORD	STORAGE LOCATION	STORAGE SYSTEM	RESPONSIBLE PERSON	RETENTION PERIOD
Significance Rating Input Spreadsheet	Project File - /Server/assignments/ Job#/Records	Electronic- Scanned PDF	Project Manager	10 Years

9. Record of Changes, Revisions and Cancellations

RECORD OF CHANGES, REVISIONS AND CANCELLATIONS		
DATE	NATURE / DETAIL OF CHANGE	REV No.
3/12/2024	Update impact criteria descriptions.	01
29/01/2025	Corrections to Significance class numbering	02

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19/01/2026	Add Note re dealing with Uncertainty	03
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