Terrestrial Biodiversity Assessment

prepared in accordance with the
"*Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Biodiversity*"

Electrical Grid Infrastructure for the Great Karoo Cluster of Renewable Energy Facilities near Richmond, Northern Cape Province

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Terrestrial Biodiversity Assessment for the proposed Electrical Grid Infrastructure for the Great Karoo Cluster of Renewable Energy Facilities near Richmond, Northern Cape Province.

Location:
Ubuntu Local Municipality within the Pixley Ka Seme District Municipality

for

Great Karoo Renewable Energy (Pty) Ltd.

17 May 2022

Report version: 1st Draft

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SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species, terrestrial plant species and terrestrial biodiversity", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation	Signature
Dr David Hoare	• PhD Botany • Pr.Sci.Nat. 400221/05 (Ecological Science, Botanical Science)	 Date: 17/05/2022

Details of Author:
Dr David Hoare

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation and general ecology (grasslands, savanna, Albany thicket, fynbos, coastal systems, wetlands).
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Professional Natural Scientist, South African Council for Natural Scientific Professions, Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history

- 1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
- 1January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
- 1January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
- 1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Declaration of independence:

David Hoare Consulting (Pty) Ltd in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

David Hoare Consulting (Pty) Ltd undertake to disclose, to the competent authority, any material information that has 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 National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.

_____ 17 May 2022

Dr David Hoare Date

TERMS OF REFERENCE

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1. An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "**very high sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.

1.2. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being "**low sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.

1.3. However, where the information gathered from the site sensitivity verification differs from the designation of "very high" terrestrial biodiversity sensitivity on the screening tool and it is found to be of a "low" sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

1.4. Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a "low" terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.

1.5. If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint, ***excluding linear activities*** *for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase*, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any are that will be disturbed.

Terrestrial Biodiversity Specialist Assessment

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.

2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:

2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;

2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;

2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;

2.3.4. the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;

2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including:

(a) main vegetation types;

(b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;

(c) ecologicalconnectivity,habitatfragmentation,ecologicalprocessesandfine- scale habitats; and

(d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;

2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and

2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:

2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:

(a) the reasons why an area has been identified as a CBA;

(b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;

(c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);

(d) the impact on ecosystem threat status;

(e) the impact on explicit subtypes in the vegetation;

(f) the impact on overall species and ecosystem diversity of the site; and

(g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;

2.3.7.2. terrestrial ecological support areas (ESAs), including:

(a) the impact on the ecological processes that operate within or across the site;

(b) the extent the proposed development will impact on the functionality of the ESA; and

(c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;

2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-

(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;

2.3.7.4. priority areas for protected area expansion, including-

(a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;

2.3.7.5. SWSAsincluding:

(a) the impact(s) on the terrestrial habitat of a SWSA; and

(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);

2.3.7.6. FEPAsubcatchments,including-

(a) theimpactsoftheproposeddevelopmentonhabitatconditionand species in the FEPA sub catchment;

2.3.7.7 indigenous forests, including:

(a) impact on the ecological integrity of the forest; and

(b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.

2.4. The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.

Terrestrial Biodiversity Specialist Assessment Report

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
3.1.2. a signed statement of independence by the specialist;
3.1.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;
3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;
3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);
3.1.7. additional environmental impacts expected from the proposed development;
3.1.8. any direct, indirect and cumulative impacts of the proposed development;
3.1.9. the degree to which impacts and risks can be mitigated;
3.1.10. the degree to which the impacts and risks can be reversed;
3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;
3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);
3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate;
3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and
3.1.15. any conditions to which this statement is subjected.

3.2.The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.

3.3. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

LIMITATIONS, ASSUMPTIONS & UNCERTAINTIES

The following assumptions, limitations, uncertainties are listed regarding the terrestrial biodiversity assessment of the study site:

- All fieldwork undertaken for this project was within the entire collection of farms within which the cluster of renewable energy projects is situated. The proposed grid layout was only provided during the EIA process; therefore the grid footprint area was not specifically assessed in the field, although it did intersect significantly with the assessed areas.

ACRONYMS

AIS	Alien and Invasive species
CBA	Critical Biodiversity Area
CBD	Convention on Biodiversity
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
BA	Basic Assessment
ESA	Ecological Support Area
IUCN	International Union for the Conservation of Nature
I&APs	Interested and Affected Parties
GIS	Geographical Information System
NC	Northern Cape province
NEMA	National Environmental Management Act
NEM:BA	National Environmental Management: Biodiversity Act
NCNCA	Northern Cape Nature Conservation Act
NPAES	National Protected Area Expansion Strategy
ONA	Other Natural Areas
PA	Protected Area
REDZ	Renewable Energy Development Zone
SCC	Species of conservation concern
SEA	Strategic Environmental Assessment
SANBI	South African National Biodiversity Institute
ToPS	Threatened and Protected Species
ToR	Terms of Reference
WEF	Wind Energy Facility

ABBREVIATIONS

%	Percentage
MW	Megawatt
kV	Kilovolt
cm	Centimetres
m	Metres
km	Kilometres

GLOSSARY

Definitions	
Alternative	Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.
Category 1a Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. Landowners are obliged to take immediate steps to control Category 1a species.
Category 1b Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled or 'contained'. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. However, where an Invasive Species Management Programme has been developed for a Category 1b species, then landowners are obliged to "control" the species in accordance with the requirements of that programme.
Category 2 Listed Invasive Species	Species which require a permit to carry out a restricted activity e.g. cultivation within an area specified in the Notice or an area specified in the permit, as the case may be. Category 2 includes plant species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasiveness. It is important to note that a Category 2 species that falls outside the demarcated area specified in the permit, becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species.
Category 3 Listed Invasive Species	A species 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. Category 3 species are less-transforming invasive species which are regulated by activity. The principal focus with these species is to ensure that they are not introduced, sold or transported. However, Category 3 plant species are automatically Category 1b species within riparian and wetland areas.
Connectivity	The spatial continuity of a habitat or land cover type across a landscape.
Corridor	A relatively narrow strip of a particular type that differs from the areas adjacent on both sides.
Edge	The portion of an ecosystem or cover type near its perimeter, and within which environmental conditions may differ from interior locations in the ecosystem.
Exempted Alien Species	An alien species that is not regulated in terms of this statutory framework - as defined in Notice 2 of the AIS List.
Fragmentation	The breaking up of a habitat or cover type into smaller, disconnected parcels, often associated with, but not equivalent to, habitat loss.
Prohibited Alien Species	An alien species listed by notice by the Minister, in respect of which a permit may not be issued as contemplated in section 67(1) of the act. These species are contained in Notice 4 of the AIS List, which is referred to as the List of Prohibited Alien Species.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
"No-Go" option	The "no-go" development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area.
Patch	A surface area that differs from its surroundings in nature or appearance.
Rehabilitation	Less than full restoration of an ecosystem to its predisturbance condition.
Restoration	To return a site to an approximation of its condition before alteration.
Riparian	The land adjacent to a river or stream that is, at least periodically, influenced by flooding.
Runoff	Non-channelized surface water flow.

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INTRODUCTION

Background

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a cluster of renewable energy projects and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province. The electrical grid infrastructure assessed here links the entire cluster of renewable energy projects to the Eskom Gamma Substation (Figure 1).

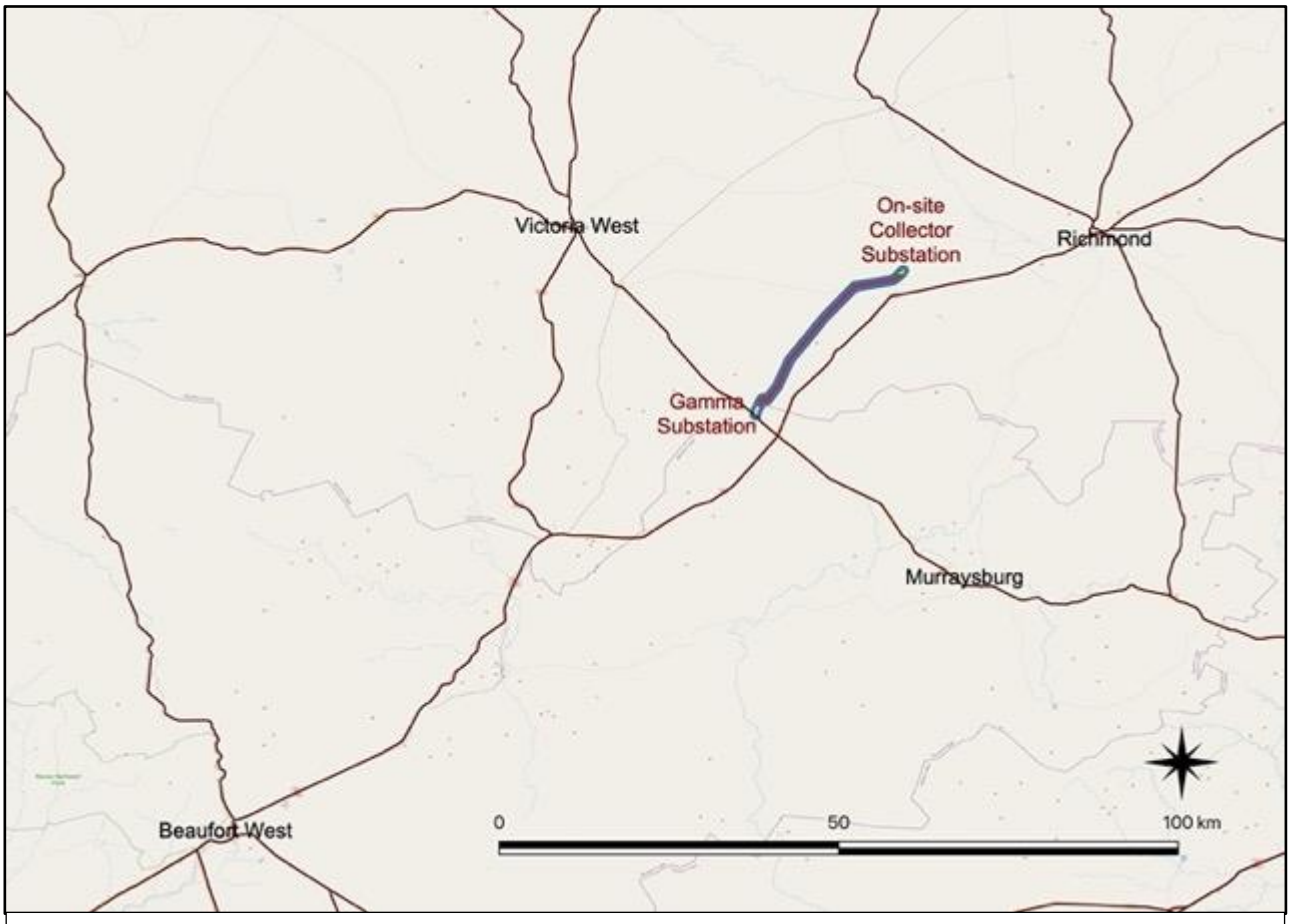

Figure 1**: Location of the proposed electrical grid infrastructure.**

APPROACH & METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Approach

The general study commenced as a desktop-study followed by site-specific field surveys on 25th – 27th April 2016, 11th October 2020, 4th - 6th December 2020, and 30th - 31st July 2021.

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made. Digital photographs were taken of features and habitats on site, as well as of all plant species that were seen. All plant species recorded were uploaded to the iNaturalist website.

Aerial imagery from Google Earth was used to identify and map habitats on site. Patterns identified from satellite imagery were verified on the ground. During the field survey, a checklist of plant species was compiled as well as an estimate of cover/abundance. From this vegetation survey, as well as *ad hoc* observations on site, a checklist of plant species occurring on site was compiled. Digital photographs were taken at locations where features of interest were observed.

Field surveys

The study area was visited and assessed to confirm patterns identified from the desktop assessment. Site-specific field surveys were conductecd on 25th – 27th April 2016, 11th October 2020, 4th - 6th December 2020, and 30th - 31st July 2021.

Specific features of potential concern were investigated in the field, including the following:

- General vegetation status, i.e. whether the vegetation was natural, disturbed/secondary or transformed;
- Presence of habitats of conservation concern in terms of high biodiversity, presence of SCC, specific sensitivities, e.g. wetlands, and any other factors that would indicate an elevated biodiversity or functional value that could not be determined from the desktop assessment;
- Presence of protected trees; and
- Potential presence of SCC, including observation of individual plants found on site or habitats that are suitable for any of the species identified from the desktop assessment.

Key parts of the development site were visited during the site visit in such a way as to ensure all major variation within the study area of the renewable energy cluster was covered and that any unusual habitats or features were observed. A checklist of species occurring on site was collected during the surveys (Appendix 3, highlighted in green). Plant names follow Germishuizen *et al*. (2005). The season of the survey was favourable, and it there is moderate confidence that many of species present on site were identifiable at the time of the survey, the main limitation being the persistent drought on site over a period of a number of years. The survey was of adequate duration and intensity to characterise the flora of the development site as per the regulations.

Sources of information

Vegetation

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org).

- The conservation status of the vegetation types were obtained from Mucina and Rutherford (2006) and the National List of Ecosystems that re Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).

Regional plans

- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on http://bgis.sanbi.org).).
- The Northern Cape Biodiversity Area Maps were consulted for inclusion of the site into a Critical Biodiversity Area or Ecological Support Area (biodiversityadvisor.sanbi.org).

Habitat sensitivity

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area was derived by compiling a landcover data layer for the study area (*sensu* Fairbanks *et al*., 2000) using available satellite imagery and aerial photography. From this, it can be seen which areas are transformed versus those that are still in a natural status.
2. Various provincial, regional or national level conservation planning studies have been undertaken in the area, e.g. the National Spatial Biodiversity Assessment (NSBA). The mapped results from these were taken into consideration in compiling the habitat sensitivity map.
3. Habitats in which various species of plants or animals occur that may be protected or are considered to have high conservation status are considered to be sensitive.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation of conservation concern, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 2: Explanation of sensitivity ratings.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
VERY HIGH	Indigenous natural areas that are highly positive for any of the following: • presence of threatened species (Critically Endangered, Endangered, Vulnerable) and/or habitat critical for the survival of populations of threatened species. • High conservation status (low proportion remaining intact, highly fragmented, habitat for species that are at risk). • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act) And may also be positive for the following: • High intrinsic biodiversity value (high species richness and/or turnover, unique ecosystems) • High value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value)	• CBA 1 areas. • Remaining areas of vegetation type listed in Draft Ecosystem List of NEM:BA as Critically Endangered, Endangered or Vulnerable. • Protected forest patches. • Confirmed presence of populations of threatened species.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
	• Low ability to respond to disturbance (low resilience, dominant species very old).	
HIGH	Indigenous natural areas that are positive for any of the following: • High intrinsic biodiversity value (moderate/high species richness and/or turnover). • presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age). • Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). • Moderate to high value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value). And may also be positive for the following: • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act)	• CBA 2 "critical biodiversity areas". • Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records). • Confirmed habitat for species of lower threat status (near threatened, rare). • Habitat containing individuals of extreme age. • Habitat with low ability to recover from disturbance. • Habitat with exceptionally high diversity (richness or turnover). • Habitat with unique species composition and narrow distribution. • Ecosystem providing high value ecosystem goods and services.
MEDIUM-HIGH	Indigenous natural areas that are positive for one or two of the factors listed above, but not a combination of factors.	• CBA 2 "corridor areas". • Habitat with high diversity (richness or turnover). • Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).
MEDIUM	Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional.	• Natural habitat with no specific sensitivities.
MEDIUM-LOW	Degraded or disturbed indigenous natural vegetation.	• Highly degraded areas or highly disturbed areas in which the original species composition has been lost.
LOW	No natural habitat remaining.	• Transformed areas.

Any natural vegetation within which there are features of conservation concern will be classified into one of the high sensitivity classes (MEDIUM-HIGH, HIGH or VERY HIGH). The difference between these three high classes is based on a combination of factors and can be summarised as follows:

1. Areas classified into the VERY HIGH class are vital for the survival of species or ecosystems. They are either known sites for threatened species or are ecosystems that have been identified as being remaining areas of vegetation of critical conservation importance. CBA1 areas would qualify for inclusion into this class.
2. Areas classified into the HIGH class are of high biodiversity value, but do not necessarily contain features that would put them into the VERY HIGH class. For example, a site that is known to contain a population of a threatened species would be in the VERY HIGH class, but a site where a threatened species could potentially occur (habitat is suitable), but it is not known whether it does occur there or not, is classified into the HIGH sensitivity class. The class also includes any areas that are not specifically identified as having high conservation status, but have high local species richness, unique species composition, low resilience or provide very important ecosystem goods and services. CBA2 "irreplaceable biodiversity areas" would qualify for inclusion into this class, if there were no other factors that would put them into the highest class.
3. Areas classified into the MEDIUM-HIGH sensitivity class are natural vegetation in which there are one or two features that make them of biodiversity value, but not to the extent that they would be classified into one of the other two higher categories. CBA2 "corridor areas" would qualify for inclusion into this class.

Impact assessment methodology

Direct, indirect and cumulative impacts associated with the projects were assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment
    - 2 is minor and will not result in an impact on processes
    - 4 is low and will cause a slight impact on processes
    - 6 is moderate and will result in processes continuing but in a modified way
    - 8 is high (processes are altered to the extent that they temporarily cease)
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where
    - 1 is very improbable (probably will not happen),
    - 2 is improbable (some possibility, but low likelihood),
    - 3 is probable (distinct possibility),
    - 4 is highly probable (most likely) and
    - 5 is definite (impact will occur regardless of any prevention measures).
- the significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the status, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$$S=(E+D+M)P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

Convention on Biodiversity (CBD)

South Africa became a signatory to the United Nations Convention on Biological Diversity (CBD) in 1993, which was ratified in 1995. The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. According to Article 14 (a) of the CBD, each Contracting Party, as far as possible and as appropriate, must introduce appropriate procedures, such as environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity, to avoid or minimize these effects and, where appropriate, to allow for public participation in such procedures.

National Environmental Management Act, Act No. 107 of 1998 (NEMA)

NEMA is the framework environmental management legislation, enacted as part of the government's mandate to ensure every person's constitutional right to an environment that is not harmful to his or her health or wellbeing. It is administered by DEA but several functions have been delegated to the provincial environment departments. One of the purposes of NEMA is to provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment. The Act further aims to provide for institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for the administration and enforcement of other environmental management laws.

NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable",
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ,
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

This report considers the Environmental Impact Assessment (EIA) Regulations of 2014 (NEMA, 2014) as amended in 2017 (NEMA, 2017), under the National Environmental Management Act, (Act No. 107 of 1998). According to these Regulations under Listing Notice 1 (GRN No. 327), Listing Notice 2 (GRN No 325) and Listing Notice 3 (GRN No 324), the activities listed are identified as activities that may require Environmental Authorisation prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of the Act.

National Environmental Management: Biodiversity Act (Act No 10 of 2004)

As the principal national act regulating biodiversity protection, NEM:BA, which is administered by DEA, is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. The term biodiversity according to the Convention on Biodiversity (CBD) refers to the variability among living organisms from all sources including, inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity in genes, species and ecosystems.

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species".

Alien and Invasive Species

Chapter 5 of NEM:BA relates to species and organisms posing a potential threat to biodiversity. The Act defines alien species and provides lists of invasive species in regulations. The Alien and Invasive Species (AIS) Regulations, in terms of Section 97(1) of NEM:BA, was published in Government Notice R598 in Government Gazette 37885 in 2014 (NEM:BA, 2014). The Alien and Invasive Species (AIS) lists were subsequently published in Government Notice R 864 of 29 July 2016 (NEM:BA, 2016).

According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

The National Environmental Management: Biodiversity Act (NEMBA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

a) to prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "Restricted activities involving alien species":

1) A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7. Restricted activities include the following:
    a. Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
    b. Having in possession or exercising physical control over any specimen of a listed invasive species.
    c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
    d. Conveying, moving or otherwise translocating any specimen of a listed invasive species.
    e. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
    f. Spreading or allowing the spread of any specimen of a listed invasive species.
    g. Releasing any specimen of a listed invasive species.
    h. Additional activities that apply to aquatic species.

2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.
3)

An "**alien species**" is defined in the Act as:

a) a species that is not an indigenous species; or
b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by means of migration or dispersal without human intervention.

According to Section 71 of the Act, "Restricted activities involving listed invasive species":

1) A person may not carry out a restricted activity involving a specimen of a listed invasive species without a permit issued in terms of Chapter 7.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**invasive species**" is defined in the Act as any species whose establishment and spread outside of its natural distribution range:

a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and
b) may result in economic or environmental harm or harm to human health.

A "**listed invasive species**" is defined in the Act as any invasive species listed in terms of section 70(1).

According to Section 73 of the Act, "Duty of care relating to listed invasive species":

2) A person who is the owner of land on which a listed invasive species occurs must-
    a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
    b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
    c) take all the required steps to prevent or minimize harm to biodiversity.

According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

Government Notice No. 1002 of 2011: National List of Ecosystems that are Threatened and in need of protection

Published under Section 52(1)(a) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). This Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

The EIA Regulations (2014, as amended) include three lists of activities that require environmental authorisation:

- Listing Notice 1: activities that require a basic assessment (GNR. 327 of 2014, as amended),
- Listing Notice 2: activities that require a full environmental impact assessment report (EIR) (GNR. 325 of 2014, as amended),
- Listing Notice 3: activities that require a basic assessment in specific identified geographical areas only (GNR. 324 of 2014, as amended).

The proposed WEF is located partially within the Komsberg Renewable Energy Development Zone (REDZ 2), one of the eight REDZ formally gazetted[1] in South Africa indicating the procedure to be followed in applying for environmental authorisation (EA) for large scale solar and wind energy generation facilities. Considering that a portion of the proposed facility is located outside of the Komsberg REDZ, the Rondekop WEF will be subject to a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended and EIA Regulations, 2014 (as amended).

The full list of trigger activities has been included in the application form and will be assessed and discussed in the Ecology Impact Assessment Report.

GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List
Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List
Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy
Published under the National Environmental Management Act (Act No. 107 of 1998). The aim of the Policy is to ensure that significant residual impacts of developments are remedied as required by NEMA, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the Mitigation Sequence has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact. The Policy specifies that one impact that has come across consistently as unmitigatable is the rapid and consistent transformation of certain ecosystems and vegetation types, leading to the loss of ecosystems and extinction of species. The Policy specifically targets ecosystems where the ability to reach protected area targets is lost or close to being lost. However, the Policy states that "*[w]here ecosystems remain largely untransformed, intact and functional, an offset would not be required for developments that lead to transformation, provided they have not been identified as a biodiversity priority*". Biodivesity offsets should be considered to remedy residual negative impacts on biodiversity of 'medium' to 'high' significance. Residual impacts of 'very high' significance are a fatal flaw for development and residual biodiversity impacts of 'low' significance would usually not require offsets. The Policy indicates that impacts should preferably be avoided in protected areas, CBAs, verified wetland and river features and areas earmarked for protected area expansion.

National Forests Act (Act no 84 of 1998)

Protected trees
According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

Forests
Prohibits the destruction of indigenous trees in any natural forest without a licence.

National Water Act (Act 36 of 1998)

Wetlands, riparian zones and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (Act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;

[1] Formally gazetted on 16 February 2018 (government notice 114).

- A wetland, lake or dam into which, or from which, water flows; and

Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

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

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

Northern Cape Nature Conservation Act, No. 9 of 2009

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:

- Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;
- Aquatic habitats may not be destroyed or damaged;
- The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

The Act provides lists of protected species for the Province. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list.

Other Acts

Other Acts that may apply to biodiversity issues, but which are considered to not apply to the current site are as follows:

- National Environmental Management Protected Areas Act (Act No. 57 of 2003)
- Marine Living Resources Act (Act No. 18 of 1998)
- Sea Birds and Seals Protection Act (Act No. 46 of 1973)
- Lake Areas Development Act (Act No. 39 of 1975)
- Mountain Catchment Areas Act (Act No. 63 of 1970)
- Integrated Coastal Zone Management Act (Act No. 24 of 2008)

SENSITIVITIES IDENTIFIED FROM DEA ONLINE SCREENING TOOL

Terrestrial Biodiversity theme

The terrestrial biodiversity theme indicates that the site is within two sensitivity classes, namely **VERY HIGH** and **LOW** (Figure 3). Sensitivity features are indicates as follows:

Sensitivity	Feature(s)
Very High	Ecological Support Area 2
Very High	Critical biodiversity area 1
Very High	Critical biodiversity area 2
Very High	Ecological Support Area
Very High	FEPA Subcathments
Very High	FEPA subcatchments

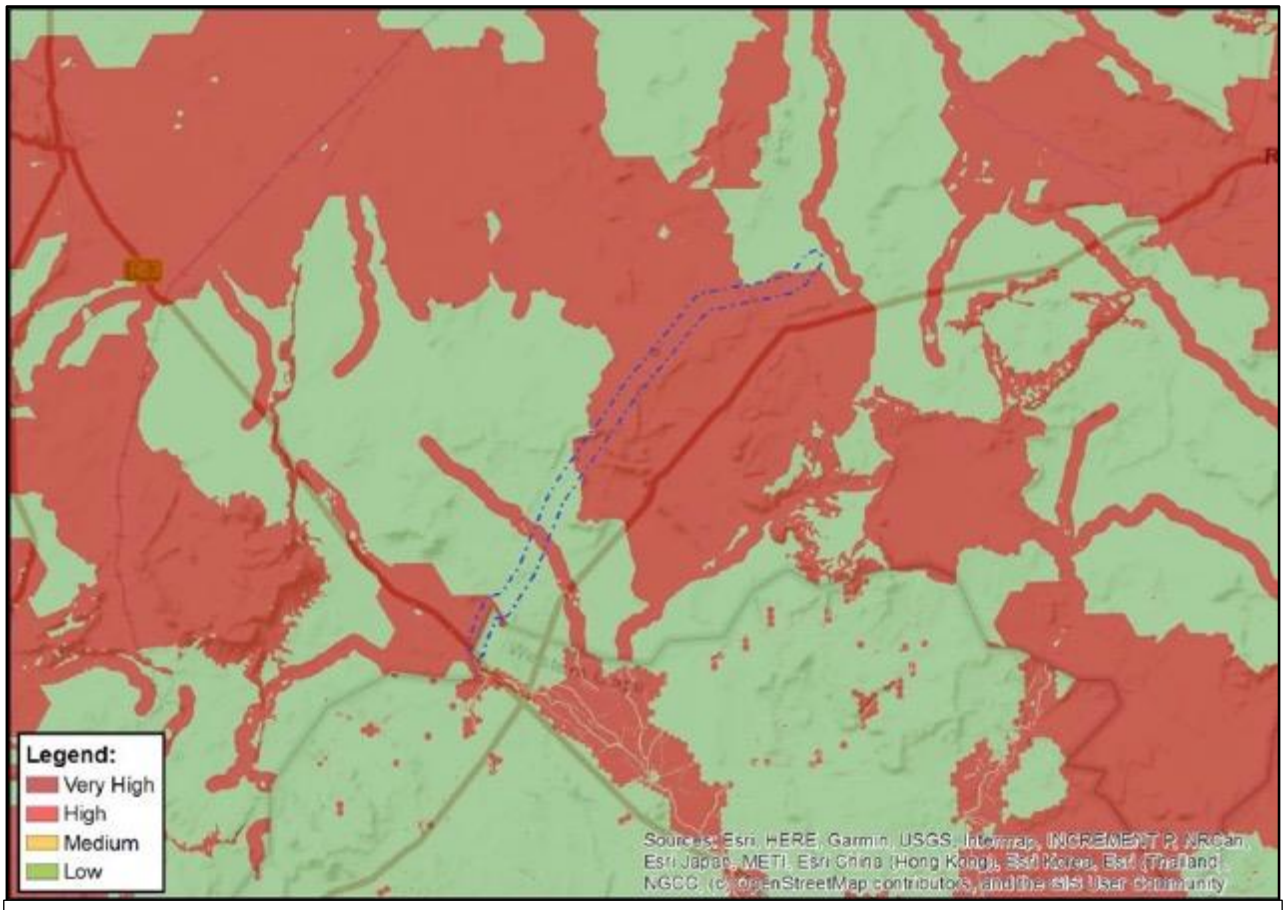

Figure 2: DEA Screening Tool extract for Terrestrial Biodiversity Theme.

DESCRIPTION OF STUDY AREA

Site conditions

A landcover map of the study area (Fairbanks *et al*. 2000) indicates that the entire study area consists of natural vegetation, classified as “shrubland and low fynbos” with scattered waterbodies. The 1:50 000 topocadastral maps of the study area confirm this pattern, including small areas of cultivation and homesteads associated with the farmhouse complexes at Rondavel and Bultfontein.

Topography and drainage

The study site is situated in an area with a combination of steep and relatively gentle topography (Figure 3). Adjacent to the N1, the landscape is gently sloping. Inland of this is a relatively steep escarpment / ridge area that runs more-or-less parallel to the national road (Figure 2). Above this the landscape is relatively flat again, with the exception of localised ridges, koppies and shallow valleys. The elevation on site varies from 1284 to 1507 m above sea level, an elevation difference of approximately 223 m.

The main drainage is in the southern part of the site. This is a non-perennial drainage that forms the upper reaches of the Brakrivier. This starts near to the collector substation, then runs southwards to pass under the N2 national road near to the halfway mark of the grid corridor.

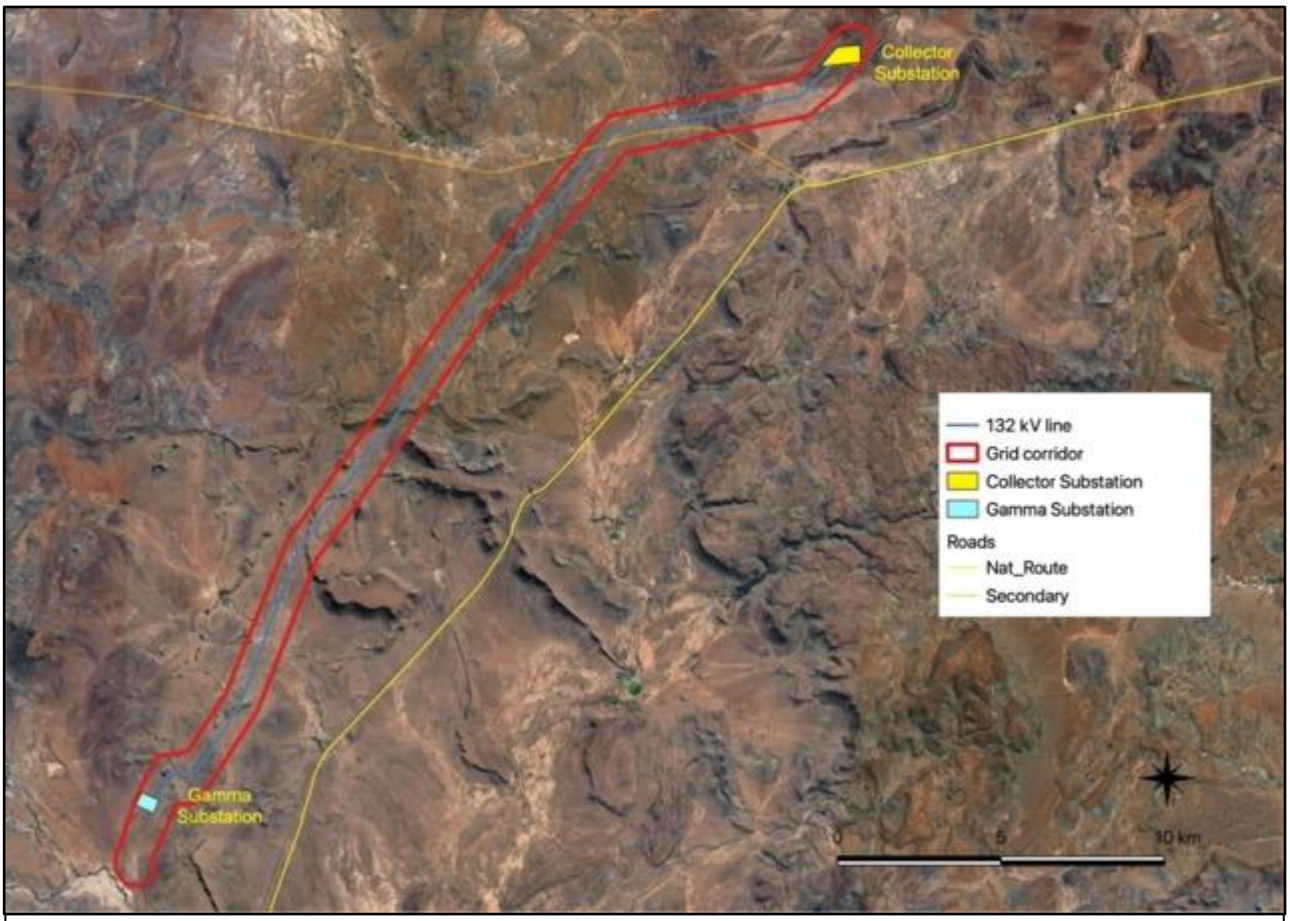

Figure 3**: Aerial image showing drainage and topography of the site and surrounding areas.**

Climate

The study area is within a relatively dry area. Rainfall occurs mainly in Summer and Autumn, peaking in March. Mean annual rainfall is just under 300 mm per year. All areas with less than 400 mm rainfall are considered to be arid and all areas with more than 600 mm are moist. The study area can therefore be considered to be arid. Winter frost is common and may occur for more than 80 days per year. Mean maximum and minimum monthly temperatures for Victoria West are 36.6°C and -8°C.

Broad vegetation patterns

The vegetation of the study area indicates that there are two regional vegetation types occurring in the study area, one of which only occurs as thin strips in parts of the study area. These are Eastern Upper Karoo across most of the site and Upper Karoo Hardeveld associated with low mountains. Another vegetation type, Southern Karoo Riviere, is shown as occurring nearby, but there is a possibility that this may occur within drainage areas on site, even though it is not mapped at a regional scale as occurring there. The distribution of these relative to the site is shown in Figure 3. The vegetation types that occur on site are briefly described below.

Upper Karoo Hardeveld (NKu2)

Distribution

Northern, Western and Eastern Cape Provinces: Discrete areas of slopes and ridges including dolerite dykes and sills in the region spanning Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east. Most crest areas

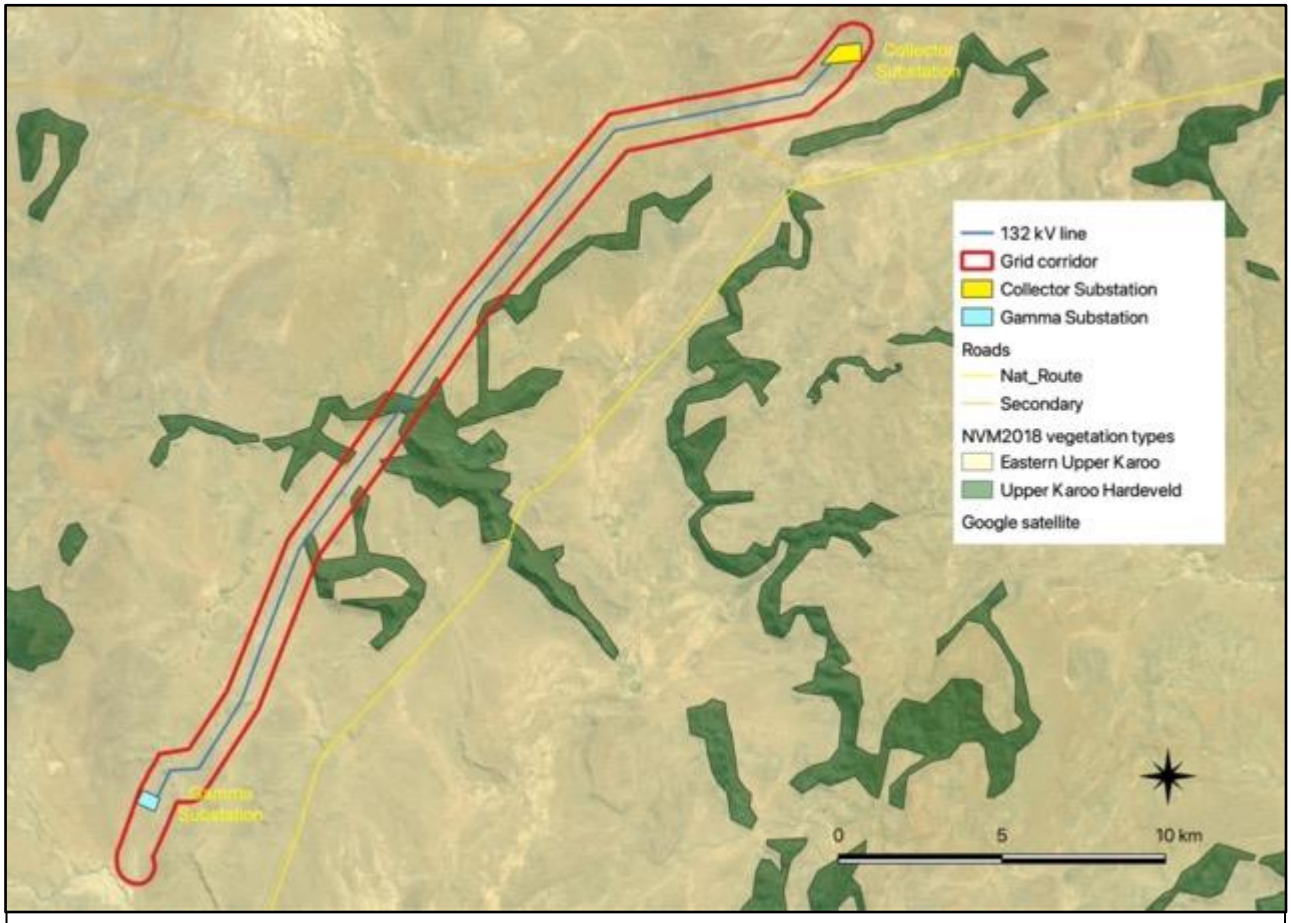

Figure 4: Regional vegetation types of the site and surrounding areas.

and steep slopes of the Great Escarpment facing south between Teekloofpas (connecting Leeu-Gamka and Fraserburg) and eastwards to Graaff-Reinet. Altitude varies mostly from 1 000–1 900 m..

Vegetation & Landscape Features

Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as *Aristida, Eragrostis* and *Stipagrostis*.

Geology & Soils

Primitive, skeletal soils in rocky areas developing over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and subsummit positions of mesas and butts with dolerite boulder slopes. Almost entirely Ib land type.

Climate

In the western part of its area this unit experiences the same climate as the Western Upper Karoo. In the eastern part the climate is very close to that of Karoo Escarpment. The MAP ranges from about 150 mm in the northwest to 350 mm along some grassland margins on the Great Escarpment and in the east. Water concentrates between rocks as a result of rainfall runoff. Incidence of frost is relatively high, but ranging widely from <30 days per year at lower altitudes to >80 days at highest altitudes. See also climate diagram for NKu 2 Upper Karoo Hardeveld (Figure 7.2).

Important Taxa

Tall Shrubs: *Lycium cinereum* (d), *Rhigozum obovatum* (d), *Cadaba aphylla*, *Diospyros austro-africana*, *Ehretia rigida* subsp. *rigida*, *Lycium oxycarpum*, *Melianthus comosus*, *Rhus burchellii*. **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *Euryops lateriflorus* (d), *Felicia muricata* (d), *Limeum aethiopicum* (d), *Pteronia glauca* (d), *Amphiglossa triflora*, *Aptosimum elongatum*, *A. spinescens*, *Asparagus mucronatus*, *A. retrofractus*, *A. striatus*, *A. suaveolens*, *Eriocephalus spinescens*, *Euryops annae*, *E. candollei, E. empetrifolium, E. nodosus, Felicia filifolia* subsp. *filifolia*, *Garuleum latifolium*, *Helichrysum lucilioides*, *H. zeyheri*, *Hermannia filifolia* var. *filifolia*, *H. multiflora*, *H. pulchella*, *H. vestita*, *Indigofera sessilifolia*, *Jamesbrittenia atropurpurea*, *Lessertia frutescens*, *Melolobium candicans*, *M. microphyllum*, *Microloma armatum*, *Monechma incanum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pelargonium abrotanifolium*, *P. ramosissimum*, *Pentzia globosa*, *P. spinescens*, *Plinthus karooicus*, *Polygala seminuda*, *Pteronia adenocarpa*, *P. sordida*, *Rosenia humilis*, *Selago albida*, *Solanum capense*, *Sutera halimifolia*, *Tetragonia arbuscula*, *Wahlenbergia tenella*. **Succulent Shrubs:** *Aloe broomii*, *Drosanthemum lique*, *Faucaria bosscheana*, *Kleinia longiflora*, *Pachypodium succulentum*, *Trichodiadema barbatum*, *Zygophyllum flexuosum*. **Semiparasitic Shrub**: *Thesium lineatum* (d). Herbs: *Troglophyton capillaceum* subsp. *capillaceum*, *Dianthus caespitosus* subsp. *caespitosus*, *Gazania krebsiana*, *Lepidium africanum* subsp. *africanum*, *Leysera tenella*, *Pelargonium minimum*, *Sutera pinnatifida*, *Tribulus terrestris*. **Geophytic Herbs:** *Albuca setosa*, *Androcymbium albomarginatum*, *Asplenium cordatum*, *Boophone disticha*, *Cheilanthes bergiana*, *Drimia intricata*, *Oxalis depressa*, Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Cenchrus ciliaris* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Enneapogon scaber*, *E. scoparius*, *Eragrostis curvula*, *E. nindensis, E. procumbens*, *Fingerhuthia africana*, *Heteropogon contortus*, *Merxmuellera disticha*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*.

Endemic Taxa

Succulent Shrubs: *Aloe chlorantha*, *Crassula barbata* subsp. *broomii*, *Delosperma robustum, Sceletium expansum*, *Stomatium suaveolens*. **Low Shrubs**: *Cineraria polycephala*, *Euryops petraeus*, *Lotononis azureoides*, *Selago magnakarooica*. **Tall Shrub**: *Anisodontea malvastroides*. **Herbs**: *Cineraria arctotidea*, *Vellereophyton niveum*. **Succulent Herbs**: *Adromischus fallax*, *A. humilis*. **Geophytic Herbs**: *Gethyllis longistyla*, *Lachenalia auriolae, Ornithogalum paucifolium* subsp. *karooparkense.*

Eastern Upper Karoo (NKu4)

Distribution

Northern Cape, Eastern Cape and Western Cape Provinces: Between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north, Burgersdorp, Hofmeyr and Cradock in the east and the Great Escarpment and the Sneeuberge-Coetzeesberge mountain chain in the south. Altitude varies between mostly 1 000–1 700 m.
Vegetation & Landscape Features

Flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.

Geology & Soils

Mudstones and sandstones of the Beaufort Group (incl. both Adelaide and Tarkastad Subgroups) supporting duplex soils with prismacutanic and/or pedocutanic diagnostic horizons dominant (Da land type) as well as some shallow Glenrosa and Mispah soils (Fb and Fc land types). In places, less prominent Jurassic dolerites (Karoo Dolerite Suite) are also found.

Climate

Rainfall mainly in autumn and summer, peaking in March. MAP ranges from about 180 mm in the west to 430 mm in the east. Incidence of frost is relatively high, but ranging widely from <30 days (in the lower-altitude Cradock area) to >80 days of frost per year (bordering the Upper Karoo Hardeveld on the Compassberg and mountains immediately to the west). Mean maximum and minimum monthly temperatures in Middelburg (Grootfontein) are 36.1°C and –7.2°C for January and July, respectively. Corresponding values are 37°C and –8°C for Victoria West and 36.6°C and –4.2°C for Hofmeyr. See also climate diagram for NKu 4 Eastern Upper Karoo.

Important Taxa

Tall Shrubs: *Lycium cinereum* (d), *L. horridum*, *L. oxycarpum*. **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *E. spinescens* (d), *Pentzia globosa* (d), *P. incana* (d), *Phymaspermum parvifolium* (d), *Salsola calluna* (d), *Aptosimum procumbens*, *Felicia muricata*, *Gnidia polycephala*, *Helichrysum dregeanum*, *H. lucilioides*, *Limeum aethiopicum*, *Nenax microphylla*, *Osteospermum leptolobum*, *Plinthus karooicus*, *Pteronia glauca*, *Rosenia humilis*, *Selago geniculata*, *S. saxatilis*. **Succulent Shrubs**: *Euphorbia hypogaea*, *Ruschia intricata*. **Herbs**: *Indigofera alternans*, *Pelargonium minimum*, *Tribulus terrestris*. **Geophytic Herbs**: *Moraea pallida* (d), *Moraea polystachya*, *Syringodea bifucata*, *S. concolor***. Succulent Herbs**: *Psilocaulon coriarium*, *Tridentea jucunda, T. virescens.* **Graminoids**: *Aristida congesta* (d), *A. diffusa* (d), *Cynodon incompletus* (d), *Eragrostis bergiana* (d), *E. bicolor* (d), *E. lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis ciliata* (d), *Tragus koelerioides* (d), *Aristida adscensionis*, *Chloris virgata*, *Cyperus usitatus*, *Digitaria eriantha*, *Enneapogon desvauxii*, *E. scoparius*, *Eragrostis curvula*, *Fingerhuthia africana*, *Heteropogon contortus*, *Sporobolus ludwigii*, *S. tenellus*, *Stipagrostis obtusa*, *Themeda triandra*, *Tragus berteronianus*.

Endemic Taxa

Succulent Shrubs: *Chasmatophyllum rouxii*, *Hertia cluytiifolia*, *Rabiea albinota*, *Salsola tetrandra*. **Tall Shrub:** *Phymaspermum scoparium*. **Low Shrubs:** *Aspalathus acicularis* subsp. *planifolia*, *Selago persimilis*, *S. walpersii*.

Conservation status of broad vegetation types

On the basis of a scientific approach used at national level by SANBI (Driver *et al*., 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of 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. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 4 below, as determined by best available scientific approaches (Driver *et al*., 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al*., 2005).

Determining ecosystem status (Driver *et al.*, 2005). *BT = biodiversity target (the minimum conservation requirement).

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

Table 3: Conservation status of different vegetation types occurring in the study area.

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al*. 2005; Mucina *et al*., 2006	**National Ecosystem List (NEM:BA)**
Eastern Upper Karoo	21	0.7	2	Least Threatened	Not listed
Upper Karoo Hardeveld	21	2.9	<1	Least Threatened	Not listed

According to scientific literature (Driver *et al*., 2005; Mucina *et al*., 2006), as shown in Table 3, both vegetation types are listed as Least Threatened.

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

Neither vegetation types are listed in the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011).

Biodiversity Conservation Plans

The Northern Cape Critical Biodiversity Area (CBA) Map (Figure 5) was published in 2016 (Holness & Oosthuysen 2016) and "updates, revises and replaces all older systematic biodiversity plans and associated products for the province". The Northern Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

1. Protected
2. Critical Biodiversity Area One (Irreplaceable Areas) (RED)
3. Critical Biodiversity Area Two (Important Areas) (ORANGE)
4. Ecological Support Area (GREEN)
5. Other Natural Area (YELLOW)

This shows features within the study area within four of these classes, as follows (Figure 5):

1. Critical Biodiversity Areas: There is one drainage line protruding into the corridor from the north that is within a CBA1 area. The Gamma substation and surrounding areas is within a CBA2 area.
2. Ecological Support Areas: One other drainage line that crosses the corridor is within an ECA.
3. Other Natural Areas: Most remaining areas on site are indicated as being in a natural state (Other Natural Area).

The presence of CBA1 areas indicate that these areas are considered important for biodiversity conservation. Additionally, the ESAs indicate that the site has importance in a wider ecological context for supporting biodiversity patterns.

Protected areas and proposed protected areas

According to an online database hosted by the Department of Forestry, Fisheries and the Environment (South African Protected, Conservation and Marine Protected Areas Data), there are no protected areas on site or in the near vicinity. The nearest protected area is more than 50 km away.

According to the National Parks Area Expansion Strategy (NPAES), there are no areas within the study area that have been identified as priority areas for inclusion in future protected areas. The study area is therefore **outside the NPAES focus area**. There are many areas outside of the study site, to the north, south, east and west that are included as being part of future protected areas, but not within or adjacent to the site itself.

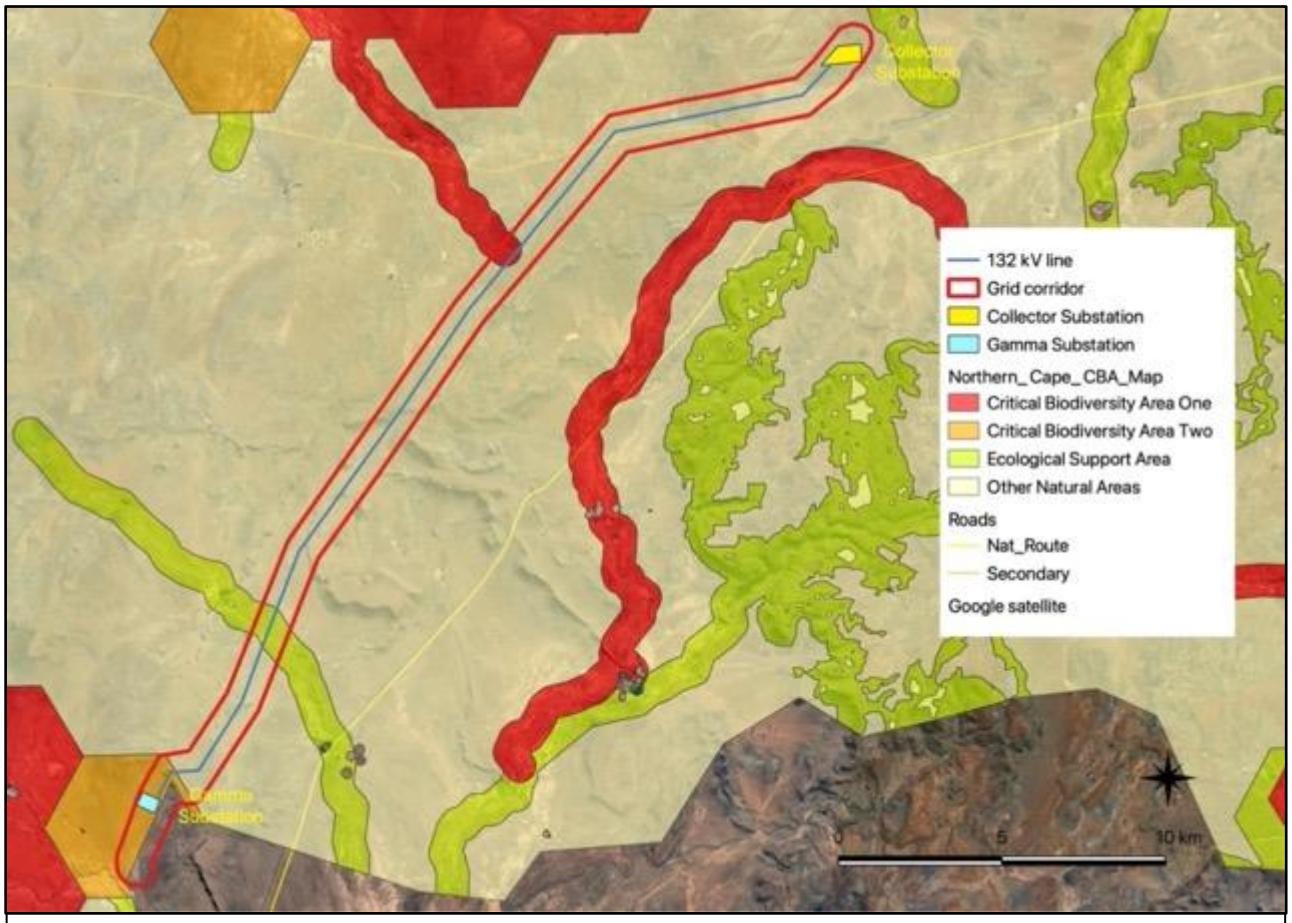

Figure 5: Northern Cape CBA map of the site and surrounding areas.

Habitats on site

A map of habitats on site is provided in (Figure 5). This shows various habitat units on site, as follows:

1. Hills and mountains
2. Rocky areas
3. Plains
4. Drainage areas
5. Drainage scrub
6. Open water
7. No natural habitat

Hills and mountains
The site is characterised by the presence of a range of hills that form a mini-escarpment parallel to the national road. The topography within these areas is relatively steep and rugged. There are also various low hills and the free-standing Bloukop inland of the mini-escarpment. The vegetation in these areas is a grassy dwarf karroid shrubland.

Rocky areas
There are various parts of the hills that contain outcrops of rocks, either as shelves or as boulders. The vegetation within these areas is largely woody, consisting of various low- to medium-height shrubs. The rocky areas constitute important refugia for small mammals and reptiles, including as potential habitat for the Near Threatened Karoo Dwarf Tortoise (*Homopus boulengeri*).

Plains
The plains on the lowlands have gently undulating topography. They are found between the hills throughout the site. The vegetation in these areas is mostly a dwarf karroid shrubland. These areas have been moderately to heavily grazed throughout the study area.

Drainage areas
In the lowest parts of the plains, often in wide bands, are areas that are shaped by fluvial processes and are either channelled in places or eroded from water movement. The soils are mostly deep sands where they have not been eroded away. The vegetation is a karroid dwarf shrubland or a sparse weedy community in eroded areas.

Drainage scrub
This forms part of the drainage areas, but has been mapped as a separate unit due to the clearly different vegetation structure and composition. The vegetation is a scrub or shrubland with shrubs up to 3 m high in places. The vegetation is relatively dense and the soils are deep and sandy. It constitutes an important refuge for wildlife, both in terms of the dense vegetation cover as well as the deep sands which are ideal for burrowing animals. Although considered unlikely that it would occur on site, this is the habitat that most closely matches the habitat requirements of the Critically Endangered Riverine Rabbit.

Open water
There are a number of farm dams on site. These are all man-made, but they nevertheless constitute an important water resource for wildlife. There is a possibility that the Protected Giant Bullfrog occurs in the general area, in which case these areas of open water may constitute important habitat for them.

No natural habitat
All areas where natural habitat has been lost have been included in this map unit. This includes farm houses, roads, cultivated areas, previously cultivated areas, quarries and other disturbed areas.

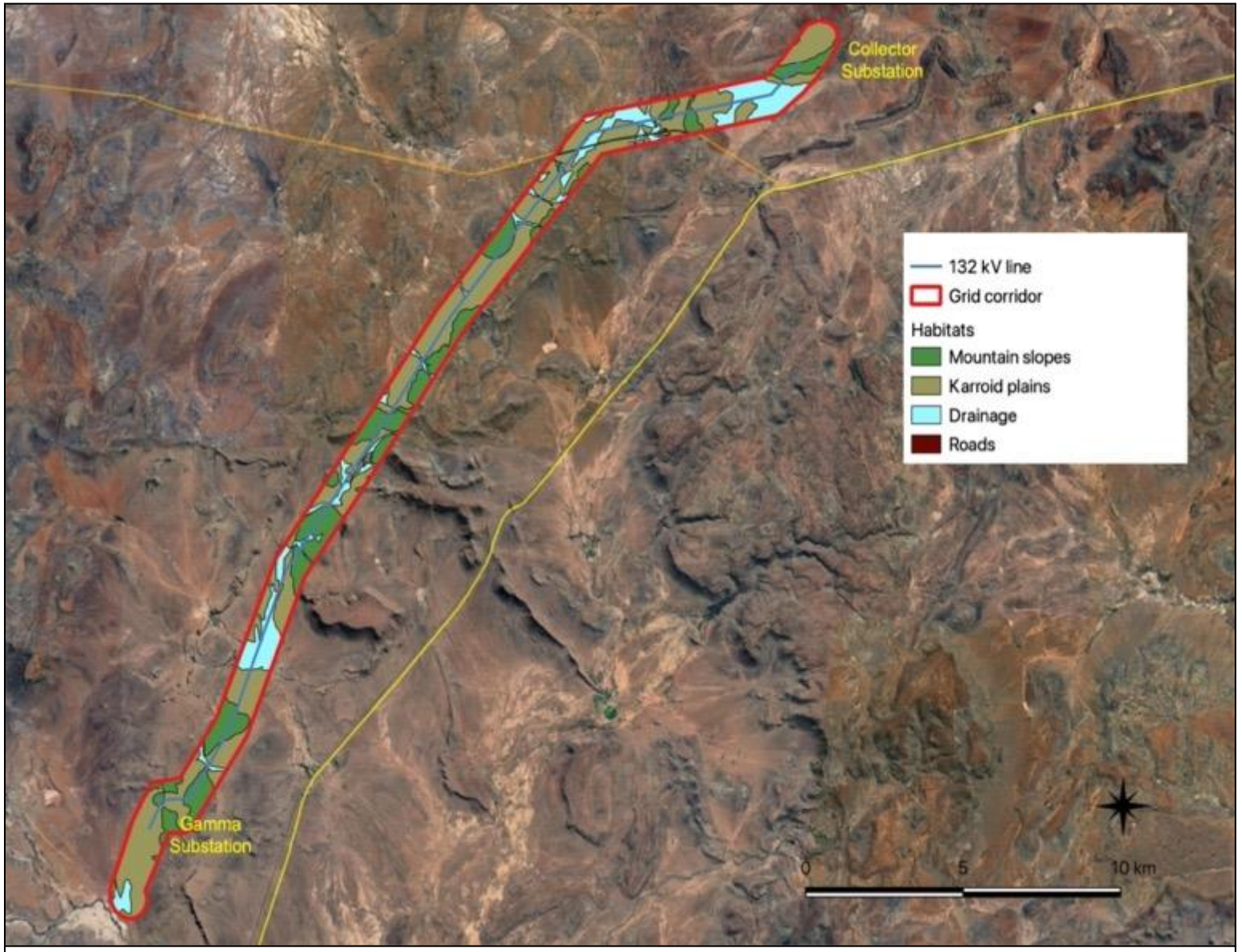

Figure 6**: Habitats of the study area.**

Habitat sensitivity

To determine sensitivity on site, local and regional factors were taken into account. There are some habitats on site that have been described as sensitive in their own right, irrespective of regional assessments. This includes primarily the dry stream beds and associated riparian zones. Rocky outcrops and steep slopes are more sensitive than surrounding areas, mainly due to higher floristic diversity and the likelihood of plant species with low local abundance occurring there.

At a regional level, the Critical Biodiversity Area (CBA) map for Northern Cape indicates one drainage line, along with a buffer on each side, that is designated as being a CBA1 area. The remaining drainage lines of the study area are indicated as being Ecological Support Areas (ESAs).

In terms of other species of concern and overall biological diversity, including both plants and animals, the low hills and mountain ranges are the areas with the most species as well as being most likely to contain any species of concern. However, the southern main drainage line is the most likely habitat for the Critically Endangered Riverine Rabbit, if it occurs on site, which is unknown but possible.

A summary of sensitivities that occur on site and that may be vulnerable to damage from the proposed project are as follows:

1. Dry stream beds, including the associated riparian habitats and adjacent floodplains;
2. CBA1 areas;
3. Habitat suitable for Riverine Rabbit.

Based on this information, a map of habitat sensitivity on site is provided in Figure 6. This shows main habitat sensitivity classes on site, namely VERY HIGH for habitat suitable for Riverine Rabbit, VERY HIGH for other CBA1 areas, HIGH for other riparian habitats, MEDIUM-HIGH for ridges, outcrops, hills and mountain slopes, and MEDIUM for plains vegetation.

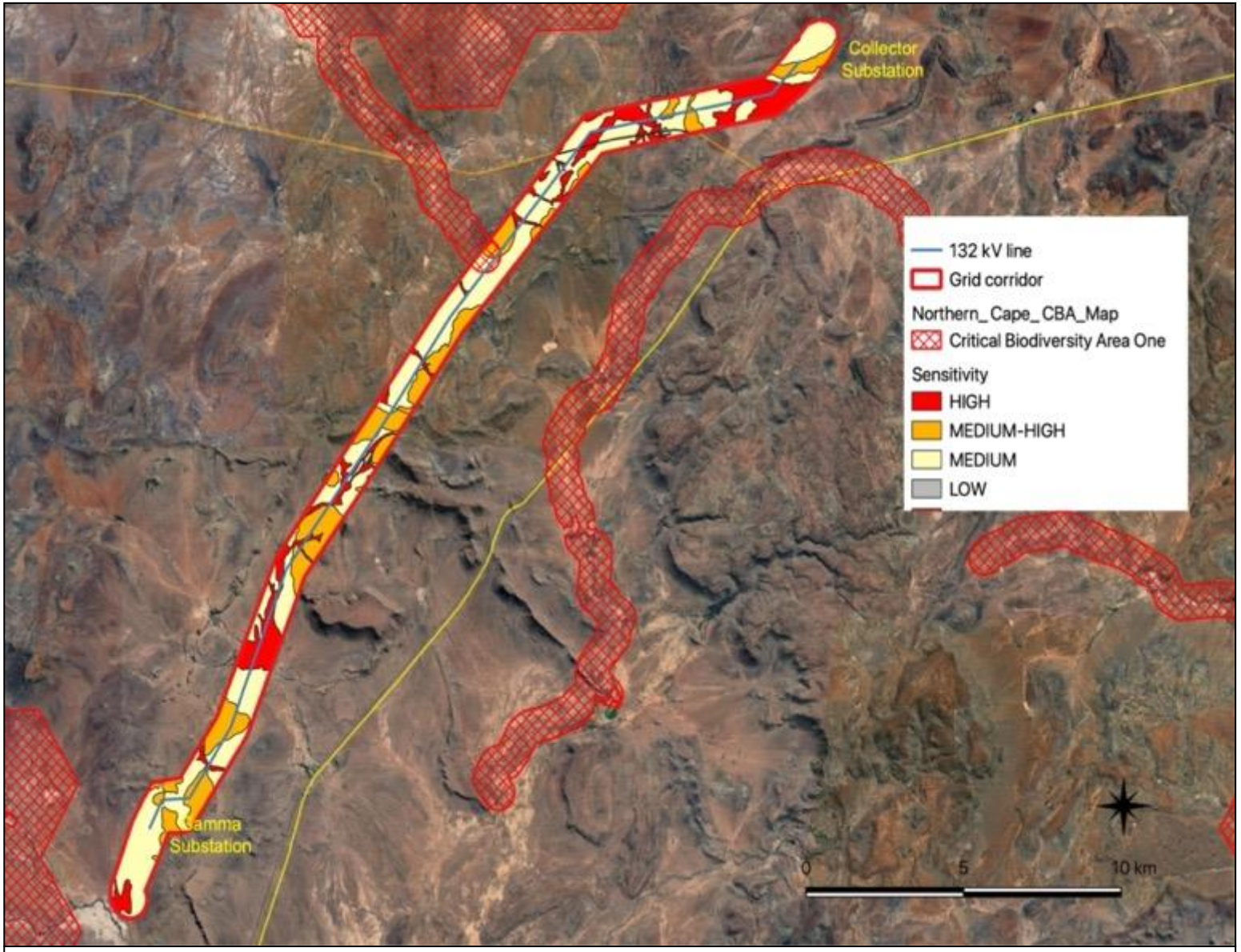

Figure 7: Habitat sensitivity of the study area.

DESCRIPTION OF POTENTIAL IMPACTS

Proposed infrastructure in relation to sensitivities

The collector substation is within an area of MEDIUM sensitivity, except along its southern side where it is against the hill, where the sensitivity is MEDIUM-HIGH. The poiwer line crosses all sensitivity classes, including various drainage areas that are classified as having HIGH sensitivity.

The Critical Biodiversity Area 1 (CBA1) that protrudes into the corridor is a drainage line with a 500 m buffer around it. The point of origin is just within the corridor and, although the buffer extends beyond the centreline of the proposed power line, the drainage line is not affected.

Potential sensitive receptors in the general study area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g. on birds and on wetland and hydrological function, are not included here):

- Presence of natural vegetation on site, a small part of which has high conservation value due to being within Critical Biodiversity Areas (CBA1). Designated-natural vegetation on site is vulnerable to disturbance, especially direct habitat loss and habitat fragmentation.
- Possible presence of Critically Endangered mammal on site (assessed separately).
- Presence of dry stream beds and associated riparian vegetation on site, assessed as being sensitive to impacts associated with development as well as being important habitat for various plant and animal species.
- Presence of various plant species protected according to the Northern Cape Nature Conservation Act (Act 9 of 2009) (assessed separately). The identity of such species requires detailed floristic surveys within the footprint of the proposed project.
- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features.

Construction Phase Impacts

Direct impacts
Direct impacts include the following:

1. Loss and/or fragmentation of indigenous natural vegetation due to clearing;

Indirect impacts
Indirect impacts during the construction phase include the following:

1. Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation;
2. Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.

Operational Phase Impacts

Direct impacts
Ongoing direct impacts will include the following:

1. Continued disturbance to natural habitats due to general operational activities and maintenance;

Indirect impacts
These will include the following:

1. Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
2. Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;

Decommissioning Phase Impacts

Direct impacts
These will include the following:

1. Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;

Indirect impacts
These will occur due to renewed disturbance due to decommissioning activities, as follows:

1. Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
2. Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;

ASSESSMENT OF IMPACTS

A detailed assessment, as per the requirements of the protocol for the specialist assessment and minimum report content requirements of environmental impacts on terrestrial biodiversity for activities requiring environmental authorisation, (20 March 2020), of the significance of all impacts during all phases of the project (Construction, Operation, Decommissioning and Cumulative) is provided below. This also includes all proposed mitigation measures and provides assessment before and after the implementation of proposed mitigation measures.

The proposed site is identified by the national web-based environmental screening tool as being very high sensitivity for Terrestrial Biodiversity, and the protocol therefore requires that the level of assessment must be written up in a Terrestrial Biodiversity Impact Assessment Report.

Note that the impact assessment methodology requires placing a potential impact within a category of extent, probability, duration, etc. There are many cases where mitigation measures will have a clear effect on reducing an impact, but not to the degree that it would result in an assessed impact being placed in a lower category. The impact assessment methodology is categorical in nature and incremental improvements in design and implementation may possibly not lead to a change in the category in which a potential impact is placed. In the current case, mitigation measures can potentially reduce by approximately half the extent of the potential impact (loss of vegetation), which is a significant reduction, but the extent remains "Site", because there is no lower category. This does not reduce the value of proposed measures, even if it gives the appearance in the assessment that no improvement is realized.

Detailed discussion of each impact, including justification for assigned scores, is provided below.

Construction Phase Impacts

Loss and/or fragmentation of indigenous natural vegetation due to clearing

IMPACT 1: Direct loss and/or fragmentation of indigenous natural vegetation			
Impact description: The impact will occur due to clearing of natural habitat for construction of infrastructure.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	The effect of clearing will be long-term, until the area around the base of each tower has recovered.	**Medium Negative (35)**
Extent	Site (1)	The impact will occur at the scale of the proposed infrastructure.	
Magnitude	Minor (2)	Clearing will be partial in localised places (footprint of tower structures) and will lead to some impact on ecological processes.	
Probability	Definite (5)	The site is in a mostly natural state and construction cannot take place without clearing.	
Mitigation/Enhancement Measures			
Mitigation: It is not possible to completely avoid impacts on indigenous vegetation for this project. The following mitigation measures would help to limit impacts: 1. Restrict impact to development footprint only and limit disturbance creeping into surrounding areas. 2. As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.			

3. Avoid sensitive features and habitats when locating infrastructure. 4. Compile a Rehabilitation Plan. 5. Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. 6. Where possible, access roads should be located along existing farm and district roads, and existing service roads. 7. Access to sensitive areas should be limited during construction. 8. Undertake monitoring to evaluate whether further measures would be required to manage impacts.			
Post Mitigation/Enhancement Measures			
Duration	Medium-term (3)	The effect of clearing will be long-term, until the area around the base of each tower has recovered.	**Low Negative (25)**
Extent	Site (1)	The impact will occur at the scale of the proposed infrastructure.	
Magnitude	Minor (1)	Clearing will be partial in localised places (footprint of tower structures) and will lead to some impact on ecological processes.	
Probability	Definite (5)	The site is in a mostly natural state and construction cannot take place without clearing.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: There is residual risk on the basis that construction crews are unlikely to remain within the confines of the demarcated construction zone. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.			

Impact on integrity of Critical Biodiversity Areas

IMPACT 2: Impact on integrity of Critical Biodiversity Areas			
Impact description: The impact will occur due to clearing of natural habitat for construction of infrastructure and may result inloss of natural areas within designated CBA1 areas.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	The effect of clearing will be long-term, until the area around the base of each tower has recovered.	**Medium Negative (30)**
Extent	Province (4)	The impact will affect conservation planning at the provincial level.	
Magnitude	Minor (2)	A relatively small area will be affected, and adjacent to the location of existing disturbance	
Probability	Probable (3)	Some of the proposed infrastructure is within a CBA1.	
Mitigation/Enhancement Measures			
Mitigation: 1. Choose alternatives outside of CBA1 areas.			

2. Place tower structures as far as possible away from the point of origin of the drainage line that constitutes the core of the CBA1 area (this point is approximately at 31°31'36.1"S, 23°31'28"E). 3. Locate linear infrastructure outside boundaries of CBA1 areas, except where these are located entirely within existing disturbance and/or transformation. 4. Use the existing service roads under the existing power line to access towers at this particular location. 5. Apply mitigation measures for impact 1.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	The effect of clearing will be long-term, until the area around the base of each tower has recovered.	**Low Negative (14)**
Extent	Site (1)	The impact will occur at the scale of the proposed infrastructure.	
Magnitude	Minor (2)	Applying mitigation will mean no impact.	
Probability	Improbable (2)	There may be residual local impacts.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: There is residual risk on the basis that construction crews are unlikely to remain within the confines of the demarcated construction zone. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.			

Establishment and spread of alien invasive plants

IMPACT 3: Establishment and spread of declared weeds and alien invader plants			
Impact description: The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Medium Negative (40)**
Extent	Local (2)	Alien invader plants will become established on site but can cause problems more widely by spreading into surrounding landscapes.	
Magnitude	Low (4)	In the construction phase of the project the problem will not appear to be big, as this would be the initial establishment phase for alien invader plants.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Mitigation/Enhancement Measures			
Mitigation: 1. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Implement control measures.			

4. Apply mitigation measures for impact 1.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Low Negative (28)**
Extent	Site (1)	Control measures can contain alien invader plants to local sites.	
Magnitude	Minor (2)	Early control can largely contain the problem.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.			

Increased runoff and erosion

IMPACT 4: Increased runoff and erosion			
Impact description: Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to impacts on downslope areas.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Medium Negative (33)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly where surface gradients are inappropriate.	
Magnitude	Moderate (6)	At a very local level, the impact can be relatively severe, although it is likely to be less so on average across the extent of the project area.	
Probability	Probable (3)	Some infrastructure crosses steep slopes where impacts are much more likely.	
Mitigation/Enhancement Measures			
Mitigation: 1. Compile and implement a stormwater management plan. 2. Keep gradients of roads adequately low to minimise erosion. 3. Align the power line to avoid steep slopes and avoid the necessity for crossing steep areas. Apply this especially where the power line can go around a steep slope and not directly across it. 4. Monitor road surfaces for erosion and repair or upgrade, where necessary.			
Post Mitigation/Enhancement Measures			

Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Low Negative (18)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly where surface gradients are inappropriate.	
Magnitude	Low (4)	Good planning and management can minimize the magnitude of the impact.	
Probability	Improbable (2)	Mitigation will reduce probability of impact occurring.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: Extreme rainfall events are likely to render any control measures irrelevant.			

Operational Phase Impacts

Disturbance of indigenous natural vegetation

IMPACT 5: Direct disturbance of indigenous natural vegetation			
Impact description: Continued disturbance and/or degradation of habitat.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	The impact will be for the duration of the project.	**Medium Negative (30)**
Extent	Site (1)	The impact will occur at the scale of the proposed infrastructure.	
Magnitude	Low (4)	Disturbance will be related to normal operational activities in areas adjacent to existing infrastructure.	
Probability	Probable (3)	Post-construction monitoring indicates that there is a strong probability of activities spilling into areas surrounding constructed infrastructure.	
Mitigation/Enhancement Measures			
Mitigation: 1. Restrict activities to infrastructure locations only and limit disturbance creeping into surrounding areas. 2. Manage erosion of service roads and repair timeously. 3. Protect sensitive features and habitats during operational activities. 4. Implement and monitor Rehabilitation Plan. 5. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. 7. Access to sensitive areas must be enforced. 8. Undertake monitoring to evaluate whether further measures would be required to manage impacts.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	The impact will be for the duration of the project.	**Low Negative (24)**

Extent	Site (1)	The impact will occur at the scale of the proposed infrastructure.	
Magnitude	Low (3)	Disturbance will be related to normal operational activities in areas adjacent to existing infrastructure.	
Probability	Probable (3)	Post-construction monitoring indicates that there is a strong probability of activities spilling into areas surrounding constructed infrastructure.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: There is residual risk on the basis that maintenance personnel are unlikely to remain within the confines of the demarcated project area. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.			

Continued establishment and spread of alien invasive plants

IMPACT 6: Establishment and spread of declared weeds and alien invader plants			
Impact description: The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Medium Negative (48)**
Extent	Local (2)	Alien invader plants will become established on site but can cause problems more widely by spreading into surrounding landscapes.	
Magnitude	Moderate (6)	In the operational phase of the project alien invader plants will actively establish and spread in disturbed areas.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Mitigation/Enhancement Measures			
Mitigation: 1. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Implement control measures. 4. Apply mitigation measures for impact 1.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Low Negative (28)**

Extent	Site (1)	Control measures can contain alien invader plants to local sites.	
Magnitude	Minor (2)	Early control can largely contain the problem.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.			

Continued impacts due to runoff and erosion

IMPACT 7: Impacts from runoff and erosion			
Impact description: Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to impacts on downslope areas.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Medium Negative (33)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly where surface gradients are inappropriate.	
Magnitude	Moderate (6)	At a very local level, the impact can be relatively severe, although it is likely to be less so on average across the extent of the project area.	
Probability	Probable (3)	Post-construction monitoring on WEFs suggests that this is likely to happen, especially where roads are inappropriately located and poorly constructed.	
Mitigation/Enhancement Measures			
Mitigation: 1. Implement a stormwater management plan. 2. Monitor road surfaces for erosion and repair or upgrade, where necessary. 3. Install additional flood and/or erosion control measures, where necessary.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Low Negative (18)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly	

		where surface gradients are inappropriate.	
Magnitude	Low (4)	Good planning and management can minimize the magnitude of the impact.	
Probability	Improbable (2)	Mitigation will reduce probability of impact occurring.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: Extreme rainfall events are likely to render any control measures irrelevant.			

Decommissioning Phase Impacts

Disturbance of indigenous natural vegetation

IMPACT 8: Direct disturbance of indigenous natural vegetation			
Impact description: Disturbance and/or degradation of habitat due to removal of infrastructure.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long term (4)	The impact will have a footprint for a long period of time beyond the life of the project.	**Medium Negative (30)**
Extent	Site (1)	The impact will occur at the scale of the removed infrastructure.	
Magnitude	Low (4)	Disturbance will be related to de-construction and rehabilitation activities in footprint areas.	
Probability	Probable (3)	Difficult to avoid.	
Mitigation/Enhancement Measures			
Mitigation: 1. Restrict activities to infrastructure locations only and limit disturbance creeping into surrounding areas. 3. Protect sensitive features and habitats during operational activities. 4. Implement and monitor Rehabilitation Plan. 5. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. 7. Access to sensitive areas must be enforced. 8. Undertake monitoring to evaluate whether further measures would be required to manage impacts.			
Post Mitigation/Enhancement Measures			
Duration	Long term (4)	The impact will have a footprint for a long period of time beyond the life of the project.	**Low Negative (24)**
Extent	Site (1)	The impact will occur at the scale of the removed infrastructure.	
Magnitude	Low (3)	Disturbance will be related to de-construction and rehabilitation activities in footprint areas.	
Probability	Probable (3)	Difficult to avoid.	

Cumulative impacts:
The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).
Residual Risks:
There is residual risk on the basis that de-construction teams are unlikely to remain within the confines of the demarcated project area. There is always likely to be "spillage" into surrounding areas, or movement of personnel and/or machinery into areas beyond the footprint of the proposed project.

Continued establishment and spread of alien invasive plants

IMPACT 9: Establishment and spread of declared weeds and alien invader plants			
Impact description: The impact will occur due to alien invader plants immigrating into the site, becoming established and spreading, which degrades and displaces indigenous natural habitat.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur beyond the life of the project, until rehabilitated areas are completely stable.	**Medium Negative (48)**
Extent	Local (2)	Alien invader plants will become established on site but can cause problems more widely by spreading into surrounding landscapes.	
Magnitude	Moderate (6)	In the decommissioning phase of the project alien invader plants will actively establish and spread in disturbed areas.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Mitigation/Enhancement Measures			
Mitigation: 1. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Implement control measures. 4. Apply mitigation measures for impact 1.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	This issue will occur beyond the life of the project, until rehabilitated areas are completely stable.	**Low Negative (28)**
Extent	Site (1)	Control measures can contain alien invader plants to local sites.	
Magnitude	Minor (2)	Early control can largely contain the problem.	
Probability	Highly probable (4)	Alien invader plants are almost certain to become established in disturbed areas.	
Cumulative impacts:			

The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).
Residual Risks: Due to the high number of alien invader plant species in the country, the problem of local invasion is pervasive. Seasonal climate conditions make it unpredictable which species are likely to spread at any particular time. Any drop in focus on this problem can lead to breakaway invasion.

Continued impacts due to runoff and erosion

IMPACT 10: Impacts from runoff and erosion			
Impact description: Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to impacts on downslope areas.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Medium Negative (33)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly where surface gradients are inappropriate.	
Magnitude	Moderate (6)	At a very local level, the impact can be relatively severe, although it is likely to be less so on average across the extent of the project area.	
Probability	Probable (3)	Post-construction monitoring on WEFs suggests that this is likely to happen, especially where roads are inappropriately located and poorly constructed.	
Mitigation/Enhancement Measures			
Mitigation: 1. Implement a stormwater management plan. 2. Monitor road surfaces for erosion and repair or upgrade, where necessary. 3. Install additional flood and/or erosion control measures, where necessary. Undertake effective rehabilitation of disturbed areas.			
Post Mitigation/Enhancement Measures			
Duration	Long-term (4)	This issue will occur for the duration of the life of the project and beyond.	**Low Negative (18)**
Extent	Site (1)	Problem will affect localised areas, especially in steep landscapes and mostly where surface gradients are inappropriate.	
Magnitude	Low (4)	Good planning and management can minimize the magnitude of the impact.	
Probability	Improbable (2)	Mitigation will reduce probability of impact occurring.	
Cumulative impacts:			

The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).
Residual Risks: Extreme rainfall events are likely to render any control measures irrelevant.

Assessment of Cumulative Impacts

Cumulative impacts, in relation to an activity, refer to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For practical purposes a sub-regional scale of 30km is considered for the evaluation of cumulative impact of wind farms.

The site for the proposed development is located within 30km from several other authorised renewable energy facilities. Each renewable energy project requires transmission power lines. There are also a variety of existing transmission power lines on the property. These renewable projects include the following (refer to Figure 9):

Project Name	Project Status
Brakpoort Solar PV Facility	Authorised
Umsinde Emoyeni Wind Energy Facility	Authorised
Aurora Solar PV Facility	Authorised
Mainstream Renewable Energy Cluster	Authorised
Ishwati Emoyeni Wind Energy Facility	Authorised
Trouberg Wind Energy Facility	Authorised

Figure 8: Approved renewable energy facilities within a radius of approximately 30km (red line) around the project site (DEA, 2021).

Modderfontein Wind Energy Facility	Authorised
Nobelsfontein Wind Energy Facility	Authorised
Bietjiesfontein Solar Energy Facility	Authorised
Karoo Renewable Energy Facility	Authorised

In addition to the renewable energy facilities listed above, four new renewable energy facilities (three solar PV facilities and one wind farm are proposed adjacent to the Merino Wind Farm, namely:

Project Name	Affected property	Contracted Capacity
Kwana Solar PV Facility	Portion 0 of Farm Rondavel 85	100MW
Moriri Solar PV Facility	Portion 0 of Farm Rondavel 85	100MW
Nku Solar PV Facility	Portion 1 of Farm Rondavel 85	100MW
Angora Wind Farm	Portion 11 of Farm Gegundefontein 53 Portion 0 of Farm Vogelstruisfontein 84 Portion 1 of Farm Rondavel 85 Portion 0 of Farm Rondavel 85	140MW

Cumulative loss and/or fragmentation of indigenous natural vegetation due to clearing

Nature:

Nature: Loss and/or fragmentation of indigenous natural vegetation due to clearing		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Local (2)
Duration	Long term (4)	Permanent (5)
Magnitude	Minor (2)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (55)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	No
Confidence in findings: High.		
Mitigation: As for site impact		

Cumulative impact on integrity of Critical Biodiversity Areas

Nature:

Nature: Impact on integrity of CBAs		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Province (4)	Province (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (36)**

Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: As for site impact		

Cumulative establishment and spread of alien invasive plants

Nature:

Nature: Establishment and spread of alien invasive plants over wide areas		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: As for site impact		

Cumulative damage from increased runoff and erosion

Nature:

Nature: Cumulative damage from increased runoff and erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Partly reversible	Partly reversible
Irreplaceable loss of resources?	Yes but limited	Yes but limited
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: As for site impact		

Assessment of No-Go alternative

If the project does not proceed then the current *status quo* will continue. This will involve continued use of the land for livestock production. Current patterns suggest that this will mean that the landscape remains unaltered into the future under an unchanging land-use regime. However, historical evidence has shown that livestock production, especially in arid parts of the country has led to overall degradation of the vegetation, especially in times of drought. This degradation has been shown to accumulate over time, incrementally reducing the productive capacity of the landscape. Indications are that, due to human-induced climate change, the risk of future degradation has increased. The site is in an arid area and, based on the scientific consensus that global climate change is affecting local climate and that South Africa is more significantly affected than other parts of the planet, in terms of a warming effect as well increased risk of drought, the risks to livestock production have probably worsened and will continue to do so into the future. This implies that stocking rates, and therefore profitability, will need to be reduced to avert land degradation, putting financial strain on producers. An alternative income stream associated with financial benefits from hosting renewable energy projects is likely to improve the financial viability of any land manager, which in turn reduces the pressure to carry unsustainable stock numbers. This in turn puts less pressure on the land, which reduces the likelihood of grazing-induced degradation of the land. In summary, the No-Go option could increase the risk of land degradation due to over-grazing under adverse future climate scenarios, whereas there is a possibility of this effect being lessened in the case of the project promoting local economic diversity.

Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

- Use existing stream crossings
- Cross streams and other linear features at right angles, and also near their end-points or where there are natural breaks in the feature of concern.
- Internal access roads should be aligned along existing farm, access and district roads, even if these require upgrading.
- Restrict impact to development footprint only and limit disturbance spreading into surrounding areas.
- Footprints of infrastructure, laydown areas, construction sites, roads and substation sites should be clearly demarcated.
- Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff.
- Compile a Rehabilitation Plan prior to the commencement of construction.
- No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- No driving of vehicles off-road outside of construction areas.
- It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project.
- A detailed pre-construction walk-through survey will be required during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is **early to late Summer**, but dependent on recent rainfall and vegetation growth.
- It is possible that some plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas, but the description and appropriateness of such measures must be included in a Plant Rescue Plan. Any such measures will reduce the irreplaceable loss of resources as well as the cumulative effect. Note that Search and Rescue is only appropriate for some species and that a high mortality rate can be expected from individuals of species that are not appropriate to transplant.
- A Plant Rescue Plan must be compiled to be approved by the appropriate authorities.
- For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas <u>not</u> disturbed by the project) to evaluate mortality relative to wild populations.
- Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats, where possible. This has already been applied during the Design phase of the project where attempts have been made to avoid sensitive habitats.
- Speed limits should be set for all roads on site, as well as access roads to the site. These limits should not exceed 40 km/h, but may be set lower, depending on local circumstances. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary.
- Night driving should be strictly limited and, where absolutely required, lower speed limits should apply for night driving.
- Pre-construction walk-through, undertaken in the correct season, in front of construction must be undertaken to move any individual animals, such as tortoises, prior to construction.
- No dogs or other pets should be allowed on site, except those confined to landowners' dwellings.
- Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas..
- Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.
- No collecting, hunting or poaching of any plant or animal species.
- Report any mortality of protected species to conservation authorities
- Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species.

- Implement strict access control for the site.
- Report any illegal collection to conservation authorities.
- Excessive dust can be controlled by using appropriate dust-control measures.
- Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled, as per the Alien Management Plan.
- Implement control measures, as per the Alien Management Plan.
- Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.
- Construction activities should not be undertaken at night.
- Maintain adequate buffer zones around hydrological features so that these do not become degraded from runoff and erosion.
- Compile and implement a Stormwater Management Plan, which highlights control priorities and areas and provides a programme for long-term control.
- Undertake regular monitoring to detect erosion features early so that they can be controlled.
- Implement erosion control measures.
- Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow.
- No additional clearing of vegetation should take place during the operational phase without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- Surface runoff and erosion must be properly controlled during the operational phase, and any issues addressed as quickly as possible.
- Continued implementation and monitoring of Rehabilitation Plan during operational phase.
- Personnel and vehicles should be restricted to access / internal roads and no off-road driving should occur.
- Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled. This should include formal monitoring on an annual basis by a qualified botanist for up to five years.
- Implement control measures on an ongoing basis, according to the Alien Management Plan.
- Do NOT use any alien plants during rehabilitation.
- Noise and light pollution should be managed according to guidelines from the noise specialist study and visual specialist assessment respectively.

Summary of monitoring recommendations

Specific monitoring recommendations should be provided in the Plant Rescue Plan, the Alien Invasive Management Plan, and the Rehabilitation Plan. The following are broad recommendations:

Alien Invasive Species:

- Monitor for early detection, to find species when they first appear on site. This should be annual, and should be conducted by an experienced botanist. Early detection should provide a list of species and locations where they have been detected.
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action.
- Monitor for the effect of management actions on non-target species and habitats.

Rescued plants:

- The location of all transplanted rescued plants must be recorded, along with the identity of the plant.
- The health / vigour of each transplanted individual should be monitored annually for a minimum of three years.
- As a scientific control, an equal number of non-transplanted individuals of the same species, within similar habitats, should be monitored in the same way as the transplanted specimens. This will provide comparative data on the survival of wild populations relative to transplanted plants.

Threatened species

- Where populations of threatened species are found to occur on site (flora and fauna), annual monitoring of population health should take place. This should be appropriate to the species concerned.

Rehabilitated areas:

- All management actions associated with rehabilitation must be recorded after each management action has taken place.
- All rehabilitated areas should be monitored to assess vegetation recovery. For each monitoring site, an equivalent comparitive site in adjacent undisturbed vegetation should be similarly monitored. Monitoring data collection should include the following:
    - total vegetation cover and height, as well as for each major growth form;
    - species composition, including relative dominance;
    - soil stability and/or development of erosion features;
    - representative photographs should be taken at each monitoring period.
- Monitoring of rehabilitated areas should take place annually for a minimum of three years, or until vegetation stability has been achieved.

DISCUSSION AND CONCLUSIONS

The study area consists mostly of natural habitat that is used for commercial animal husbandry. There are existing transmission power lines running across the site with associated access tracks as well infrastructure associated with a farmstead (Rondavel), but no other infrastructure on site. Existing impacts on natural habitat are related to grazing effects and erosion in lowland areas. The proposal to build a power line will therefore have some effects on natural habitat. The existing biodiversity on site is, however, relatively limited in terms of uniqueness or potential presence of species of concern, with the possible presence of one Critically Endangered mammal species.

The vegetation on site is not part of any threatened ecosystem. The regional vegetation types that occur on site, Eastern Upper Karoo and Upper Karoo Hardeveld, are both widespread and have low rates of transformation across their geographical range.

A risk assessment was undertaken which identified seven potential negative impacts due to construction or operation of the proposed power line. The potential impacts are as follows:

1. Direct loss of vegetation. For power lines, the main impact on terrestrial ecosystems is due to construction of towers and service roads. The placement of towers and service roads is therefore critical in limiting impacts. Placement adjacent to existing power lines if preferable.
2. Impacts on CBA1 areas. There is a CBA1 area in the northern part of the corridor that is very marginally affected by proposed infrastructure. It can, however, be avoided.
3. Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats. This can lead to additional degradation of natural areas.
4. Runoff and erosion due to creation of hard surfaces. This cn lead to downslope impacts that can cause additional degradation beyond the direct footprint of proposed infrastructure.

An assessment of these impacts indicates that they will have a significance of low or medium. If appropriate mitigation measures are put in place, all impacts can be reduced to having low significance after mitigation. On the basis of this assessment, the opinion is that the project should be able to proceed on condition the recommended mitigation measures are put in place to minimise predicted impacts.

REFERENCES:

FAIRBANKS, D.H.K., THOMPSON, M.W., VINK, D.E., NEWBY, T.S., VAN DEN BERG, H.M & EVERARD, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. *S.Afr.J.Science* 96: 69-82.

HOLNESS, S. and OOSTHUYSEN, E. 2016. Critical Biodiversity Areas of the Northern Cape: Technical Report.

MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C. AND POWRIE, I.W. (editors) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS South African National Biodiversity Institute, Pretoria.

MYERS, N., MITTERMEIR, R.A., MITTERMEIR, C.G., DE FONSECA, G.A.B., AND KENT, J. 2000. Biodiversity hotspots for conservation priorities. Nature 403, 853-858.

RUTHERFORD, M.C. AND WESTFALL., R.H. 1994. Biomes of Southern Africa. An objective characterisation. Memoirs of the Botanical Survey of South Africa 63, 1-94.

RUTHERFORD, M.C., MUCINA, L. AND POWRIE, L.W. 2006. Biomes and Bioregions of Southern Africa. In: L. Mucina and M.C. Rutherford (Eds). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, pp. 30-51. South African National Biodiversity Institute, Pretoria.

VAN WYK, A.E. AND SMITH, G.F. (Eds) 2001. Regions of Floristic Endemism in Southern Africa: A review with emphasis on succulents, pp. 1-199. Umdaus Press, Pretoria.

APPENDICES:

Appendix 1: Curriculum vitae: Dr David Hoare

Education
Matric - Graeme College, Grahamstown, 1984
B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction
M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history
1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
1January 2009 – 30 June 2009, Lecturer (contract), University of Pretoria, Botany Dept.
1January 2013 – 30 June 2013, Lecturer (contract), University of Pretoria, Botany Dept.
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant
Ecological consultant since 1995. Author of over 800 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:

Refereed scientific articles (in chronological order):

Journal articles:

HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

PFAB, M.F., COMPAAN, P.C., WHITTINGTON-JONES, C.A., ENGELBRECHT, I., DUMALISILE, L., MILLS, L., WEST, S.D., MULLER, P., MASTERSON, G.P.R., NEVHUTALU, L.S., HOLNESS, S.D., **HOARE, D.B.** 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. Bothalia, Vol. 47:1. a2182. https://doi.org/10.4102/abc.v47i1.2182.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. http://www.biodiversityhotspots.org/xp/hotspots/maputaland/.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.

HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).

HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.

BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.

HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 800 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afriakaanse Universiteit postgraduate symposium, 1997.

South African Association of Botanists Annual Congress, Bloemfontein, January 1995.

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Terrestrial Plant Species Compliance Statement

prepared in accordance with the
"Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Plant Species"

Electrical Grid Infrastructure for the Great Karoo Cluster of Renewable Energy Facilities near Richmond, Northern Cape Province

Prepared by: Dr David Hoare
Pr.Sci.Nat. (Botany, Ecology) 400221/05

For: Greater Kroo Renewable Energy (Pty) Ltd

11 May 2022

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SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation	Signature
Dr David Hoare	PhD Botany SACNASP (Pr.Sc.Nat.)	 Date: 11/05/2022

Details of Author:
Dr David Hoare

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Professional Natural Scientist, South African Council for Natural Scientific Professions, Reg. no. 400221/05 (Ecology, Botany)

Statement of independence:

I, David Hoare, as the appointed plant species specialist, hereby declare/affirm the correctness of the information provided in this compliance statement, and that I:

1. meet the general requirements to be independent and
2. have no business, financial, personal or other interest in the proposed development and that no circumstances have occurred that may have compromised my objectivity; and
3. am aware that a false declaration is an offence in terms of regulation 48 of the EIA Regulations (2014).

_____ 11/05/2022
Dr David Hoare Date

TERMS OF REFERENCE

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES

Prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the screening tool must be confirmed by the undertaking a site sensitivity verification. For the current site, the site web-based Online Screening Tool indicated MEDIUM sensitivity for the Terrestrial Plant Species Theme. This was confirmed as part of the Site Sensitivity Verification process (suspected habitat for SCC).

According to the Protocols, the following process must be followed:

- The presence or likely presence of the SCC identified by the screening tool, must be confirmed through a site inspection by a specialist registered with the SACNASP in a field of practice relevant to the taxonomic group ("taxa") for which the assessment is being undertaken.
- The assessment must be undertaken within the study area.
- The site inspection to determine the presence or likely presence of SCC must be undertaken in accordance with the Species Environmental Assessment Guideline.
- The site inspection is to confirm the presence, likely presence or confirmed absence of a SCC within the site identified as "medium" sensitivity by the screening tool.
- Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Plant Species Specialist Assessment must be submitted in accordance with the requirements specified for "very high" and "high" sensitivity in this protocol.
- Similarly, where no SCC are found on site during the investigation or if the presence is confirmed to be unlikely, a Terrestrial Plant Species Compliance Statement must be submitted.

On the basis of the outcome of the reconnaissance site inspection, where no SCC were found on site, a Compliance Statement process is proposed to be followed here. However, detailed research on the species flagged for this project indicates that both have a high likelihood of occurring within specific habitats on site. Suitable habitat on site is therefore automatically treated as having HIGH sensitivity (SCC found to be likely present).

TERRESTRIAL PLANT SPECIES COMPLIANCE STATEMENT

Where the sensitivity in the Screening Report from the web-based Online Screening Tool has been confirmed to be LOW, a Plant Species Compliance Statement is required, either (1) for areas where no natural habitat remains, or (2) in natural areas where there is no suspected occurrence of SCC.

The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).

The compliance stement must:
- be applicable within the study area
- confirm that the study area is of "low" sensitivity for terrestrial plant species; and
- indicate whether or not the proposed development will have anyimpact on SCC.

The compliance statement must contain, as a minimum, the following information:
- contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
- a signed statement of independence by the specialist;

- a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
- a baseline profile description of biodiversity and ecosystems of the site;
- the methodology used to verify the sensitivities of the terrestrial biodiversity and plant species features on the site including the equipment and modelling used where relevant;
- in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;
- where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;
- a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and
- any conditions to which this statement is subjected.

A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

INTRODUCTION

Project Background

Great Karoo Renewable Energy (Pty) Ltd is proposing the development of a commercial wind farm and associated infrastructure on a site located approximately 35km south-west of Richmond and 80km south-east of Victoria West (Figure 1), within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province. The electrical grid infrastructure assessed here links the entire cluster of renewable energy projects to the Eskom Gamma Substation (Figure 1).

The proposed facility is located just to the north of the Beaufort West Renewable Energy Development Zone (REDZ 11), one of the eleven REDZ formally gazetted in South Africa for development of solar and wind energy generation facilities.

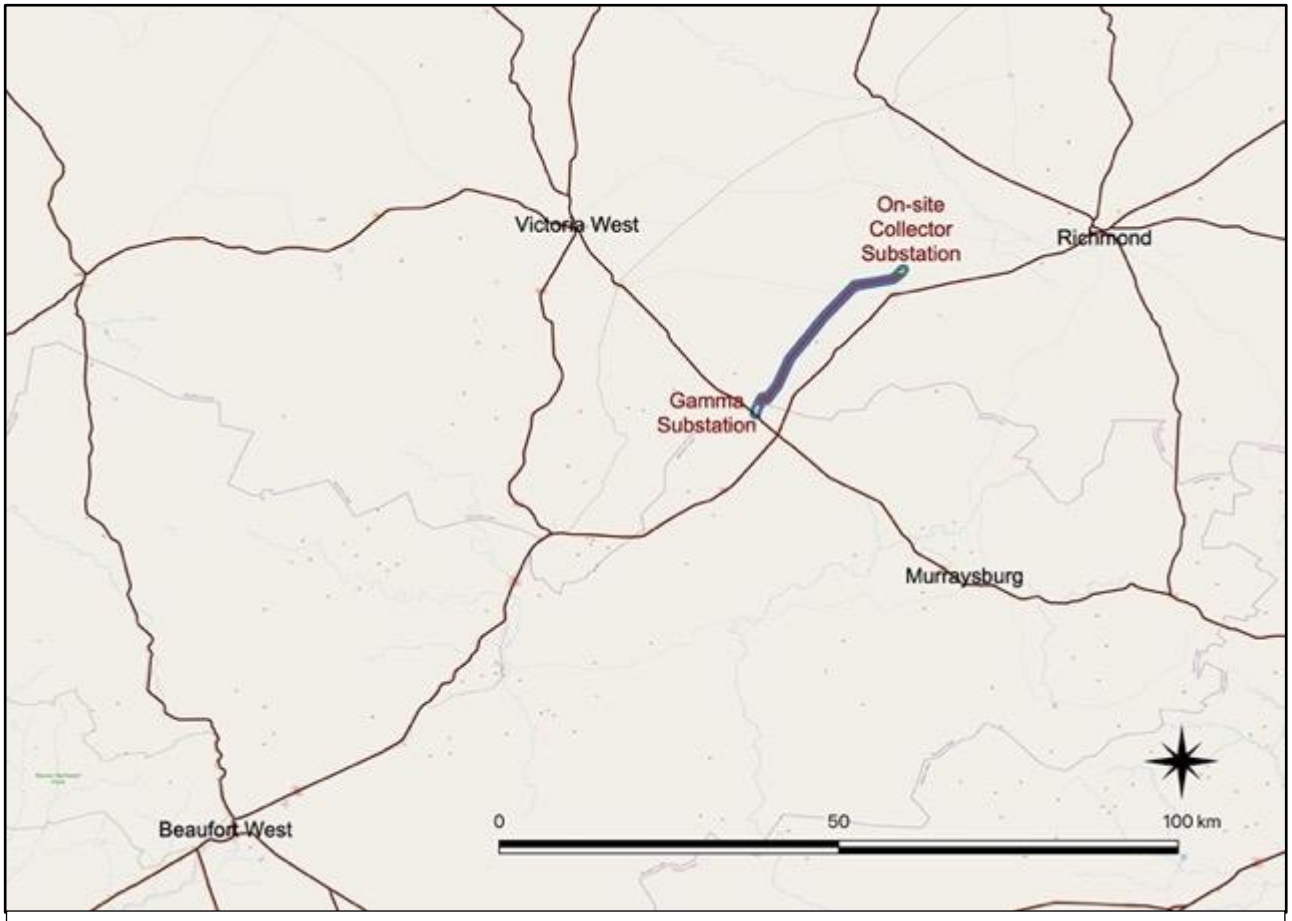

Figure 1**: Location of the proposed electrical grid infrastructure.**

Identified Theme Sensitivities

A sensitivity screening report from the DEA Online Screening Tool was requested in the application category: Utilities Infrastructure | Electricity | Generation | Renewable | Wind. The DEA Screening Tool report for the area indicates the following ecological sensitivities:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Plant Species Theme			X	

Plant Species theme
The plant species theme was highlighted as being of Medium sensitivity due the potential presence of the following species:

Sensitivity	Feature(s)
Medium	Isolepis expallescens
Medium	Hereroa concava
Medium	Sensitive species 945

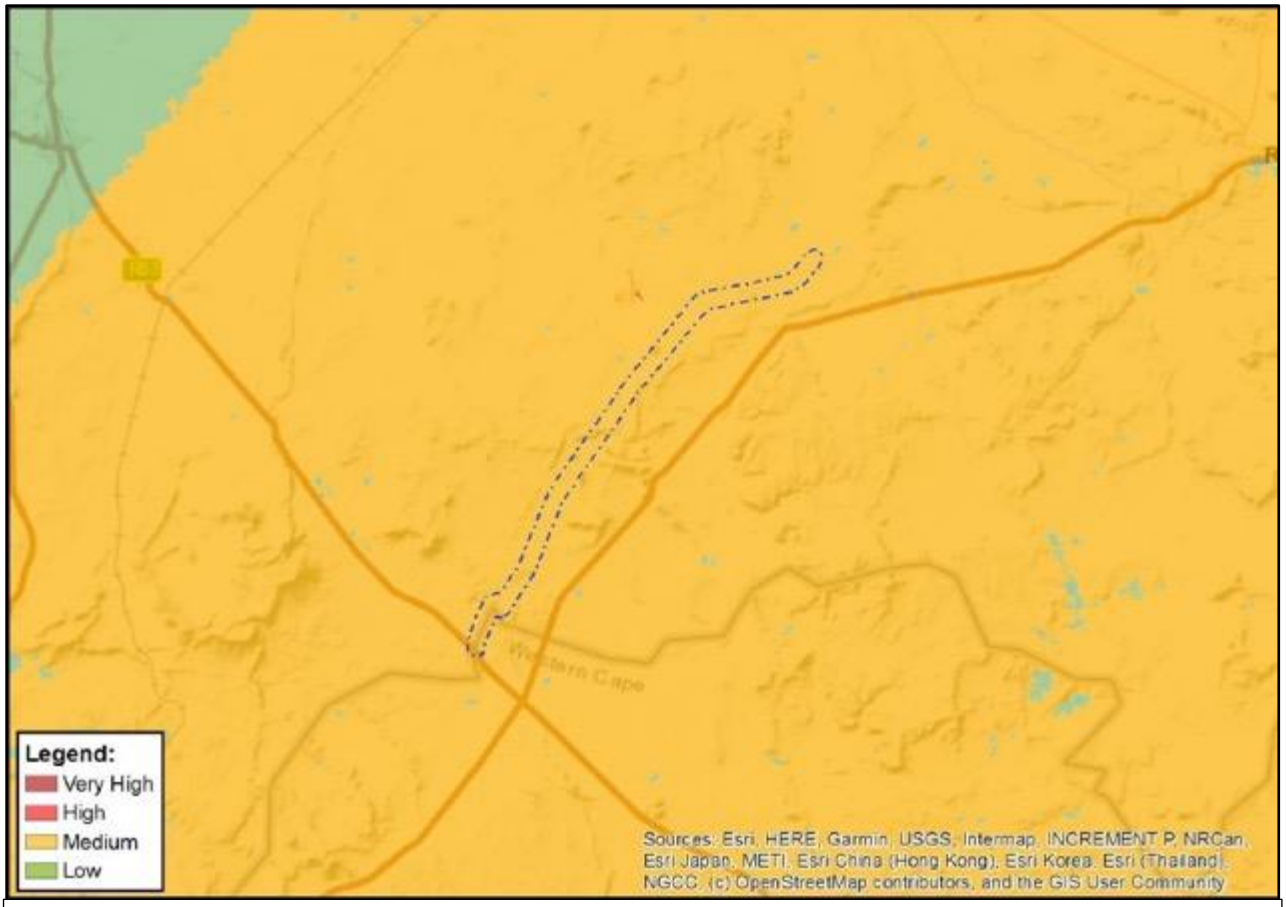

Figure 2**: DEA Screening Tool extract for Plant Theme.**

METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Survey timing

The study commenced as a desktop-study followed by a site-specific field surveys on 25th – 27th April 2016, 11th October 2020, 4th - 6th December 2020, and 30th - 31st July 2021. The site is within the Nama-Karoo Biome with a peak rainfall season in summer, spring and autumn, which occurs in March (major) and December / January (minor). The timing of the survey is therefore good in terms of assessing the flora of the site.

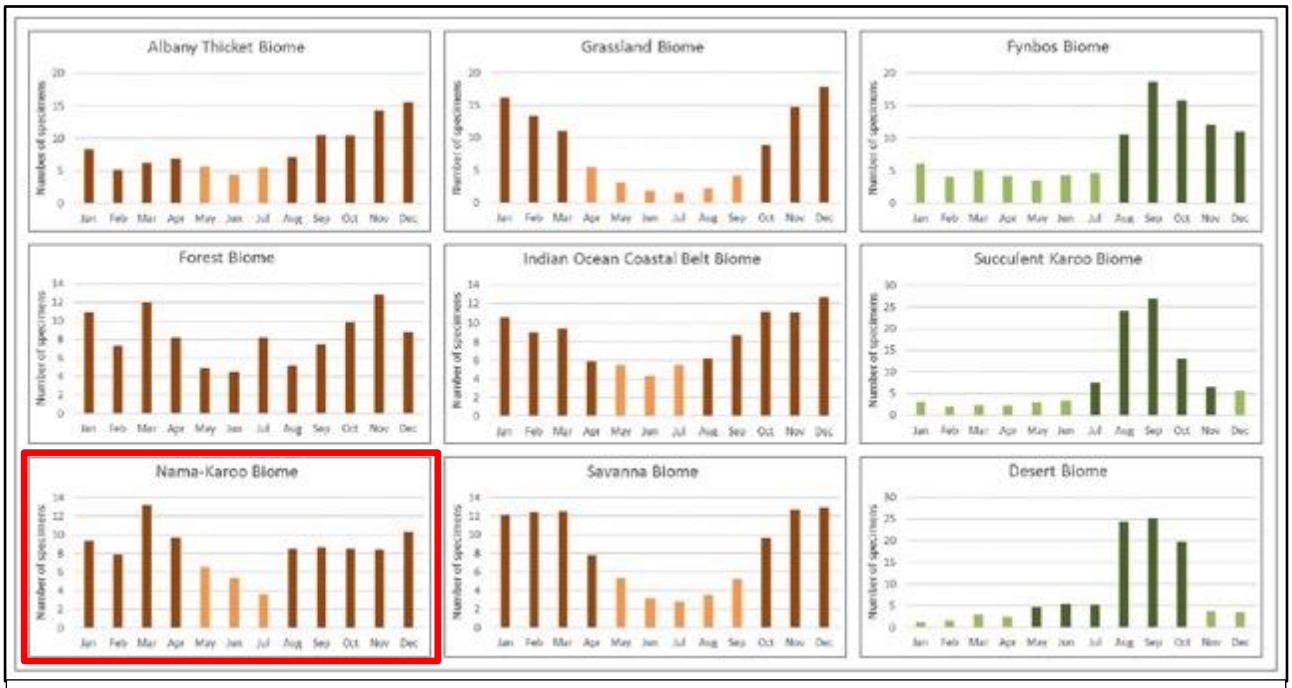

Figure 3: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines). The site is within the Nama-Karoo Biome.

Field survey approach

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made.

Aerial imagery from Google Earth was used to identify and assess habitats on site. Patterns identified from satellite imagery were verified on the ground. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground during the search for plant species. From this ground survey, as well as ad hoc observations on site, a checklist of plant species occurring on site was compiled.

Digital photographs were taken of all plant species that were seen on site. All plant species recorded were uploaded to the iNaturalist website.

Sources of information

Plant species

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org). The description of each vegetation type includes a list of plant species that may be expected to occur within the particular vegetation type.
- Plant species that could potentially occur on in the general area was extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grid/s in which the site is located.
- The IUCN Red List Category for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, http://redlist.sanbi.org).
- Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (http://posa.sanbi.org) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.
- Regulations published for the National Forests Act (Act 84 of 1998) (NFA) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area. The distribution of species on this list were obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (http://sibis.sanbi.org/) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there.

Limitations

- All fieldwork undertaken for this project was of a general nature to characterize the habitat of the study area, compile checklists from as diverse a variety of habitats as possible, and to map habitats within the entire collection of farms within which the cluster of renewable energy projects is situated. The proposed project layout was only provided during the EIA process; therefore no specific footprint areas were assessed for the Merino Wind Farm, only the general area in which the project is located.

Impact assessment methodology

Direct, indirect and cumulative impacts associated with the projects were assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.

- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment
    - 2 is minor and will not result in an impact on processes
    - 4 is low and will cause a slight impact on processes
    - 6 is moderate and will result in processes continuing but in a modified way
    - 8 is high (processes are altered to the extent that they temporarily cease)
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where
    - 1 is very improbable (probably will not happen),
    - 2 is improbable (some possibility, but low likelihood),
    - 3 is probable (distinct possibility),
    - 4 is highly probable (most likely) and
    - 5 is definite (impact will occur regardless of any prevention measures).
- the significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the status, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$$S=(E+D+M)P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

RESULTS

Broad vegetation patterns

There are two regional vegetation type in the study area, namely Eastern Upper Karoo and Upper Karoo Hardeveld, briefly described below, including expected species composition.

Upper Karoo Hardeveld (NKu2)

Distribution

Northern, Western and Eastern Cape Provinces: Discrete areas of slopes and ridges including dolerite dykes and sills in the region spanning Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east. Most crest areas and steep slopes of the Great Escarpment facing south between Teekloofpas (connecting Leeu-Gamka and Fraserburg) and eastwards to Graaff-Reinet. Altitude varies mostly from 1 000–1 900 m..

Vegetation & Landscape Features

Steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones supporting sparse dwarf Karoo scrub with drought-tolerant grasses of genera such as *Aristida, Eragrostis* and *Stipagrostis*.

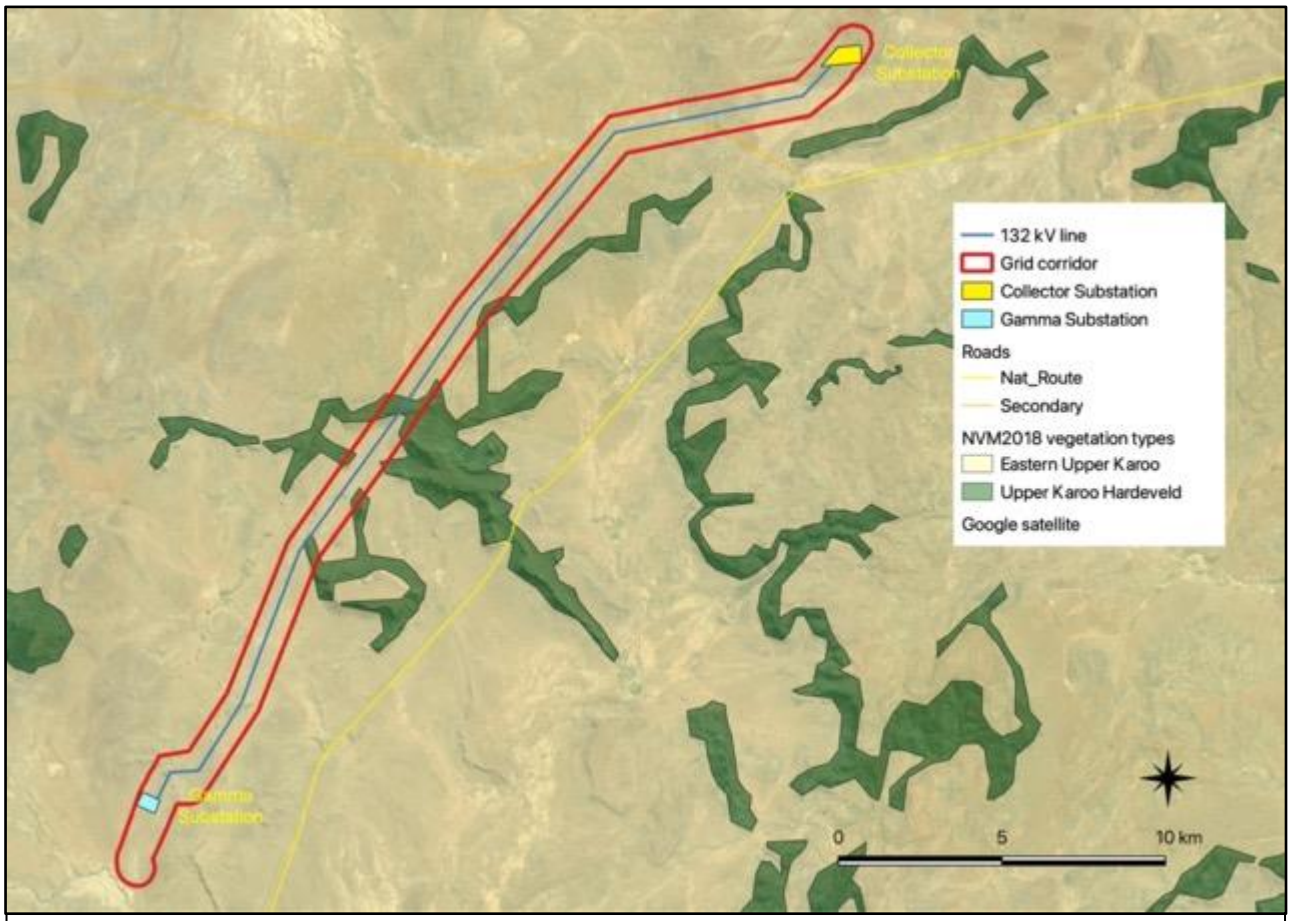

Figure 4: **Regional vegetation types of the site and surrounding areas.**

Geology & Soils

Primitive, skeletal soils in rocky areas developing over sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup of the Karoo Supergroup and to a lesser extent also the Ecca Group (Waterford and Volksrust Formations) as well as Jurassic dolerite sills and dykes and subsummit positions of mesas and butts with dolerite boulder slopes. Almost entirely Ib land type.

Climate

In the western part of its area this unit experiences the same climate as the Western Upper Karoo. In the eastern part the climate is very close to that of Karoo Escarpment. The MAP ranges from about 150 mm in the northwest to 350 mm along some grassland margins on the Great Escarpment and in the east. Water concentrates between rocks as a result of rainfall runoff. Incidence of frost is relatively high, but ranging widely from <30 days per year at lower altitudes to >80 days at highest altitudes. See also climate diagram for NKu 2 Upper Karoo Hardeveld (Figure 7.2).

Important Taxa

Tall Shrubs: *Lycium cinereum* (d), *Rhigozum obovatum* (d), *Cadaba aphylla*, *Diospyros austro-africana*, *Ehretia rigida* subsp. *rigida*, *Lycium oxycarpum*, *Melianthus comosus*, *Rhus burchellii*. **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *Euryops lateriflorus* (d), *Felicia muricata* (d), *Limeum aethiopicum* (d), *Pteronia glauca* (d), *Amphiglossa triflora*, *Aptosimum elongatum*, *A. spinescens*, *Asparagus mucronatus*, *A. retrofractus*, *A. striatus*, *A. suaveolens*, *Eriocephalus spinescens*, *Euryops annae*, *E. candollei, E. empetrifolium, E. nodosus, Felicia filifolia* subsp. *filifolia*, *Garuleum latifolium*, *Helichrysum lucilioides*, *H. zeyheri*, *Hermannia filifolia* var. *filifolia*, *H. multiflora*, *H. pulchella*, *H. vestita*, *Indigofera sessilifolia*, *Jamesbrittenia atropurpurea*, *Lessertia frutescens*, *Melolobium candicans*, *M. microphyllum*, *Microloma armatum*, *Monechma incanum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pelargonium abrotanifolium*, *P. ramosissimum*, *Pentzia globosa*, *P. spinescens*, *Plinthus karooicus*, *Polygala seminuda*, *Pteronia adenocarpa*, *P. sordida*, *Rosenia humilis*, *Selago albida*, *Solanum capense*, *Sutera halimifolia*, *Tetragonia arbuscula*, *Wahlenbergia tenella*. **Succulent Shrubs:** *Aloe broomii*, *Drosanthemum lique*, *Faucaria bosscheana*, *Kleinia longiflora*, *Pachypodium succulentum*, *Trichodiadema barbatum*, *Zygophyllum flexuosum*. **Semiparasitic Shrub**: *Thesium lineatum* (d). Herbs: *Troglophyton capillaceum* subsp. *capillaceum*, *Dianthus caespitosus* subsp. *caespitosus*, *Gazania krebsiana*, *Lepidium africanum* subsp. *africanum*, *Leysera tenella*, *Pelargonium minimum*, *Sutera pinnatifida*, *Tribulus terrestris*. **Geophytic Herbs:** *Albuca setosa*, *Androcymbium albomarginatum*, *Asplenium cordatum*, *Boophone disticha*, *Cheilanthes bergiana*, *Drimia intricata*, *Oxalis depressa*, Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *A. diffusa* (d), *Cenchrus ciliaris* (d), *Enneapogon desvauxii* (d), *Eragrostis lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis obtusa* (d), *Cynodon incompletus*, *Digitaria eriantha*, *Ehrharta calycina*, *Enneapogon scaber*, *E. scoparius*, *Eragrostis curvula*, *E. nindensis, E. procumbens*, *Fingerhuthia africana*, *Heteropogon contortus*, *Merxmuellera disticha*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*.

Endemic Taxa

Succulent Shrubs: *Aloe chlorantha, Crassula barbata* subsp. *broomii, Delosperma robustum, Sceletium expansum, Stomatium suaveolens*. **Low Shrubs**: *Cineraria polycephala, Euryops petraeus, Lotononis azureoides, Selago magnakarooica*. **Tall Shrub**: *Anisodontea malvastroides*. **Herbs**: *Cineraria arctotidea, Vellereophyton niveum*. **Succulent Herbs**: *Adromischus fallax, A. humilis*. **Geophytic Herbs**: *Gethyllis longistyla, Lachenalia auriolae, Ornithogalum paucifolium* subsp. *karooparkense*.

Eastern Upper Karoo (NKu4)

Distribution

Northern Cape, Eastern Cape and Western Cape Provinces: Between Carnarvon and Loxton in the west, De Aar, Petrusville and Venterstad in the north, Burgersdorp, Hofmeyr and Cradock in the east and the Great Escarpment and the Sneeuberge-Coetzeesberge mountain chain in the south. Altitude varies between mostly 1 000–1 700 m. Vegetation & Landscape Features

Flats and gently sloping plains (interspersed with hills and rocky areas of Upper Karoo Hardeveld in the west, Besemkaree Koppies Shrubland in the northeast and Tarkastad Montane Shrubland in the southeast), dominated by dwarf microphyllous shrubs, with 'white' grasses of the genera *Aristida* and *Eragrostis* (these become prominent especially in the early autumn months after good summer rains). The grass cover increases along a gradient from southwest to northeast.

Geology & Soils

Mudstones and sandstones of the Beaufort Group (incl. both Adelaide and Tarkastad Subgroups) supporting duplex soils with prismacutanic and/or pedocutanic diagnostic horizons dominant (Da land type) as well as some shallow Glenrosa and Mispah soils (Fb and Fc land types). In places, less prominent Jurassic dolerites (Karoo Dolerite Suite) are also found.

Climate

Rainfall mainly in autumn and summer, peaking in March. MAP ranges from about 180 mm in the west to 430 mm in the east. Incidence of frost is relatively high, but ranging widely from <30 days (in the lower-altitude Cradock area) to >80 days of frost per year (bordering the Upper Karoo Hardeveld on the Compassberg and mountains immediately to the west). Mean maximum and minimum monthly temperatures in Middelburg (Grootfontein) are 36.1°C and –7.2°C for January and July, respectively. Corresponding values are 37°C and –8°C for Victoria West and 36.6°C and –4.2°C for Hofmeyr. See also climate diagram for NKu 4 Eastern Upper Karoo.

Important Taxa

Tall Shrubs: *Lycium cinereum* (d), *L. horridum*, *L. oxycarpum*. **Low Shrubs**: *Chrysocoma ciliata* (d), *Eriocephalus ericoides* subsp. *ericoides* (d), *E. spinescens* (d), *Pentzia globosa* (d), *P. incana* (d), *Phymaspermum parvifolium* (d), *Salsola calluna* (d), *Aptosimum procumbens*, *Felicia muricata*, *Gnidia polycephala*, *Helichrysum dregeanum*, *H. lucilioides*, *Limeum aethiopicum*, *Nenax microphylla*, *Osteospermum leptolobum*, *Plinthus karooicus*, *Pteronia glauca*, *Rosenia humilis*, *Selago geniculata*, *S. saxatilis*. **Succulent Shrubs**: *Euphorbia hypogaea*, *Ruschia intricata*. **Herbs**: *Indigofera alternans*, *Pelargonium minimum*, *Tribulus terrestris*. **Geophytic Herbs**: *Moraea pallida* (d), *Moraea polystachya*, *Syringodea bifucata*, *S. concolor*. **Succulent Herbs**: *Psilocaulon coriarium*, *Tridentea jucunda, T. virescens.* **Graminoids**: *Aristida congesta* (d), *A. diffusa* (d), *Cynodon incompletus* (d), *Eragrostis bergiana* (d), *E. bicolor* (d), *E. lehmanniana* (d), *E. obtusa* (d), *Sporobolus fimbriatus* (d), *Stipagrostis ciliata* (d), *Tragus koelerioides* (d), *Aristida adscensionis*, *Chloris virgata*, *Cyperus usitatus*, *Digitaria eriantha*, *Enneapogon desvauxii*, *E. scoparius*, *Eragrostis curvula*, *Fingerhuthia africana*, *Heteropogon contortus*, *Sporobolus ludwigii*, *S. tenellus*, *Stipagrostis obtusa*, *Themeda triandra*, *Tragus berteronianus*.

Endemic Taxa

Succulent Shrubs: *Chasmatophyllum rouxii*, *Hertia cluytiifolia*, *Rabiea albinota*, *Salsola tetrandra*. **Tall Shrub:** *Phymaspermum scoparium*. **Low Shrubs:** *Aspalathus acicularis* subsp. *planifolia*, *Selago persimilis*, *S. walpersii*.

Habitats on site

A map of habitats on site is provided in (Figure 5). This shows various habitat units on site, as follows:

1. Hills and mountains
2. Rocky areas
3. Plains
4. Drainage areas
5. Drainage scrub
6. Open water
7. No natural habitat

Hills and mountains

The site is characterised by the presence of a range of hills that form a mini-escarpment parallel to the national road. The topography within these areas is relatively steep and rugged. There are also various low hills and the free-standing Bloukop inland of the mini-escarpment. The vegetation in these areas is a grassy dwarf karroid shrubland. There are various parts of the hills that contain outcrops of rocks, either as shelves or as boulders. The vegetation within these areas is largely woody, consisting of various low- to medium-height shrubs.

The hills and mountains areas, including the rocky areas within them, are the most likely habitat for any SCC flagged for the site.

Plains
The plains on the lowlands have gently undulating topography. They are found between the hills throughout the site. The vegetation in these areas is mostly a dwarf karroid shrubland. These areas have been moderately to heavily grazed throughout the study area.

Drainage areas
In the lowest parts of the plains, often in wide bands, are areas that are shaped by fluvial processes and are either channelled in places or eroded from water movement. The soils are mostly deep sands where they have not been eroded away. The vegetation is a karroid dwarf shrubland or a sparse weedy community in eroded areas.

Open water
There are a number of farm dams on site. These are all man-made, but they nevertheless constitute and important water resource for wildlife. There is a possibility that the Protected Giant Bullfrog occurs in the general area, in which case these areas of open water may constitute important habitat for them.

No natural habitat
All areas where natural habitat has been lost have been included in this map unit. This includes farm houses, roads, cultivated areas, previously cultivated areas, quarries and other disturbed areas.

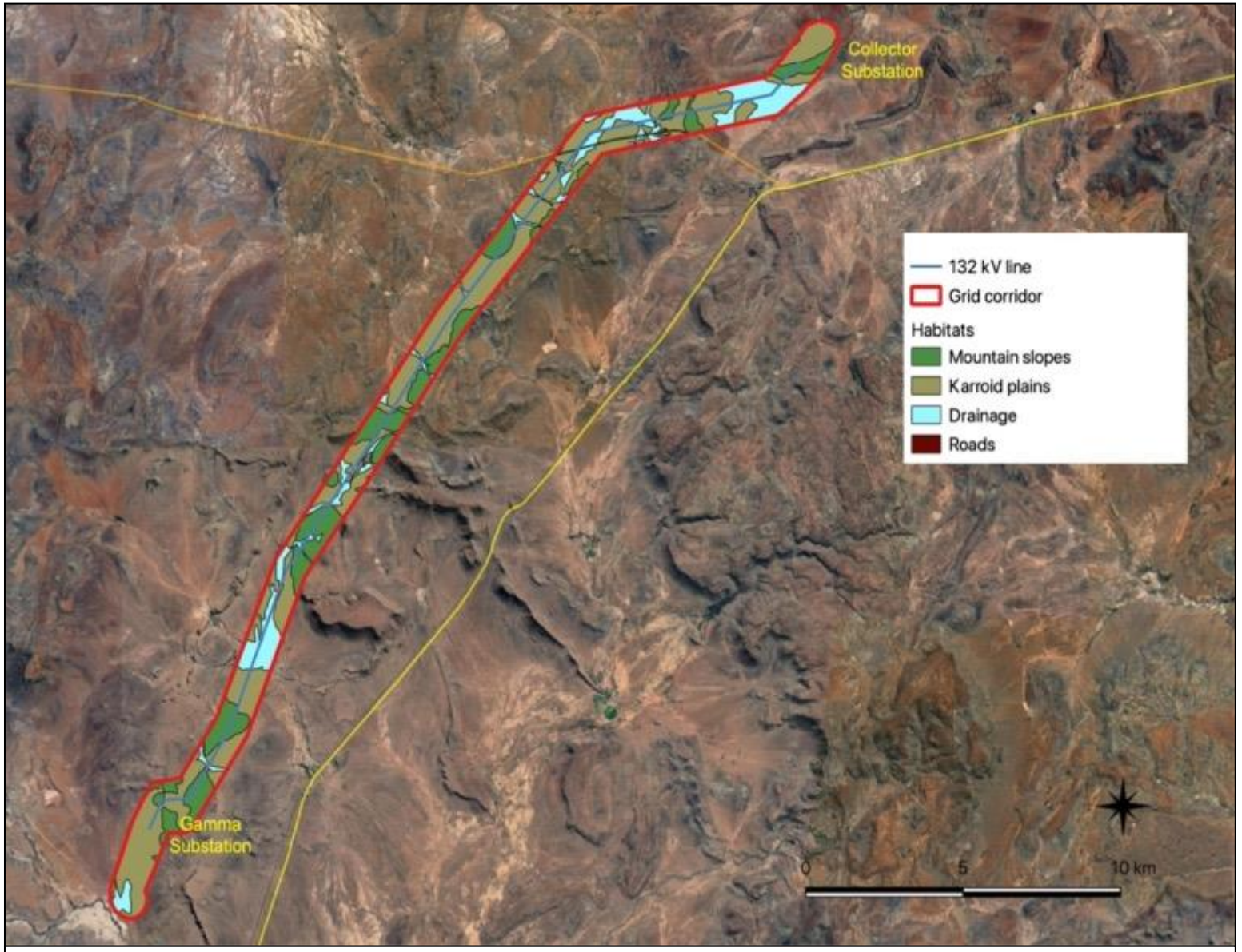

Figure 5: **Habitats of the study area.**

Plant species flagged for the study area

According to the National Web-Based Environmental screening tool, 2 plant species have been flagged as of concern for the area the current project is in, these are listed below. A description of each species is provided.

Isolepis expallescens (Cyperaceae)
Vulnerable D2
This is a range-restricted habitat specialist known from only three locations, although its distribution range is botanically very poorly explored. It is found in the Nuweveld Mountains between Fraserburg and Victoria West in damp areas along stream channels. One of the known collections is near to Gamma substation – the given locality is the quarter degree grid 3123CB, which includes the entire southern half of the corridor. It could occur on site, in which case it would be found in channels with permanent moisture.

Hereroa concava (Aizoaceae)
Vulnerable B1ab(iii)
Due to taxonomic uncertainty, this species' distribution range is not well known. It appears to be endemic to a small area in the Great Karoo between Beaufort West, Richmond and De Aar. It is known to occur in Eastern Upper Karoo and Upper Karoo Hardeveld vegetation types. Plants occur sheltered among shrubs on flats and plateaus with shale outcrops. There are very few records of this species, and these known records are scattered over a wide area. Herbarium collections, where the identity is confirmed, indicate that it is common in the Karoo National Park. Its abundance elsewhere is not well known. Known records from iNaturalist include the plains above the mountains north of Beaufort West, and a hilltop north of Hanover. The study site is almost exactly half way between these two locations and habitat on site fits the description of locations where this species has been previously recorded. There are two records of *Hereroa* species on site that have only been identified to genus level. Based on the distribution of known taxa, it is highly likely that they are *Hereroa concava*. It is therefore assumed that it probably occurs on site, and that rocky hills are the most likely habitat on site.

Sensitive species 945
A Near Threatened geophyte known from the summits of rocky dolerite ridges in the Nama Karoo. It is endemic to the karoo, occurring in the Sneeuberg, Agter-Sneeuberg and Nuweveld Mountains, extending inland to the area between Hanover and Beaufort West, broadly following the N1 road. There is a known photographic observation within the broad renewable energy cluster assessed for this overall project, which is near to the current Merino Wind Farm project. It is likely, based on the habitat requirements and distribution, that the species occurs on site, and that rocky hills are the most likely habitat on site.

Additional listed plant species for the study area
A database search identifies a number of additional listed plant species that could possibly occur on site that are not flagged in the Screening Tool output. This includes the following:

- *Tridentia virescens* (APOCYNACEAE) (Rare): Warmbad in southern Namibia to Kakamas and Prieska in the Nortern Cape stretching east to Prince Albert and Aberdeen. Stony ground, or hard loam in floodplains. It has a very wide geographical distribution but is rarely found. A relatively recent (2017) observation was made in the Doornkloof Nature Reserve north of Colesberg (www.ispotnature.org) and it was documented in 1957 from near Murraysburg in habitat similar to that found on site. There is therefore at least a moderate probability that it occurs on site.
- *Anisodontea malvastroides* (Rare): This species is endemic to the mountains of the Great Karoo, where it occurs in the Nuweveld and Sneeuberg mountains between Beaufort West and Middelburg in arid grassland on summit plateaus and escarpments. It has also been

recorded on an inselberg-like outcrop north of Richmond. It could possibly occur on site, in which case it is likely to be found on the summit of prominent hills.

- *Aloe broomii* var *tarkaensis* (Rare) is found from Tarkastad and Middelburg to Graaff-Reinet in low stony ridges associated with the escarpment. The distribution of var. *tarkaensis* is to the south-east of the current site. Two observations of *Aloe broomii* were made on site, but both are from var. *broomii* and not var. *tarkaensis*. *Aloe broomii* var *tarkaensis* is therefore unlikely to occur on site.

Protected species recorded in the study area

There are a number of species recorded on site that are protected under the Northern Cape Nature Conservation Act No. 9 of 2009 (Appendix 3). It is a legal requirement to obtain a permit from the provincial authorities for the destruction of any of these species. A comprehensive walk-through survey of the final footprint is required to compile a complete list of these protected species.

Plant species recorded in the study area

A total of 72 plant species were recorded during the field surveys (Appendix 2). If other observation data is taken into account from other ad hoc surveys in the area, then there are close to 200 plant species that are known to occur in the direct study area and nearly 470 that are known from the general area that includes the site. This is relatively diverse for an arid environment.

POSSIBLE IMPACTS

Anticipated impacts

For all infrastructure components there is the possibility that individuals or populations of plant species of conservation concern may be lost due to construction impacts. It is, however, not possible to assess the significance of such impacts without information on the location of any such species, if they occur on site or not.

Based on known information, and data collected on site, the probability of encountering SCC at any particular location is considered to be low, but moderate to high across the entire site. Due to the arid nature of the area and the dispersed nature of plant populations, it is likely that any SCC on site will occur at low densities, if they occur there. Given the nature of the project (wind energy and powerlines), the dispersed nature of the infrastructure is unlikely to consistently strike any SCC. The exception is the road network, which, for wind energy projects, is usually extensive and a a significant cause of habitat loss.

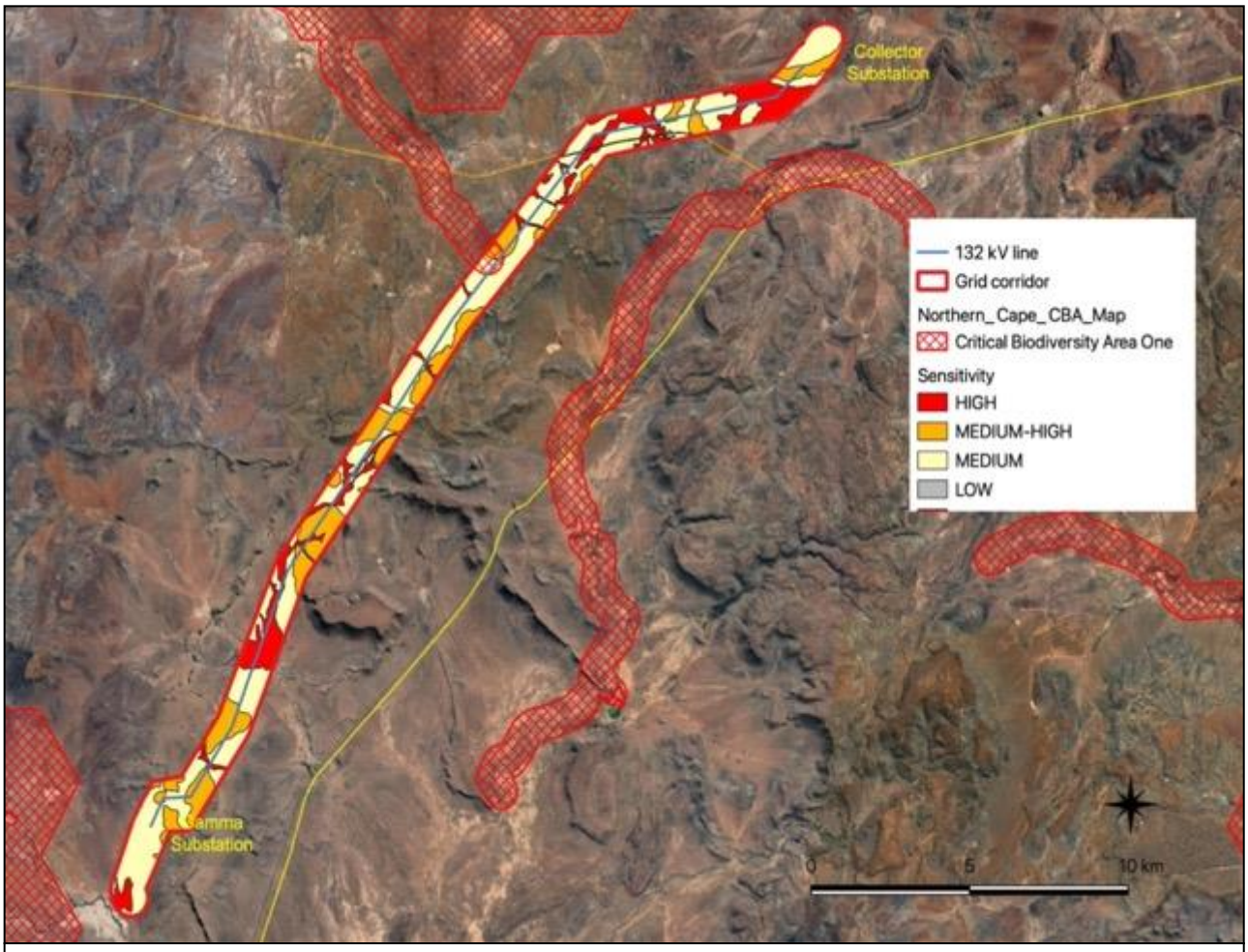

Figure 6: Location of proposed infrastructure relative to plant species sensitivity of the study area.

The best mitigation to address uncertainty issues related to SCC is to do a walk-through survey of all final infrastructure positions to check for SCC, and to collect the necessary data for any flora permits that may be required.

Based on the field data and desktop assessment of SCC, the specific habitats or locations where the risk is considered to be higher than anywhere else is within the ridges and mountain slopes. Any areas with permanent moisture are potential habitat for one SCC.

Proposed infrastructure in relation to sensitivities

Infrastructure locations relative to mapped Plant Theme sensitivities are shown in Figure 6.

Construction Phase Impacts

1. Loss of individuals of SCC

ASSESSMENT OF IMPACTS

A detailed assessment, as per the requirements the protocol for the specialist assessment and minimum report content requirements of environmental impacts on terrestrial plant species for activities requiring environmental authorisation, (20 March 2020), of the significance of all impacts during all phases of the project (Construction, Operation, Decommissioning and Cumulative) is provided below. This also includes all proposed mitigation measures and provides assessment before and after the implementation of proposed mitigation measures.

The proposed site is identified by the national web-based environmental screening tool as being medium sensitivity for Plant Species, and the protocol therefore requires that the level of assessment must be written up in a Terrestrial Plant Species Compliance Statement.

Construction Phase Impacts

Loss of individuals of Species of Conservation Concern due to clearing for construction

Nature: Loss of individuals of Species of Conservation Concern due to clearing for construction			
Impact description: The impact will occur due to clearing of indigenous vegetation for the purposes of construction of infrastructure.			
	Rating	**Motivation**	**Significance**
Prior to Mitigation			
Duration	Permanent (5)	Clearing of habitat and consequent loss of individuals of plant species will be permanent	**Medium Negative (45)**
Extent	Local (2)	The impact will occur at the scale of the proposed infrastructure but could affect population processes more widely	
Magnitude	High (8)	For populations of plant species of concern, a worst-case scenario is that local populations are exterminated on site, in which case local population processes will cease.	
Probability	Possible (3)	The location of possible populations is unknown, but infrastructure will be located in favourable habitt, therefore there is a possibility of it happening	
Mitigation/Enhancement Measures			
Mitigation: 1. Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur. 2. Where significant populations of SCC are found, shift infrastructure to avoid direct impacts. 3. Compile a Plant Rescue Plan. 4. Undertake monitoring to evaluate whether further measures would be required to manage impacts.			

Post Mitigation/Enhancement Measures			
Duration	Permanent (5)	Clearing of habitat and consequent loss of individuals of plant species will be permanent	**Low Negative (9)**
Extent	Local (2)	The impact will occur at the scale of the proposed infrastructure but could affect population processes more widely	
Magnitude	Minor (2)	Avoidance of impact will lead to minimal loss of individuals of SCC.	
Probability	Very improbable (1)	Locating and avoiding any populations of SCC means the impact will probably not occur.	
Cumulative impacts: The probability of the impact occurring increases with the number of projects that are constructed. An assessment of cumulative impacts is provided below (separate table).			
Residual Risks: There is some residual risk on the basis that SCC are often difficult to locate in the field and could be overlooked during a walk-through survey. The risk is dependent on the competence and diligence of the botanist undertaking the walk-through survey, and the degree to which resources are limited in support of the walk-down survey.			

Nature: Cumulative impacts on SCC from construction clearing due to a number of projects

Nature:		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium (45)**	**High (60)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: As above.		

Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

- It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project.
- A detailed pre-construction walk-through survey will be required during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal service roads and footprints of tower structures (final infrastructure layout). The best season is **early to late Summer**, but dependent on recent rainfall and vegetation growth.
- It is possible that some plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas, but the description and appropriateness of such measures must be included in a Plant Rescue Plan. Any such measures will reduce the irreplaceable loss of resources as well as the cumulative effect. Note that Search and Rescue is only appropriate for some species and that a high mortality rate can be expected from individuals of species that are not appropriate to transplant.
- A Plant Rescue Plan must be compiled to be approved by the appropriate authorities.
- For any plants that are transplanted, annual monitoring should take place to assess survival. This should be undertaken for a period of three years after translocation and be undertaken by a qualified botanist. The monitoring programme must be designed prior to translocation of plants and should include control sites (areas not disturbed by the project) to evaluate mortality relative to wild populations.
- No collecting or poaching of any plant species.
- Report any loss of protected species to conservation authorities
- Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species.
- Implement strict access control for the site.
- Report any illegal collection to conservation authorities.

Summary of monitoring recommendations

Specific monitoring recommendations should be provided in the Plant Rescue Plan, the Alien Invasive Management Plan, and the Rehabilitation Plan. The following are broad recommendations:

Rescued plants:

- The location of all transplanted rescued plants must be recorded, along with the identity of the plant.
- The health / vigour of each transplanted individual should be monitored annually for a minimum of three years.
- As a scientific control, an equal number of non-transplanted individuals of the same species, within similar habitats, should be monitored in the same way as the transplanted specimens. This will provide comparative data on the survival of wild populations relative to transplanted plants.

Threatened species

- Where populations of threatened species are found to occur on site (flora and fauna), annual monitoring of population health should take place. This should be appropriate to the species concerned.

CONCLUSIONS

- There are three plant species of conservation concern that could possibly occur on site, but none were seen during general field surveys. A targeted walk-through survey of footprint areas is required to determine if either occurs at any particular location or not. This survey can take place at the same time as the required walk-through surveys for permitting purposes, or it can be undertaken as a separate targeted survey.

- The mountain slopes and ridges are the specific locations or habitats on site where the risk of encountering two of the plant species of conservation concern is considered to be higher than any other part. Permanently moist areas are a high risk for the third species. It is therefore possible that any infrastructure component could affect plant species of concern, although the overall risk is considered to be low.

Required pre-construction survey

For permitting purposes, the following flora survey is required prior to construction activities taking place:

1. Detailed floristic walk-through survey of all footprint areas in order to document composition, especially of protected species. This must be undertaken after an appropriate time-period after rainfall to allow emergence of any species of potential concern. The survey must also cover ALL footprint areas, including final road alignments. Renewal energy projects similar to the one assessed here tend to have high fluidity in terms of layout and technology, due to the current rapid evolution of the technology, which allows more efficient deployment of infrastructure. However, this means that "final" layouts regularly change. The walk-through survey:
    a. MUST ASSESS THE FOOTPRINT THAT WILL BE CONSTRUCTED – if this changes then the new footprint areas must be subject to a walk-through suvey in full.
    b. MUST BE UNDERTAKEN IN THE CORRECT SEASON.
    c. MUST BE ADEQUATELY RESOURCED TO ENSURE IT IS DONE PROPERLY.
    d. MUST BE UNDERTAKEN BY A COMPETENT BOTANIST WITH KNOWLEDGE OF THE AREA.

REFERENCES:

GERMISHUIZEN, G., MEYER, N.L., STEENKAMP, Y and KEITH, M. (eds.) (2006). A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41, SABONET, Pretoria.

IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.

MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

VAN WYK, A.E. AND SMITH, G.F. (Eds) 2001. Regions of Floristic Endemism in Southern Africa: A review with emphasis on succulents, pp. 1-199. Umdaus Press, Pretoria.

APPENDICES:

Appendix 1: List of protected tree species (National Forests Act, 1998).

In terms of section 15(1) of the National Forests Act, 1998, 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 product derived from a protected tree, except under a licence or exemption granted by the Minister of Agriculture, Forestry and Fisheries. The list of Protected Tree Species under the National Forest Act, 1998 (Act No. 84 of 1998) is attached here as Appendix 1. The most recent version of this list was published in the Government Gazette No. 41887 on 7 September 2018, designated as GN No. 536 of 2018, and contains 47 species distributed across South Africa.

SCHEDULE A

Botanical name	**English common names**	**Other common names** **Afrikaans (A), Sepedi (P), Sesotho (S), Setswana (T), Tshivenda (V), isiXhosa (X), isiZulu (Z), Xitsonga (XT)**	**National tree number**
Acacia erioloba	Camel thorn	Kameeldoring (A)/Mogohlo (NS)/Mogo̓tlho̓ (T)/	168
Acacia haematoxylon	Grey camel thorn	Vaalkameeldoring (A)/Mokholo (T))	169
Adansonia digitata	Baobab	Kremetart (A)/Seboi (NS)/Mowana (T)/Ximuwu (XT	467
Afzelia quanzensis	Pod mahogany	Peulmahonie (A)/Mutokota (V)/Inkehli (Z)	207
Balanites subsp. *maughamii*	Torchwood	Groendoring (A)/Ugobandlovu (Z)	251
Barringtonia racemosa	Powder-puff tree	Poeierkwasboom (A)/Iboqo (Z)	524
Boscia albitrunca	Shepherd's tree	Witgat (A)/Mohlo̓pi (NS)/Motlho̓pi (T)/ Muvhombwe (V)/Umgqomogqomo (X)/Umvithi (Z)	122
Brachystegia spiciformis	Msasa	Msasa (A)	198.1
Breonadia salicina	Matumi	Mingerhout (A)/Mohlome̓ (NS)/Mutu-lume (V)/Umfomfo (Z)	684
Bruguiera gymnorrhiza	Black mangrove	Swartwortelboom (A)/isiKhangati (X)/IsiHlobane (Z)	527
Cassipourea swaziensis	Swazi onionwood	Swazi-uiehout (A)	531.1
Catha edulis	Bushman's tea	Boesmanstee (A)/Mohlatse (NS)/Igqwaka (X)/Umhlwazi (Z)	404
Ceriops tagal	Indian mangrove	Indiese wortelboom (A)/isinkaha (Z)	525

Cleistanthus schlechteri var. *schlechteri*	False tamboti	Bastertambotie (A)/Umzithi (Z)	320
Colubrina nicholsonii	Pondo weeping thorn	Pondo-treurdoring (A)	453.8
Combretum imberbe	Leadwood	Hardekool (A)/Mohwelere-tsʰipi (NS)/Motswiri (T)/Impondondlovu (Z)	539
Curtisia dentata	Assegai	Assegaai (A)/Umgxina (X)/Umagunda (Z)	570
Elaeodendron transvaalensis	Bushveld saffron	Bosveld-saffraan (A)/Monomane (T)/Ingwavuma (Z)	416
Erythrophysa transvaalensis	Bushveld red balloon	Bosveld-rooiklapperbos (A)/Mofalatsane (T)	436.2
Euclea pseudebenus	Ebony guarri	Ebbeboom-ghwarrie (A)	598
Ficus trichopoda	Swamp fig	Moerasvy (A)/Umvubu (Z)	54
Leucadendron argenteum	Silver tree	Silwerboom (A)	77
Lumnitzera racemosa var. *racemosa*	Tonga mangrove	Tonga-wortelboom (A)/isiKhaha-esibomvu (Z)	552
Lydenburgia abbottii	Pondo bushman's tea	Pondo-boesmanstee (A)	407
Lydenburgia cassinoides	Sekhukhuni bushman's tea	Sekhukhuni-boesmanstee (A)	406
Mimusops caffra	Coastal red milkwood	Kusrooimelkhout (A)/Umthunzi (X)/Umkhakhayi (Z)	583
Newtonia hildebrandtii var. *hildebrandtii*	Lebombo wattle	Lebombo-wattel (A)/Umfomothi (Z)	191
Ocotea bullata	Stinkwood	Stinkhout (A)/Umhlungulu (X)/Umnukane (Z)	118
Ozoroa namaquensis	Gariep resin tree	Gariep-harpuisboom (A)	373.2
Philenoptera violacea	Apple-leaf	Appelblaar (A)/Mphata (NS)/Mohata (T)/isiHomohomo (Z)	238
Pittosporum viridiflorum	Cheesewood	Kasuur (A)/Kgalagangwe (NS)/Umkhwenkwe (X)/Umfusamvu (Z)	139
Podocarpus elongatus	Breede River yellowwood	Breëriviergeelhout (A)	15
Podocarpus falcatus (Afrocarpus falcatus)	Outeniqua yellowwood	Outniekwageelhout (A)/Mogo͡bago͡ba (NS)/Umkhoba (X)/Umsonti (Z)	16
Podocarpus henkelii	Henkel's yellowwood	Henkel se geelhout (A)/Umsonti (X)/Umsonti (Z)	17
Podocarpus latifolius	Real yellowwood	Regte-geelhout (A)/Mogo͡bago͡ba (NS)/Umcheya (X)/Umkhoba (Z)	18
Protea comptonii	Saddleback sugarbush	Barberton-suikerbos (A)	88
Protea curvata	Serpentine sugarbush	Serpentynsuikerbos (A)	88.1
Prunus africana	Red stinkwood	Rooistinkhout (A)/Umkhakhase (X)/Umdumezulu (Z)	147
Pterocarpus angolensis	Wild teak	Kiaat (A)/Moro͡to͡ (NS)/Mokwa (T)/Mutondo (V)/Umvangazi (Z)	236
Rhizophora mucronata	Red mangrove	Rooiwortelboom (A)/isiKhangathi (X)/Umhlume (Z)	526

Sclerocarya birrea subsp. *caffra*	Marula	Maroela (A)/Morula (NS)/Morula (T)/Umganu (Z) /Nkanyi (XT)	360
Securidaca longepedunculata	Violet tree	Krinkhout (A)/Mmaba (T)	303
Sideroxylon inerme subsp. *inerme*	White milkwood	Witmelkhout (A)/Ximafana (X)/Umakhwelafingqane (Z)	579
Tephrosia pondoensis	Pondo poison pea	Pondo-gifertjie (A)	226.1
Warburgia salutaris	Pepper-bark tree	Peperbasboom (A)/Molaka (NS)/Mulanga (V)/isiBaha (Z)	488
Widdringtonia cedarbergensis	Clanwilliam cedar	Clanwilliamseder (A)	19
Widdringtonia schwarzii	Willowmore cedar	Baviaanskloofseder (A)	21
Berchemia zeyheri *(RHAMNACEAE) LC*	Red ivory Pink ivory	Rooi-ivoor (A) / Rooihout (A) / Monee (S) / umNeyi (SW) / umNini (Z, X) / Xiniyani (TS) / Moye (T) / Munia-niane (V)	450
Diospyros mespiliformis *(EBENACEAE) LC*	Jackal berry	Jakkalsbessie (A) / Musuma (V) / Muntoma (TS) / Mgula (TS)	606
Schinziophyton rautanenii	Manketti / Mongongo	Mankettiboom (A) / Monghongho (T) / Makongwa (T)	337
Umtiza listeriana	Umtiza	Umtiza (X) / Omtisa (A)	205

Boscia albitrunca has a geographical distribution that is close to the study area.

Appendix 2: Plant species recorded on site and nearby.

This list was compiled by extracting a list of species that have been recorded within a rectangular area that includes the study area as well as similar habitats in surrounding areas, as obtained from http://newposa.sanbi.org/ accessed on 12 September 2021. It is probable that it includes some species that occur in habitats that do not occur on site. The list was supplemented from field observations, as well as observations from www.inaturalist.org, which are photographic observations verified by an online community.

The list is arranged by family in alphabetical order. Species listed in green are those that were found on site and those in blue are from iNaturalist for the general area.

Scrophulariaceae *Aptosimum procumbens* Indigenous
Acanthaceae *Blepharis capensis* Indigenous
Acanthaceae *Justicia incana* Indigenous
Agavaceae *Agave americana** (Category 1b)
Aizoaceae *Chasmatophyllum musculinum* Indigenous
Aizoaceae *Delosperma lootsbergense* Indigenous; Endemic
Aizoaceae *Delosperma multiflorum* Indigenous; Endemic
Aizoaceae *Drosanthemum hispidum* Indigenous; Endemic
Aizoaceae *Drosanthemum lique* Indigenous; Endemic
Aizoaceae *Galenia africana* Indigenous
Aizoaceae *Galenia glandulifera* Indigenous; Endemic
Aizoaceae *Galenia procumbens* Indigenous; Endemic
Aizoaceae *Galenia pubescens* Indigenous; Endemic
Aizoaceae *Galenia secunda* Indigenous
Aizoaceae *Hereroa incurva* Indigenous; Endemic
Aizoaceae *Mesembryanthemum coriarium* Indigenous
Aizoaceae *Mesembryanthemum crystallinum*
Aizoaceae *Mesembryanthemum nodiflorum* Indigenous
Aizoaceae *Pleiospilos compactus* Indigenous
Aizoaceae *Ruschia cradockensis*
Aizoaceae *Ruschia intricata*
Aizoaceae *Ruschia spinosa*
Aizoaceae *Ruschia sp.*
Aizoaceae *Trichodiadema attonsum* Indigenous; Endemic
Aizoaceae *Trichodiadema peersii* Indigenous; Endemic
Aizoaceae *Trichodiadema rogersiae* Indigenous; Endemic
Aizoaceae *Trichodiadema setuliferum* Indigenous; Endemic
Alliaceae *Allium sp.*
Amaranthaceae *Amaranthus thunbergii* Indigenous
Amaranthaceae *Amaranthus hybridus**
Amaranthaceae *Atriplex nummularia**
Amaranthaceae *Atriplex semibaccata**
Amaranthaceae *Blitum virgatum* subsp. *virgatum* Not indigenous; Cryptogenic
Amaranthaceae *Caroxylon aphyllum*
Amaranthaceae *Dysphania schraderiana* Indigenous
Amaranthaceae *Exomis microphylla* var. *axyrioides* Indigenous; Endemic
Amaranthaceae *Salsola kali* Not indigenous; Naturalised; Invasive
Amaranthaceae *Sericorema remotiflora* Indigenous
Amaryllidaceae *Cyrtanthus macowanii* Indigenous; Endemic
Amaryllidaceae *Brunsvigia radulosa*
Amaryllidaceae *Boophone disticha*
Anacardiaceae *Schinus molle**

Anacardiaceae *Searsia burchellii*
Anacardiaceae *Searsia discolor* Indigenous
Anacardiaceae *Searsia divaricata* Indigenous
Anacardiaceae *Searsia lancea* Indigenous
Anacardiaceae *Searsia lucida*
Anacardiaceae *Searsia pyroides* Indigenous
Apiaceae *Berula thunbergii*
Apiaceae *Chamarea longipedicellata* Indigenous
Apiaceae *Chamarea sp.*
Apiaceae *Deverra denudata* subsp. *aphylla* Indigenous
Apocynaceae *Gomphocarpus fruticosus* Indigenous
Apocynaceae *Cynanchum orangeanum* Indigenous
Apocynaceae *Cynanchum viminale* Indigenous
Apocynaceae *Duvalia maculata* Indigenous
Apocynaceae *Fockea comaru* Indigenous
Apocynaceae *Huernia barbata* subsp. *barbata* Indigenous
Apocynaceae *Stapelia grandiflora* var. *grandiflora* Indigenous
Apocynaceae *Microloma armatum* Indigenous
Apocynaceae *Tridentea jucunda* Indigenous
Apocynaceae *Tridentea virescens* Indigenous RARE
Apocynaceae *Xysmalobium gomphocarpoides* Indigenous
Aponogetonaceae *Aponogeton junceus*
Asparagaceae *Asparagus asparagoides* Indigenous
Asparagaceae *Asparagus burchellii* Indigenous
Asparagaceae *Asparagus capensis* var. *capensis* Indigenous
Asparagaceae *Asparagus exuvialis* Indigenous
Asparagaceae *Asparagus glaucus* Indigenous
Asparagaceae *Asparagus laricinus* Indigenous
Asparagaceae *Asparagus mucronatus* Indigenous
Asparagaceae *Asparagus retrofractus*
Asparagaceae *Asparagus suaveolens*
Asparagaceae *Daubenya comata* Indigenous
Asphodelaceae *Bulbine abyssinica* Indigenous
Asphodelaceae *Haworthia bolusii* var. *blackbeardiana* Indigenous; Endemic
Asphodelaceae *Haworthia bolusii* var. *bolusii* Indigenous; Endemic
Asphodelaceae *Haworthia marumiana* var. *marumiana* Indigenous; Endemic
Asphodelaceae *Haworthiopsis tessellata* Indigenous
Asphodelaceae *Kniphofia stricta* Indigenous; Endemic
Asphodelaceae *Trachyandra acocksii* Indigenous; Endemic
Asphodelaceae *Trachyandra karrooica* Indigenous
Asphodolaceae *Aloe broomii var. broomii*
Asphodolaceae *Aloe claviflora*
Asteraceae *Arctotheca calendula* Indigenous
Asteraceae *Arctotis adpressa* Indigenous; Endemic
Asteraceae *Arctotis dregei* Indigenous
Asteraceae *Arctotis leiocarpa* Indigenous
Asteraceae *Arctotis sp.*
Asteraceae *Arctotis subacaulis* Indigenous
Asteraceae *Centaurea calcitrapa** Not indigenous; Naturalised
Asteraceae *Chrysocoma ciliata*
Asteraceae *Cineraria aspera* Indigenous
Asteraceae *Cineraria lyratiformis* Indigenous
Asteraceae *Cirsium vulgare** Category 1b
Asteraceae *Conyza scabrida* Indigenous
Asteraceae *Crassothonna protecta* Indigenous
Asteraceae *Crassothonna sedifolia* Indigenous

Asteraceae *Curio radicans* Indigenous
Asteraceae *Cuspidia cernua* subsp. *annua* Indigenous; Endemic
Asteraceae *Denekia capensis* Indigenous
Asteraceae *Dicerothamnus rhinocerotis* Indigenous; Endemic
Asteraceae *Dimorphotheca caulescens* Indigenous
Asteraceae *Dimorphotheca cuneata* Indigenous
Asteraceae *Eriocephalus africanus*
Asteraceae *Eriocephalus ericoides*
Asteraceae *Eriocephalus eximius* Indigenous
Asteraceae *Eriocephalus sp.*
Asteraceae *Euryops annae* Indigenous
Asteraceae *Euryops lateriflorus* Indigenous
Asteraceae *Euryops nodosus* Indigenous
Asteraceae *Euryops oligoglossus* subsp. *oligoglossus* Indigenous
Asteraceae *Euryops petraeus* Indigenous; Endemic
Asteraceae *Euryops tenuissimus* subsp. *trifurcatus* Indigenous; Endemic
Asteraceae *Felicia filifolia* subsp. *filifolia* Indigenous
Asteraceae *Felicia filifolia* subsp. *schaeferi* Indigenous
Asteraceae *Felicia muricata* subsp. *muricata* Indigenous
Asteraceae *Felicia ovata* Indigenous; Endemic
Asteraceae *Garuleum bipinnatum* Indigenous; Endemic
Asteraceae *Garuleum pinnatifidum* Indigenous; Endemic
Asteraceae *Gazania krebsiana* subsp. *arctotoides* Indigenous
Asteraceae *Gazania krebsiana* subsp. *krebsiana* Indigenous
Asteraceae *Gazania linearis* var. *linearis* Indigenous
Asteraceae *Geigeria ornativa* subsp. *ornativa* Indigenous
Asteraceae *Helichrysum albo-brunneum* Indigenous
Asteraceae *Helichrysum cerastioides* var. *cerastioides* Indigenous
Asteraceae *Helichrysum hamulosum* Indigenous; Endemic
Asteraceae *Helichrysum lineare* Indigenous
Asteraceae *Helichrysum lucilioides* Indigenous
Asteraceae *Helichrysum nudifolium* var. *nudifolium* Indigenous
Asteraceae *Helichrysum pumilio* subsp. *pumilio* Indigenous; Endemic
Asteraceae *Helichrysum rosum* var. *arcuatum* Indigenous; Endemic
Asteraceae *Helichrysum splendidum* Indigenous
Asteraceae *Helichrysum stoloniferum* Indigenous; Endemic
Asteraceae *Helichrysum tysonii* Indigenous; Endemic
Asteraceae *Helichrysum zeyheri* Indigenous
Asteraceae *Hertia cluytiifolia* Indigenous
Asteraceae *Hilliardiella capensis* Indigenous
Asteraceae *Oedera humilis*
Asteraceae *Oedera oppositifolia* Indigenous; Endemic
Asteraceae *Oedera spinescens* Indigenous; Endemic
Asteraceae *Osteospermum incanum* subsp. *subcanescens* Indigenous; Endemic
Asteraceae *Osteospermum leptolobum* Indigenous
Asteraceae *Osteospermum scariosum* var. *scariosum* Indigenous
Asteraceae *Osteospermum sinuatum* Indigenous
Asteraceae *Osteospermum sinuatum* var. *sinuatum* Indigenous
Asteraceae *Osteospermum spinescens* Indigenous
Asteraceae *Othonna auriculifolia* Indigenous; Endemic
Asteraceae *Othonna coronopifolia* Indigenous; Endemic
Asteraceae *Pegolettia retrofracta* Indigenous
Asteraceae *Pentzia globosa* Indigenous
Asteraceae *Pentzia incana* Indigenous
Asteraceae *Pentzia punctata* Indigenous
Asteraceae *Pentzia quinquefida* Indigenous

Asteraceae *Phymaspermum aciculare* Indigenous
Asteraceae *Phymaspermum parvifolium* Indigenous
Asteraceae *Phymaspermum thymelaeoides* Indigenous
Asteraceae *Pteronia adenocarpa* Indigenous; Endemic
Asteraceae *Pteronia glauca*
Asteraceae *Pteronia glomerata*
Asteraceae *Pteronia viscosa*
Asteraceae *Senecio alchelleifolius* Indigenous
Asteraceae *Senecio acutifolius* Indigenous
Asteraceae *Senecio cotyledonis* Indigenous
Asteraceae *Senecio erysimoides* Indigenous
Asteraceae *Senecio hastatus* Indigenous
Asteraceae *Senecio reptans* Indigenous; Endemic
Asteraceae *Sonchus asper*
Asteraceae *Tagetes minuta**
Asteraceae *Taraxacum officinale**
Asteraceae *Tarchonanthus minor*
Asteraceae *Ursinia pilifera* Indigenous; Endemic
Asteraceae *Vallereophyton* sp.
Asteraceae *Xanthium spinosum** (Category 1b)
Asterceae *Cichorium intybus**
Bignoniaceae *Rhigozum obovatum* Indigenous
Boraginaceae *Anchusa riparia* Indigenous
Brassicaceae *Cadaba aphylla*
Brassicaceae *Erucastrum strigosum* Indigenous
Brassicaceae *Heliophila cornuta* var. *squamata* Indigenous
Brassicaceae *Heliophila crithmifolia* Indigenous
Brassicaceae *Heliophila rigidiuscula* Indigenous
Brassicaceae *Heliophila suavissima* Indigenous
Brassicaceae *Lepidium africanum* subsp. *divaricatum* Indigenous
Brassicaceae *Lepidium trifurcum* Indigenous
Brassicaceae *Sisymbrium capense* Indigenous
Brassicaceae *Sisymbrium turczaninowii* Indigenous
Cactaceae *Cylindropuntia imbricata imbricata** (Category 1b)
Cactaceae *Cylindropuntia pallida** (Category 1b)
Cactaceae *Opuntia ficus-indica** (Category 1b)
Cactaceae *Opuntia robusta** (Category 1b)
Campanulaceae *Wahlenbergia albens* Indigenous
Campanulaceae *Wahlenbergia androsacea* Indigenous
Campanulaceae *Wahlenbergia nodosa* Indigenous
Campanulaceae *Wahlenbergia thunbergiana* Indigenous
Capparaceae *Boscia albitrunca* Indigenous PROTECTED
Caryophyllaceae *Dianthus laingsburgensis* (wrong id / distribution)
Caryophyllaceae *Pollichia campestris*
Caryophyllaceae *Silene undulata undulata*
Characeae *Chara* sp.
Colchicaceae *Colchicum asteroides* Indigenous; Endemic
Colchicaceae *Colchicum burkei* Indigenous
Colchicaceae *Colchicum melanthioides* subsp. *melanthioides* Indigenous
Colchicaceae *Ornithoglossum vulgare* Indigenous
Colchicaceae *Ornithoglossum undulatum* Indigenous
Convolvulaceae *Convolvulus sagittatus* Indigenous
Crassulaceae *Adromischus filicaulis* subsp. *marlothii* Indigenous; Endemic
Crassulaceae *Adromischus triflorus* Indigenous; Endemic
Crassulaceae *Adromischus trigynus* Indigenous; Endemic
Crassulaceae *Anacampseros sp.* Indigenous; Endemic

Crassulaceae *Crassula campestris*
Crassulaceae *Crassula capitella capitella*
Crassulaceae *Crassula corallina*
Crassulaceae *Crassula muscosa* var. *muscosa* Indigenous
Crassulaceae *Crassula pyramidalis*
Crassulaceae *Crassula subaphylla*
Crassulaceae *Crassula vaillantii*
Cucurbitaceae *Kedrostis africana* Indigenous
Cyperaceae *Afroscirpoides dioeca* Indigenous
Cyperaceae *Carex glomerabilis* Indigenous
Cyperaceae *Cyperus capensis* Indigenous
Cyperaceae *Cyperus congestus* Indigenous
Cyperaceae *Cyperus marginatus* Indigenous
Cyperaceae *Cyperus usitatus* Indigenous
Cyperaceae *Isolepis expallescens* Indigenous; Endemic
Cyperaceae *Isolepis sororia* Indigenous; Endemic
Dryopteridaceae *Dryopteris antarctica* Indigenous
Dryopteridaceae *Dryopteris dracomontana* Indigenous
Ebenaceae *Diospyros austro-africana* var. *microphylla* Indigenous
Ebenaceae *Diospyros austroafricana* Indigenous
Ebenaceae *Diospyros lycioides*
Ericaceae *Erica woodii* var. *woodii* Indigenous
Eriospermaceae *Eriospermum alcicorne*
Euphorbiaceae *Euphorbia caterviflora*
Euphorbiaceae *Euphorbia clavarioides*
Euphorbiaceae *Euphorbia decepta* Indigenous; Endemic
Euphorbiaceae *Euphorbia mauritanica* Indigenous
Euphorbiaceae *Euphorbia rhombifolia*
Euphorbiaceae *Euphorbia stellispina* Indigenous; Endemic
Fabaceae *Aspalathus perforata* Indigenous; Endemic
Fabaceae *Aspalathus triquetra* Indigenous; Endemic
Fabaceae *Cullen tomentosum* Indigenous
Fabaceae *Calobota spinescens* Indigenous
Fabaceae *Indigastrum niveum* Indigenous
Fabaceae *Indigofera alternans* var. *alternans* Indigenous
Fabaceae *Indigofera sessilifolia* Indigenous
Fabaceae *Lessertia annularis* Indigenous
Fabaceae *Lessertia frutescens* subsp. *microphylla* Indigenous
Fabaceae *Melolobium calycinum* Indigenous
Fabaceae *Melolobium candicans*
Fabaceae *Melolobium microphyllum* Indigenous
Fabaceae *Prosopis glandulosa** (Category 1b)
Fabaceae *Rhynchosia capensis* Indigenous; Endemic
Fabaceae *Vachellia karroo* Indigenous
Geraniaceae *Erodium cicutarium**
Geraniaceae *Pelargonium abrotanifolium*
Geraniaceae *Pelargonium alchemilloides*
Geraniaceae *Pelargonium aridum*
Geraniaceae *Pelargonium karooicum*
Geraniaceae *Pelargonium minimum*
Geraniaceae *Monsonia salmoniflora*
Geraniaceae *Pelargonium proliferum* Indigenous; Endemic
Geraniaceae *Pelargonium tragacanthoides* Indigenous
Grimmiaceae *Grimmia laevigata*
Hyacinthaceae *Albuca prasina* Indigenous
Hyacinthaceae *Albuca setosa* Indigenous

Hyacinthaceae *Daubenya comata* Indigenous; Endemic
Hyacinthaceae *Drimia anomala* Indigenous; Endemic
Hyacinthaceae *Drimia platyphylla* Indigenous; Endemic
Hyacinthaceae *Lachenalia ensifolia* Indigenous; Endemic
Hyacinthaceae *Massonia dentata* Indigenous; Endemic
Hypoxidaceae *Empodium gloriosum* Indigenous; Endemic
Iridaceae *Babiana bainesii* Indigenous
Iridaceae *Babiana hypogaea* Indigenous
Iridaceae *Babiana sambucina* subsp. *sambucina* Indigenous; Endemic
Iridaceae *Dierama pendulum* Indigenous; Endemic
Iridaceae *Gethyllis longistyla* Indigenous
Iridaceae *Hesperantha longituba* Indigenous
Iridaceae *Lapeirousia plicata* subsp. *plicata* Indigenous
Iridaceae *Moraea polystachya*
Iridaceae *Romulea macowanii* var. *alticola* Indigenous
Iridaceae *Syringodea concolor* Indigenous; Endemic
Iridaceae *Tritonia karooica* Indigenous; Endemic
Iridaceae *Tritonia laxifolia* Indigenous
Juncaceae *Juncus rigidus* Indigenous
Juncaceae *Juncus excertus* Indigenous
Lamiaceae *Mentha longifolia capensis* Indigenous
Lamiaceae *Salvia runcinata* Indigenous
Lamiaceae *Salvia stenophylla* Indigenous
Lamiaceae *Salvia verbenaca* Indigenous
Lamiaceae *Stachys hyssopoides* Indigenous
Lamiaceae *Stachys rugosa* Indigenous
Limeaceae *Limeum aethiopicum* Indigenous
Limeaceae *Limeum aethiopicum* var. *aethiopicum* Indigenous; Endemic
Limeaceae *Limeum fenestratum* var. *fenestratum* Indigenous
Limeaceae *Limeum humifusum* Indigenous
Loranthaceae *Moquiniella rubra* Indigenous
Loranthaceae *Septulina glauca* Indigenous
Malvaceae *Anisodontea capensis* Indigenous; Endemic
Malvaceae *Hermannia coccocarpa* Indigenous
Malvaceae *Hermannia cuneifolia* var. *cuneifolia* Indigenous
Malvaceae *Hermannia cuneifolia* var. *glabrescens* Indigenous
Malvaceae *Hermannia filifolia*
Malvaceae *Hermannia grandiflora* Indigenous
Malvaceae *Hermannia pulchella* Indigenous
Malvaceae *Hermannia spinosa*
Malvaceae *Hermannia vestita*
Malvaceae *Hermannia vestita* Indigenous
Melianthaceae *Melianthus comosus*
Melianthaceae *Melianthus dregeanus* subsp. *dregeanus* Indigenous; Endemic
Myrtaceae *Eucalyptus camaldulensis** (Category 1b)
Orchidaceae *Eulophia ovalis* var. *ovalis* Indigenous
Orchidaceae *Habenaria arenaria* Indigenous
Orobanchaceae *Hyobanche sanguinea* Indigenous
Osmundaceae *Todea barbara* Indigenous
Oxalidaceae *Oxalis depressa* Indigenous
Oxalidaceae *Oxalis obliquifolia* Indigenous
Oxalidaceae *Oxalis smithiana* Indigenous
Papaveraceae *Argemone ochroleuca** (Category 1b)
Pedaliaceae *Pterodiscus speciosus* Indigenous
Pedaliaceae *Sesamum capense* Indigenous
Plantaginaceae *Veronica anagallis-aquatica**

Poaceae *Agrostis lachnantha* var. *lachnantha* Indigenous
Poaceae *Amelichloa clandestina** Not indigenous; Naturalised
Poaceae *Aristida adscensionis* Indigenous
Poaceae *Aristida congesta* subsp. *congesta* Indigenous
Poaceae *Aristida diffusa* subsp. *burkei* Indigenous
Poaceae *Aristida diffusa* subsp. *diffusa* Indigenous; Endemic
Poaceae *Aristida* sp.
Poaceae *Arundo donax** (Category 1b)
Poaceae *Brachiaria eruciformis* Indigenous
Poaceae *Bromus catharticus* Not indigenous; Naturalised; Invasive
Poaceae *Bromus sp.*
Poaceae *Cenchrus ciliaris* Indigenous
Poaceae *Cymbopogon prolixus* Indigenous
Poaceae *Cymbopogon pospischilii* Indigenous; Endemic
Poaceae *Cynodon incompletus* Indigenous; Endemic
Poaceae *Digitaria eriantha*
Poaceae *Digitaria sanguinalis* Not indigenous; Naturalised
Poaceae *Echinochloa crus-galli* Indigenous
Poaceae *Ehrharta calycina* Indigenous
Poaceae *Ehrharta erecta* var. *erecta* Indigenous
Poaceae *Ehrharta pusilla* Indigenous
Poaceae *Enneapogon desvauxii* Indigenous
Poaceae *Enneapogon scoparius* Indigenous
Poaceae *Eragrostis bicolor* Indigenous
Poaceae *Eragrostis chloromelas* Indigenous
Poaceae *Eragrostis cilianensis* Indigenous
Poaceae *Eragrostis curvula* Indigenous
Poaceae *Eragrostis cylindriflora* Indigenous
Poaceae *Eragrostis lehmanniana* var. *lehmanniana* Indigenous
Poaceae *Eragrostis nindensis* Indigenous
Poaceae *Eragrostis obtusa* Indigenous
Poaceae *Eragrostis tef* Not indigenous; Naturalised
Poaceae *Eragrostis truncata* Indigenous
Poaceae *Eustachys paspaloides* Indigenous
Poaceae *Festuca arundinacea* Not indigenous; Naturalised
Poaceae *Fingerhuthia africana* Indigenous
Poaceae *Fingerhuthia sesleriiformis* Indigenous
Poaceae *Heteropogon contortus*
Poaceae *Koeleria capensis* Indigenous
Poaceae *Leptochloa fusca* Indigenous
Poaceae *Lolium arundinaceum**
Poaceae *Lolium multiflorum* Not indigenous; Naturalised; Invasive
Poaceae *Lolium perenne* Not indigenous; Naturalised; Invasive
Poaceae *Lolium temulentum* Not indigenous; Naturalised; Invasive
Poaceae *Melica decumbens*
Poaceae *Miscanthus ecklonii* Indigenous
Poaceae *Panicum coloratum* Indigenous
Poaceae *Paspalum dilatatum* Not indigenous; Naturalised; Invasive
Poaceae *Paspalum distichum**
Poaceae *Phragmites australis* Indigenous
Poaceae *Polypogon monspeliensis* Not indigenous; Naturalised
Poaceae *Schismus barbatus* Indigenous
Poaceae *Setaria italica* Not indigenous; Naturalised
Poaceae *Setaria verticillata* Indigenous
Poaceae *Sporobolus fimbriatus* Indigenous
Poaceae *Sporobolus ioclados* Indigenous

Poaceae *Sporobolus tenellus* Indigenous
Poaceae *Stipa dregeana* var. *dregeana* Indigenous; Endemic
Poaceae *Stipagrostis ciliata* var. *capensis* Indigenous
Poaceae *Stipagrostis namaquensis*
Poaceae *Stipagrostis obtusa* Indigenous
Poaceae *Tetrachne dregei* Indigenous
Poaceae *Themeda triandra*
Poaceae *Tragus berteronianus* Indigenous
Poaceae *Tragus koelerioides* Indigenous
Poaceae *Tragus racemosus* Indigenous
Poaceae *Tribolium purpureum* Indigenous
Poaceae *Trisetopsis hirtula* Indigenous
Poaceae *Trisetopsis imberbis* Indigenous
Poaceae *Typha capensis* Indigenous
Polygalaceae *Muraltia alticola* Indigenous
Polygalaceae *Polygala leptophylla*
Polygalaceae *Polygala sp.*
Polygonaceae *Polygonum aviculare*
Polypodiaceae *Polypodium vulgare* Indigenous
Pteridaceae *Adiantum capillus-veneris* Indigenous
Pteridaceae *Asplenium cordatum* Indigenous
Pteridaceae *Cheilanthes eckloniana* Indigenous
Pteridaceae *Cheilanthes hirta* var. *brevipilosa* Indigenous
Pteridaceae *Cheilanthes hirta* var. *hirta* Indigenous
Pteridaceae *Cheilanthes induta* Indigenous; Endemic
Pteridaceae *Pellaea calomelanos* var. *calomelanos* Indigenous
Ranunculaceae *Ranunculus multifidus*
Rosaceae *Rubus rigidus* Indigenous
Rubiaceae *Anthospermum spathulatum* subsp. *spathulatum* Indigenous
Rubiaceae *Nenax microphylla* Indigenous
Salicaceae *Populus x canescens**
Salicaceae *Salix babylonica babylonica**
Salviniaceae *Azolla filiculoides** Category 1b
Santalaceae *Lacomucinaea lineata* Indigenous
Santalaceae *Thesium megalocarpum* Indigenous
Santalaceae *Thesium hystricoides* Indigenous
Santalaceae *Thesium namaquense* Indigenous
Santalaceae *Viscum* sp.
Santalaceae *Viscum capense*
Santalaceae *Viscum continuum*
Scrophulariaceae *Aptosimum indivisum* Indigenous
Scrophulariaceae *Buddleja glomerata* Indigenous; Endemic
Scrophulariaceae *Chaenostoma macrosiphon* Indigenous; Endemic
Scrophulariaceae *Chaenostoma rotundifolium* Indigenous; Endemic
Scrophulariaceae *Diascia alonsooides* Indigenous; Endemic
Scrophulariaceae *Gomphostigma virgatum*
Scrophulariaceae *Jamesbrittenia filicaulis*
Scrophulariaceae *Jamesbrittenia tysonii*
Scrophulariaceae *Limosella africana* Indigenous
Scrophulariaceae *Limosella grandiflora* Indigenous
Scrophulariaceae *Manulea crassifolia* subsp. *thodeana* Indigenous
Scrophulariaceae *Nemesia cynanchifolia* Indigenous
Scrophulariaceae *Nemesia fruticans* Indigenous
Scrophulariaceae *Peliostomum leucorrhizum* Indigenous
Scrophulariaceae *Selago acocksii* Indigenous; Endemic
Scrophulariaceae *Selago albida* Indigenous

Scrophulariaceae *Selago corymbosa* Indigenous; Endemic
Scrophulariaceae *Selago crassifolia* Indigenous; Endemic
Scrophulariaceae *Selago densiflora*
Scrophulariaceae *Selago divaricata* Indigenous
Scrophulariaceae *Selago geniculata* Indigenous; Endemic
Scrophulariaceae *Selago saxatilis* Indigenous
Scrophulariaceae *Selago sp.*
Scrophulariaceae *Zaluzianskya peduncularis* Indigenous
Simaroubaceae *Ailanthus altissima** Category 1b
Solanaceae *Datura ferox** (Category 1b)
Solanaceae *Lycium cinereum*
Solanaceae *Lycium horridum*
Solanaceae *Lycium oxycarpum*
Solanaceae *Lycium pumilum*
Solanaceae *Lycium schizocalyx*
Solanaceae *Solanum nigrum* Indigenous
Solanaceae *Solanum retroflexum* Indigenous
Solanaceae *Solanum tomentosum*
Solanaceae *Withania somnifera* Indigenous
Thymelaeaceae *Lasiosiphon microphyllus* Indigenous; Endemic
Urticaceae *Urtica lobulata* Indigenous
Urticaceae *Urtica urens* Not indigenous; Naturalised; Invasive
Verbenaceae *Chascanum pinnatifidum* subsp. *pinnatifidum*
Vitaceae *Rhoicissus tridentata* subsp. *tridentata* Indigenous; Endemic
Zygophyllaceae *Roepera incrustata*

Appendix 3: Flora protected under the Northern Cape Nature Conservation Act No. 9 of 2009.

SCHEDULE 1: SPECIALLY PROTECTED SPECIES
As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 1

Family: AMARYLLIDACEAE	
Clivia mirabilis	Oorlofskloof bush lily / Clivia
Haemanthus graniticus	April fool
Hessea pusilla	
Strumaria bidentata	
Strumaria perryae	
Family: ANACARDIACEAE	
Ozoroa spp.	All species
Family: APIACAEAE	
Centella tridentata	
Chamarea snijmaniae	
Family: APOCYNACEAE	
Hoodia gordonii	
Pachypodium namaquanum	Elephant's trunk
Family: ASPHODOLACEAE	
Aloe buhrii	
Aloe dichotoma	
Aloe dichotoma var. rumosissima	Maiden quiver tree
Aloe dabenorisana	
Aloe erinacea	
Aloe meyeri	
Aloe pearsonii	
Aloe pillansii	
Trachyandra prolifera	
Family: ASTERACEAE	
Athanasia adenantha	
Athanasia spathulata	
Cotula filifolia	
Euryops mirus	
Euryops rosulatus	
Euryops virgatus	
Felicia diffusa subsp. khamiesbergensis	
Othonna armiana	
Family: CRASSULACEAE	
Tylecodon torulosus	
Family: DIOSCORACEAE	
Dioscorea spp.	Elephant's foot, all species
Family: ERIOSPERMACEAE	
Eriospermum erinum	
Eriospermum glaciale	
Family: FABACEAE	
Amphithalea obtusiloba	
Lotononis acutiflora	
Lotononis polycephala	
Lessertia spp.	
Sceletium toruosum	
Sutherlandia spp.	Cancer Bush, all species

Wiborgia fusca subsp. macrocarpa	
Family: GERANIACEAE	
Pelargonium spp.	Pelargonium, all species
Family: HYACINTHACEAE	
Drimia nana	
Ornithogalum bicornutum	
Ornithogalum inclusum	
Family: IRIDACEAE	
Babiana framesii	
Ferraria kamiesbergensis	
Freesia marginata	
Geissorhiza subrigida	
Hesperantha minima	
Hesperantha oligantha	
Hesperantha rivulicola	
Lapeirousia verecunda	
Moraea kamiesensis	
Moraea namaquana	
Romulea albiflora	
Romulea discifera	
Romulea maculata	
Romulea rupestris	
Family: MOLLUGINACEAE	
Hypertelis trachysperma	
Psammotropha spicata	
Family: ORCHIDACEAE	
Corycium ingeanum	
Disa macrostachya	Disa
Family: OXALIDACEAE	
Oxalis pseudo-hirta	Sorrel
Family: PEDALIACEAE	
Harpagophytum spp.	Devils' claw
Family: POACEAE	
Prionanthium dentatum	
Secale strictum subsp. africanum	Wild rye
Family: PROTEACEAE	
Leucadendron meyerianum	Tolbos
Mimetes spp.	All species
Orothamnus zeyheri	
Family: ROSACEAE	
Cliffortia arborea	Sterboom
Family: SCROPHULARIACEAE	
Charadrophila capensis	Cape Gloxinia
Family: STANGERIACEAE	
Stangeria spp.	Cycads, all species
Family: ZAMIACEAE	
Encephalartos spp.	Cycads, all species

SCHEDULE 2: PROTECTED SPECIES
As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 2

Family: ACANTHACEAE	
Barleria paillosa	

Monechme saxatile	
Peristrophe spp.	All species
Family: ADIANTHACEAE	
Adiantium spp.	Maidenhair Fern, all species
Family: AGAPANTHACEAE	
Agapanthus spp.	All species
Family: AIZOACEAE (MESEMBRYANTHEMACEAE)	**All species**
Family:AMARYLLIDACEAE	**All species except those listed in Schedule 1**
Family: ANTHERICACEAE	All species
Family: APIACEAE	All species except those listed in Schedule 1
Family: APOCYNACEAE	All species except those listed in Schedule 1
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia spp.	Arum lilies, all species
Family: ARALIACEAE	
Cussonia spp.	Cabbage trees, all species
Family: ASPHODOLACEAE	**All species except those listed in Schedule 1 and the species *Aloe ferox***
Family: ASTERACEAE	
Helichrysum jubilatum	
Felicia deserti	
Gnaphalium simii	
Lopholaena longipes	
Senecio albo-punctatus	
Senecio trachylaenus	
Trichogyne lerouxiae	
Tripteris pinnatilobata	
Troglophyton acocksianum	
Vellereophyton lasianthum	
Family: BURMANNIACEAE	
Burmannia madagascariensis	Wild ginger
Family: BURSERACEAE	
Commiphora spp.	All species
Family: CAPPARACEAE	
Boscia spp.	Shepherd's trees, all species
Family: CARYOPHYLLACEAE	
Dianthus spp.	**All species**
Family: CELASTRACEAE	
Gymnosporia spp.	All species
Family: COLCHICACEAE	
Androcymbium spp.	All species
Gloriosa spp.	All species
Family: COMBRETACEAE	
Combretum spp.	All species
Family: CRASSULACEAE	**All species except those listed in Schedule 1**
Family: CUPPRESSACEAE	
Widdringtonia spp.	Wild cypress, all species
Family: CYATHEACEAE	

Cyathea spp.	Tree ferns, all species
Cyathea capensis	Tree Fern
Family: CYPERACEAE	
Carex acocksii	
Family: DROSERACEAE	
Drosera spp.	Sundews, all species
Family: DRYOPTERIDACEAE	
Rumohra spp.	Seven Weeks Fern, all species
Family: ERICACEAE	Erica, all species
Family: EUPHORBIACEAE	
Alchornea laxiflora	Venda Bead-string
Euphorbia spp.	**All species**
Family: FABACEAE	
Aspalathus spp.	Tea Bush, all species
Erythrina zeyheri	Ploughbreaker
Argyrolobium petiolare	
Caesalpinia bracteata	
Calliandra redacta	
Crotalaria pearsonii	
Indigofera limosa	
Lebeckia bowieana	
Polhillia involucrate	
Rhynchosia emarginata	
Wiborgia humilis	
Family: HYACINTHACEAE	
Daubenya spp	
Lachenalia spp.	**Daubenya, all species**
Veltheimia spp.	Viooltjie, all species
Eucomis spp.	Pineapple flower, all species
Neopatersonia namaquensis	
Ornithogalum spp.	All species
Family: IRIDACEAE	**All species except those listed in Schedule 1**
Family: LAURACEAE	
Ocotea spp.	Stinkwood, all species
Family: MESEMBRYANTHEMACEAE	**All species**
Family: MELIACEAE	
Nymania capensis	Chinese Lantern
Family: OLEACEAE	
Olea europea subsp. africana	Wild olive
Family: ORCHIDACEAE	Orchids, all species except those listed in Schedule 1
Family: OROBANCHACEAE	
Harveya spp.	Harveya, all species
Family: OXALIDACEAE	
Oxalis spp.	**Sorrel, all species except those listed in Schedule 1**
Family: PLUMBAGINACEAE	
Afrolimon namaquanum	
Family: POACEAE	
Brachiaria dura var. dura	
Dregeochloa calviniensis	
Pentaschistis lima	
Family: PODOCARPACEAE	

Podocarpus spp.	Yellowwoods, all species
Family: PORTULACACEAE	
Anacampseros spp.	All species
Avonia spp.	All species
Portulaca foliosa	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	
Phylica spp.	All species
Family: RUTACEAE	
Agathosma spp.	Buchu, all species
Family: SCROPHULARIACEAE	
Diascia spp.	All species
Halleria spp.	All species
Jamesbrittenia spp.	All species
Manulea spp.	All species
Nemesia spp.	**All species**
Phyllopodium spp.	All species
Polycarena filiformis	
Chaenostoma longipedicellatum	
Family: STRELITZIACEAE	
Strelitzia spp.	All species
Family: TECOPHILACEAE	
Cyanella spp.	All species
Family: THYMELAEACEAE	
Gnidia leipoldtii	
Family: ZINGIBERACEAE	
Siphonochilus aethiopicus	Wild ginger

Appendix 4: Flora and vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES

Flora
Adenium swazicum
Aloe pillansii
Diaphananthe millarii
Dioscorea ebutsniorum
Encephalartos aemulans
Encephalartos brevifoliolatus
Encephalartos cerinus
Encephalartos dolomiticus
Encephalartos heenanii
Encephalartos hirsutus
Encephalartos inopinus
Encephalartos latifrons
Encephalartos middelburgensis
Encephalartos nubimontanus
Encephalartos woodii

Reptilia
Loggerhead sea turtle
Leatherback sea turtle
Hawksbill sea turtle

Aves
Wattled crane
Blue swallow
Egyptian vulture
Cape parrot

Mammalia
Riverine rabbit
Rough-haired golden mole

ENDANGERED SPECIES

Flora
Angraecum africae
Encephalartos arenarius
Encephalartos cupidus
Encephalartos horridus
Encephalartos laevifolius
Encephalartos lebomboensis
Encephalartos msinganus
Jubaeopsis caffra
Siphonochilus aethiopicus
Warburgia salutaris
Newtonia hilderbrandi

Reptilia
Green turtle
Giant girdled lizard
Olive ridley turtle
Geometric tortoise

Aves
Blue crane
Grey crowned crane
Saddle-billed stork
Bearded vulture
White-backed vulture
Cape vulture
Hooded vulture
Pink-backed pelican
Pel's fishing owl
Lappet-faced vulture

Mammalia
Robust golden mole
Tsessebe
Black rhinoceros
Mountain zebra
African wild dog
Gunning's golden mole
Oribi
Red squirrel
Four-toed elephant-shrew

VULNERABLE SPECIES

Flora
Aloe albida
Encephalartos cycadifolius
Encephalartos Eugene-maraisii
Encephalartos ngovanus
Merwilla plumbea
Zantedeschia jucunda

Aves
White-headed vulture
Tawny eagle
Kori bustard
Black stork
Southern banded snake eagle
Blue korhaan
Taita falcon
Lesser kestrel
Peregrine falcon

Bald ibis
Ludwig's bustard
Martial eagle
Bataleur
Grass owl

Mammalia
Cheetah
Samango monkey
Giant golden mole
Giant rat
Bontebok
Tree hyrax
Roan antelope
Pangolin
Juliana's golden mole
Suni
Large-eared free-tailed bat
Lion
Leopard
Blue duiker

PROTECTED SPECIES
Flora
Adenia wilmsii
Aloe simii
Clivia mirabilis
Disa macrostachya
Disa nubigena
Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii
Protea odorata
Stangeria eriopus

Amphibia
Giant bullfrog
African bullfrog

Reptilia
Gaboon adder
Namaqua dwarf adder
Smith's dwarf chameleon
Armadillo girdled lizard
Nile crocodile
African rock python

Aves
Southern ground hornbill
African marsh harrier
Denham's bustard
Jackass penguin

Mammalia
Cape clawless otter
South African hedgehog
White rhinoceros
Black wildebeest
Spotted hyaena
Black-footed cat
Brown hyaena
Serval
African elephant
Spotted-necked otter
Honey badger
Sharpe's grysbok
Reedbuck
Cape fox

Appendix 5: Curriculum vitae: Dr David Hoare

Education
Matric - Graeme College, Grahamstown, 1984
B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction
M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation
- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Member, International Association of Vegetation Scientists (IAVS)
Member, Ecological Society of America (ESA)
Member, International Association for Impact Assessment (IAIA)
Member, Herpetological Association of Africa (HAA)

Employment history
1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
1January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
1January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant
Ecological consultant since 1995. Author of over 800 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:
Refereed scientific articles (in chronological order):
Journal articles:

HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

Pfab, M.F., Compaan, P.C., Whittington-Jones, C.A., Engelbrecht, I., Dumalisile, L., Mills, L., West, S.D., Muller, P., Masterson, G.P.R., Nevhutalu, L.S., Holness, S.D., **Hoare, D.B.** 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. Bothalia, Vol. 47:1. a2182. https://doi.org/10.4102/abc.v47i1.2182.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. http://www.biodiversityhotspots.org/xp/hotspots/maputaland/.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome*. In: Mucina, L. &

Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.

HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).

HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.

BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.

HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 800 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.

Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.

BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques

South African Association of Botanists Annual Congress, Grahamstown, January 2002.

28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.

Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.

South African Association of Botanists Annual Congress, Potchefstroom, January 2000

National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.

Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.

WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.

34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999

Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.

South African Association of Botanists Annual Congress, Cape Town, January 1998
Randse Afriakaanse Universiteit postgraduate symposium, 1997.
South African Association of Botanists Annual Congress, Bloemfontein, January 1995.