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## ECOLOGICAL IMPACT ASSESSMENT

*PROPOSED SALDANHA BAY NETWORK STRENGTHENING PROJECT, SALDANHA BAY LOCAL MUNICIPALITY,  
WESTERN CAPE PROVINCE*

**JANUARY 2017**



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## Declaration

I, **Leigh-Ann de Wet**, declare that -

- I act as an independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010 and 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have not and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

Signature of the specialist:



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- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010 and 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have not and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.

**Signature of the specialist:**

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## Declaration

I, **Craig Widdows**, declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I will comply with the National Environmental Act (NEMA), regulations and all other applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity; and I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this form are true and correct.

**Signature of the specialist:**

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## Executive Summary

Afzelia Environmental Consultants (Pty) Ltd were appointed by Savannah Environmental (Pty) Ltd to undertake an ecological impact assessment for the proposed construction of the Saldanha Bay Network Strengthening Project, Saldanha Bay Local Municipality, Western Cape. The strengthening project will consist of:

- Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers;
- Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area;
- The construction of 2 x 400kV power lines (approximately 35 - 40 km) from the Aurora Substation to the new proposed distribution and transmission substations;
- Replace two of the four existing 250 MVA 400/132kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- Establishing 2 x 132 kV feeder bays around Aurora Substation.

The ecological assessment involves two components, namely a botanical and faunal assessment.

The main findings of this report have been summarised below:

### *Vegetation assessment*

- A field survey was conducted to determine the vegetation types and species present within the study area. This was undertaken with the assistance of Koos Classens and Michelle Malan, who are recognised Fynbos specialists.
- The dominant vegetation type in the study area is Saldanha Flats Shrubland, which occupies the majority of the study area.
- Dominant plant species identified on site included *Eriocephalus africanus*, *Euphorbia* spp, *Aloe perfoliata*, *Limonium peregrinum*, *Asparagus capensis*, *Phyllica cephalantha*, *Othonna cylindrica*, *Stoebe capitata*, *Putterlickia pyracantha*, *Tylecodon grandifloras*, *Erica mammosa*, *Searsia laevigata var laevigata* and *Searsia glauca*.
- Eleven species of conservation concern were recorded during the site visit.
- Possible impacts that may occur as a result of this project include the loss of indigenous vegetation, fragmentation of vegetation communities, the proliferation of alien invasive species and the loss of Species of Special Concern
- Once the substation and power line tower sites have been selected and pegged, a site visit must be conducted by a suitably qualified botanist to determine the presence of Species of Special Concern within the site footprint, prior to the commencement of any construction and construction related activities. Permits are required for removal or destruction of these species.

- Mitigation measures are proposed and must be implemented fully and correctly during the construction and operational phase to minimise these impacts.
- The construction of the proposed transmission substation at site alternative A or F is considered the most favourable option from a vegetation perspective. These sites are considered disturbed due to the limited vegetation communities present on site. The construction of the distribution substation at site A is preferable from a vegetation perspective as it is in the most disturbed area.
- All power line alternatives traverse through Strandveld vegetation for approximately 15km. Power line alternatives 4 and 6 deviated to the north and traverse through a mosaic of agricultural land and fringe Strandveld habitat. Further to this, corridor 4 and 6 run adjacent to the existing R27 road. As a result, the construction of the 400kV power lines within corridor alternatives 4 or 6 is considered to be the most favourable.
- The overall recommended route is Power line alternative 6 with transmission substation F.

#### *Faunal assessment*

- The study area falls within the range of 34 mammals, 8 amphibians and 37 reptile species.
- Faunal species likely to be impacted by the proposed substation and power line developments are smaller, less mobile species (certain reptiles and amphibians). This includes the endemic Cape Caco, Cape Dwarf Chameleon and the Bloubergstrand Dwarf Burrowing Skink.
- A search and rescue is recommended prior to any construction taking place; an experienced herpetologist should do this.
- The impacts associated with the proposed substation and power line developments include the loss of faunal habitat and ecological structure, mortality or injuries to faunal species and disturbance to faunal communities.
- The construction of the proposed transmission substation at site alternative A or F is considered the most favourable from a faunal perspective.
- The construction of the proposed distribution substation at site alternative A is preferred from a faunal perspective due to its close proximity to the existing Blouwatter substation and disturbed nature of the site.
- The construction of the 400kV power lines within corridor alternatives 4 or 6 is considered to be the most favourable from a faunal perspective. These corridors will pose a limited threat to the fauna occurring in the vicinity of the new infrastructure. This is largely due to the disturbance already experienced within these areas.
- Given the relative homogeneity of the habitat within the study area as well as existing levels of disturbance (existing roads, urban development, power lines and substations, agricultural and stock farming), the proposed strengthening project is unlikely to have a significant, long-term impact on the local faunal populations.

## Table of Contents

<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Background and Locality of the assessment area .....	1
1.2 Scope of work- Botanical Assessment .....	2
1.3 Scope of work- Faunal Assessment .....	2
1.4 Assumptions and Limitations .....	3
<b>2. METHODOLOGY</b> .....	<b>6</b>
2.1 Literature review and desktop study .....	6
2.2 Vegetation analysis of the study site .....	6
2.3 Faunal assessment .....	8
2.4 Impact rating scales .....	9
<b>3. BIOPHYSICAL CHARACTERISTICS OF THE STUDY AREA</b> .....	<b>11</b>
3.1 Climate .....	11
3.2 Vegetation .....	11
3.3 Geology .....	12
3.4 Conservation Planning .....	14
3.4.1. <i>Threatened Ecosystems in need of Protection</i> .....	14
3.4.2. <i>Critical Biodiversity Areas</i> .....	16
<b>4. VEGETATION ASSESSMENT</b> .....	<b>19</b>
4.1 Vegetation identified on site .....	19
4.1.1. <i>Distribution Substation Sites</i> .....	19
4.1.2. <i>Transmission Substation Site A</i> .....	20
4.1.3. <i>Transmission Substation Site D</i> .....	21
4.1.4. <i>Transmission Substation Site F</i> .....	21
4.1.5. <i>Aurora to Blouwater SS Corridor Alternative 3, Lines 1 and 2</i> .....	22
4.1.6. <i>Aurora to Blouwater SS Corridor Alternative 4, Lines 1 and 2</i> .....	24
4.1.7. <i>Aurora to Blouwater SS Corridor Alternative 6, Lines 1 and 2</i> .....	25
<b>5. FLORA ASSESSMENT</b> .....	<b>27</b>
5.1 Species List .....	27
5.2 Species of Conservation Importance .....	27
5.2.1. <i>Threatened species that may occur on site</i> .....	27
5.2.2. <i>Threatened species identified on site</i> .....	30
5.3 Invasive Alien Plants .....	31
<b>6. FAUNA ASSESSMENT</b> .....	<b>33</b>
6.1 Species List Faunal micro-habitats .....	33
5.1 Mammal species composition .....	38



5.2	Mammal species of concern .....	42
5.3	Amphibian species composition .....	42
5.4	Reptile species composition .....	44
5.6	Reptile species of concern .....	44
5.7	Site visit .....	44
6	SENSITIVITY ASSESSMENT .....	45
7	CONSIDERATION OF ALTERNATIVES .....	48
8	IMPACTS IDENTIFIED AND ASSESSED .....	53
8.1	Issue 1: Loss of Vegetation Communities .....	53
8.2	Issue 2: Loss of Species of Special Concern and Biodiversity .....	55
8.3	Issue 3: Disruption of Ecosystem Function and Process .....	58
9	CONCLUSIONS AND RECOMMENDATIONS .....	61
11	REFERENCES .....	64

## List of Tables

<b>Table 1: Significance scoring used for each potential impact</b> .....	8
<b>Table 2: Significance scoring used for each potential impact</b> .....	9
<b>Table 3: Threatened Species and Species of Conservation Concern (SANBI, Quarter degree square Grid 3218CC &amp; 3318AA).</b> .....	28
<b>Table 4: Confirmed Species of Special Concern</b> .....	31
<b>Table 5: Red Listed mammal species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.</b> .....	38
<b>Table 6: Mammal species recorded within the proposed development area.</b> .....	42
<b>Table 7: Amphibian species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.</b> .....	43
<b>Table 8: Red Listed reptile species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.</b> .....	44

## List of Photographs

<b>Photograph 1: (A) <i>Amellus tenuifolius</i> present on site (B) Limestone Strandveld vegetation present on site showing <i>Aloe perfoliata</i>.</b> .....	20
<b>Photograph 2: Overview of Transmission Substation site alternative A</b> .....	20
<b>Photograph 3: (A) Overview of vegetation present at Transmission Substation site D and (B) <i>Limonium peregrinum</i></b> .....	21
<b>Photograph 4: Overview of Transmission Substation site alternative F, showing burnt vegetation.</b> .....	22
<b>Photograph 5: (A) Overview of Vegetation of corridor alternative 3 and (B) <i>Cotyledon orbiculata</i>.</b> .....	23
<b>Photograph 6: <i>Ornithogalum thyrsoides</i></b> .....	23
<b>Photograph 7: <i>Erica mammosa</i></b> .....	24
<b>Photograph 8: <i>Searsia laevigata var laevigata</i></b> .....	25
<b>Photograph 9: <i>Diosma oppositifolia</i></b> .....	25
<b>Photograph 10: The Strandveld shrubland habitat, which occupies the central and southern sections of the study area.</b> .....	33
<b>Photograph 11: Endorheic depressions located within the study area.</b> .....	34
<b>Photograph 12: A series of rocky outcrops to the south of the project area.</b> .....	35
<b>Photograph 13: A series of water troughs located within the study area.</b> .....	35
<b>Photograph 14: Mammalian species recorded within the study area including Caracal (A), Cape Grey Mongoose (B), Common Duiker (C) and Cape Gerbil (D).</b> .....	40
<b>Photograph 15: Droppings of Common Duiker (A) and Cape Hare (B) and a Cape Gerbil burrow (C) that were recorded within the study area.</b> .....	41

## List of Figures

<b>Figure 1: Locality of study area for the proposed substations and associated power line infrastructure.</b> .....	4
<b>Figure 2: Site description map of the proposed substation site alternatives and power line corridor alternatives.</b> .....	5
<b>Figure 3: Vegetation types located within the study area and surrounds.</b> .....	13
<b>Figure 4: Threatened Ecosystems on Need of Protection</b> .....	15
<b>Figure 5: Critical Biodiversity Areas in relation to the study area</b> .....	18
<b>Figure 6: Faunal micro-habitats identified within the study area</b> .....	37

<b>Figure 7:</b> Sensitivity map for the study area .....	47
<b>Figure 8:</b> Powerline corridor alternative 3.....	49
<b>Figure 9:</b> Powerline corridor alternative 4.....	51
<b>Figure 10:</b> Powerline corridor alternative 6.....	52
<b>Figure 11:</b> Recommended powerline alternative .....	63

## 1. INTRODUCTION

### 1.1 Background and Locality of the assessment area

Afzelia Environmental Consultants (Pty) Ltd were appointed by Savannah Environmental (Pty) Ltd to undertake an ecological impact assessment of the proposed Saldanha Bay Network Strengthening Project in the Saldanha Bay Local Municipality, Western Cape Province.

Eskom Holdings SOC Ltd is proposing the construction of new dual 400kV power lines of approximately 35km as well as a new transmission substation (Tx) and a new distribution substation (Dx) in the Saldanha Bay area of the Western Cape. The construction development footprint for the transmission substation is 600m x 600m and the distribution substation is 120m x 120m. The infrastructures associated with the proposed development include:

- Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers;
- Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area;
- The construction of 2 x 400kV power lines from the Aurora Substation to the new proposed distribution and transmission substations;
- Replace two of the four existing 250 MVA 400/132kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- Establishing 2 x 132 kV feeder bays around Aurora Substation.

The proposed development is known as the Saldanha Bay Network Strengthening Project and will increase the power capacity within the area. The establishment of the Transmission and Distribution Substations will assist in resolving the transmission capacity constraints at Aurora Substation and will play an important role in addressing the forecasted load requirements from industrial customers, the Industrial Development Zone (IDZ), local distributors and facilitate the integration of renewable generation in the area.

The proposed development is located in the Saldanha Bay area, within the Saldanha Bay Local Municipality, Western Cape Province (**Figure 1**). The study area (GPS coordinates: 33° 0'10.19"S, 18° 8'3.18"E) is located approximately 4.5 km from Saldanha Bay, between the R27 and R45. The West Coast National Park borders the study area on the south. The West Coast National Park borders the study area on the south. (**Appendix A**). The study area falls within the buffer zone of the West Coast National Park and Priority Natural Areas. Further to this, SANParks Managed Areas are located within the study area (West Coast National Park Management Plan for the period 2013-2023). There are three proposed power line corridors, three transmission substation site alternatives and three distribution substation site alternatives. All of the alternatives are located within the quarter-degree squares 3218CC and 3318AA (**Figure 2**).

## **1.2 Scope of work- Botanical Assessment**

The scope of work for the botanical assessment included the following:

- A desktop review of the study area documenting sensitive habitats and possible areas of concern. This included:
  - i. An initial remote sensing mapping exercise identifying important habitats and vegetation types and contextualising the significance of the natural assets on the study site;
  - ii. An examination of Critical Biodiversity Features through the C.A.P.E. Fine-Scale Biodiversity Planning project;
  - iii. An evaluation of the modelled conservation importance of the vegetation on the site in terms of C.A.P.E. Fine-Scale Biodiversity Planning targets;
  - iv. An examination of the C.A.P.E. Fine-Scale Biodiversity Planning project identification of important plant species;
  - v. An examination of SANBI GIS databases on Endemic and Red Data plant species in the study area;
  - vi. A literature search on Red Data Book species predicted to occur in the study area; and
  - vii. Establish the environmental baseline in terms of the benchmark condition (as per Mucina & Rutherford Veld Type) for comparative on-site investigations.
  
- An initial ecological survey documenting the vegetation patterns within the study area and identifying important habitats;
- A site assessment of the ecological habitats and description of any Species of Special Concern (SSC) (including endemic, Red Data and protected species) within the study area;
- Consideration of invasive alien plant status and rehabilitation potential of natural areas;
- The use of previous vegetation surveys conducted within the vicinity of the proposed development and literature investigations to supplement field data where necessary;
- An overall assessment of the condition of the vegetation found on the site including an assessment of cover and vegetation structure;
- Identification of potential negative ecological impacts of the proposed development and assess the significance of these impacts; and
- Providing recommended mitigation measures for the identified impacts in order to avert or lower the significance of the negative impacts.

## **1.3 Scope of work- Faunal Assessment**

In summary, the objectives of this faunal impact assessment report were to evaluate the study area from a faunal sensitivity perspective:

- Field visit to identify important faunal habitats associated with the proposed development;
- A description of the environment that will be affected by the proposed development;

- A description of the current fauna within the study area and the identification of Species of Special Concern potentially affected by the proposed substation and power line development;
- The use of previous ecological surveys conducted within the vicinity of the proposed development and literature investigations to supplement field data where necessary;
- Identify potential negative ecological impacts on the faunal diversity and species composition at the site of the proposed development and assess the significance of these impacts;
- To provide recommended mitigation measures to address the potential impacts so as to avert or lower the significance of such negative impacts on faunal species; and
- To provide recommendations regarding the alternative that will have the least impact on the faunal communities within the study area.

#### **1.4 Assumptions and Limitations**

It is difficult to apply pure scientific methods within a natural environment without limitations, and consequential assumptions need to be made. The following constraints may have affected this assessment:

- Modelled biodiversity databases have limitations in terms of accuracy and have to be ground-truthed;
- A hand held Garmin 60 GPS used during the assessment has an accuracy of 4-6m.
- Due to time constraints, the ecological assessment was based on a five-day assessment of the site during summer; the identification of bulbs and flowering plants was limited. It is therefore recommended that once the final substation site and power line tower sites are determined, a botanist should conduct a site walkthrough during the late winter season to identify protected flowering and bulb species which could be affected by the project.
- Many faunal SSC are secretive and difficult to observe even during intensive field surveys; and
- Conclusions of this report were based on experience of these and similar species in different parts of South Africa. Faunal behaviour cannot be entirely reduced to formulas that will hold true under all circumstances.

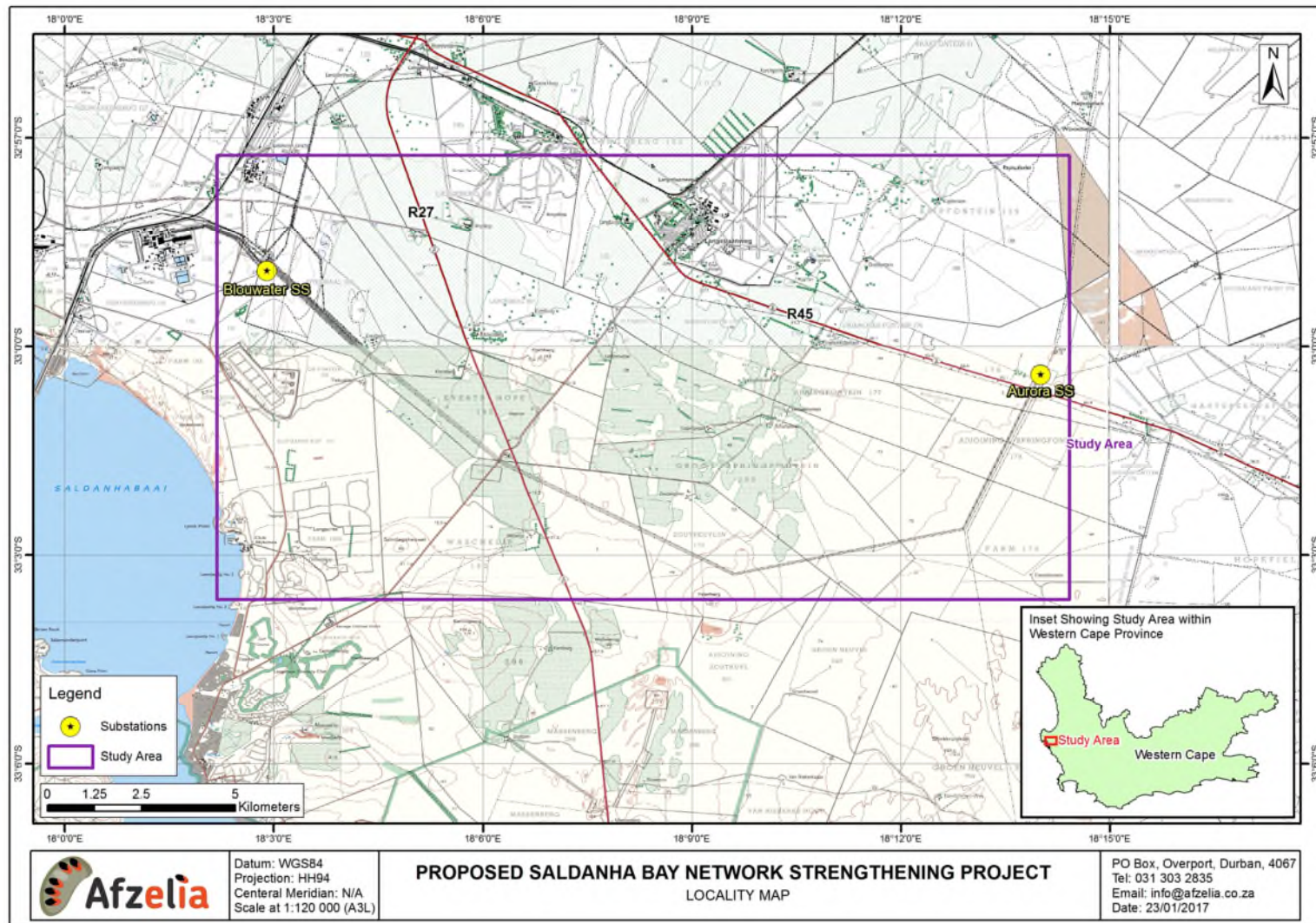
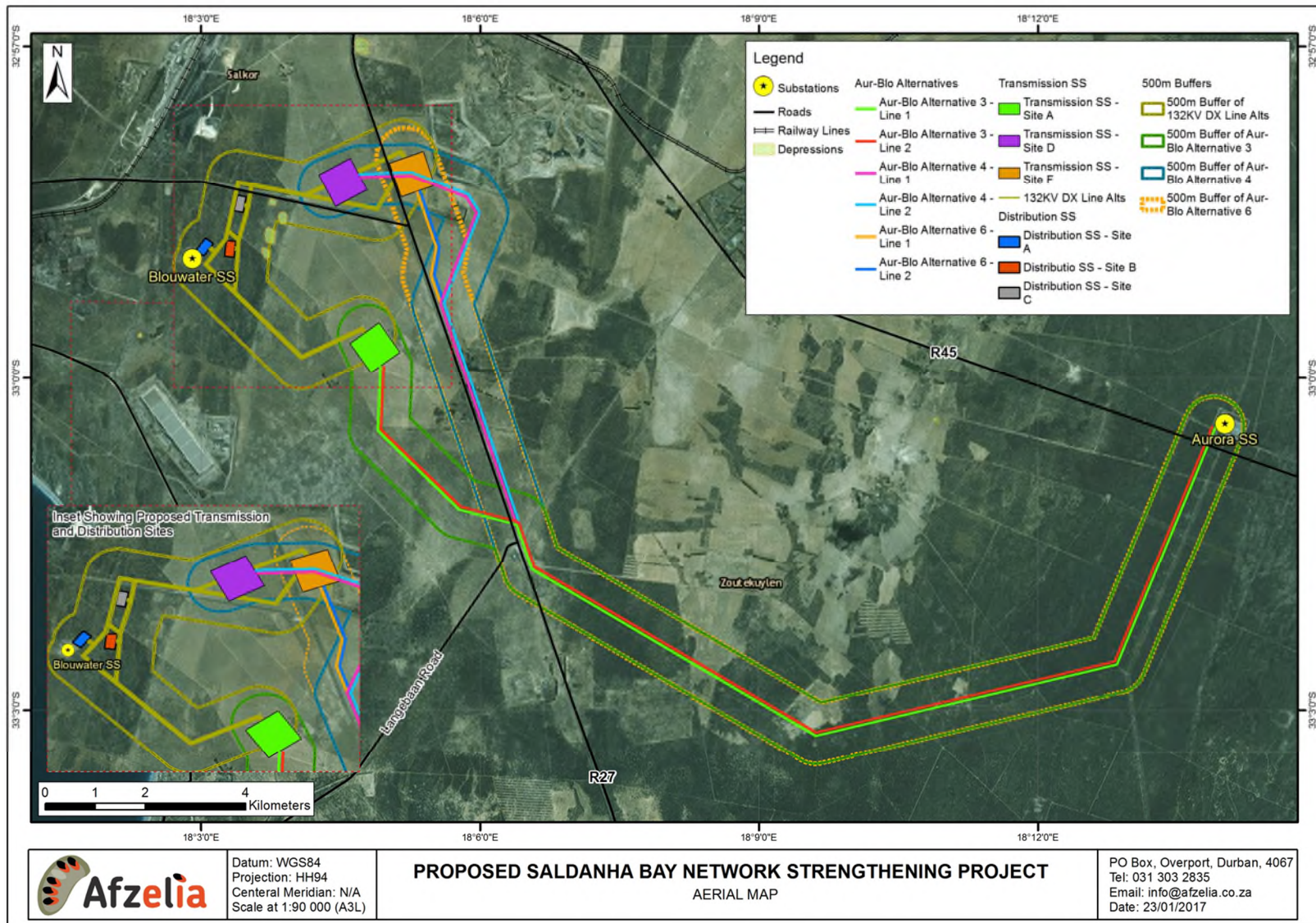


Figure 1: Locality of study area for the proposed substations and associated power line infrastructure.



**Figure 2:** Site description map of the proposed substation site alternatives and power line corridor alternatives.



## **2. METHODOLOGY**

### **2.1 Literature review and desktop study**

A comprehensive desktop study was carried out to document all known and predicted vegetation characteristics of the study area. The following methods and resources were used in the assessment of the study site:

A desktop assessment of the biodiversity value of on-site vegetation types and plant species within the study area included:

- An initial mapping exercise identifying important habitats and vegetation types and contextualising the significance of the natural asset on the study site. This was done using Google Earth satellite imagery;
- A search for species lists for the study area;
- An inspection of SANBI GIS databases on Endemic and Red Data plant species in Western Cape;
- A literature search on SSC predicted to occur in the study area; and
- Establishing the environmental baseline in terms of the benchmark condition (as per Mucina & Rutherford Veld Type) for comparative on-site investigations.

The faunal investigation focused on mammals, reptiles and amphibians in the proposed project area. The following methodology was applied:

- Data sets were collected and examined to determine the focus species for this study, these included:
  - Faunal distribution data obtained from the Animal Demography Unit of the University of Cape Town;
  - Alexander and Marais (2007) for reptiles; and
  - Du Preez and Carruthers (2009) for amphibians; and
  - Skinner and Chimimba (2005) for mammals;
- Similarly, the data were examined to determine the possible occurrence of any Red Data and non-Red Data species;

### **2.2 Vegetation analysis of the study site**

#### **2.2.1: Vegetation**

A site visit was conducted from the 1st to the 5th of February 2016. Vegetation was assessed through a walkover field survey of the site verifying the Mucina and Rutherford (2006) vegetation types. In addition, important habitats, such as wetlands and rocky outcrops were identified. Areas of conservation and/or ecological importance were also noted. Overall vegetation condition, cover and vegetation structure were noted.

The vegetation types were evaluated in terms of conservation priority according to the following categories as per the South African National Biodiversity Institute (SANBI):

Critically endangered:	Species that are facing a very high risk of extinction in the immediate future. It is the highest risk category assigned to a species.
Endangered:	Species that are facing a high risk of extinction in the near future. If these species are not properly protected, they will become critically endangered and eventually extinct.
Vulnerable:	Species that are facing a high risk of extinction in the medium term future.
Near threatened:	Species that are facing a risk of extinction in the medium-long term.
Least concern:	Species that are not facing an imminent threat of extinction during the next five years.
Data deficient:	Inadequate data available to make a direct or indirect assessment of a species at risk of extinction.

#### 2.2.2: Flora

Through the sample plots, several aspects of the flora were identified. These included the species list, list of Species of Special Concern (SSC), and the list of alien and invasive species.

##### Species List

The species list is compiled mainly from the data gathered from the sample plots. All species occurring in each of the sample plots were identified as far as possible, either during the site visit or afterwards from photographs. In addition, species seen within the study area, but not occurring within specific sample plots were also recorded. This allowed for the production of a species list representative of the entire study area.

##### Species of Special Concern (SSC)

From the overall species list, a list of Species of Special Concern was drawn up. To be as comprehensive as possible, this list includes plants on each of the following lists:

- National Protected Tree List (Government Gazette Vol. 593, 21 November 2014, No. 38215);
- Provincial Protected Species List (Nature Conservation Ordinance No. 19 of 1974);
- National Protected Species List or TOPS (R 1187 of 2007); and
- The National Red List ([redlist.sanbi.org](http://redlist.sanbi.org)).

An initial list of Species of Special Concern expected to be found within the study area comprises Possible Species of Special Concern (PSSC). If any of these (and any additional species on the above lists) are recorded on site, they are ascribed the status Confirmed Species of Special Concern (CSSC). It is likely that many of the PSSC do occur on site, but were not recorded in this site visit.

According to the IUCN all species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation (IUCN, 2010). The categories are described in Table 1 below.

**Table 1: Significance scoring used for each potential impact**

Category		Description
Extinct	(EX)	No known individuals remaining.
Extinct in the Wild	(EW)	Known only to survive in captivity.
Critically Endangered	(CR)	Extremely high risk of extinction in the wild.
Endangered	(EN)	High risk of extinction in the wild
Vulnerable	(VU)	High risk of endangerment in the wild.
Near Threatened	(NT)	Likely to become endangered in the near future.
Least Concern	(LC)	Lowest risk. Does not qualify for a more at risk category.
Data Deficient	(DD)	Not enough data to make an assessment of its risk of extinction.
Not Evaluated	(NE)	Has not yet been evaluated against the criteria.

### Alien invasive species

Alien invasive species were recorded from each of the sample plots, as well as through opportunistic sightings throughout the study area. Alien invasive species are those that are not indigenous and can create problems by invading areas that should be open to indigenous species. These plants can reduce habitat size and impact on community structure quite extensively.

### **2.3 Faunal assessment**

The site was assessed during a field investigation (01<sup>st</sup> – 05<sup>th</sup> February 2016) to determine fauna and faunal micro habitats present within the site. This included a thorough walk over of the site, taking photographs and the use of indirect evidence such as droppings, spoor and footprints. Furthermore, camera traps were used to record the presence of any nocturnal or secretive faunal species. Information was supplemented by historical records, personal accounts from residents within the study area and a comprehensive literature review; and

The impacts of the proposed project on faunal species were predicted and mitigation measures were proposed.

The faunal species were evaluated in terms of their conservation priority according to the following categories as per the International Union for the Conservation of Nature (IUCN):

Critically endangered: Species that are facing a very high risk of extinction in the immediate future. It is the highest risk category assigned to a species.

Endangered: Species that are facing a high risk of extinction in the near future. If these species are not properly protected, they will become critically endangered and eventually extinct.

Vulnerable: Species that are facing a high risk of extinction in the medium term future.

Near threatened: Species that are facing a risk of extinction in the medium-long term.

Least concern: Species that are not facing an eminent threat of extinction during the next five years.

Data deficient: Inadequate data available to make a direct or indirect assessment of a species at risk of extinction.

## 2.4 Impact rating scales

Any development activity in a natural system will have an impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify and assess the significance of the potential impacts caused by the proposed development and to provide a description of the mitigation required so as to limit the identified impacts on the natural environment.

A number of potential impacts relating to the loss of indigenous vegetation, floral habitat and ecological structure, loss of floral diversity and ecological integrity, proliferation of alien invasive species, loss of plant species of conservation concern, loss of faunal habitat, direct faunal impacts and disturbance to fauna are predicted to occur as a result of the proposed project. In order to minimise these impacts it is necessary that mitigation measures must be fully implemented to limit the significance of these impacts on the receiving environment.

Significance scoring assesses and predicts the significance of environmental impacts through evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed taking into account any proposed mitigations. The significance of the impact “without mitigation” is the prime determinant of the nature and degree of mitigation required<sup>1</sup>. Each of the above impact factors has been used to assess each potential impact using ranking scales (**Table 2**).

Unknown parameters are given the highest score (5) as significance scoring follows the Precautionary Principle. The Precautionary Principle is based on the following statement: *When the information available to an evaluator is uncertain as to whether or not the impact of a proposed development on the environment will be adverse, the evaluator must accept as a matter of precaution, that the impact will be detrimental. It is a test to determine the acceptability of a proposed development. It enables the evaluator to determine whether enough information is available to ensure that a reliable decision can be made.*

**Table 2: Significance scoring used for each potential impact**

<b>Probability</b>	<b>Duration</b>
1 - very improbable	1 - very short duration (0-1years)
2 - improbable	2- short duration (2-5 years)
3 - probable	3 - medium term (5-15 years)
4 - highly probable	4 - long term (>15 years)
5 - definite	5 - permanent/unknown

<sup>1</sup> Impact scores given “with mitigation” are based on the assumption that the mitigation measures recommended in this assessment are implemented correctly and rehabilitation of the site is undertaken. Failure to implement mitigation measures during and after construction will keep the impact at an unacceptably high level.

<b>Extent</b>	<b>Magnitude</b>
1 - limited to the site	0 – no impact
2 - limited to the local area	2 – minor
3 - limited to the region	4 – low
4 - national	6 – moderate
5 - international	8 – high
	10 – very high

Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points.

Potential Environmental Impacts are rated as high, moderate or low significance as per the following:

<30 significance points = Low environmental significance

31-59 significance points = Moderate environmental significance

>60 significance points = High environmental significance

The assessment of impacts was based on the professional judgment of specialists at Afzelia Environmental Consultants, fieldwork, and desk-top analysis. The significance of potential impacts that may result from the proposed development will be determined in order to assist the Department of Environmental Affairs (DEA) in making a decision.

### 3. BIOPHYSICAL CHARACTERISTICS OF THE STUDY AREA

#### 3.1 Climate

The Saldanha Bay area is characterised by a winter rainfall pattern with some rain occurring in summer. The mean annual precipitation is approximately 250mm per year. It receives the lowest rainfall in February (1mm) and the highest in June (49mm). The average daily maximum temperatures range from 16.4 °C in July to 25.1 °C in February. The region is the coldest in June with minimum temperatures of 8.0 °C (Mucina and Rutherford, 2006).

#### 3.2 Vegetation

According to the national vegetation map (Mucina & Rutherford, 2006; Scott-Shaw and Escott, 2011), four vegetation types occur within the study area (**Figure 3**): Saldanha Flats Strandveld, Saldanha Limestone Strandveld, Saldanha Granite Strandveld and Hopefield Sand Fynbos. All four vegetation types form part of the Fynbos Biome. Saldanha Flats Strandveld is the dominant vegetation type located within the study area while the Saldanha Limestone Strandveld occupies the western edge.

The main topographical aspect within the study area consists of flat plains with limited undulations and ridgelines, which are characteristic of the West Coast coastal plains. The Berg River is the main watercourse located in the study area, which drains northwards and is located 15km to the east of the proposed site alternatives.

##### 3.2.1 Saldanha Flats Strandveld

Saldanha Flats Strandveld occurs on coastal flats in the Western Cape (Rebelo *et. al.* 2006). It comprises sclerophyllous, moderately tall shrublands. The undergrowth is a low succulent shrub layer, and the vegetation type is rich in herbaceous plants and geophytes in spring. This vegetation type is listed as **Endangered**, with a conservation target of 24% and 11% statutorily conserved. Over 50% has been transformed for cultivation, road building or urban development. Alien vegetation is problematic (Rebelo *et.al.* 2006).

According to CapeNature: " Saldanha Flats Strandveld should be considered as Endangered under criterion A1 (loss of habitat)."

##### 3.2.2 Saldanha Limestone Strandveld

This vegetation type occurs on slightly undulating ridges and steeper coastal slopes of the Western Cape (Rebelo *et.al.* 2006). It comprises low shrublands with low succulent-stemmed and deciduous, fleshy-leaved shrubs in deeper soils. Geophytic herbs are common in shallow depressions in the limestone. This vegetation type is listed as **Endangered**, with a conservation target of 24%. None is statutorily conserved. 40% has been transformed for cultivation or urban development, with some areas heavily utilised for grazing. Alien invasive species are a threat. This vegetation type has over 20 red data species, some of which are restricted to Saldanha Limestone Strandveld (Rebelo *et.al.* 2006).

### 3.2.3 Saldanha Granite Strandveld

This vegetation type is restricted to the Western Cape on granite domes from Vredenberg to St. Helena bay and many points along the coast (Rebello *et.al.* 2006). The vegetation occurs on rounded forms of granite sheets and smooth forms at their feet. It comprises a low to medium shrubland with some succulent elements and rich in geophyte flora. This vegetation type is listed as **Endangered**, with a conservation target of 24%, with less than 10% statutorily conserved. Already 70% has been transformed for cultivation or urban development. Alien invasive plant species are problematic with coastal development also forming a threat (Rebello *et al.* 2006).

### 3.2.4 Hopefield Sand Fynbos

Hopefield Sand Fynbos occurs within the Western Cape on flat to undulating coastal sand plains (Rebello *et.al.* 2006). The vegetation of this type is moderately tall shrubland with a dense herbaceous layer. It tends to be asteraceous and restioid fynbos, though may contain proteaceous and ericaceous patches. This is the most diverse vegetation type of the area with dominant species including *Leucodendron foedium*, *Leucospermum rodolentum* and *Serruria fucifolia*. This vegetation type is listed as **Endangered** with a conservation target of 30%. A very small portion is statutorily conserved. 40% has been transformed for cultivation and grazing. Alien invasive species are a concern (Rebello *et al.* 2006).

According to CapeNature: " Hopefield Sand Fynbos has also undergone an analysis by our conservation planner which showed that this vegetation type still qualifies for listing as a Vulnerable habitat although it is very close to qualifying as Endangered under criterion A1 (remaining extent) and could possibly qualify as Endangered under criterion D1 (number of threatened species associated with this habitat)."

## 3.3 Geology

The study site is situated on calcareous sand over a limestone hardpan layer along an old marine terrace. The Sandveld Group overlies the Cape Granites as well as the Malmesbury Group metasediments into which the granites intrude (Mucina and Rutherford, 2006; AGIS<sup>2</sup>).

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<sup>2</sup> Land type information was obtained from the Department of Agriculture's Global Information Service (AGIS) January 2014 – [www.agis.agric.za](http://www.agis.agric.za)

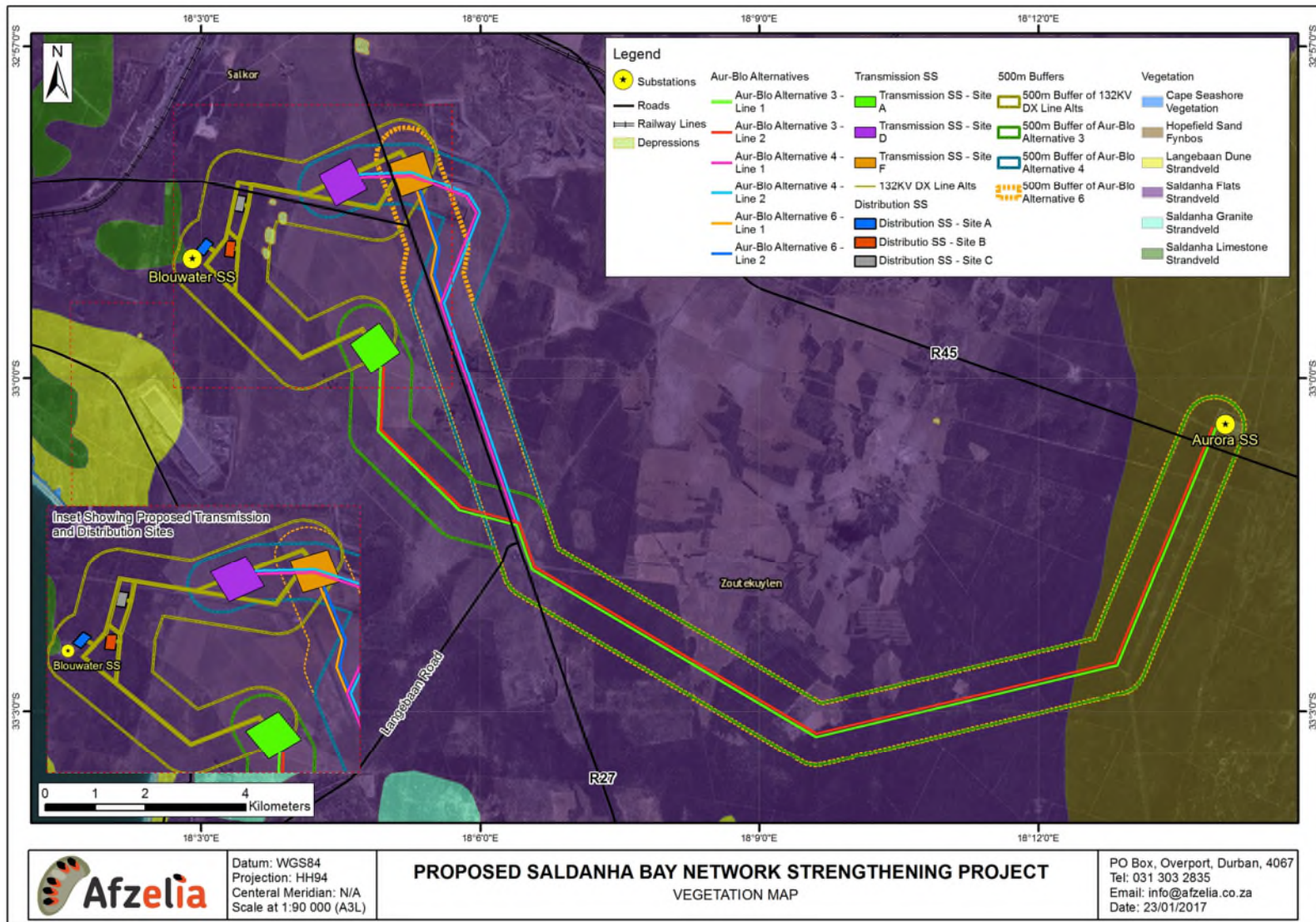


Figure 3: Vegetation types located within the study area and surrounds



### 3.4 Conservation Planning

There are a number of conservation and mapping tools that can be used to put the proposed powerline into perspective within the province and region. These include Protected Areas, National Threatened Ecosystems, and wetlands within the area.

Protected areas occurring within 10km of the proposed reserve include the Hopefield Private Nature Reserve and the West Coast National Park. Protected areas form corridors within a transformed landscape where they are linked, where they are not linked, these protected areas form islands of biodiversity that allow flora and fauna to travel between them. They also perform a vital role of meeting conservation targets.

#### 3.4.1. *Threatened Ecosystems in need of Protection*

South Africa has a legislated list of Threatened Ecosystems in need of Protection. This list is important as these ecosystems should be conserved wherever possible to meet biodiversity conservation targets nationally. These systems fall into three categories, Critically Endangered, Endangered and Vulnerable, each of these categories have different implications for potential development and Environmental Impact Assessment (EIA) regulations. The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems in one of the following categories:

- **critically endangered (CR) ecosystems**, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
- **endangered (EN) ecosystems**, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;
- **vulnerable (VU) ecosystems**, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems;
- **protected ecosystems**, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

Figure 4 indicates the Threatened Ecosystems within and surrounding the study site, including Vulnerable and Endangered ecosystems.

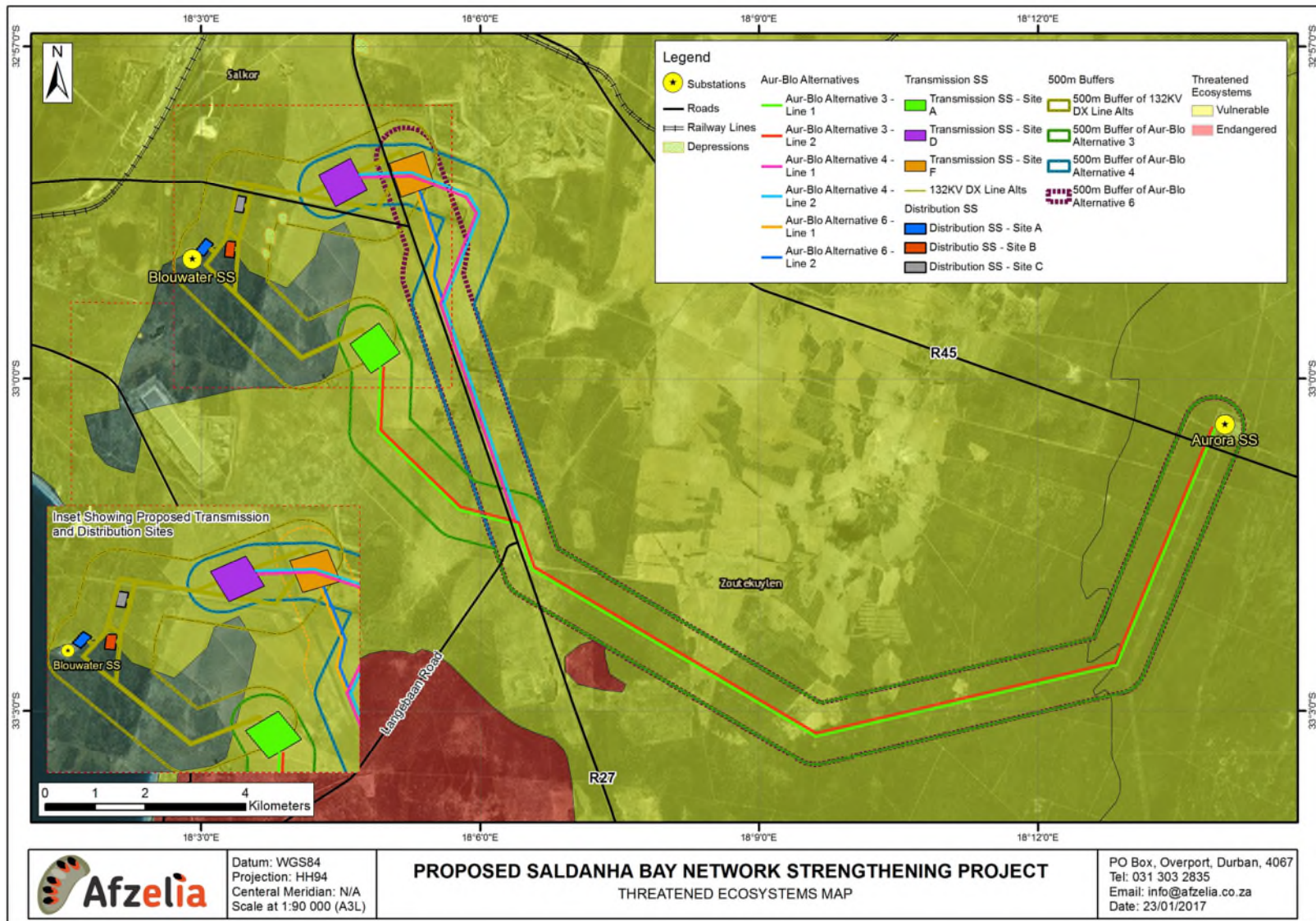


Figure 4: Threatened Ecosystems on Need of Protection

### **3.4.2. Critical Biodiversity Areas**

Biodiversity areas represent terrestrial and aquatic sites identified as Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESA), Other Natural Areas and No Natural Remaining Areas through the systematic assessment conducted by the C.A.P.E. Fine Scale Biodiversity Planning (FSP) project (refer to Figure 5). The study site contains several CBAs through which the proposed power line traverses.

#### *Critical Biodiversity Areas*

Critical Biodiversity Areas are those areas required to meet biodiversity thresholds. CBAs are areas of terrestrial or aquatic features (or riparian buffer vegetation alongside CBA aquatic features), which must be protected in their natural state to maintain biodiversity and ecosystem functioning (Maree and Vromans, 2010). According to Maree and Vromans (2010), these CBAs include:

- areas that need to be protected in order to meet national biodiversity pattern thresholds (target area);
- areas required to ensure the continued existence and functioning of species and ecosystems (including the delivery of ecosystem services); and/or
- important locations for biodiversity features or rare species.

#### *Ecological Support Areas*

Ecological Support Areas (ESA) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may include an aquatic or terrestrial feature. ESAs can be further subdivided into Critical Ecological Support Areas (CESA) and Other Ecological Support Areas (OESA). Critical Ecological Support Areas are aquatic features, with their terrestrial buffers, which fall within priority sub-catchments, whose protection is required in order to support the aquatic and terrestrial CBAs. An example might be a river-reach, which feeds directly into a CBA. Other Ecological Support Areas are all remaining aquatic ecosystems (not classed as CESA or CBA), with their terrestrial buffers, which have a less direct impact on the CBA, e.g. a wetland that is geographically isolated from a CBA, but contributes to ecological processes such as groundwater recharge, thereby indirectly impacting on a CBA downstream. (Maree *et al*, 2010).

#### *Other Natural Areas*

Other Natural Areas are areas of lesser biodiversity importance whose protection is not required in order to meet national biodiversity thresholds. Other Natural Areas may withstand some loss in terms of biodiversity through the conversion of their natural state for development. However, if all Critical Biodiversity Areas are not protected, certain Other Natural Areas will need to be reclassified as Critical Biodiversity Areas in order to meet thresholds. (Maree *et al*, 2010).

#### *No Natural Remaining Areas*

No Natural Remaining Areas are those areas that have been irreversibly transformed through urban development, plantation and agriculture and poor land management. As a result, these areas no

longer contribute to the biodiversity of the region. However, in some cases transformed land may be classified as an ESA or CBA if they still support biodiversity (Maree *et al*, 2010).

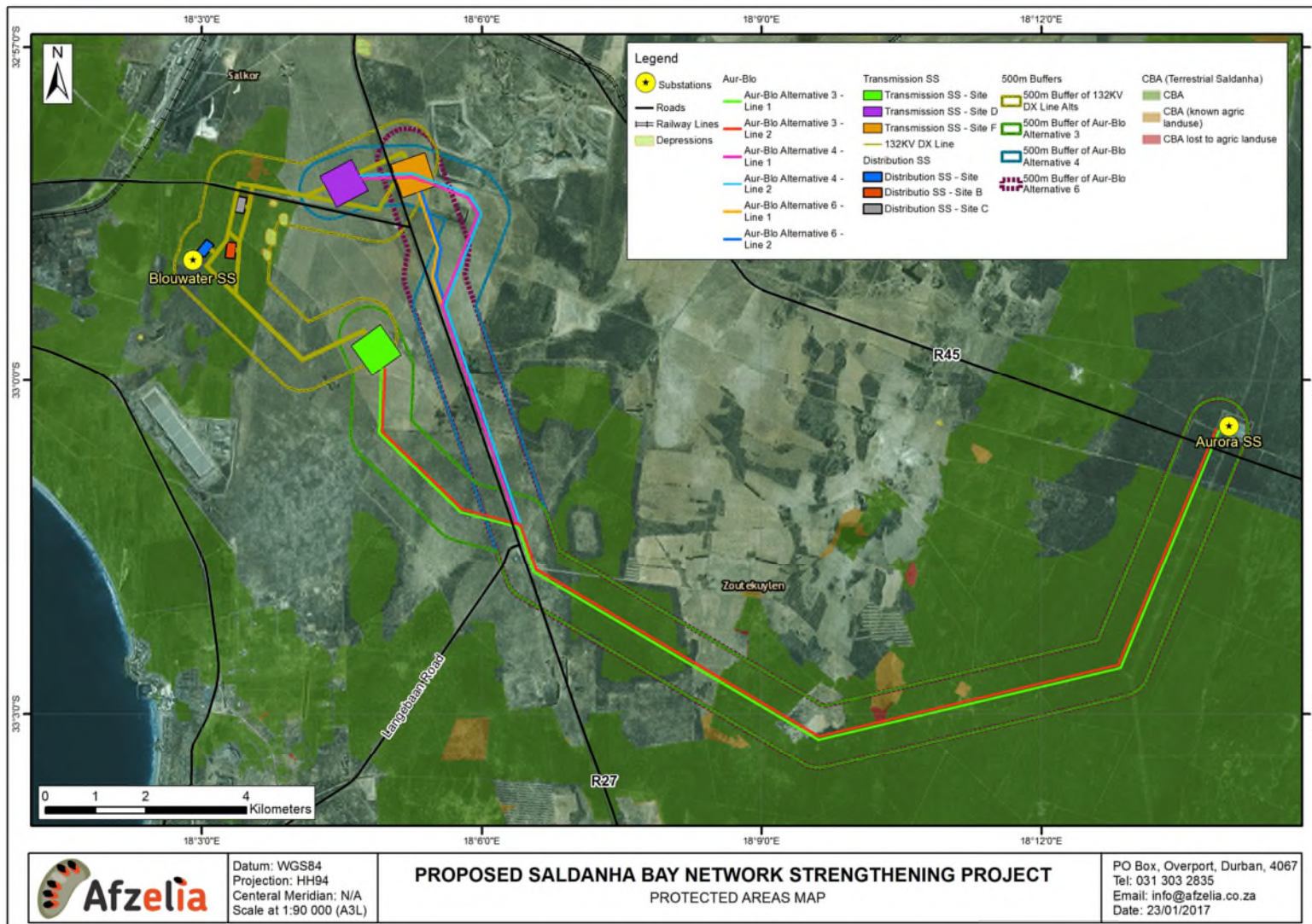


Figure 5: Critical Biodiversity Areas in relation to the study area

#### 4. VEGETATION ASSESSMENT

##### 4.1 Vegetation identified on site

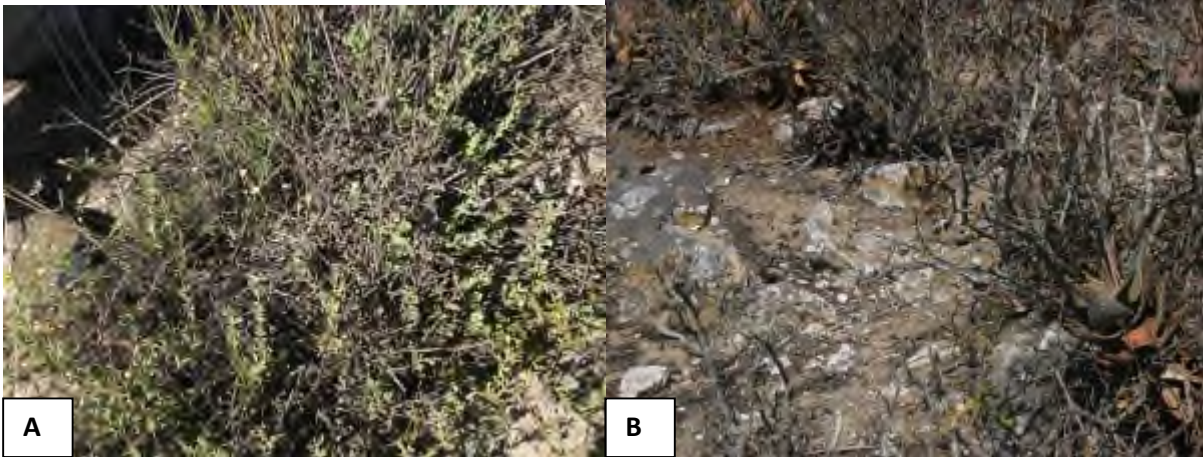
The following section provides a summary of the plant species identified on site. For a complete list of identified species, please refer to **Appendix B**.

##### 4.1.1. Distribution Substation Sites

All alternatives for the proposed DX substation comprise of Cape Vernal Pools and Saldanha Limestone Strandveld vegetation types. Indigenous species found included *Eriocephalus africanus*, *Euclea racemose*, *Euphorbia spp*, *Crysanthemoides monilifera*, *Asparagus capensis*, *Aloe perfoliata*, *Thesium spinosum* and *Searsia spp*.

Distribution Substation Site A			
Vegetation type	Cape Vernal Pools and Saldanha Limestone Strandveld		
Conservation priority	Low	Sensitivity	Low
Species richness	Low	Need for rehabilitation	High
Dominant plant species	<i>Searsia spp.</i>		
Red data species	None		
Alien species	None		
Condition	Poor		

Distribution Substation Site B and C			
Vegetation type	Cape Vernal Pools and Saldanha Limestone Strandveld		
Conservation priority	High	Sensitivity	High
Species richness	High	Need for rehabilitation	Low
Dominant plant species	<i>Eriocephalus africanus</i> , <i>Euphorbia spp</i> , <i>Searsia spp</i> , <i>Aloe perfoliata</i>		
Red data species	<i>Lampranthus vernalis</i> , <i>Limonium capense</i> , <i>Cephalophyllum rostellum</i>		
Alien species	None		
Condition	Excellent		



**Photograph 1:** (A) *Amellus tenuifolius* present on site (B) Limestone Strandveld vegetation present on site showing *Aloe perfoliata*.

**4.1.2. Transmission Substation Site A**

The site consists of old agricultural land and is highly degraded and disturbed. An absence of vegetation was noted during the time of the assessment. It is likely that wildflowers will occur on site during the rainy season. However, it is unlikely that any vegetation present on site will be of conservation concern.

Transmission Substation Site A			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	Low	Sensitivity	Low
Species richness	Low	Need for rehabilitation	High
Likely plant species to occur	<i>Dimorpotheca pluvialis, Cotula turbinata</i>		
Red data species	None		
Alien species	None		
Condition	Poor		

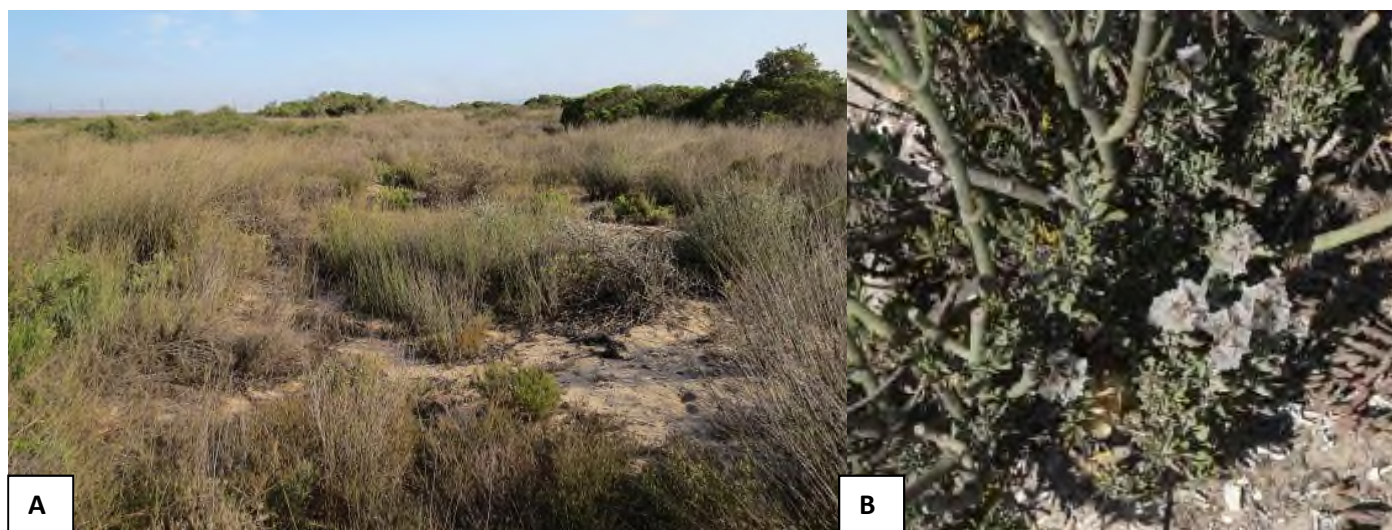


**Photograph 2:** Overview of Transmission Substation site alternative A

#### 4.1.3. Transmission Substation Site D

Indigenous species recorded on this site included *Limonium peregrinum*, *Eriocephalus africanus*, *Asparagus capensis*, *Crysanthemoides monilifera* and *Searsia* spp.

Transmission Substation Site D			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	Medium	Sensitivity	Medium-High
Species richness	Medium-High	Need for rehabilitation	Low
Dominant plant species	<i>Limonium peregrinum</i> , <i>Asparagus capensis</i> , <i>Searsia</i> spp.		
Red data species	<i>Lampranthus vernalis</i> and <i>Limonium capense</i>		
Alien species	<i>Acacia cyclops</i>		
Condition	Very good		



**Photograph 3:** (A) Overview of vegetation present at Transmission Substation site D and (B) *Limonium peregrinum*

#### 4.1.4. Transmission Substation Site F

This site consists of old agricultural land and is disturbed and degraded. No natural vegetation was present on site at the time of this assessment. Some wildflowers are likely to be present during the rainy season; however, it is unlikely that these flowers will be of any conservation concern. Once again, it must be borne in mind that undertaking a botanical assessment of the Fynbos Biome during the dry season is not ideal.

Transmission Substation Site F			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	Low	Sensitivity	Low
Species richness	Low	Need for rehabilitation	High



Transmission Substation Site F	
Likely plant species to occur	<i>Dimorpotheca pluvialis, Cotula turbinata</i>
Red data species	None
Alien species	None
Condition	Poor

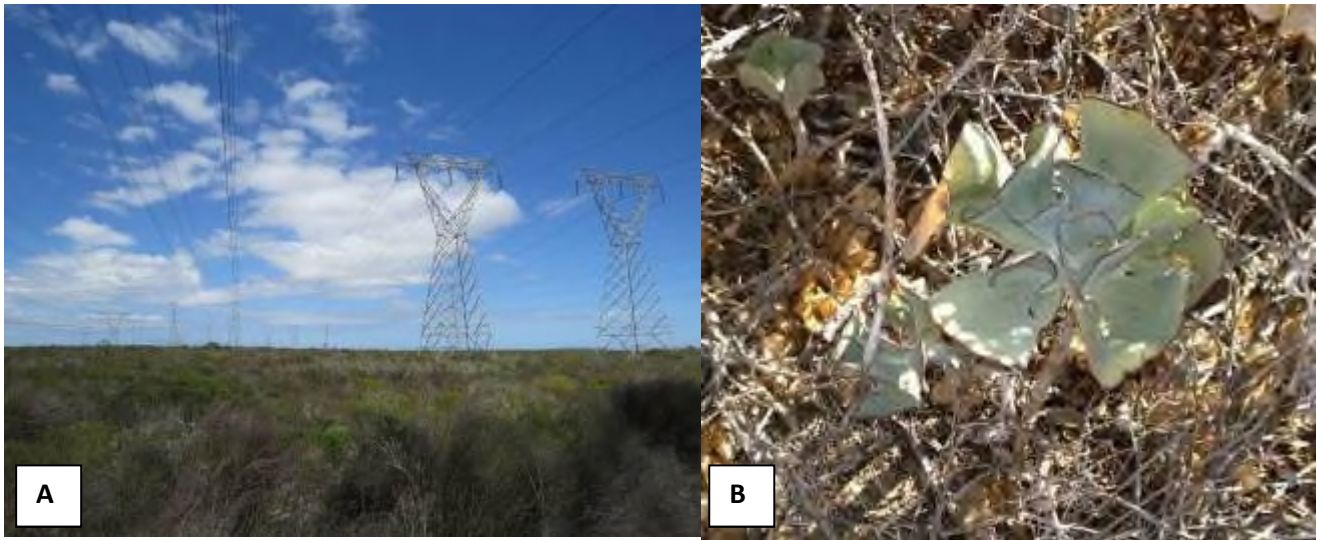


**Photograph 4:** Overview of Transmission Substation site alternative F, showing burnt vegetation.

#### 4.1.5. Aurora to Blouwater SS Corridor Alternative 3, Lines 1 and 2

Indigenous species identified along Corridor Alternative 1 included *Leucospermum hypophyllocarpodendron*, *Stoebe capitata*, *Othonna cylindrica*, *Lampranthus* spp, *Chrysanthemoides incana*, *Viscum capense*, *Cotyledon orbiculata*, *Leucospermum hypophyllocarpodendron*, *Ballota Africana* and *Phyllica cephalantha*.

Corridor Alternative 3			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	High	Sensitivity	High
Species richness	High	Need for rehabilitation	Low
Dominant plant species	<i>Phyllica cephalantha, Othonna cylindrica, Stoebe capitata</i>		
Red data species	<i>Leucospermum hypophyllocarpodendron</i>		
Alien species	None		
Condition	Excellent within intact Strandveld vegetation surrounding the first portion of the corridor. Through fringe vegetation the condition could be considered to be reasonable. Through the agricultural land the condition of the vegetation is low.		



**Photograph 5:** (A) Overview of Vegetation of corridor alternative 3 and (B) *Cotyledon orbiculata*.



**Photograph 6:** *Ornithogalum thyrsoides*

**4.1.6. Aurora to Blouwater SS Corridor Alternative 4, Lines 1 and 2**

Indigenous species recorded along this corridor included *Asparagus capensis*, *Erica mammosa*, *Phylica cephalantha*, *Oxalis compressa*, *Thesium spinosum*, *Searsia laevigata* var *laevigata*, *Putterlickia pyracantha*, *Chrysanthemoides incana*, *Euphorbia* spp, *Tylecodon grandiflorus*, *Cynanchum africanum* and *Metalasia muricata*.

Route Alternative 2			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	Medium	Sensitivity	Medium
Species richness	Medium-High	Need for rehabilitation	Medium
Dominant plant species	<i>Phylica cephalantha</i> , <i>Putterlickia pyracantha</i> and <i>Tylecodon grandiflorus</i>		
Red data species	None		
Alien species	None		
Condition	Excellent within intact Strandveld vegetation surrounding the first portion of the corridor. Through fringe vegetation the condition could be considered to be reasonable. Through the agricultural land the condition of the vegetation is low.		



**Photograph 7:** *Erica mammosa*



**Photograph 8:** *Searsia laevigata var laevigata*

**4.1.7. Aurora to Blouwater SS Corridor Alternative 6, Lines 1 and 2**

*Erica mammosa*, *Diosma oppositifolia* and *Searsia laevigata var laevigata* are among the plant species identified along Route 6 this corridor alternative.

Route Alternative 6			
Vegetation type	Saldanha Flats Strandveld		
Conservation priority	Medium	Sensitivity	Medium
Species richness	Medium-High	Need for rehabilitation	Medium
Dominant plant species	<i>Searsia laevigata var laevigata</i> , <i>Diosma oppositifolia</i>		
Red data species	None		
Alien species	<i>Acacia cyclops</i>		
Condition	Excellent within intact Strandveld vegetation surrounding the first portion of the corridor. Through fringe vegetation the condition could be considered to be reasonable. Through the agricultural land the condition of the vegetation is low.		



**Photograph 9:** *Diosma oppositifolia*

**Note:** The primary impact on the vegetation communities for all substation sites and power line corridors will be the loss of natural vegetation as a result of activities relevant to the project.

## 5. FLORA ASSESSMENT

### 5.1 Species List

Species lists were compiled from both the SANBI POSA database for the quarter degree squares within which the study site falls and the species listed by Mucina and Rutherford (2006) for the vegetation types within the study area. The total list of possible species in the study area includes 828 species. The full list can be seen in Appendix B. 78 species were recorded from the site overall.

It should be noted that the site visit was conducted towards the end of summer. This is not the ideal time for assessing fynbos and it is essential that field work and plant identification be done during winter, early spring and early summer in order to record the majority of species that would have been dormant during the site visit.

### 5.2 Species of Conservation Importance

Legislation exists at both provincial and national levels that serve to protect and preserve important plant taxa particularly those that are considered to be of conservation value. The purpose is to ensure the long-term survival of these species.

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 solely by listed activities 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.
- 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”.

Lists checked include:

- National Protected Tree List (Government Gazette Vol. 593, 21 November 2014, No. 38215);
- Provincial Protected Species List (Nature Conservation Ordinance No. 19 of 1974);
- National Protected Species List or TOPS (R 1187 of 2007); and
- The National Red List ([redlist.sanbi.org](http://redlist.sanbi.org)).

#### 5.2.1. Threatened species that may occur on site

The SANBI POSA database for the 3218CC & 3318AA Quarter Degree Square Grid Squares (QDGS) contains 729 species. It is important to note that the summarised plant list of SANBI contains only the species for which there are herbarium specimens housed in the National Herbarium. This is therefore not regarded as a fully comprehensive and complete list. In addition, the Mucina and Rutherford (2006) lists for each of the vegetation types on site were included.

The POSA and Mucina and Rutherford lists were then run through the Redlist of South African Plants, and checked against the NEM:BA regulations and the Provincial Conservation Ordinance to determine the list of Possible Species of Special Concern (PSSC). 221 PSSC were identified for the site. The full list of these species can be found in Appendix C. Table 3 lists those species on the Redlist classified as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), the top three classifications.

**Table 3: Threatened Species and Species of Conservation Concern (SANBI, Quarter degree square Grid 3218CC & 3318AA).**

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Aizoaceae	<i>Antimima aristulata</i>	VU		
	<i>Antimima limbata</i>	EN		
	<i>Cephalophyllum rostellum</i>	EN		
	<i>Cheiridopsis rostrata</i>	VU		
	<i>Lampranthus aureus</i>	VU		
	<i>Lampranthus scaber</i>	EN		
	<i>Oscularia vredenburghensis</i>	VU		
	<i>Ruschia cupulata</i>	VU		
	<i>Ruschia geminiflora</i>	VU		
	<i>Ruschia tecta</i>	EN		
	<i>Hessea mathewsii</i>	CR		SC4
	<i>Strumaria chaplinii</i>	EN		SC4
Asteraceae	<i>Amellus asteroides</i> subsp. <i>mollis</i>	VU		
	<i>Amellus capensis</i>	VU		
	<i>Cotula duckittiae</i>	VU		SC4
	<i>Cotula eckloniana</i>	VU		
	<i>Felicia elongata</i>	VU		
	<i>Helichrysum bachmannii</i>	VU		
	<i>Metalasia capitata</i>	VU		
	<i>Relhania rotundifolia</i>	EN		
	<i>Steirodiscus tagetes</i>	VU		
Boraginaceae	<i>Echiostachys spicatus</i>	EN		SC4
Campanulaceae	<i>Wahlenbergia suffruticosa</i>	CR		
	<i>Silene ornata</i>	VU		
	<i>Erica trichostigma</i>	VU		SC4
Euphorbiaceae	<i>Euphorbia flanaganii</i>	VU		
Fabaceae	<i>Amphithalea ericifolia</i> subsp. <i>erecta</i>	CR		
	<i>Aspalathus albens</i>	VU		
	<i>Aspalathus lotoides</i> subsp. <i>lagopus</i>	VU		
	<i>Aspalathus lotoides</i> subsp. <i>lotoides</i>	VU		
	<i>Aspalathus pinguis</i> subsp. <i>occidentalis</i>	VU		
	<i>Aspalathus recurva</i>	VU		
	<i>Indigofera platypoda</i>	EN		
	<i>Lebeckia plukenetiana</i>	EN		

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
	<i>Liparia splendens</i> subsp. <i>splendens</i>	VU		SC4
	<i>Othobium venustum</i>	VU		
	<i>Podalyria sericea</i>	VU		
	<i>Wiborgia fusca</i> subsp. <i>macrocarpa</i>	EN		
	<i>Xiphotheca reflexa</i>	EN		
Geraniaceae	<i>Pelargonium chelidonium</i>	EN		
Hemerocallidaceae	<i>Caesia sabulosa</i>	VU		
Hyacinthaceae	<i>Daubenyia zeyheri</i>	VU		
	<i>Lachenalia mathewsii</i>	EN		
	<i>Lachenalia mediana</i> var. <i>mediana</i>	VU		
	<i>Lachenalia paucifolia</i>	EN		
	<i>Lachenalia reflexa</i>	VU		
	<i>Polyxena paucifolia</i>	EN		
Hypoxidaceae	<i>Empodium veratrifolium</i>	EN		
	<i>Pauridia linearis</i>	VU		
	<i>Pauridia longituba</i>	EN		
	<i>Babiana nana</i> subsp. <i>nana</i>	EN		SC4
	<i>Ferraria densepunctulata</i>	VU		SC4
	<i>Ferraria parva</i>	EN		SC4
	<i>Geissorhiza lewisiae</i>	VU		SC4
	<i>Geissorhiza purpurascens</i>	EN		SC4
	<i>Gladiolus griseus</i>	CR		SC4
	<i>Hesperantha juncifolia</i>	EN		SC4
	<i>Hesperantha saldanhae</i>	CR PE		SC4
	<i>Ixia purpureorosea</i>	VU		SC4
	<i>Lachenalia viridiflora</i>	CR		SC4
	<i>Moraea calcicola</i>	EN		SC4
	<i>Moraea loubseri</i>	CR		SC4
	<i>Moraea tricolor</i>	EN		SC4
	<i>Romulea barkerae</i>	EN		SC4
	<i>Romulea elliptica</i>	EN		SC4
	<i>Romulea saldanhensis</i>	EN		SC4
	<i>Sparaxis grandiflora</i> subsp. <i>Violacea</i>	EN		SC4
<i>Sparaxis parviflora</i>	VU		SC4	
Oxalidaceae	<i>Oxalis burtoniae</i>	VU		
	<i>Oxalis suavis</i>	VU		
	<i>Limonium acuminatum</i>	VU		
	<i>Limonium depauperatum</i>	EN		
	<i>Limonium purpuratum</i>	CR		
Polygalaceae	<i>Muraltia harveyana</i>	VU		
	<i>Muraltia macropetala</i>	VU		



Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Proteaceae	<i>Leucadendron cinereum</i>	VU		SC4
	<i>Leucadendron foedum</i>	VU		SC4
	<i>Leucadendron stellare</i>	CR		SC4
	<i>Leucospermum hypophyllocarpodendron</i> subsp. <i>canaliculatum</i>	VU		SC4
	<i>Leucospermum parile</i>	EN		SC4
	<i>Leucospermum rodolentum</i>	VU		SC4
	<i>Leucospermum tomentosum</i>	VU		SC4
	<i>Serruria decipiens</i>	VU		SC4
	<i>Serruria fucifolia</i>	EN		SC4
	<i>Elegia verreauxii</i>	VU		
Rhamnaceae	<i>Phylica greyii</i>	EN		
	<i>Phylica harveyi</i>	VU		
	<i>Phylica stenopetala</i>	VU		
Rosaceae	<i>Cliffortia longifolia</i>	VU		
	<i>Agathosma glabrata</i>	EN		SC4
	<i>Agathosma thymifolia</i>	VU		SC4
	<i>Diosma dichotoma</i>	EN		SC4
	<i>Macrostylis crassifolia</i>	VU		SC4
	<i>Diascia collina</i>	VU		SC4
	<i>Freylinia visseri</i>	CR		
	<i>Manulea augei</i>	EN		
	<i>Manulea corymbosa</i>	VU		
Thymelaeaceae	<i>Lachnaea capitata</i>	VU		
	<i>Lachnaea grandiflora</i>	VU		

### 5.2.2. Threatened species identified on site

Eleven CSSC were identified within the study area during the site visit (Table 4). Species of conservation concern are those species that are facing a risk of extinction. This includes species in the categories Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). *Lampranthus vernalis* and *Limonium capense* were recorded at the DX substation sites. Both of these species are classified as Near Threatened according to the SANBI Red List of species. *Cephalophyllum rostellum*, classified as Endangered was also recorded at the DX substation sites. *Leucospermum hypophyllocarpodendron*, classified as Vulnerable, was identified along power line corridor Alternative 3, Lines 1 and 2.

Considering that the PSSC list is exceptional, with a large number of Critically Endangered and Endangered species, it is imperative that sampling be done in the correct season for the study area prior to the commencement of any construction.

**Table 4: Confirmed Species of Special Concern**

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Aizoaceae	<i>Cephalophyllum rostellum</i>	EN		
Aizoaceae	<i>Lampranthus vernalis</i>	NT		
Amaryllidaceae	<i>Brunsvigia orientalis</i>	LC		SC4
Bruniaceae	<i>Staavia radiata</i>	LC		SC4
Ericaceae	<i>Erica mammosa</i>	LC		SC4
Iridaceae	<i>Moraea</i> spp.	LC		SC4
Iridaceae	<i>Sparaxis</i> spp.	LC		SC4
Plumbaginaceae	<i>Limonium capense</i>	NT		
Proteaceae	<i>Leucospermum hypophyllocarpodendron</i> subsp. <i>canaliculatum</i>	VU		SC4
Rutaceae	<i>Agathosma imbricata</i>	LC		SC4
Rutaceae	<i>Diosma oppositifolia</i>	LC		SC4

A permit is required to remove or destroy these plants should they fall within the construction footprint. The authority controlling the issuing of permits is the Western Cape Nature Conservation Board trading as Cape Nature.

### 5.3 Invasive Alien Plants

Invasive alien plants are described as species which are 'non-indigenous' to an area and which have been introduced from other countries either intentionally (for domestic or commercial use) or accidentally; furthermore, they have the ability to reproduce and spread with alacrity without the direct assistance of people into natural or semi-natural habitats and are destructive to biodiversity and human interests (WESSA-KZN 2008).

Notice 3 of the **National Environmental Management: Biodiversity Act 2004 (Act No, 10 of 2004)** lists 379 plant species that are legally declared invasive species. Each species is assigned to one of three categories based on the level of threat posed by the species and the legal status assigned to each:

- **Category 1a** – Plant species that must be combatted or eradicated.
- **Category 1b** – Plant species that must be controlled.
- **Category 2** – Plant species that must not be allowed to spread outside any property.
- **Category 3** – Plant species that when occurring in riparian areas must be considered to be category 1b Listed Invasive Species and must be managed according to regulation 3 of NEM:BA, 2014.

Regulation 15 of the **Conservation of Agricultural Resources Act No. 43 of 1983 (CARA)** regulates and restricts the propagation, harbouring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. All listed Invasive Alien Plants are divided into three categories, which are:

- **Category 1** – Prohibited Plants
- **Category 2** – Invader plants with commercial or utility value
- **Category 3** – Primarily ornamental or 'exotic' horticultural plants

The only alien invasive species that was recorded during the site visit was *Acacia cyclops*.

## 6. FAUNA ASSESSMENT

### 6.1 Species List Faunal micro-habitats

In determining how suitable the study area is for faunal species, it is necessary to look at the habitats available to determine where the relevant species will most likely occur within the study area. These “micro habitats” do not always correspond to vegetation types and are determined by a combination of vegetation type, topography, land use, food sources and other various intrinsic factors.

Investigation of the study area revealed the following important micro-habitats (**Figure 6**). In each case, some of the species likely to make use of the various micro habitats have been described.

#### Strandveld shrublands

Strandveld shrublands occupy the central and southern boundaries of the study area (**Photograph 10**). These shrubland areas support certain species such as Grants Golden Mole, Cape Grey Mongoose, Cape Grysbok, burrowing reptiles and several rain frogs. Although the shrublands within the area are negatively impacted due to the disturbance and encroachment from agricultural land and power line infrastructure, they still provide important corridors of natural vegetation, cover and foraging opportunities for many faunal species within the largely anthropogenically disturbed landscape.



**Photograph 10:** The Strandveld shrubland habitat, which occupies the central and southern sections of the study area.

### Endorheic depression

These depression systems may provide suitable habitats for a variety of faunal species when water is present. These depressions are located on the western portion of the study area (**Photograph 11**). These may potentially include endemic species and those of conservation importance. Various amphibians present within the study area will be localised around these micro-habitats. Various faunal species rely on these wetland areas as a water source as well as providing suitable habitats for roosting, foraging and breeding. At certain times of the year, these depressions will be characterised by slow flowing water. These factors provide habitats for various faunal species.



**Photograph 11:** Endorheic depressions located within the study area.

### Rocky outcrops

A series of rocky outcrops were identified along the southern border of the study area. Within the relatively homogenous nature of the vegetation, rocky outcrops provide a unique habitat for faunal species. These areas are important micro-habitats for reptile species as they provide suitable foraging opportunities and cover from predators. Species likely to be present within this micro-habitat include Cape Girdled Lizard (*Cordylus cordylus*), Spiny Ground Agama (*Agama hispida*), Marbled Leaf-toed Gecko (*Afrogecko porphyreus*) and Ocellated Gecko (*Pachydactylus geitje*).



**Photograph 12:** A series of rocky outcrops to the south of the project area.

#### Artificial habitats

A series of troughs are located within the western section of the study site. These contain water all year round and are used by a variety of faunal species as a predictable water source. As a result, these water sources act as a beacon attracting faunal species into the area, particularly during dry periods.



**Photograph 13:** A series of water troughs located within the study area

This study focused on the current status of threatened faunal species (mammals, reptiles and amphibians) occurring or likely to occur within the study area. Present impacts on faunal communities within the proposed development footprint include:

- I. The study area is located within a largely anthropogenically modified environment. Large sections of natural land have been converted into agricultural land. A series of power lines exiting the Aurora and Blouwater substations radiate through the landscape.
- II. A phosphate mine is located near Elandsfontein Private Nature Reserve.
- III. Saldanha Steel and Freight Rail Pre Cast (Transnet) are located within the western section of the study area.
- IV. Numerous informal access roads occur throughout the study area as well as a railway line to the west.

This combination of factors has resulted in habitat transformation and subsequent reduction in suitable habitats for faunal species. These impacts have had a direct negative impact on the remaining fauna living within the study area.

It is important to note that, although the predicted impacts are mostly concerned with Red Data species, non-Red Data species will also benefit from the proposed mitigation measures as they share the same habitat and face the same potential impacts.

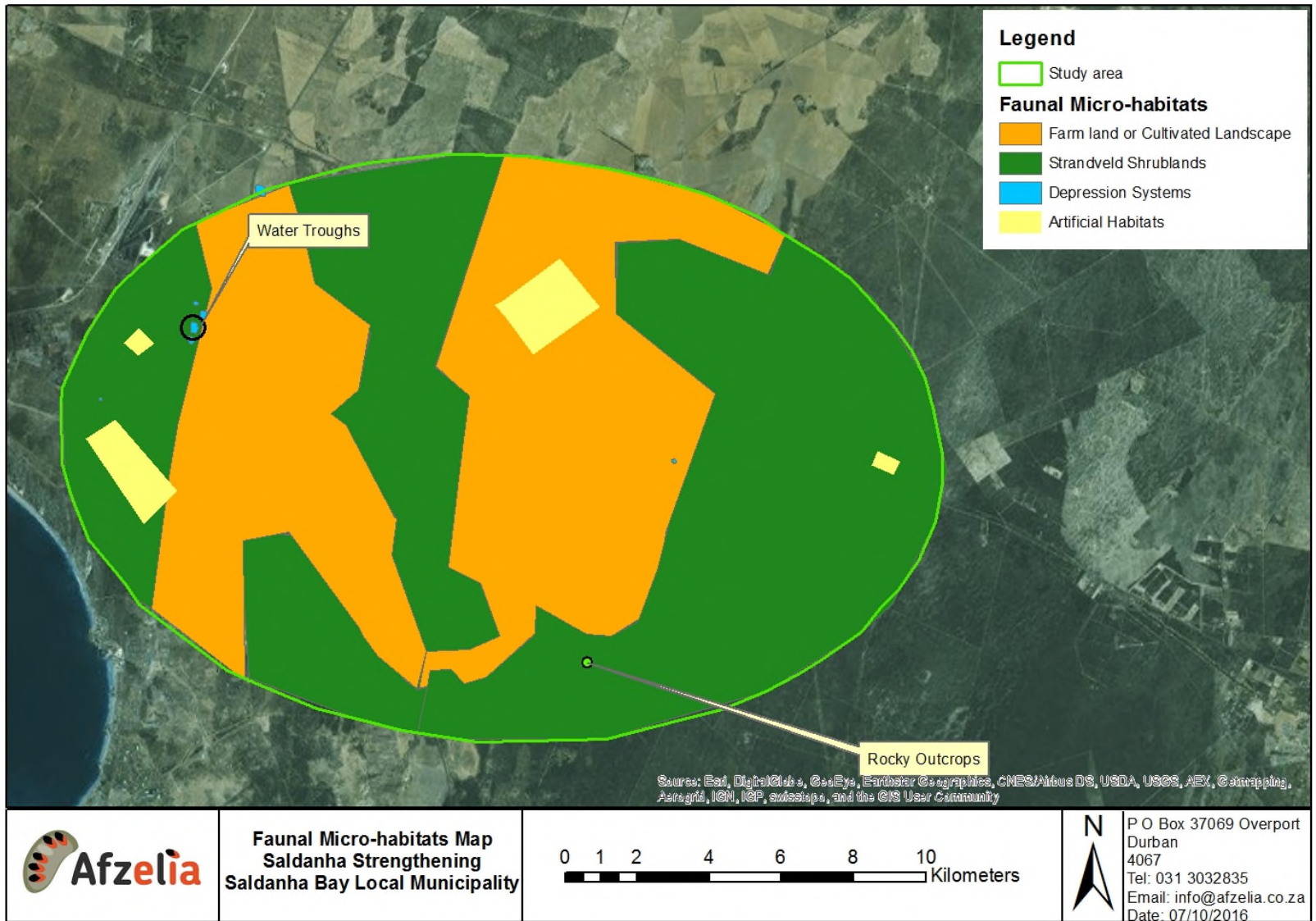


Figure 6: Faunal micro-habitats identified within the study area



## 5.1 Mammal species composition

According to distribution maps, thirty-seven (37) different terrestrial mammals may occur within the proposed development area, indicating relatively low mammal diversity (Skinner and Chimimba 2005). These include six (6) insectivores, five (5) Chiropterans, seven (7) rodents, five (5) viverrids, three (3) felids and two (2) canids. Of these, five are listed as endemic to the region. However, given the transformed nature of large portions of the area due to agricultural practices, the majority of these species would not have resident populations within the proposed project area. It is predicted that fifteen (15) mammalian species are highly likely to be present within the study area.

The ecological factors that influence the distribution of mammalian species within the Cape Floristic Region are complex and the available literature only permits broad scale interpretations. The distribution of many medium sized mammals is influenced by the availability of suitable habitat and food requirements and as a result, the distribution is often patchy (Boshoff and Kerley 2001). Furthermore, large scale movements of species play an integral role in many mammalian life histories. The proposed development is likely to have an impact on smaller mammals that rely on the shrubland habitats for cover to reduce the risk of predation.

Four Red Listed species are likely to occur within the study area (**Table 5**). Honey Badgers (Near Threatened) are nocturnal carnivores with a solitary life style. They are able to persist in human altered environments due to their opportunistic diet and tolerance to human disturbance. This species could occur within the proposed study area.

Brown Hyena (Near Threatened) require extensive home ranges to maintain a viable population. These large home ranges often coincide with livestock grazing areas and as a result, *H. brunnea* is heavily persecuted by farmers. Habitat loss is another primary threat to *H. brunnea*. Due to the high levels of disturbance and habitat transformation within the study area, the abundance of Brown Hyena is likely to be very low.

Both of the above species have a wide distribution within Southern Africa and as a result, the development is not predicted to have a significant influence on the regional populations.

The Cape Horseshoe Bat is endemic to the southwest region of Southern Africa and shows a preference for the Fynbos and Karoo biomes. This species roosts in caves and mine shafts and is a clutter forager (due to short wings and low wing loading), mainly foraging in the canopies of trees (Monadjem et al. 2010). This wing structure allows this species to manoeuvre through dense vegetation in pursuit of prey (Coleoptera and Lepidoptera) (Stuart and Stuart 2015).

The White-tailed Mouse has a relatively wide distribution across South Africa and Lesotho. *M. albicaudatus* frequents shrubland and grassland habitats and requires the presence of black loam and sufficient vegetation cover (Coetzee and Monadjem 2008). Black loam occurs where there is a large amount of organic matter within the top soil. The majority of soils identified in the study area were cohesionless, quarzitic and of aeolian origin. The topsoil was devoid of any organic matter due to the highly aerated conditions found in these sandy soils, which tends to oxidise organic matter. As a result, this species is not likely to have resident populations within the study area.

**Table 5: Red Listed mammal species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.**

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	PROBABILITY OF OCCURRENCE
Cape Golden Mole	<i>Chrysochloris asiatica</i>	Data Deficient	Low
Brown Hyena	<i>Hyaena brunnea</i>	Near Threatened	Low

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	PROBABILITY OF OCCURRENCE
Honey Badger	<i>Mellivora capensis</i>	Near Threatened	Possible
Cape Horseshoe Bat	<i>Rhinolophus capensis</i>	Near Threatened	Possible
White-Tailed Mouse	<i>Mystromys albicaudatus</i>	Endangered	Low

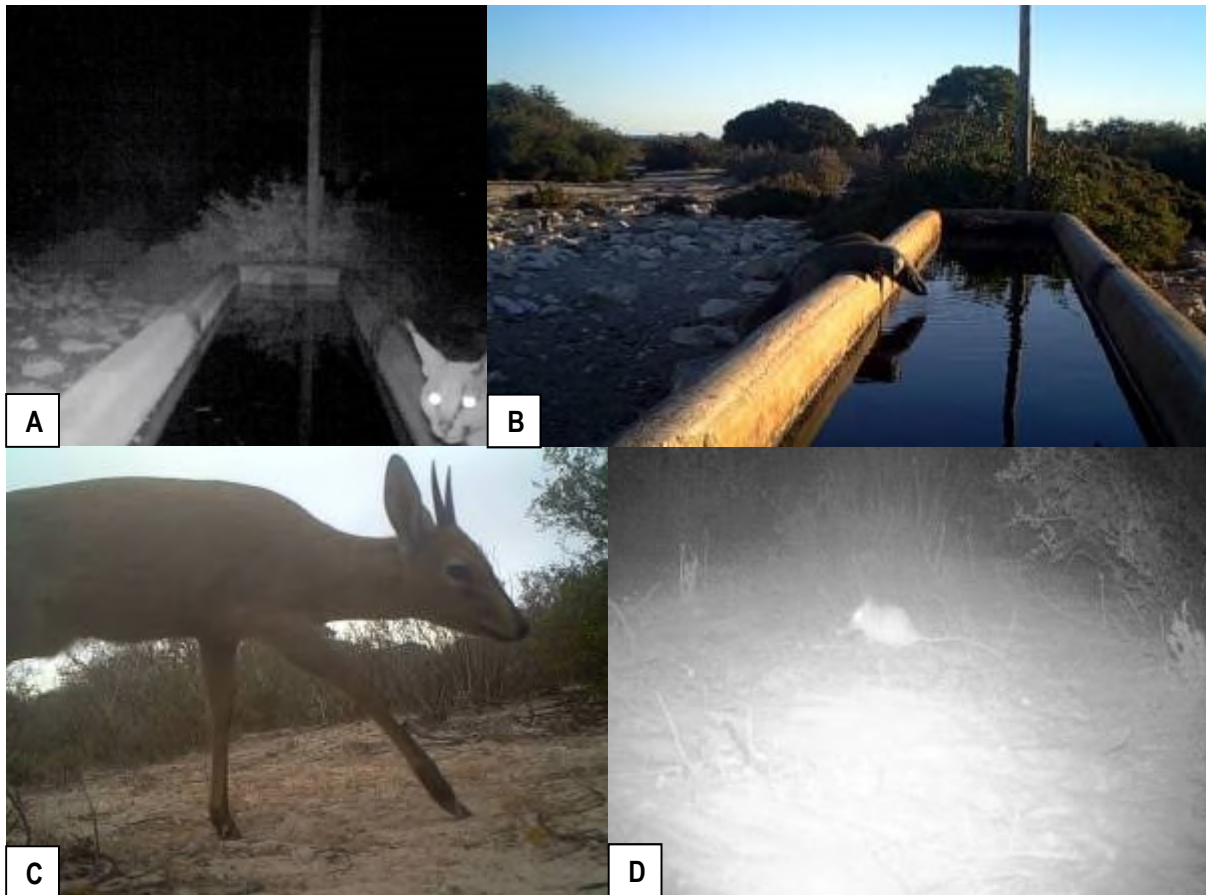
Given the transformed nature of large portions of the area due to settlements, agricultural practices and urban expansion, the majority of these species would not have resident populations within the proposed development area.

#### CAMERA TRAP SURVEY

Digital camera traps (Ltl Acorn® 6210MC, China) triggered by passive infrared sensors, were set up at suitable mammal habitats within the study area. Three camera traps were positioned within close proximity of the identified micro-habitats in order to provide a short term sample of mammals occurring within these areas. Each camera was mounted to a fixed point such as a tree, cross beam, fence or a pole placed on the ground. Camera height was set between 30cm and 40cm above the ground in order to increase the probability of detecting all mammalian species that are encountered.

The camera traps were operational continuously over a 24hr cycle recording the date and time of each photograph. The cameras were programmed to delay one minute between successive photographs and the motion sensor was programmed to “medium sensitivity”. This time interval prevented numerous images during one triggering episode. Over the study period each camera remained at a point for five nights.

The camera trap survey yielded 62 independent photographs and videos within the proposed development area. 43 of these photographs (74%) were triggered by bird species and false triggers due to wind disturbance. All identified mammal images consisted of 5 species from four orders and six families (Table 3). These included Caracal (A), Cape Grey Mongoose (B), Common Duiker (C) and Cape Gerbil (D). The most commonly photographed mammal was the Cape Grey Mongoose (n=4). All of the recorded species have been known to persist within disturbed agricultural landscapes and are able to utilise resources within this mosaic landscape.



**Photograph 14:** Mammalian species recorded within the study area including Caracal (A), Cape Grey Mongoose (B), Common Duiker (C) and Cape Gerbil (D).

#### SITE VISIT

Four mammal species, namely Cape Grey Mongoose (*Galerella pulverulenta*), Cape Grysbok (*Raphicerus melanotis*), Common Duiker (*Sylvicapra grimmia*) and Cape Hare (*Lepus Capensis*) were recorded within the proposed development site during the field survey. The Cape Grey Mongoose was recorded within the western section of the study area, primarily due to their generalist diet and habitat requirements. The Common Duiker was observed within the agricultural landscape within the central portion of the power line corridor. Numerous sightings of Cape Grysbok occurred within close proximity of the substation alternatives and the power line corridor exiting the Aurora substation. Fynbos dominated this area and the Cape Grysbok is found almost exclusively within this habitat type. The Cape Hare was recorded within the coastal scrub habitat on the border of the study site. The presence of the mammal species recorded within the study area is not surprising as these species are able to tolerate human disturbance primarily due to behavioural adaptations.

Spoor and dung encountered indicated the presence of several small to medium sized mammal species (Cape Hare, Cape Grysbok and Common Duiker). A series of Cape Grysbok middens were observed along the power line corridor exiting the Aurora substation. A series of Cape Gerbil burrows were recorded within the eastern and western portion of the study area.



**Photograph 15:** Droppings of Common Duiker (A) and Cape Hare (B) and a Cape Gerbil burrow (C) that were recorded within the study area.

The Thali Thali Game Lodge is located within the study area and power line corridor alternative 1 traverses through the southern portion of this reserve. Mammalian species observed within this reserve during the field assessment included Eland (*Taurotragus oryx*) and Black Wildebeest (*Connochaetes gnou*). Other species present within the reserve are detailed in the **Appendix D**

**Table 6: Mammal species recorded within the proposed development area.**

MAMMAL	OBSERVATIONS	CAMERA TRAP IMAGES	CONSERVATION STATUS
COMMON GREY DUIKER <i>Sylvicapra grimmia</i>	Droppings	2	Least Concern
CAPE GREY MONGOOSE <i>Galerella pulverulenta</i>	Visual sighting and camera trap	4	Least Concern
STRIPED POLECAT <i>Ictonyx striatus</i>	Camera trap	1	Least Concern
CARACAL <i>Caracal caracal</i>	Camera trap	2	Least Concern
CAPE GRYSBOK <i>Raphicerus melanotis</i>	Visual and Camera trap	3	Least Concern
CAPE HARE <i>Lepus capensis</i>	Visual sighting and droppings	-	Least Concern
CAPE GERBIL <i>Gerbilliscus afra</i>	Burrow and camera trap	4	Least Concern

### 5.2 Mammal species of concern

No endangered mammals were recorded within the study area and the likelihood of any threatened mammal species being encountered within the study area is considered to be low. The majority of large mammals are likely to have been eradicated or have moved away from the study area because of increased levels of anthropogenic disturbances such as habitat modification and degradation.

The large area (600m x 600m) required for the Transmission substation will result in the transformation of natural habitats making the land uninhabitable for faunal species. Furthermore, if the substation is placed within areas containing important micro-habitats, the development will have a negative impact on landscape connectivity and influence the movement of mammalian species.

The transmission substation site alternatives are however, located in open areas, with limited cover and high levels of human disturbance. These areas would largely be avoided by mammalian species and the new substation development is therefore unlikely to have a significant impact on mammalian species. The proposed strengthening project is likely to have an impact on habitats for smaller mammals that rely on the Fynbos and shrubland habitats for cover to reduce the risk of predation.

Given the high levels of disturbance, the majority of faunal species would not have resident populations within the proposed development area. Therefore, the proposed substation and power line development is unlikely to pose a threat to mammal species conservation in the region, provided that the mitigation measures as set out in this report are adhered to.

### 5.3 Amphibian species composition

During this survey, fieldwork was augmented with species lists compiled from data recorded during the South African Frog Atlas Project (SAFAP) (1999-2003). A probable and comprehensive list of amphibian species, which could occur in the study area, is provided in Table 7

The study area falls within the distribution range of only six amphibian species. The low amphibian diversity was attributed to the limited amphibian habitats within the proposed development area. A series of endorheic depressions are located within the study area and may after heavy rains provide suitable breeding and foraging habitats for resident amphibian species. Apart from these depressions there are no other natural occurring water bodies or wetlands within the development area. Species likely to be present include Clicking Stream Frog (*Strongylopus grayii*), Cape River Frog (*Amietia fuscigula*) and Raucous Toad (*Amietophrynus rangeri*).

The only Red Listed species, which may occur within the study area, is the Cape Caco (*Cacosternum capense*), which has been listed as Vulnerable. *C. capense* inhabits low lying areas with poorly drained, loamy or clay soils and the preferred habitat consists of Renosterveld. Due to the lack of suitable natural habitat (the site falls within Strandveld vegetation) and breeding habitats coupled with the fact that the study area is on the edge of its recorded distribution, it is not predicted that *C. capense* will have resident populations within the study area.

No amphibians were encountered during the field assessment. This may be primarily due to the limited habitat diversity and lack of wetlands within the development footprint.

**Table 7: Amphibian species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.**

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	HABITAT
Namaqua Rain Frog	<i>Breviceps namaquensis</i>	Least Concern	Dry savannah/bushland, not associated with water
Sand Rain Frog	<i>Breviceps rosei</i>	Least Concern	Wide range, permanent and semi-permanent pools
Clicking Stream Frog	<i>Strongylopus grayii</i>	Least Concern	Requires permanent water in grassland to agricultural land
Sand Toad	<i>Bufo anguistriceps</i>	Least Concern	Wide range with fresh water
Cape Sand Frog	<i>Tomopterna delandii</i>	Least Concern	Dry/ arid vegetation with fresh water
Cape Caco	<i>Cacosternum capense</i>	Vulnerable	Savannah woodland to grassland

Potential impacts on amphibian species associated with the proposed development include habitat loss, direct mortality, and degradation of the limited wetland habitats. Habitat loss for amphibians is predicted to be of low significance and will not have an impact on a broader scale. Excessive dust, runoff and disturbance during the construction phase will result in the degradation of suitable amphibian breeding habitats. This is particularly true for distribution substation site alternatives B and C, which appear to be located within close proximity of endorheic depressions.

During the construction and maintenance phase there will be an increase in vehicle activity and subsequently increased probability of frog mortalities on the access roads. These impacts will be amplified during the breeding season, during which frog activity and dispersal is increased.

It is not envisaged that the development would result in long term impacts on amphibian populations within the area. All species within the site have a relatively wide distribution and are not confined to the study area and the development is therefore not expected to have an impact on regional populations.

#### 5.4 Reptile species composition

Reptiles are sensitive to habitat modification and fragmentation. Due to the site's close proximity to agricultural development and associated anthropogenic activity coupled with high levels of disturbance, it is predicted that modifications to reptilian populations within the study area have already occurred.

The study area falls within the distribution range of 44 reptile species and the South African Reptile Conservation Assessment (SARCA) indicated that 37 species have been recorded within the study area (**Appendix E**).

The large sections of natural Strandveld located within the southern portions of the study area are likely to provide habitat for a variety of reptile species including Puff Adders (*Bitis arietans arietans*), Cape Dwarf Chameleon (*Bradypodion pumilum*) and several Skink species. The study area had limited rocky areas to support Girdled Lizard species, snakes and geckos. A series of rocky outcrops were noted within the Thali Thali Nature Reserve (**Figure 7**). Reptile species will utilise this micro-habitat and degradation of these areas will have a negative impact on reptilian community structure. It is predicted that these rocky areas will contain the highest diversity of reptilian species.

#### 5.6 Reptile species of concern

According to SARCA, five Red listed species could be present within the study area (**Table 8**).

The Black Girdled Lizard (*Cordylus niger*) is often located around rocky areas and outcrops. Localised populations have been recorded in the Langebaan and Saldanha Bay area where they have been recorded living among granitic outcrops. It is unlikely that *C. niger* will be present within the study area due to the limited rocky micro-habitats available, which this species requires as an important niche.

The Large-scaled Girdled Lizard (*Cordylus macropholis*) is differentiated from other members of this family as is not found in rocky areas. *C. macropholis* shows an affinity for areas that have *Euphorbia caput-medusae* or other members of this succulents' family present. *C. macropholis* takes shelter within this succulent (Niewoudt *et al.* 2004) *E. caput-medusae* was observed within the study area and as a result *C. macropholis* may be present.

**Table 8: Red Listed reptile species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.**

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS
Cape Dwarf Chameleon	<i>Bradypodion pumilum</i>	Vulnerable
Large-scaled Girdled Lizard	<i>Cordylus macropholis</i>	Near Threatened
Black Girdled Lizard	<i>Cordylus niger</i>	Near Threatened
Gronovi's Dwarf Burrowing Skink	<i>Scelotes gronovii</i>	Near Threatened
Bloubergstrand Dwarf Burrowing Skink	<i>Scelotes montispectus</i>	Near Threatened

#### 5.7 Site visit

Five (5) reptile species were recorded during the survey, namely a Brown House Snake (*Lamprophis capensis*), Striped Skaapstekers (*Psammophylax tritaeniatus*), Knox's Desert Lizard (*Meroles knoxii*), Variegated Skink (*Trachylepis variegata*) and Angulate Tortoises (*Chersina angulata*).

Numerous Angulate Tortoises (*Chersina angulata*) were recorded during the site visit. This species is endemic to Southern Africa is listed on CITES Appendix II and is classified as a protected species by the Nature Conservation Ordinance No. 19 of 1974 (as amended in 2000) and it may not be collected nor transported from the Western Cape Province. Many shells from adults and juveniles were recovered during the field survey. Many of these were burnt as tortoises are vulnerable to veld fired due to their slow movements.

The proposed substation and power line developments will result in the some natural habitat being replaced and largely unusable for various reptile species and the species diversity within this area will be lower than adjacent natural alternatives. This is particularly true for burrowing species such as the Near Threatened Bloubergstrand Dwarf Burrowing Skink (*Scelotes montispectus*) and Gronovi's Dwarf Burrowing Skink (*Scelotes gronovii*) as the hardened surface will restrict movement in the affected areas, as these species avoid movement above the ground. However, various species, usually those not sensitive to anthropogenic disturbance, such as Variegated Skink (*Trachylepis variegata*), Red Lipped Herald Snake (*Crotaphopeltis hotamboeia*) and Mole Snakes (*Pseudaspis cana*) will still use the transformed area.

The main impact of the proposed development on reptiles would be associated with habitat loss and disturbance during the construction phase. As large portions of the habitat within the development footprint does not fall within a unique habitat (i.e. Strandveld vegetation is located to the south, west and east of the line alternatives) and does not contain habitats of high significance to reptilian species, the proposed strengthening project is unlikely to have a long term impact on reptilian populations within the area. Furthermore, these impacts would be on a local scale. This is also attributed to the limited footprint of the power line towers.

**Although this assessment focuses on Red Data faunal species, other less threatened species will also be affected by the proposed project. Mitigation measures proposed for Red Data species will therefore also serve to protect the more common species.**

## 6 SENSITIVITY ASSESSMENT

It is important to delineate sensitive ecological habitats within the study area in order to ensure the development does not have a long term negative impact on these areas. Important ecological habitats play an integral role within a landscape from both a floral and faunal perspective providing vegetation cover as well as foraging and reproductive benefits for faunal species.

A sensitivity map was compiled for the study area by making use of the results of the ecological assessment (Figure 7).

The large eastern portion of the project area has been assessed as being of high sensitivity from an ecological perspective. This is attributed to the intact Strandveld vegetation, which, has a conservation status of **Endangered**. As a result of current and historic anthropogenic activities, which have transformed the ecological integrity of the central portion of the project area, the vegetation is considered to have a low-moderate sensitive status. Moderate sensitivity was attributed to fringe habitats adjacent to anthropogenically disturbed areas. Fynbos of varying condition was identified within these areas.

All Red Listed plant species identified within the project area have a medium-high sensitivity and must be translocated to an undisturbed area outside the project footprint, prior to the commencement of any construction and construction related activities. This process must be undertaken in terms of appropriate permits and must be supervised by a qualified botanist. This will promote the conservation of these species.



Further to this a series of gates and fences are located within the area, restricting the movement of various faunal species

There are also some sensitive faunal areas located within the western portion of the project area associated with the endorheic depressions. Although these are not directly affected by the proposed infrastructure, it is important that these depression habitats are protected from further degradation. The protection of these habitats will ensure that possible faunal species displaced will still have suitable habitat requirements within the area that will provide an important ecological corridor and refuge.

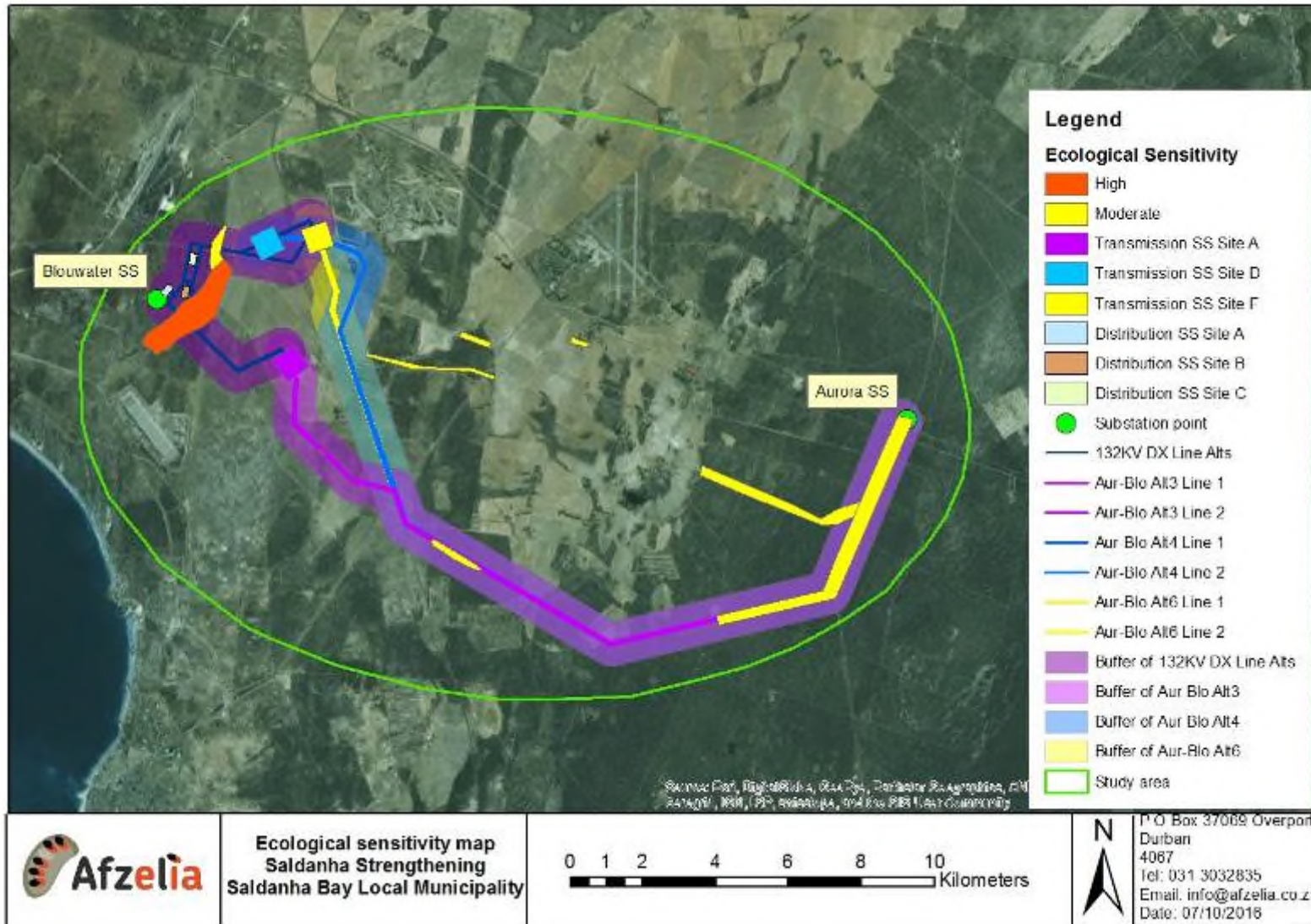


Figure 7: Sensitivity map for the study area

## 7 CONSIDERATION OF ALTERNATIVES

### Transmission Substation Site Alternatives

These sites are located within close proximity to industrial development and infrastructure including ArcelorMittal South Africa, Saldanha Works to the west ( $\pm 3$ km), and the existing Blouwater Substation and associated power lines. Transmission substation site alternative D is located within an area of moderate-high species richness and must be considered as a medium-high conservation priority. Transmission substation site alternatives A and F are located within an agricultural landscape. These sites are located next to the R27 road and 4.5km west of Langebaanweg. As a result, the area often experiences high levels of disturbance. No natural vegetation or trees are present within these site alternative areas. The topography of the site is flat and the soils were sparsely vegetated during the field survey. There are no sensitive faunal micro-habitats within close proximity of these substation site alternatives. No plant species of conservation concern are likely to occur within these site alternatives.

### Distribution Substation Site Alternatives

All three distribution substation site alternatives are located within close proximity (1km radius) of each other. The topography of all site alternatives is flat and the vegetation is dominated by Strandveld fynbos including *Eriocephalus africanus*, *Euphorbia spp*, *Searsia spp*, *Aloe perfoliata*. Three Red Listed species were identified within the site alternatives, i.e. *Lampranthus vernalis*, *Limonium capense*, *Cephalophyllum rostellum*. A series of endorheic depressions and Strandveld avian micro-habitats are located within the surrounds of all of the Distribution Substation site alternatives. Substation site alternative A is located close to the existing Blouwater substation and as a result this area has experienced some level of disturbance. Site alternative A is located in a highly transformed area.

### Power Line Corridor Alternative 3 (Figure 8)

A large portion of this power line corridor runs adjacent to existing power lines exiting the Aurora Substation. The selection of this corridor alternative will result in the reduction of new, isolated power lines thus reducing the likelihood of disturbance from an ecological perspective.

Corridor alternative 3 enters into transmission substation A. The use of the existing access roads located along this corridor would also reduce the impact of the power line project. This power line corridor alternative traverses through natural Strandveld Fynbos vegetation (for approximately 15km). It must be noted that existing power line infrastructure is within this reserve and corridor alternative 3 is proposed to traverse the landscape parallel to the existing power line. The power line then deviates to the north-west and traverses through transformed agricultural land. One floral species of conservation concern, *Leucospermum hypophyllocarpodendron* was identified along this corridor alternative. Corridor alternative 3 is the shortest alternative, approximately 19.74km in length.

Despite the advantages of localising the new power line parallel to the existing power lines in the area, the limited levels of disturbance associated with the southern section of the power line corridor could impact on intact ecological structure and processes. As all power line alternatives follow the same route for approximately 15km, it is imperative that mitigation measures be implemented to minimise the impact on the Endangered Strandveld vegetation.

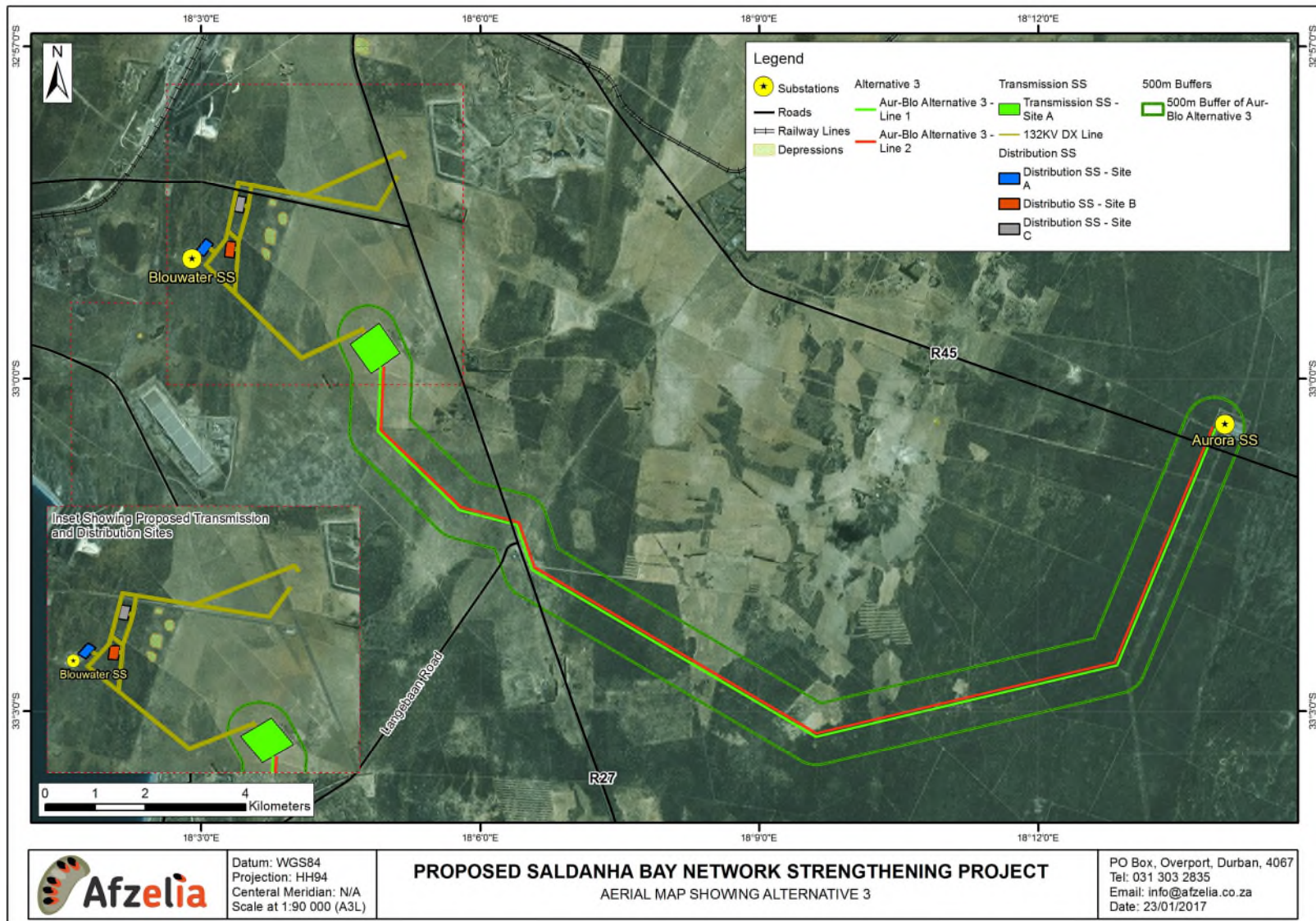


Figure 8: Powerline corridor alternative 3

### **Power Line Corridor Alternatives 4 and 6**

These alternatives follow the same route as alternative 3 for this first approximately 15.7km and then deviate to the north east. Alternative 4 is 23.56km in length and enters into transmission substation D. This is the longest line alternative (Figure 9).

Alternative 6 is 21.6km in length and enters into transmission substation F (Figure 10). The power line corridors traverse Strandveld fynbos and a mosaic of agricultural land and Fynbos fringe habitats. The central portion of these power line corridors runs parallel to the regional road (R27). A series of farm roads traverse the area. Fringe faunal micro-habitats were identified within close proximity of these corridor alternatives. Vegetation adjacent to the agricultural landscape is considered disturbed and no species of conservation concern were identified. Despite this, these fringe habitats are important ecotones and must be conserved.

The presence of an existing road structure within close proximity of the route alternatives will ensure that the need for new access roads will be reduced.

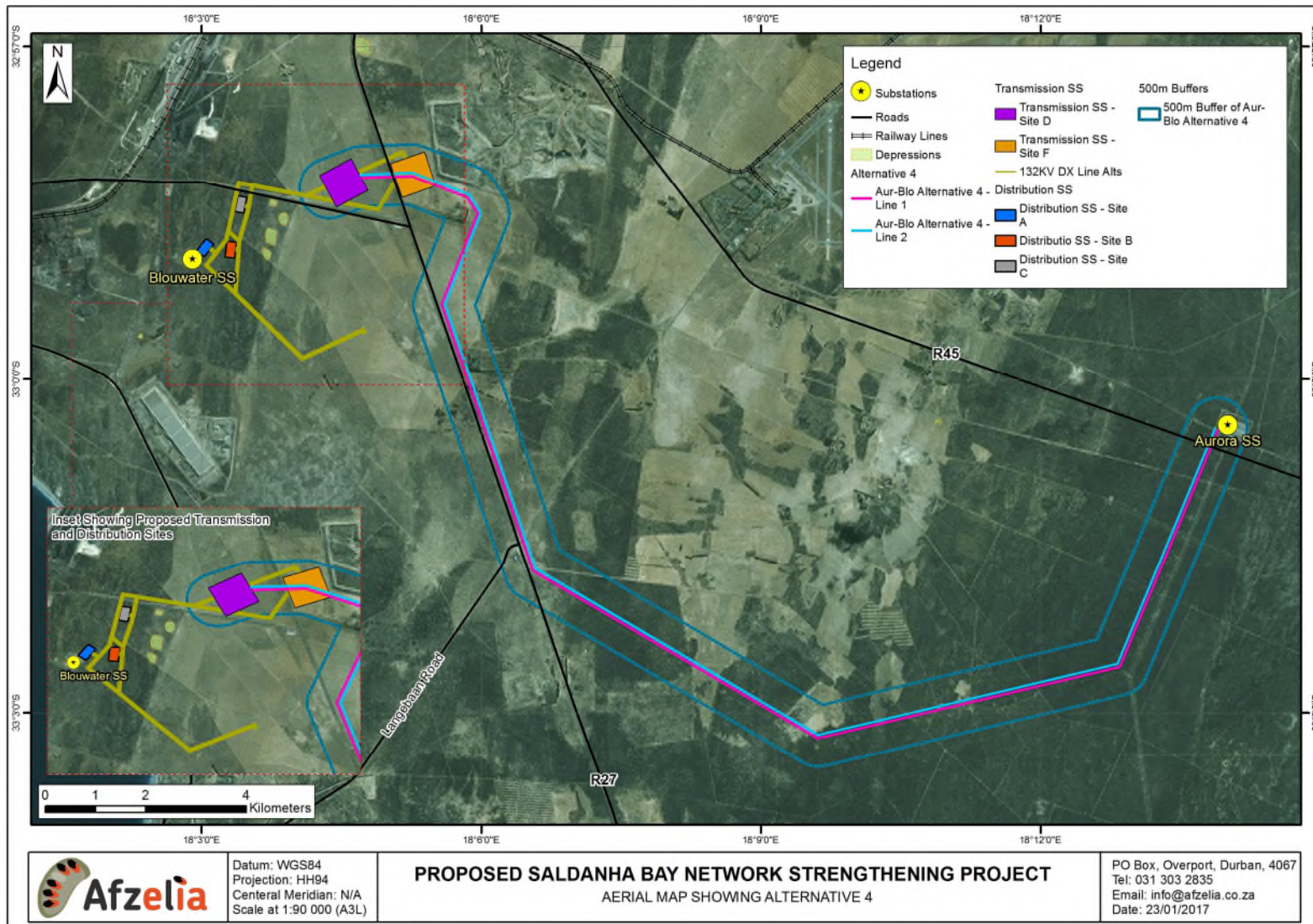


Figure 9: Powerline corridor alternative 4

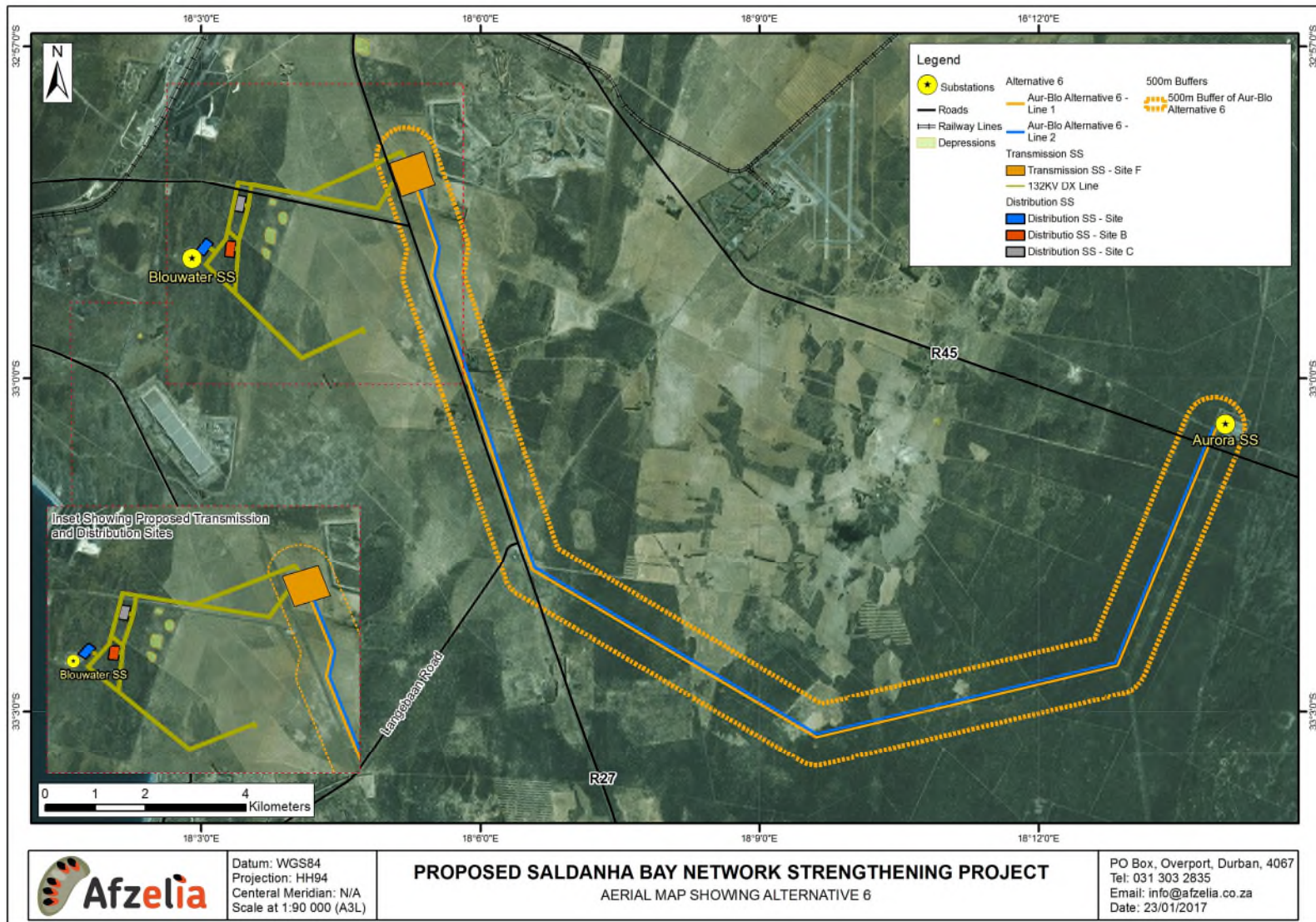


Figure 10: Powerline corridor alternative 6

## 8 IMPACTS IDENTIFIED AND ASSESSED

Impacts are assessed for 3 alternatives as described in section 7. Each of the three alternatives include a line route and a transmission substation. In order to clarify and measure impacts effectively, metrics are used to determine exactly the area of vegetation that will be lost as a result of each option.

### 8.1 Issue 1: Loss of Vegetation Communities

The powerline and, distribution and transmission stations of all three alternatives affect two vegetation communities: Hopefield Sand Fynbos and Saldanha Flats Strandveld. Mitigation measures for the loss of these communities are the same, and are therefore outlined here:

#### **Mitigation:**

- The clearing of vegetation must be restricted to the tower footprints within the designated reserve (within 50m of the line) and where possible, existing roads must be utilised during the construction phase.
- During the operational phase, no mowing must be done to allow for the indigenous vegetation to regrow.
- During the construction phase, workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled.
- Harvesting and collection of any flora must be strictly prohibited.
- During construction, erosion control measures must be implemented in areas sensitive to erosion such as exposed soil, edges of slopes (including trenches cut for construction) etc. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences and retention or replacement of vegetation.
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area by planting appropriate indigenous plant species led by a botanist.
- No whole-scale vegetation clearing should be done on-site. Clearing should be kept to a minimum by preferably only restricting the height of vegetation under powerlines. This will allow geophytes, forbs and more tolerant perennials to persist within the disturbed area which should largely recover after the disturbance if the soil is not disturbed. Only the actual footprint of the pylon, where excavation is required, should be disturbed.
- A pre-construction survey should be undertaken and a qualified botanist must identify all conservation-important species and tag these. The work area should be demarcated by an ecologist prior to construction and enforced by the ECO during construction. This area should be demarcated with construction tape or similar and no activity should be allowed outside of this area.
- A comprehensive Vegetation Management Plan should be developed and implemented, and this document should include details on:
  - Preventing total clearing under powerlines
  - Which plant SSC can be translocated and which are not suitable for this.



- Appropriate methodology on moving SSC which can be translocated to areas adjacent to the servitude
- Alien invasive plant management control
- Rehabilitation where total clearance of vegetation is unavoidable
- Construction camps and laydown areas must only be located in previously transformed areas.
- All access roads must be approved by a botanical specialist prior to construction commencing. If new access roads are required these should be groundtruthed and approved by a local botanist who is highly familiar with the vegetation types and Species of Conservation Concern found in the area.

**Cumulative impacts:**

Medium. A decrease in floral habitat and ecological structure will lead to the proliferation of alien invasive species and habitat fragmentation. This will lead to an overall decrease in indigenous species richness in the area.

**Residual Risks:**

Low provided that mitigation measures are implemented fully and correctly. Once the substation sites and power line routes have been constructed, indigenous vegetation should not be cleared. The vegetation will therefore recover and indigenous vegetation cover should remain stable.

**8.1.1: Impact 1: Loss of Saldanha Flats Strandveld**

This vegetation type is the main veg type of the study site, with each of the alternatives traversing a large section. Construction of the powerline routes will entail loss of this vegetation type as the reserve is cleared for construction and then continually mowed for maintenance. This vegetation type is Endangered and on the List of Threatened Ecosystems as well as forming CBA areas, indicating that this veg type is essential to maintain conservation targets. Areas of Saldanha Flats Fynbos that will be lost are as follows:

- Alternative 3: 228.28ha and transmission substation A: 36.29ha
- Alternative 4: 286.94ha and transmission substation D: 36ha
- Alternative 6: 257.86ha and transmission substation F: 36ha
- Distribution substations: 4.1ha

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>Alternative 3 and Transmission substation A</b>						
Without mitigation	Local area (2)	Very high (10)	Long-term (4)	16	Definite (5)	High
With mitigation	Local area (2)	High (8)	Very short (1)	11	Definite (5)	Moderate
<b>Alternative 4 and Transmission substation D</b>						

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
Without mitigation	Local area (2)	Very high (10)	Long-term (4)	16	Definite (5)	High
With mitigation	Local area (2)	High (8)	Very short (1)	11	Definite (5)	Moderate
<b>Alternative 6 and Transmission substation F</b>						
Without mitigation	Local area (2)	Very high (10)	Long-term (4)	16	Definite (5)	High
With mitigation	Local area (2)	High (8)	Very Short (1)	11	Definite (5)	Moderate
<b>Distribution substations (all same)</b>						
Without mitigation	Site (1)	Moderate (6)	Long-term (4)	11	Definite (5)	Moderate
With mitigation	Site (1)	Low (4)	Long term (4)	8	Definite (5)	Moderate

### 8.1.2: Impact 2: Loss of Hopefield Sand Fynbos

This vegetation type occurs to the west of the site, near to the Aurora substation. All route options traverse the same area of this vegetation type and no alternatives have been considered for this section of the powerline route. The total area of this vegetation type that will be lost (within a 50m buffer) is 77.8ha.

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>All alternative powerline routes</b>						
Without mitigation	Local area (2)	Very high (10)	Long-term (4)	16	Definite (5)	High
With mitigation	Local area (2)	High (8)	Very short (1)	11	Definite (5)	Moderate

## 8.2 Issue 2: Loss of Species of Special Concern and Biodiversity

The plant PSSC list for the site is exceptional, and though only few CSSC were recorded from the site, it is highly likely that additional site visits at the right time would record many more. Impacts on SSC are thus likely to be extremely high.

Mitigation measures for the loss of plant and animal SSC for each of the alternatives are the same, and are therefore outlined here:

**Mitigation:**

- The clearing of vegetation, during the construction phase, must be kept to a minimum and must be within the footprint;
- Operational phase mowing must be prohibited to allow for the natural vegetation to regenerate;
- Permits are required for the removal or destruction of both plants and animal species. The permitting process requires other site visits to locate and GPS any and all SSC occurring on site and the permitting reporting process must be followed. Considering the likely occurrence of Critically Endangered and Endangered species in the footprint, it is unlikely that, should these be recorded, permits will be granted for their removal and destruction;
- A search and rescue must be implemented prior to construction for both plant and animal species by a qualified professional;
- No new access roads should be developed. Any deviation from the infrastructure proposed in this assessment will require additional environmental studies;
- During the construction phase, workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled;
- Harvesting and collection of any flora must be strictly prohibited;
- Collection and/or killing of any fauna must be strictly prohibited;
- During construction, erosion control measures must be implemented in areas sensitive to erosion such as exposed soil, edges of slopes (including trenches cut for construction) etc. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences and retention or replacement of vegetation. These measures must be maintained during operation.
- Disturbed areas must be rehabilitated immediately after construction has been completed in that area. In areas where natural vegetation was disturbed appropriate indigenous plant species must be used for this purpose.
- A comprehensive Vegetation Management Plan should be developed and implemented, and this document should include details on:
  - Preventing total clearing under power lines
  - Which plant SSC can be translocated and which are not suitable for this.
  - Appropriate methodology on moving SSC which can be translocated to areas adjacent to the servitude
  - Alien invasive plant management control
  - Rehabilitation where total clearance of vegetation is unavoidable

**Cumulative impacts:**

High. A decrease in floral habitat and ecological structure may lead to the proliferation of alien invasive species, a loss of red listed plant species, habitat fragmentation and an overall decrease in species richness in the area.

**Residual Risks:**

Low provided that mitigation measures are implemented fully and correctly. Once the substation sites and power lines have been constructed, indigenous vegetation should not be disturbed. The vegetation will therefore recover and indigenous vegetation cover should remain stable.

**8.2.1: Impact 3: Loss of Plant SSC**

As the vegetation types and associated SSC are restricted to a very small area, loss of these species are globally, not just locally important. The impacts reflect such.

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>Alternative 3 and Transmission substation A</b>						
Without mitigation	International (5)	Very high (10)	Permanent (5)	20	Definite (5)	Very High
With mitigation	International (5)	High (8)	Long-term (4)	17	Definite (5)	High
<b>Alternative 4 and Transmission substation D</b>						
Without mitigation	International (5)	Very high (10)	Permanent (5)	20	Definite (5)	Very High
With mitigation	International (5)	High (8)	Long-term (4)	17	Definite (5)	High
<b>Alternative 6 and Transmission substation F</b>						
Without mitigation	International (5)	Very high (10)	Permanent (5)	20	Definite (5)	Very High
With mitigation	International (5)	High (8)	Long-term (4)	17	Definite (5)	High
<b>Distribution substations (all same)</b>						
Without mitigation	International (5)	High(8)	Permanent (5)	20	Definite (5)	Very high
With mitigation	International (5)	Moderate (6)	Permanent (5)	16	Definite (5)	High

**8.2.2: Impact 4: Loss of Animal SSC**

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>All powerline alternatives</b>						
Without mitigation	Local (2)	Low (4)	Permanent (5)	11	Probable (3)	Moderate
With	Local (2)	Minor (2)	Very Short	5	Probable	Low

mitigation			(1)		(3)	
<b>Distribution substations (all same)</b>						
Without mitigation	Site (1)	Low (4)	Permanent (5)	10	Probable (3)	Low
With mitigation	Site (1)	Minor (2)	Very short (1)	4	Probable (3)	Low

### 8.2.3: Impact 5: Loss of Biodiversity (general)

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>All powerline alternatives</b>						
Without mitigation	International (5)	Very high (10)	Permanent (5)	20	Definite (5)	Very High
With mitigation	International (5)	High (8)	Long-term (4)	17	Definite (5)	High
<b>Distribution substations (all same)</b>						
Without mitigation	International (5)	High (8)	Permanent (5)	20	Definite (5)	Very high
With mitigation	International (5)	Moderate (6)	Permanent (5)	16	Definite (5)	High

## 8.3 Issue 3: Disruption of Ecosystem Function and Process

### 8.3.1: Impact 5: Fragmentation and edge effects

The proposed project is likely to have a negative impact in terms of loss of ecological connectivity through the clearing of vegetation for the substations, access roads, and power line tower footprints. This will result in habitat fragmentation. Loss of habitat and habitat fragmentation will potentially disrupt ecological functioning, negatively affecting the ecological integrity of the area. Fragmentation is of concern in habitats that are important to meet conservation goals. As with the plant SSC, the conservation importance of these vegetation types mean that disturbance of these vegetation types is of global importance.

#### **Mitigation:**

- Disturbed areas must be rehabilitated immediately after disturbance and appropriate indigenous plant species must be re-established;
- The clearing of vegetation must be kept to a minimum (using existing access roads) and within the substation site and power line servitude;
- The development of new access roads must be prohibited;
- During the construction phase workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled;

- Rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas to a ground of cover of at least 85%.

**Cumulative impacts:**

High. Cumulative impacts include an increase in disturbed habitats, habitat fragmentation, proliferation of alien invasive species, the loss of species of conservation concern and the migration of sensitive avifauna and fauna away from the area.

**Residual Risks:**

Medium-Low provided that mitigation measures are implemented fully and correctly. Once the power line routes and substation sites have been constructed, disturbance to the area will be minimal.

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>All powerline alternatives</b>						
Without mitigation	International (5)	Very high (10)	Permanent (5)	20	Definite (5)	Very High
With mitigation	International (5)	High (8)	Long-term (4)	17	Definite (5)	High
<b>All substation alternatives</b>						
Without mitigation	International (5)	Moderate (6)	Permanent (5)	16	Definite (5)	High
With mitigation	International (5)	Low (4)	Long-term (4)	14	Definite (5)	High

**8.3.2: Impact 6: Invasion of Alien Species**

Alien invasive species will quickly encroach into disturbed areas, particularly adjacent to drainage areas. Alien species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and are able to easily invade a wide range of ecological niches (Bromilow, 2010). Alien invader plant species pose an ecological threat as they alter habitat structure, lower biodiversity (both number and “quality” of species), change nutrient cycling and productivity, and modify food webs (Zedler, 2004). This negatively affects the ability of the disturbed area to maintain floral biodiversity.

Although only one alien invasive species was recorded from the study area, the vegetation of the region is prone to invasive issues and should be carefully watched.

**Mitigation:**

An invasive alien control programme must be implemented during construction and operation to eradicate the existing alien invasive plants/trees within the development area and to prevent the introduction and spread of these species as per the legislative requirements specified under the Conservation of Agricultural Resources Act, 1983 amended in 2001 and the National Environmental Management: Biodiversity Act 2004 (Act No, 10 of 2004).

- All alien invasive species should be removed by hand and disposed of appropriately;
- No removed alien vegetation should be placed in any indigenous vegetation whilst awaiting removal;
- All vehicles entering the area during construction should be checked for invasive species such as *Opuntia* that could be attached from other construction areas;
- Any soil or sand used in construction should come from an alien-free source.

**Cumulative impacts:**

Moderate. A reduction in indigenous species will occur as alien invasive species spread.

**Residual Risks:**

Low provided that mitigation measures are implemented fully and correctly. Once the substation sites and power lines have been constructed, disturbance to the area will be minimal and the on-site vegetation will recover. Due to the lack of disturbance in the area, it is unlikely that alien invasive species will establish and spread.

Impact	Consequence			Consequence score (extent + magnitude + duration)	Probability	Impact significance
	Extent	Magnitude	Duration			
<b>All powerline alternatives</b>						
Without mitigation	Local (2)	Moderate (6)	Permanent (5)	13	Definite (5)	High
With mitigation	Site (1)	Minor (2)	Short (2)	5	Probable (3)	Low
<b>All substation alternatives</b>						
Without mitigation	Local (2)	Moderate (6)	Permanent (5)	13	Definite (5)	High
With mitigation	Site (1)	Minor (2)	Short (2)	5	Probable (3)	Low

## 9 CONCLUSIONS AND RECOMMENDATIONS

The dominant vegetation type in the study area is Saldanha Flats Shrubland, which occupies the majority of the study area. Dominant vegetation identified on site included *Eriosephalus africanus*, *Euphorbia* spp, *Aloe perfoliata*, *Limonium peregrinum* and *Asparagus capensis*. Four species of conservation concern were identified during the site visit. *Lampranthus vernalis* and *Limonium capense* were identified at the DX substation sites. *Cephalophyllum rostellum* was also identified at the DX substation sites. *Leucospermum hypophyllocarpodendron*, classified as vulnerable, was identified along Corridor Alternative 3, lines 1 and 2.

Low mammal diversity was predicted for the site due to large scale habitat modification and the high levels of human disturbance. The majority of faunal species recorded within the study area are often associated with disturbed habitats and have generalist habitat and dietary requirements. Low reptile diversity was expected due to the degraded nature of the site and lack of suitable habitats. Low amphibian diversity was recorded within the study area due to extremely limited habitat diversity.

No Red Data faunal species are predicted to be present within the development footprint due to high levels of disturbance and habitat transformation already present within the area.

A number of potential impacts relating to loss of indigenous vegetation, proliferation of alien invasive species, habitat fragmentation, loss of Red Listed species, loss of faunal habitat, direct faunal impacts and disturbance to fauna are predicted to occur as a result of the proposed strengthening project.

Mitigation measures are proposed to lower the significance of these impacts. Provided these mitigation measures are fully adhered to and implemented as part of the Environmental Management Programme during both the construction and operational phase of the development, the project is expected to have a limited long term impact on the surrounding environment.

Once the substation site and power line tower positions have been selected and pegged, a site visit must be conducted by a suitably qualified botanist to determine the presence of Red Listed and Endemic species within the site footprint, prior to the commencement of any construction and construction related activities. Any bulbs and red listed plant species must be immediately translocated to an undisturbed area outside of the development footprint.

Power line corridor alternatives 4 or 6 are the preferred corridor alternatives as these routes are situated within a highly disturbed area and will have the least impact on the receiving environment. Due to the current levels of disturbance, distribution substation alternative A and transmission substation alternative A or F are preferred from an ecological perspective.

Due to the high levels of habitat transformation and disturbance levels either transmission substation site alternative A or F are considered to be more suitable for the proposed substation development. It is recommended that distribution substation site alternative A is selected as the preferred option as this will minimise the ecological impacts within the area. However, any loss of the vegetation in the area will have a high negative impact as these vegetation types and associated SSC are internationally important. Power line corridors 4 or 6 are nominated as the preferred alternatives from an ecological perspective.



Should the need for the power line outweighs the high ecological impacts of its development, it is recommended by the specialist that distribution substation A is used, and power line alternative 6 with Transmission substation F is used (Figure 11).

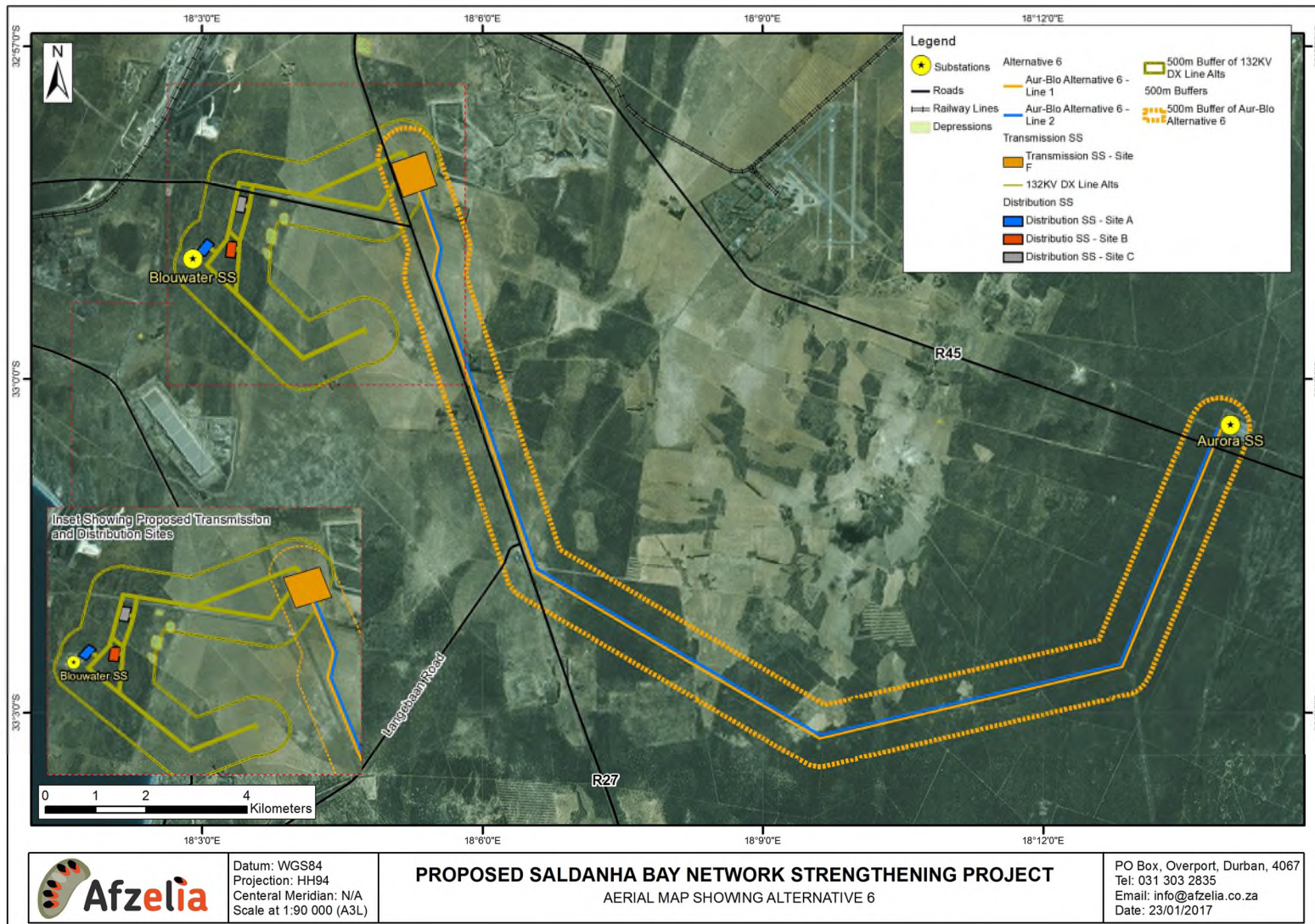


Figure 11: Recommended powerline alternative

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## GLOSSARY

**Catchment:** The area where water from atmospheric precipitation becomes concentrated and drains downslope into a river, lake or wetland. The term includes all land surface, streams, rivers and lakes between the source and where the water enters the ocean.

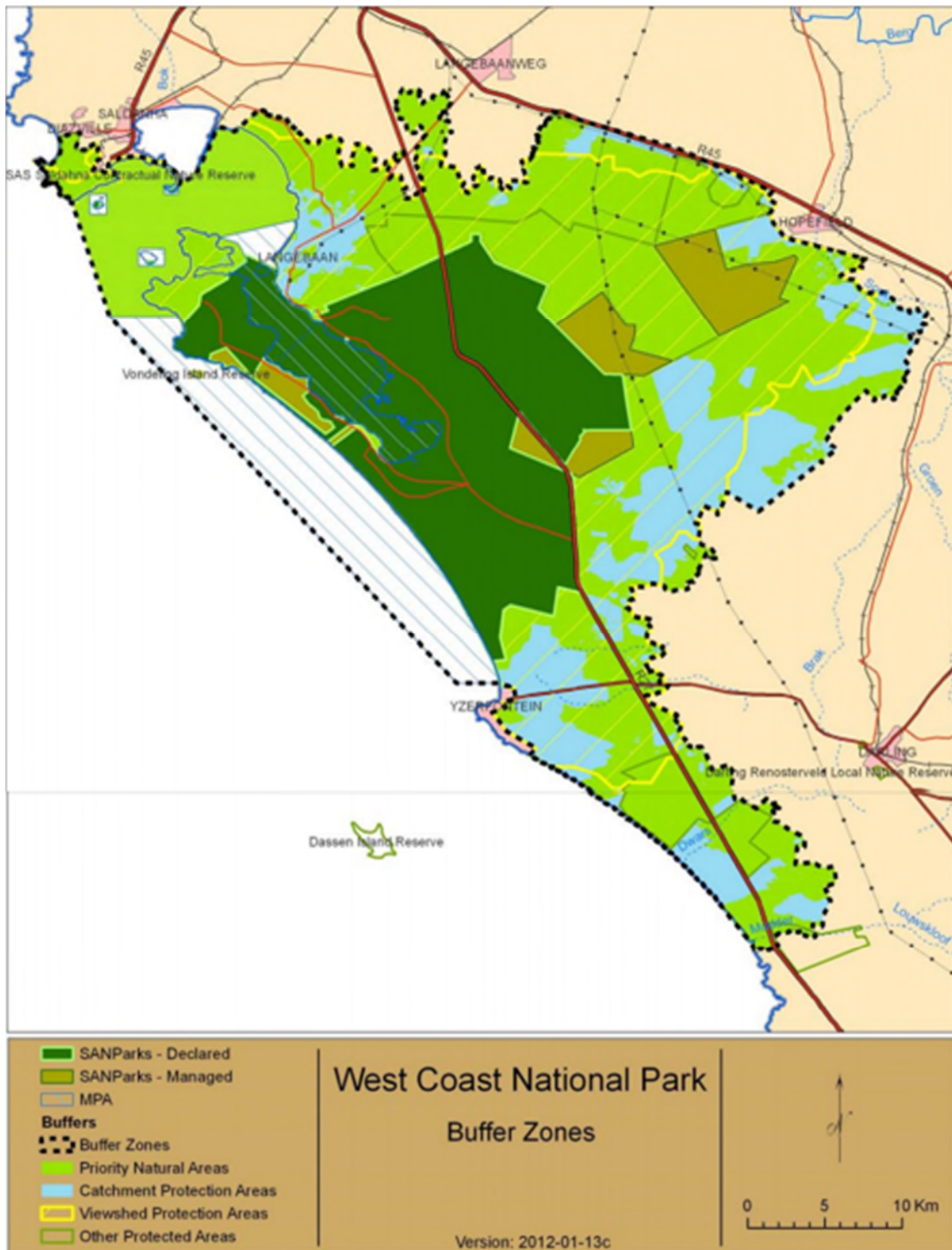
**Invasive alien species:** Invasive alien species means any non-indigenous plant or animal species whose establishment and spread outside of its natural range threatens natural ecosystems, habitats or other species or has the potential to threaten ecosystems, habitats or other species.

**Mitigate/Mitigation:** Mitigating impacts refers to reactive practical actions that minimise or reduce in situ wetland impacts. Examples of mitigation include “changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed activity, as well as restoration or rehabilitation of sites”. Mitigation actions can take place anywhere, as long as their effect is to reduce the effect on the site where change in ecological character is likely, or the values of the site are affected by those changes (Ramsar Convention, 2012).

**Present Ecological State (PES)** is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

**Water course:** Means a river or spring; a natural channel in which water flows regularly or intermittently; 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 (National Water Act, 1998).

**APPENDIX A:** Buffer Zones surrounding the West Coast National Park extracted from the West Coast National Park Management Plan for the period 2013-2013.



**APPENDIX B:** Full Expected and Recorded Species list for the study site

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
Agavaceae	<i>Chlorophytum comosum</i>		x	
	<i>Chlorophytum rangei</i>		x	
	<i>Chlorophytum triflorum</i>		x	
Aizoaceae	<i>Aizoon paniculatum</i>		x	
	<i>Amphibolia laevis</i>		x	
	<i>Antimima aristulata</i>		x	
	<i>Antimima concinna</i>		x	
	<i>Antimima limbata</i>		x	
	<i>Antimima sp.</i>		x	
	<i>Apatesia helianthoides</i>		x	
	<i>Apatesia pillansii</i>		x	
	<i>Cephalophyllum rostellum</i>	x	x	x
	<i>Cheiridopsis rostrata</i>	x	x	
	<i>Cleretum sp.</i>		x	
	<i>Conicosia pugioniformis subsp. pugioniformis</i>	x	x	x
	<i>Disphyma crassifolium</i>		x	
	<i>Drosanthemum calycinum</i>		x	
	<i>Drosanthemum floribundum</i>	x	x	x
	<i>Drosanthemum luederitzii</i>		x	
	<i>Drosanthemum marinum</i>		x	
	<i>Drosanthemum sp.</i>		x	
	<i>Erepsia anceps</i>		x	
	<i>Erepsia distans</i>		x	
	<i>Galenia africana</i>		x	
	<i>Galenia crystallina</i>		x	
	<i>Galenia crystallina var. crystallina</i>		x	
	<i>Jordaaniella dubia</i>	x	x	
	<i>Lampranthus aureus</i>	x	x	
	<i>Lampranthus densifolius</i>		x	
	<i>Lampranthus scaber</i>		x	
	<i>Lampranthus sp.</i>		x	
	<i>Lampranthus vernalis</i>		x	x
	<i>Mesembryanthemum canaliculatum</i>		x	
	<i>Mesembryanthemum guerichianum</i>	x		
	<i>Mesembryanthemum junceum</i>		x	
	<i>Mesembryanthemum spp.</i>			x
<i>Oscularia steenbergensis</i>	x	x		
<i>Oscularia vredenburgensis</i>	x	x		

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Prenia pallens</i> subsp. <i>pallens</i>	x		
	<i>Ruschia cupulata</i>		x	
	<i>Ruschia geminiflora</i>		x	
	<i>Ruschia langebaanensis</i>	x	x	
	<i>Ruschia macowanii</i>		x	
	<i>Ruschia rariflora</i>		x	
	<i>Ruschia rigidicaulis</i>		x	
	<i>Ruschia</i> sp.		x	
	<i>Ruschia subpaniculata</i>		x	x
	<i>Ruschia tecta</i>		x	
	<i>Ruschia tribracteata</i>		x	
	<i>Ruschia tumidula</i>	x		
	<i>Tetragonia chenopodioides</i>	x		
	<i>Tetragonia decumbens</i>	x		
	<i>Tetragonia fruticosa</i>	x	x	x
	<i>Tetragonia rosea</i>		x	
<i>Tetragonia spicata</i>	x			
Amaranthaceae	<i>Atriplex cinerea</i> subsp. <i>bolusii</i> var. <i>adamsonii</i>		x	
	<i>Atriplex lindleyi</i> subsp. <i>inflata</i>		x	
	<i>Atriplex semibaccata</i> var. <i>appendiculata</i>		x	x
	<i>Bassia diffusa</i>		x	
	<i>Halopeplis</i> sp.		x	
	<i>Salicornia meyeriana</i>		x	
	<i>Salicornia</i> sp.		x	
	<i>Salsola</i> sp.		x	
	<i>Sarcocornia capensis</i>		x	
	<i>Sarcocornia littorea</i>		x	
	<i>Sarcocornia mossiana</i>		x	
	<i>Sarcocornia natalensis</i> var. <i>natalensis</i>		x	
	<i>Sarcocornia perennis</i> var. <i>perennis</i>		x	
	<i>Sarcocornia pillansii</i> var. <i>pillansii</i>		x	
<i>Sarcocornia</i> sp.		x		
Amaryllidaceae	<i>Amaryllis belladonna</i>	x	x	
	<i>Boophone haemanthoides</i>		x	
	<i>Brunsvigia orientalis</i>		x	x
	<i>Gethyllis afra</i>		x	
	<i>Gethyllis lanuginosa</i>		x	
	<i>Haemanthus pubescens</i> subsp. <i>pubescens</i>		x	
	<i>Hessea mathewsii</i>	x	x	
	<i>Strumaria chaplinii</i>	x	x	



Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Strumaria tenella</i> subsp. <i>tenella</i>		x	
Anacardiaceae	<i>Searsia laevigata</i> var. <i>laevigata</i>			x
	<i>Rhus glauca</i>	x		
	<i>Searsia dissecta</i>		x	
	<i>Searsia glauca</i>		x	
	<i>Searsia glauca</i>			x
	<i>Searsia incisa</i>		x	
	<i>Searsia laevigata</i> var. <i>laevigata</i> forma <i>laevigata</i>		x	
	<i>Searsia laevigata</i> var. <i>villosa</i>			x
	<i>Searsia pterota</i>		x	
	<i>Searsia undulata</i>		x	
Apiaceae	<i>Annesorhiza grandiflora</i>		x	
	<i>Annesorhiza macrocarpa</i>		x	
	<i>Arctopus dregei</i>		x	
	<i>Arctopus echinatus</i>		x	
	<i>Berula thunbergii</i>		x	
	<i>Capnophyllum africanum</i>		x	
	<i>Capnophyllum leiocarpon</i>		x	
	<i>Centella affinis</i> var. <i>affinis</i>		x	
	<i>Centella capensis</i>			x
	<i>Chamarea</i> sp.		x	
	<i>Cynorhiza meifolia</i>		x	
	<i>Cynorhiza typica</i>		x	
	<i>Dasispermum hispidum</i>		x	
	<i>Lichtensteinia obscura</i>		x	
	<i>Lichtensteinia</i> sp.		x	
<i>Torilis arvensis</i>		x		
Apocynaceae	<i>Asclepias crispa</i> var. <i>crispa</i>		x	
	<i>Cynanchum africanum</i>			x
	<i>Cynanchum obtusifolium</i>		x	
	<i>Microloma sagittatum</i>		x	
	<i>Orbea variegata</i>		x	
	<i>Quaqua incarnata</i> subsp. <i>incarnata</i>	x	x	
Araliaceae	<i>Hydrocotyle</i> sp.		x	
Asparagaceae	<i>Asparagus aethiopicus</i>		x	
	<i>Asparagus capensis</i> var. <i>capensis</i>		x	x
	<i>Asparagus capensis</i> var. <i>litoralis</i>	x		
	<i>Asparagus declinatus</i>		x	
	<i>Asparagus exuvialis</i> forma <i>exuvialis</i>		x	
	<i>Asparagus fasciculatus</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Asparagus kraussianus</i>		x	
	<i>Asparagus lignosus</i>		x	x
	<i>Asparagus retrofractus</i>		x	
	<i>Asparagus rubicundus</i>		x	
	<i>Asparagus undulatus</i>		x	
Asphodelaceae	<i>Aloe framesii</i>		x	
	<i>Aloe perfoliata</i>	x	x	x
	<i>Bulbine annua</i>		x	
	<i>Bulbine favosa</i>		x	
	<i>Bulbine minima</i>		x	
	<i>Bulbine praemorsa</i>		x	
	<i>Bulbine sedifolia</i>		x	
	<i>Bulbinella cauda-felis</i>		x	
	<i>Bulbinella nutans subsp. nutans</i>		x	
	<i>Bulbinella triquetra</i>		x	
	<i>Kniphofia uvaria</i>		x	
	<i>Trachyandra ciliata</i>	x	x	
	<i>Trachyandra divaricata</i>	x	x	
	<i>Trachyandra hispida</i>		x	
	<i>Trachyandra revoluta</i>		x	
	<i>Trachyandra scabra</i>		x	
Asteraceae	<i>Amellus asteroides subsp. asteroides</i>	x	x	
	<i>Amellus asteroides subsp. mollis</i>		x	
	<i>Amellus capensis</i>		x	
	<i>Amellus tenuifolius</i>		x	x
	<i>Anaxeton asperum</i>	x		
	<i>Anthemis cotula</i>		x	
	<i>Arctotheca calendula</i>	x	x	
	<i>Arctotheca populifolia</i>		x	
	<i>Arctotis hirsuta</i>	x	x	
	<i>Arctotis revoluta</i>		x	
	<i>Arctotis sp.</i>		x	
	<i>Berkheya heterophylla</i>		x	
	<i>Berkheya rigida</i>		x	
	<i>Bolandia elongata</i>		x	
	<i>Chrysanthemoides incana</i>			x
	<i>Chrysanthemoides monilifera</i>	x		x
	<i>Chrysocoma ciliata</i>		x	
	<i>Chrysocoma longifolia</i>		x	
	<i>Chrysocoma spp.</i>			x

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Cineraria geifolia</i>		x	
	<i>Cineraria lobata</i>		x	
	<i>Conyza canadensis</i>		x	
	<i>Cotula bipinnata</i>		x	
	<i>Cotula coronopifolia</i>		x	
	<i>Cotula duckittiae</i>	x	x	
	<i>Cotula eckloniana</i>		x	
	<i>Cotula filifolia</i>		x	
	<i>Cotula turbinata</i>		x	
	<i>Cotula vulgaris</i>		x	
	<i>Crassothonna cylindrica</i>		x	
	<i>Didelta carnosa</i> var. <i>carnosa</i>		x	x
	<i>Didelta carnosa</i> var. <i>tomentosa</i>		x	
	<i>Dimorphotheca acutifolia</i>		x	
	<i>Dimorphotheca pluvialis</i>	x	x	
	<i>Dimorphotheca sinuata</i>		x	
	<i>Dimorphotheca tragus</i>		x	
	<i>Eriocephalus africanus</i> var. <i>africanus</i>	x		x
	<i>Eriocephalus africanus</i> var. <i>paniculatus</i>		x	
	<i>Eriocephalus racemosus</i> var. <i>affinis</i>		x	
	<i>Eriocephalus racemosus</i> var. <i>racemosus</i>		x	
	<i>Euryops linifolius</i>	x	x	
	<i>Euryops multifidus</i>		x	
	<i>Euryops</i> spp.			x
	<i>Euryops thunbergii</i>		x	
	<i>Felicia bergeriana</i>		x	
	<i>Felicia dregei</i>		x	
	<i>Felicia elongata</i>	x	x	
	<i>Felicia filifolia</i> subsp. <i>schlechteri</i>		x	
	<i>Felicia heterophylla</i>		x	
	<i>Felicia hyssopifolia</i>		x	x
	<i>Felicia hyssopifolia</i> subsp. <i>glabra</i>		x	
	<i>Felicia hyssopifolia</i> subsp. <i>hyssopifolia</i>		x	
	<i>Felicia merxmuelleri</i>		x	
	<i>Felicia tenella</i> subsp. <i>pusilla</i>		x	
	<i>Foveolina tenella</i>	x	x	
	<i>Gazania krebsiana</i>		x	
	<i>Gazania</i> sp.		x	
	<i>Gnaphalium</i> sp.		x	
	<i>Gymnodiscus capillaris</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Helichrysum bachmannii</i>		x	
	<i>Helichrysum cochleariforme</i>		x	
	<i>Helichrysum indicum</i>		x	
	<i>Helichrysum litorale</i>	x	x	
	<i>Helichrysum moesianum</i>			x
	<i>Helichrysum niveum</i>		x	x
	<i>Helichrysum patulum</i>		x	
	<i>Helichrysum revolutum</i>		x	
	<i>Helichrysum tinctum</i>	x		
	<i>Helichrysum tricoatum</i>		x	
	<i>Leucanthemum vulgare</i>		x	
	<i>Leysera gnaphalodes</i>	x	x	x
	<i>Metalasia capitata</i>	x		
	<i>Metalasia densa</i>		x	
	<i>Metalasia muricata</i>		x	x
	<i>Nidorella foetida</i>		x	
	<i>Oedera genistifolia</i>		x	
	<i>Oedera imbricata</i>		x	
	<i>Oedera uniflora</i>		x	x
	<i>Oncosiphon grandiflorum</i>	x		
	<i>Oncosiphon sabulosus</i>		x	
	<i>Oncosiphon suffruticosum</i>	x		x
	<i>Oncosiphon suffruticosus</i>		x	
	<i>Osteospermum grandiflorum</i>		x	
	<i>Osteospermum incanum subsp. incanum</i>		x	
	<i>Othonna arborescens</i>		x	
	<i>Othonna coronopifolia</i>		x	
	<i>Othonna cylindrica</i>	x		x
	<i>Othonna floribunda</i>	x		
	<i>Othonna frutescens</i>		x	
	<i>Othonna mucronata</i>		x	
	<i>Othonna perfoliata</i>		x	
	<i>Othonna quercifolia</i>		x	
	<i>Poecilolepis ficoidea</i>		x	
	<i>Pseudognaphalium luteo-album</i>		x	
	<i>Pteronia divaricata</i>	x	x	
	<i>Pteronia incana</i>		x	
	<i>Pteronia onobromoides</i>		x	
	<i>Pteronia ovalifolia</i>	x		
	<i>Pteronia uncinata</i>	x	x	x

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Relhania rotundifolia</i>	x		
	<i>Rhynchosidium pumilum</i>		x	
	<i>Senecio aloides</i>		x	
	<i>Senecio arenarius</i>	x	x	
	<i>Senecio arniciflorus</i>		x	
	<i>Senecio burchellii</i>		x	x
	<i>Senecio elegans</i>		x	
	<i>Senecio littoreus var. hispidulus</i>		x	
	<i>Senecio littoreus var. littoreus</i>	x	x	
	<i>Senecio maritimus</i>		x	
	<i>Senecio pterophorus</i>		x	
	<i>Senecio rosmarinifolius</i>		x	
	<i>Senecio sarcoides</i>		x	
	<i>Senecio sp.</i>		x	
	<i>Steirodiscus tagetes</i>		x	
	<i>Stoebe capitata</i>			x
	<i>Ursinia anethoides</i>		x	
	<i>Ursinia anthemoides subsp. anthemoides</i>	x	x	
	<i>Ursinia sp.</i>		x	
Boraginaceae	<i>Amsinckia retrorsa</i>		x	
	<i>Echiostachys spicatus</i>		x	
	<i>Heliotropium supinum</i>		x	
	<i>Myosotis discolor</i>		x	
Brassicaceae	<i>Barbarea verna</i>		x	
	<i>Brassica tournefortii</i>		x	
	<i>Heliophila acuminata</i>		x	
	<i>Heliophila adpressa</i>		x	
	<i>Heliophila africana</i>		x	
	<i>Heliophila coronopifolia</i>			x
	<i>Heliophila elata var. elata</i>		x	
	<i>Heliophila linearis var. linearifolia</i>		x	
	<i>Heliophila linearis var. linearis</i>		x	
	<i>Heliophila macowaniana</i>		x	
	<i>Heliophila patens</i>	x		
	<i>Heliophila sp.</i>		x	
	<i>Lepidium flexuosum</i>	x		
<i>Raphanus raphanistrum</i>		x		
Bruniaceae	<i>Staavia radiata</i>			x
Bryaceae	<i>Bryum torquescens</i>		x	
Campanulaceae	<i>Microcodon glomeratum</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Microcodon sp.</i>		x	
	<i>Prismatocarpus crispus</i>		x	
	<i>Roella prostrata</i>		x	
	<i>Wahlenbergia adpressa</i>		x	
	<i>Wahlenbergia androsacea</i>		x	
	<i>Wahlenbergia capensis</i>		x	
	<i>Wahlenbergia exilis</i>		x	
	<i>Wahlenbergia hispidula</i>		x	
	<i>Wahlenbergia longifolia</i>			x
	<i>Wahlenbergia obovata</i>		x	
	<i>Wahlenbergia paniculata</i>		x	
	<i>Wahlenbergia sp.</i>		x	
	<i>Wahlenbergia suffruticosa</i>		x	
Caryophyllaceae	<i>Dysphania ambrosioides</i>		x	
	<i>Silene burchellii subsp. pilosellifolia</i>		x	
	<i>Silene cretica</i>		x	
	<i>Silene ornata</i>		x	
	<i>Silene rigens</i>		x	
	<i>Silene sp.</i>		x	
	<i>Silene undulata</i>		x	
	<i>Spergularia media</i>		x	
Celastraceae	<i>Cassine peragua subsp. barbara</i>		x	
	<i>Gymnosporia buxifolia</i>		x	x
	<i>Maytenus lucida</i>		x	
	<i>Pterocelastrus tricuspidatus</i>	x	x	x
	<i>Putterlickia pyracantha</i>	x	x	x
Commelinaceae	<i>Tradescantia fluminensis</i>		x	
Convolvulaceae	<i>Cuscuta nitida</i>		x	
Crassulaceae	<i>Cotyledon orbiculata</i>			x
	<i>Crassula decumbens var. brachyphylla</i>		x	
	<i>Crassula dejecta</i>		x	
	<i>Crassula dichotoma</i>		x	
	<i>Crassula expansa subsp. expansa</i>		x	
	<i>Crassula glomerata</i>		x	
	<i>Crassula nudicaulis var. nudicaulis</i>		x	
	<i>Crassula thunbergiana subsp. thunbergiana</i>		x	
	<i>Crassula tomentosa var. tomentosa</i>		x	
	<i>Tylecodon grandiflorus</i>			x
	<i>Tylecodon paniculatus</i>	x		x
	<i>Tylecodon wallichii</i>			x

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Viscum capense</i>			X
Cucurbitaceae	<i>Kedrostis psammophylla</i>		X	
Cyperaceae	<i>Bolboschoenus maritimus</i>		X	
	<i>Carex sp.</i>		X	
	<i>Ficinia bulbosa</i>		X	
	<i>Ficinia lateralis</i>	X		
	<i>Ficinia secunda</i>		X	
	<i>Isolepis levynsiana</i>		X	
	<i>Isolepis marginata</i>		X	
	<i>Isolepis rubicunda</i>		X	
	<i>Schoenoplectus corymbosus</i>		X	
	<i>Schoenoplectus triqueter</i>		X	
Ebenaceae	<i>Diospyros austro-africana</i> var. <i>austro-africana</i>		X	
	<i>Diospyros austro-africana</i> var. <i>rugosa</i>		X	
	<i>Euclea natalensis</i> subsp. <i>capensis</i>		X	
	<i>Euclea racemosa</i> subsp. <i>racemosa</i>	X	X	X
Ericaceae	<i>Erica flacca</i>		X	
	<i>Erica inaequalis</i>		X	
	<i>Erica mammosa</i>	X	X	X
	<i>Erica plumosa</i>	X	X	
	<i>Erica subdivaricata</i>		X	
	<i>Erica trichostigma</i>		X	
	<i>Erica tristis</i>		X	
Euphorbiaceae	<i>Adenocline violifolia</i>		X	
	<i>Clutia affinis</i>		X	
	<i>Clutia alaternoides</i> var. <i>alaternoides</i>		X	
	<i>Clutia daphnoides</i>	X	X	
	<i>Clutia ericoides</i> var. <i>ericoides</i>		X	
	<i>Euphorbia burmannii</i>		X	
	<i>Euphorbia caput-medusae</i>		X	X
	<i>Euphorbia flanaganii</i>		X	
	<i>Euphorbia mauritanica</i> var. <i>mauritanica</i>	X	X	X
	<i>Euphorbia muirii</i>	X		
	<i>Euphorbia peplus</i>		X	
	<i>Euphorbia tenax</i>		X	
<i>Euphorbia tuberosa</i>			X	
Fabaceae	<i>Acacia mearnsii</i>		X	
	<i>Amphithalea ericifolia</i> subsp. <i>erecta</i>		X	
	<i>Argyrolobium sp.</i>		X	
	<i>Aspalathus albens</i>		X	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Aspalathus cordata</i>		x	
	<i>Aspalathus divaricata</i> subsp. <i>divaricata</i>		x	
	<i>Aspalathus ericifolia</i> subsp. <i>minuta</i>		x	
	<i>Aspalathus hirta</i> subsp. <i>hirta</i>		x	
	<i>Aspalathus hispida</i> subsp. <i>hispida</i>		x	
	<i>Aspalathus lactea</i> subsp. <i>lactea</i>		x	
	<i>Aspalathus lotoides</i> subsp. <i>lagopus</i>	x	x	
	<i>Aspalathus lotoides</i> subsp. <i>lotoides</i>		x	
	<i>Aspalathus pinguis</i> subsp. <i>occidentalis</i>		x	
	<i>Aspalathus quinquefolia</i> subsp. <i>quinquefolia</i>		x	
	<i>Aspalathus quinquefolia</i> subsp. <i>virgata</i>		x	
	<i>Aspalathus recurva</i>		x	
	<i>Aspalathus</i> sp.		x	
	<i>Aspalathus spinescens</i> subsp. <i>lepida</i>		x	
	<i>Aspalathus spinescens</i> subsp. <i>spinescens</i>		x	
	<i>Aspalathus spinosa</i> subsp. <i>Spinosa</i>		x	
	<i>Aspalathus subtingens</i>		x	
	<i>Aspalathus ternata</i>	x	x	
	<i>Calobota angustifolia</i>		x	
	<i>Calobota cytisoides</i>		x	
	<i>Calobota lotononoides</i>		x	
	<i>Calobota spinescens</i>		x	
	<i>Crotalaria excisa</i> subsp. <i>excisa</i>		x	
	<i>Crotalaria excisa</i> subsp. <i>namaquensis</i>		x	
	<i>Dipogon lignosus</i>		x	
	<i>Indigofera erecta</i>		x	
	<i>Indigofera heterophylla</i>		x	
	<i>Indigofera incana</i>		x	
	<i>Indigofera meyeriana</i>		x	
	<i>Indigofera platypoda</i>		x	
	<i>Indigofera procumbens</i>	x	x	
	<i>Indigofera venusta</i>		x	
	<i>Lebeckia ambigua</i>		x	
	<i>Lebeckia plukenetiana</i>		x	
	<i>Lebeckia sepiaria</i>		x	
	<i>Lebeckia sericea</i>	x		
	<i>Lessertia falciformis</i>		x	
	<i>Lessertia frutescens</i> subsp. <i>frutescens</i>		x	
	<i>Lessertia herbacea</i>		x	
	<i>Lessertia meyeri</i>		x	



Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Lessertia rigida</i>		x	
	<i>Lessertia sp.</i>		x	
	<i>Liparia splendens subsp. splendens</i>		x	
	<i>Lotononis involucrata subsp. involucrata</i>		x	
	<i>Lotononis sabulosa</i>		x	
	<i>Lotononis sp.</i>		x	
	<i>Lotus corniculatus</i>		x	
	<i>Medicago polymorpha</i>		x	
	<i>Melilotus indicus</i>		x	
	<i>Melolobium aethiopicum</i>		x	
	<i>Melolobium candicans</i>		x	
	<i>Melolobium exudans</i>		x	
	<i>Melolobium sp.</i>		x	
	<i>Otholobium bolusii</i>		x	
	<i>Otholobium bracteolatum</i>		x	
	<i>Otholobium hirtum</i>	x		
	<i>Otholobium sp.</i>		x	
	<i>Otholobium venustum</i>		x	
	<i>Podalyria sericea</i>		x	
	<i>Podalyria sp.</i>		x	
	<i>Rafnia angulata subsp. angulata</i>		x	
	<i>Rafnia capensis subsp. capensis</i>		x	
	<i>Vicia benghalensis</i>		x	
	<i>Vicia sativa subsp. sativa</i>		x	
	<i>Wiborgia fusca subsp. fusca</i>		x	
	<i>Wiborgia fusca subsp. macrocarpa</i>		x	
	<i>Wiborgia leptoptera subsp. leptoptera</i>		x	
	<i>Wiborgia obcordata</i>		x	
	<i>Wiborgia sp.</i>		x	
	<i>Xiphotheca reflexa</i>		x	
Fumariaceae	<i>Cysticapnos vesicaria subsp. vesicaria</i>		x	
Gentianaceae	<i>Chironia baccifera</i>		x	
	<i>Chironia decumbens</i>		x	
	<i>Chironia linoides subsp. linoides</i>		x	
	<i>Orphium frutescens</i>		x	
	<i>Sebaea aurea</i>		x	
Geraniaceae	<i>Pelargonium carnosum subsp. carnosum</i>		x	
	<i>Pelargonium chelidonium</i>		x	
	<i>Pelargonium fulgidum</i>		x	
	<i>Pelargonium hirtum</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Pelargonium lobatum</i>		x	
	<i>Pelargonium myrrhifolium</i> var. <i>myrrhifolium</i>		x	
Grimmiaceae	<i>Grimmia pulvinata</i>		x	
Haemodoraceae	<i>Wachendorfia multiflora</i>		x	
Hemerocallidaceae	<i>Caesia sabulosa</i>		x	
Hyacinthaceae	<i>Albuca canadensis</i>		x	
	<i>Albuca secunda</i>		x	
	<i>Albuca suaveolens</i>		x	
	<i>Daubenya zeyheri</i>	x	x	
	<i>Drimia capensis</i>			x
	<i>Eucomis regia</i>		x	
	<i>Lachenalia aloides</i> var. <i>aloides</i>		x	
	<i>Lachenalia longibracteata</i>		x	
	<i>Lachenalia mathewsii</i>	x	x	
	<i>Lachenalia mediana</i> var. <i>mediana</i>		x	
	<i>Lachenalia mutabilis</i>		x	
	<i>Lachenalia pallida</i>		x	
	<i>Lachenalia paucifolia</i>		x	
	<i>Lachenalia reflexa</i>	x		
	<i>Lachenalia</i> spp.			x
	<i>Ledebouria undulata</i>		x	
	<i>Ornithogalum conicum</i>		x	
	<i>Ornithogalum juncifolium</i> var. <i>juncifolium</i>		x	
	<i>Ornithogalum maculatum</i>		x	
	<i>Ornithogalum rupestre</i>	x	x	
<i>Ornithogalum</i> sp.		x		
<i>Ornithogalum thyrsoides</i>		x	x	
<i>Polyxena corymbosa</i>	x			
<i>Polyxena paucifolia</i>	x			
Hypoxidaceae	<i>Empodium plicatum</i>		x	
	<i>Empodium veratrifolium</i>		x	
	<i>Pauridia gracilipes</i> subsp. <i>gracilipes</i>		x	
	<i>Pauridia linearis</i>		x	
	<i>Pauridia longituba</i>	x		
	<i>Pauridia minuta</i>		x	
	<i>Pauridia serrata</i> subsp. <i>serrata</i>		x	
Iridaceae	<i>Aristea dichotoma</i>		x	
	<i>Babiana ambigua</i>		x	
	<i>Babiana angustifolia</i>		x	
	<i>Babiana hirsuta</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Babiana mucronata</i> subsp. <i>mucronata</i>		x	
	<i>Babiana nana</i> subsp. <i>nana</i>		x	
	<i>Babiana ringens</i> subsp. <i>ringens</i>		x	
	<i>Babiana tubiflora</i>		x	
	<i>Babiana tubulosa</i> var. <i>tubiflora</i>	x		
	<i>Chasmanthe floribunda</i>	x	x	
	<i>Ferraria densepunctulata</i>	x	x	
	<i>Ferraria divaricata</i>		x	
	<i>Ferraria foliosa</i>		x	
	<i>Ferraria parva</i>		x	
	<i>Freesia viridis</i> subsp. <i>viridis</i>	x	x	
	<i>Geissorhiza lewisiae</i>		x	
	<i>Geissorhiza purpurascens</i>	x		
	<i>Gladiolus alatus</i>		x	
	<i>Gladiolus brevifolius</i>		x	
	<i>Gladiolus caeruleus</i>	x	x	
	<i>Gladiolus carinatus</i>		x	
	<i>Gladiolus floribundus</i>		x	
	<i>Gladiolus gracilis</i>		x	
	<i>Gladiolus griseus</i>		x	
	<i>Gladiolus orchidiflorus</i>		x	
	<i>Gladiolus priorii</i>		x	
	<i>Hesperantha erecta</i>		x	
	<i>Hesperantha falcata</i>		x	
	<i>Hesperantha juncifolia</i>		x	
	<i>Hesperantha radiata</i>		x	
	<i>Hesperantha saldanhae</i>	x		
	<i>Ixia calendulacea</i>		x	
	<i>Ixia maculata</i> var. <i>maculata</i>		x	
	<i>Ixia purpureorosea</i>	x		
	<i>Lachenalia pustulata</i>	x		
	<i>Lachenalia viridiflora</i>	x		
	<i>Lapeirousia anceps</i>		x	
	<i>Lapeirousia jacquinii</i>		x	
	<i>Melasphaerula ramosa</i>	x		
	<i>Moraea albiflora</i>		x	
	<i>Moraea caeca</i>		x	
	<i>Moraea calcicola</i>	x		
	<i>Moraea filicaulis</i>		x	
	<i>Moraea fugax</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Moraea loubseri</i>	x	x	
	<i>Moraea macrocarpa</i>		x	
	<i>Moraea sp.</i>		x	
	<i>Moraea spp.</i>			x
	<i>Moraea tricolor</i>		x	
	<i>Romulea barkerae</i>	x	x	
	<i>Romulea elliptica</i>	x		
	<i>Romulea flava var. flava</i>		x	
	<i>Romulea flava var. viridiflora</i>		x	
	<i>Romulea hirsuta var. hirsuta</i>	x	x	
	<i>Romulea minutiflora</i>		x	
	<i>Romulea obscura</i>	x		
	<i>Romulea rosea</i>		x	
	<i>Romulea saldanhensis</i>	x	x	
	<i>Romulea tabularis</i>		x	
	<i>Sparaxis grandiflora subsp. Violacea</i>		x	
	<i>Sparaxis parviflora</i>	x	x	
	<i>Sparaxis sp.</i>		x	
	<i>Sparaxis spp.</i>			x
	<i>Watsonia hysterantha</i>	x	x	
	<i>Watsonia meriana var. meriana</i>		x	
Juncaceae	<i>Juncus effusus</i>		x	
	<i>Juncus tenuis</i>		x	
Juncaginaceae	<i>Triglochin buchenau</i>		x	
	<i>Triglochin bulbosa subsp. calcicola</i>		x	
	<i>Triglochin sp.</i>		x	
	<i>Triglochin striata</i>		x	
Lamiaceae	<i>Ballota africana</i>		x	x
	<i>Salvia africana-caerulea</i>		x	
	<i>Salvia lanceolata</i>		x	x
	<i>Stachys arvensis</i>		x	
	<i>Stachys bolusii</i>		x	
Lauraceae	<i>Cassytha ciliolata</i>			x
Limeaceae	<i>Limeum africanum subsp. africanum</i>		x	
Lobeliaceae	<i>Cyphia crenata var. crenata</i>		x	
	<i>Lobelia comosa</i>		x	
	<i>Lobelia coronopifolia</i>		x	
	<i>Lobelia sp.</i>		x	
Loranthaceae	<i>Septulina glauca</i>		x	
Malvaceae	<i>Anisodontea biflora</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Anisodonteia scabrosa</i>		x	
	<i>Anisodonteia sp.</i>		x	
	<i>Grewia monticola</i>		x	
	<i>Hermannia heterophylla</i>		x	
	<i>Hermannia linifolia</i>		x	
	<i>Hermannia litoralis</i>		x	
	<i>Hermannia pinnata</i>	x	x	
	<i>Hermannia prismatocarpa</i>		x	
	<i>Hermannia scabra</i>		x	
	<i>Hermannia scordifolia</i>		x	
	<i>Hermannia sp.</i>		x	
	<i>Hermannia spp.</i>			x
	<i>Hermannia trifurca</i>		x	
Melianthaceae	<i>Melianthus elongatus</i>		x	
Menispermaceae	<i>Cissampelos capensis</i>	x	x	
Molluginaceae	<i>Adenogramma glomerata</i>	x	x	
	<i>Adenogramma teretifolia</i>		x	
	<i>Mollugo cerviana</i> var. <i>cerviana</i>		x	
	<i>Pharnaceum croceum</i>		x	
	<i>Pharnaceum elongatum</i>		x	
	<i>Pharnaceum incanum</i>		x	
	<i>Pharnaceum lanatum</i>	x	x	
Myrtaceae	<i>Leptospermum laevigatum</i>		x	
Neuradaceae	<i>Grielum grandiflorum</i>	x		
	<i>Grielum humifusum</i> var. <i>humifusum</i>		x	
Nyctaginaceae	<i>Mirabilis jalapa</i>		x	
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>		x	
	<i>Olea exasperata</i>		x	
Onagraceae	<i>Oenothera rosea</i>		x	
Orchidaceae	<i>Disa obliqua</i> subsp. <i>clavigera</i>		x	
	<i>Pterygodium hallii</i>		x	
	<i>Pterygodium volucris</i>		x	
	<i>Satyrium coriifolium</i>		x	
	<i>Satyrium odorum</i>		x	
Orthotrichaceae	<i>Orthotrichum diaphanum</i>		x	
Oxalidaceae	<i>Oxalis burtoniae</i>	x	x	
	<i>Oxalis compressa</i>	x		x
	<i>Oxalis hirsuta</i>		x	
	<i>Oxalis hirta</i>		x	
	<i>Oxalis obtusa</i>	x		

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Oxalis suavis</i>	x		
Plantaginaceae	<i>Plantago crassifolia</i>		x	
	<i>Plantago lanceolata</i>		x	
	<i>Veronica agrestis</i>		x	
Plumbaginaceae	<i>Afrolimon capense</i>	x		
	<i>Afrolimon peregrinum</i>	x		
	<i>Limonium acuminatum</i>	x	x	
	<i>Limonium capense</i>		x	x
	<i>Limonium decumbens</i>		x	
	<i>Limonium depauperatum</i>		x	
	<i>Limonium equisetinum</i>		x	
	<i>Limonium longifolium</i>		x	
	<i>Limonium peregrinum</i>		x	x
	<i>Limonium purpuratum</i>		x	
	<i>Limonium sp.</i>		x	
Poaceae	<i>Agrostis sp.</i>		x	
	<i>Aira cupaniana</i>		x	
	<i>Avena barbata</i>		x	
	<i>Avena fatua</i>		x	
	<i>Briza maxima</i>		x	
	<i>Bromus pectinatus</i>	x		
	<i>Bromus catharticus</i>		x	
	<i>Bromus diandrus</i>		x	
	<i>Bromus pectinatus</i>		x	
	<i>Bromus rigidus</i>		x	
	<i>Capeochloa arundinacea</i>		x	
	<i>Chaetobromus involucratus subsp. dregeanus</i>	x	x	
	<i>Chaetobromus involucratus subsp. involucratus</i>	x	x	
	<i>Cladoraphis cyperoides</i>	x	x	
	<i>Cynodon dactylon</i>	x		
	<i>Dactylis glomerata</i>		x	
	<i>Ehrharta brevifolia var. brevifolia</i>		x	
	<i>Ehrharta calycina</i>	x	x	
	<i>Ehrharta erecta var. erecta</i>		x	
	<i>Ehrharta thunbergii</i>		x	
	<i>Ehrharta villosa var. villosa</i>	x		
	<i>Festuca scabra</i>	x	x	
	<i>Holcus lanatus</i>		x	
<i>Hordeum geniculatum</i>		x		

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Leptochloa fusca</i>		x	
	<i>Lolium perenne</i>		x	
	<i>Lolium rigidum</i>		x	
	<i>Lolium temulentum</i>		x	
	<i>Lophochloa pumila</i>		x	
	<i>Parapholis incurva</i>		x	
	<i>Paspalum sp.</i>		x	
	<i>Pennisetum clandestinum</i>		x	
	<i>Pentameris airoides subsp. airoides</i>		x	
	<i>Pentameris barbata subsp. barbata</i>		x	
	<i>Pentameris patula</i>		x	
	<i>Pentaschistis sp.</i>		x	
	<i>Phalaris aquatica</i>		x	
	<i>Phalaris minor</i>		x	
	<i>Poa annua</i>		x	
	<i>Polypogon monspeliensis</i>		x	
	<i>Puccinellia angusta</i>		x	
	<i>Schismus barbatus</i>	x	x	
	<i>Spartina maritima</i>		x	
	<i>Sphenopus divaricatus</i>		x	
	<i>Sporobolus virginicus</i>		x	
	<i>Stipa capensis</i>		x	
	<i>Themeda triandra</i>		x	
	<i>Tribolium acutiflorum</i>		x	
	<i>Tribolium echinatum</i>	x	x	
	<i>Tribolium hispidum</i>		x	
	<i>Tribolium obtusifolium</i>		x	
	<i>Vulpia bromoides</i>		x	
Polygalaceae	<i>Muraltia demissa</i>		x	
	<i>Muraltia dumosa</i>		x	
	<i>Muraltia harveyana</i>	x	x	
	<i>Muraltia macropetala</i>		x	
	<i>Muraltia scoparia</i>		x	
	<i>Muraltia sp.</i>		x	
	<i>Muraltia spinosa</i>			x
	<i>Nylandtia spinosa</i>	x		
	<i>Polygala myrtifolia var. myrtifolia</i>	x	x	
Polygonaceae	<i>Emex australis</i>		x	
	<i>Polygonum maritimum</i>		x	
Pottiaceae	<i>Tortella humilis</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
Primulaceae	<i>Anagallis arvensis</i>		x	
Proteaceae	<i>Leucadendron cinereum</i>	x	x	
	<i>Leucadendron foedum</i>	x	x	
	<i>Leucadendron pubescens</i>	x		
	<i>Leucadendron salignum</i>	x	x	
	<i>Leucadendron stellare</i>		x	
	<i>Leucospermum hypophyllocarpodendron</i> <i>subsp. canaliculatum</i>	x	x	x
	<i>Leucospermum parile</i>		x	
	<i>Leucospermum rodolentum</i>	x	x	
	<i>Leucospermum tomentosum</i>	x	x	
	<i>Serruria adscendens</i>		x	
	<i>Serruria cygnea</i>		x	
	<i>Serruria decipiens</i>	x	x	
	<i>Serruria fucifolia</i>	x	x	
Pteridaceae	<i>Cheilanthes hastata</i>		x	
	<i>Cheilanthes multifida</i> var. <i>multifida</i>		x	
Ranunculaceae	<i>Knowltonia vesicatoria</i>	x		
Restionaceae	<i>Cannomois parviflora</i>	x		
	<i>Elegia elephantina</i>		x	
	<i>Elegia macrocarpa</i>		x	
	<i>Elegia nuda</i>		x	
	<i>Elegia recta</i>		x	
	<i>Elegia tectorum</i>	x		
	<i>Elegia verreauxii</i>	x		
	<i>Ischyrolepis eleocharis</i>	x		
	<i>Ischyrolepis</i> spp.			x
	<i>Restio capensis</i>		x	
	<i>Restio praeacutus</i>		x	
	<i>Staberoha cernua</i>	x		
	<i>Thamnochortus bachmannii</i>		x	
	<i>Thamnochortus erectus</i>	x		
	<i>Thamnochortus obtusus</i>		x	
	<i>Thamnochortus punctatus</i>	x		
	<i>Thamnochortus spicigerus</i>	x	x	
<i>Willdenowia incurvata</i>	x	x		
Rhamnaceae	<i>Phylica cephalantha</i>	x	x	x
	<i>Phylica greyii</i>		x	
	<i>Phylica harveyi</i>	x		
	<i>Phylica karroica</i>		x	
	<i>Phylica parviflora</i>		x	



Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Phylica sp.</i>		x	
	<i>Phylica stenopetala</i>		x	
	<i>Phylica strigosa</i>		x	
	<i>Phylica tortuosa</i>		x	
	<i>Trichocephalus stipularis</i>	x	x	
Ricciaceae	<i>Riccia albomarginata</i>		x	
	<i>Riccia bulbosa</i>		x	
	<i>Riccia limbata</i>		x	
	<i>Riccia purpurascens</i>		x	
	<i>Riccia villosa</i>		x	
Rosaceae	<i>Cliffortia longifolia</i>		x	
	<i>Cliffortia obcordata</i>			x
	<i>Cliffortia tricuspidata</i>		x	
Rubiaceae	<i>Anthospermum prostratum</i>		x	
Rubiaceae	<i>Anthospermum sp.</i>		x	
	<i>Anthospermum spathulatum subsp. spathulatum</i>	x		
	<i>Galium tomentosum</i>		x	
	<i>Nenax hirta subsp. calciphila</i>	x	x	
	<i>Nenax hirta subsp. hirta</i>		x	
Rutaceae	<i>Agathosma bifida</i>	x		
	<i>Agathosma bisulca</i>		x	
	<i>Agathosma glabrata</i>		x	
	<i>Agathosma imbricata</i>		x	x
	<i>Agathosma sp.</i>		x	
	<i>Agathosma thymifolia</i>		x	
	<i>Diosma acmaeophylla</i>		x	
	<i>Diosma aspalathoides</i>		x	
	<i>Diosma dichotoma</i>		x	
	<i>Diosma guthriei</i>		x	
	<i>Diosma hirsuta</i>	x	x	
	<i>Diosma oppositifolia</i>			x
	<i>Diosma ramosissima</i>		x	
	<i>Macrostylis crassifolia</i>		x	
<i>Macrostylis squarrosa</i>		x		
Salicaceae	<i>Populus sp.</i>		x	
	<i>Salix mucronata subsp. mucronata</i>		x	
Santalaceae	<i>Colpoon compressum</i>		x	
	<i>Osyris compressa</i>	x		
	<i>Thesidium fragile</i>			x
	<i>Thesium aggregatum</i>		x	

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Thesium capitatum</i>			X
	<i>Thesium elatius</i>		X	
	<i>Thesium nudicaule</i>		X	
	<i>Thesium patulum</i>		X	
	<i>Thesium pubescens</i>		X	
	<i>Thesium sp.</i>		X	
	<i>Thesium spinosum</i>	X		X
Scrophulariaceae	<i>Buddleja glomerata</i>		X	
	<i>Chaenostoma uncinatum</i>		X	
	<i>Diascia capensis</i>		X	
	<i>Diascia collina</i>		X	
	<i>Diascia diffusa</i>		X	
	<i>Diascia longicornis</i>		X	
	<i>Diascia sp.</i>		X	
	<i>Dischisma arenarium</i>		X	
	<i>Dischisma ciliatum subsp. ciliatum</i>		X	
	<i>Freylinia visseri</i>		X	
	<i>Hebenstretia dentata</i>		X	
	<i>Hebenstretia repens</i>	X	X	
	<i>Hemimeris racemosa</i>		X	
	<i>Hemimeris sabulosa</i>		X	
	<i>Hemimeris sp.</i>		X	
	<i>Lyperia tristis</i>	X		
	<i>Manulea augei</i>	X		
	<i>Manulea corymbosa</i>		X	
	<i>Manulea rubra</i>		X	
	<i>Manulea thyrsoiflora</i>		X	
	<i>Nemesia affinis</i>		X	
	<i>Nemesia bicornis</i>		X	
	<i>Nemesia ligulata</i>		X	
	<i>Nemesia versicolor</i>	X		
	<i>Oftia revoluta</i>		X	
	<i>Phyllopodium capillare</i>		X	
	<i>Phyllopodium heterophyllum</i>		X	
	<i>Phyllopodium phyllopodoides</i>		X	
	<i>Phyllopodium sp.</i>		X	
	<i>Polycarena capensis</i>		X	
<i>Polycarena lilacina var. lilacina</i>		X		
<i>Selago polystachya</i>		X		
<i>Selago scabribractea</i>		X		

Family	Species	Species lists		
		Mucina & Rutherford	POSA	Recorded from field
	<i>Zaluzianskya parviflora</i>	x	x	
	<i>Zaluzianskya villosa</i>	x	x	
Solanaceae	<i>Lycium tetrandrum</i>	x	x	x
	<i>Lycium villosum</i>			x
	<i>Physalis peruviana</i>		x	
	<i>Solanum guineense</i>		x	
Stilbaceae	<i>Stilbe ericoides</i>		x	
Theophrastaceae	<i>Samolus porosus</i>		x	
	<i>Samolus valerandi</i>		x	
Thymelaeaceae	<i>Gnidia geminiflora</i>		x	
	<i>Lachnaea capitata</i>		x	
	<i>Lachnaea grandiflora</i>		x	
	<i>Passerina corymbosa</i>	x	x	
	<i>Passerina filiformis</i> subsp. <i>filiformis</i>		x	
	<i>Passerina filiformis</i> subsp. <i>glutinosa</i>		x	
	<i>Passerina paleacea</i>		x	
	<i>Struthiola fasciata</i>		x	
	<i>Struthiola leptantha</i>		x	
Valerianaceae	<i>Centranthus ruber</i>		x	
Verbenaceae	<i>Verbena officinalis</i>		x	
Zosteraceae	<i>Zostera capensis</i>		x	
Zygophyllaceae	<i>Roepera flexuosa</i>		x	
	<i>Roepera morgsana</i>		x	
	<i>Roepera pygmaea</i>		x	
	<i>Roepera spinosa</i>		x	
	<i>Zygophyllum cordifolium</i>	x		
	<i>Zygophyllum flexuosum</i>			x
	<i>Zygophyllum morgsana</i>	x		x
	<i>Zygophyllum</i> sp.		x	

**APPENDIX C: Possible Species of Special Concern (PSSC) list for the study site**

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Aizoaceae	<i>Antimima aristulata</i>	VU		
	<i>Antimima concinna</i>	DDT		
	<i>Antimima limbata</i>	EN		
	<i>Cephalophyllum rostellum</i>	EN		
	<i>Cheiridopsis rostrata</i>	VU		
	<i>Drosanthemum calycinum</i>	NT		
	<i>Drosanthemum marinum</i>	NT		
	<i>Lampranthus aureus</i>	VU		
	<i>Lampranthus densifolius</i>	NT		
	<i>Lampranthus scaber</i>	EN		
	<i>Lampranthus vernalis</i>	NT		
	<i>Oscularia vredenburgensis</i>	VU		
	<i>Ruschia cupulata</i>	VU		
	<i>Ruschia geminiflora</i>	VU		
	<i>Ruschia langebaanensis</i>	TH		
	<i>Ruschia rariflora</i>	DDT		
	<i>Ruschia tecta</i>	EN		
<i>Ruschia tribracteata</i>	DDT			
Amaranthaceae	<i>Atriplex cinerea</i> subsp. <i>bolusii</i> var. <i>adamsonii</i>	NT		
Amaryllidaceae	<i>Amaryllis belladonna</i>	LC		SC4
	<i>Boophone haemanthoides</i>	LC		SC4
	<i>Brunsvigia orientalis</i>	LC		SC4
	<i>Gethyllis afra</i>	LC		SC4
	<i>Gethyllis lanuginosa</i>	LC		SC4
	<i>Haemanthus pubescens</i> subsp. <i>pubescens</i>	LC		SC4
	<i>Hessea mathewsii</i>	CR		SC4
	<i>Strumaria chaplinii</i>	EN		SC4
	<i>Strumaria tenella</i> subsp. <i>tenella</i>	LC		SC4
Apiaceae	<i>Arctopus dregei</i>	NT		
	<i>Capnophyllum africanum</i>	NT		
	<i>Capnophyllum leiocarpon</i>	DE		
	<i>Cynorhiza meifolia</i>	DDD		
Asteraceae	<i>Amellus asteroides</i> subsp. <i>mollis</i>	VU		
	<i>Amellus capensis</i>	VU		
	<i>Cotula duckittiae</i>	VU		SC4
	<i>Cotula eckloniana</i>	VU		
	<i>Cotula filifolia</i>	NT		
	<i>Felicia elongata</i>	VU		

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
	<i>Helichrysum bachmannii</i>	VU		
	<i>Helichrysum cochleariforme</i>	NT		
	<i>Helichrysum tricostatum</i>	NT		
	<i>Metalasia capitata</i>	VU		
	<i>Relhania rotundifolia</i>	EN		
	<i>Steirodiscus tagetes</i>	VU		
Boraginaceae	<i>Echiostachys spicatus</i>	EN		SC4
Brassicaceae	<i>Heliophila patens</i>	DDT		
	<i>Lepidium flexuosum</i>	DDT		
	<i>Raphanus raphanistrum</i>	NE		
Campanulaceae	<i>Wahlenbergia suffruticosa</i>	CR		
Caryophyllaceae	<i>Silene cretica</i>	NE		
	<i>Silene ornata</i>	VU		
	<i>Silene rigens</i>	NT		
Crassulaceae	<i>Crassula decumbens</i> var. <i>brachyphylla</i>	NT		
Ericaceae	<i>Erica flacca</i>	LC		SC4
	<i>Erica inaequalis</i>	LC		SC4
	<i>Erica mammosa</i>	LC		SC4
	<i>Erica plumosa</i>	LC		SC4
	<i>Erica subdivaricata</i>	LC		SC4
	<i>Erica trichostigma</i>	VU		SC4
	<i>Erica tristis</i>	LC		SC4
Euphorbiaceae	<i>Euphorbia flanaganii</i>	VU		
Fabaceae	<i>Amphithalea ericifolia</i> subsp. <i>erecta</i>	CR		
	<i>Aspalathus albens</i>	VU		
	<i>Aspalathus lactea</i> subsp. <i>lactea</i>	NT		
	<i>Aspalathus lotoides</i> subsp. <i>lagopus</i>	VU		
	<i>Aspalathus lotoides</i> subsp. <i>lotoides</i>	VU		
	<i>Aspalathus pinguis</i> subsp. <i>occidentalis</i>	VU		
	<i>Aspalathus recurva</i>	VU		
	<i>Aspalathus ternata</i>	NT		
	<i>Calobota lotononoides</i>	NT		
	<i>Indigofera platypoda</i>	EN		
	<i>Lebeckia plukenetiana</i>	EN		
	<i>Liparia splendens</i> subsp. <i>splendens</i>	VU		SC4
	<i>Otholobium bolusii</i>	NT		
	<i>Otholobium venustum</i>	VU		
	<i>Podalyria sericea</i>	VU		
	<i>Wiborgia fusca</i> subsp. <i>macrocarpa</i>	EN		
<i>Xiphotheca reflexa</i>	EN			
Geraniaceae	<i>Pelargonium chelidonium</i>	EN		

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Hemerocallidaceae	<i>Caesia sabulosa</i>	VU		
Hyacinthaceae	<i>Daubenya zeyheri</i>	VU		
	<i>Lachenalia longibracteata</i>	DE		
	<i>Lachenalia mathewsii</i>	EN		
	<i>Lachenalia mediana</i> var. <i>mediana</i>	VU		
	<i>Lachenalia pallida</i>	DE		
	<i>Lachenalia paucifolia</i>	EN		
	<i>Lachenalia reflexa</i>	VU		
	<i>Polyxena paucifolia</i>	EN		
Hypoxidaceae	<i>Empodium veratrifolium</i>	EN		
	<i>Pauridia linearis</i>	VU		
	<i>Pauridia longituba</i>	EN		
	<i>Pauridia minuta</i>	NT		
Iridaceae	<i>Aristea dichotoma</i>	LC		SC4
	<i>Babiana ambigua</i>	LC		SC4
	<i>Babiana angustifolia</i>	NT		SC4
	<i>Babiana hirsuta</i>	NT		SC4
	<i>Babiana mucronata</i> subsp. <i>mucronata</i>	LC		SC4
	<i>Babiana nana</i> subsp. <i>nana</i>	EN		SC4
	<i>Babiana ringens</i> subsp. <i>ringens</i>	LC		SC4
	<i>Babiana tubiflora</i>	DE		SC4
	<i>Babiana tubulosa</i> var. <i>tubiflora</i>	DE		SC4
	<i>Chasmanthe floribunda</i>	LC		SC4
	<i>Ferraria densepunctulata</i>	VU		SC4
	<i>Ferraria divaricata</i>	LC		SC4
	<i>Ferraria foliosa</i>	NT		SC4
	<i>Ferraria parva</i>	EN		SC4
	<i>Freesia viridis</i> subsp. <i>viridis</i>	NT		SC4
	<i>Geissorhiza lewisiae</i>	VU		SC4
	<i>Geissorhiza purpurascens</i>	EN		SC4
	<i>Gladiolus alatus</i>	LC		SC4
	<i>Gladiolus brevifolius</i>	LC		SC4
	<i>Gladiolus caeruleus</i>	NT		SC4
	<i>Gladiolus carinatus</i>	LC		SC4
	<i>Gladiolus floribundus</i>	LC		SC4
	<i>Gladiolus gracilis</i>	LC		SC4
	<i>Gladiolus griseus</i>	CR		SC4
	<i>Gladiolus orchidiflorus</i>	LC		SC4
	<i>Gladiolus priorii</i>	LC		SC4
<i>Hesperantha erecta</i>	NT		SC4	
<i>Hesperantha falcata</i>	LC		SC4	

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
	<i>Hesperantha juncifolia</i>	EN		SC4
	<i>Hesperantha radiata</i>	LC		SC4
	<i>Hesperantha saldanhae</i>	CR PE		SC4
	<i>Ixia calendulacea</i>	LC		SC4
	<i>Ixia maculata</i> var. <i>maculata</i>	NT		SC4
	<i>Ixia purpureorosea</i>	VU		SC4
	<i>Lachenalia pustulata</i>	NT		SC4
	<i>Lachenalia viridiflora</i>	CR		SC4
	<i>Lapeirousia anceps</i>	LC		SC4
	<i>Lapeirousia jacquinii</i>	LC		SC4
	<i>Melaspheerula ramosa</i>			SC4
	<i>Moraea albiflora</i>	LC		SC4
	<i>Moraea caeca</i>	LC		SC4
	<i>Moraea calcicola</i>	EN		SC4
	<i>Moraea filicaulis</i>	LC		SC4
	<i>Moraea fugax</i>	LC		SC4
	<i>Moraea loubseri</i>	CR		SC4
	<i>Moraea macrocarpa</i>	LC		SC4
	<i>Moraea</i> sp.			SC4
	<i>Moraea tricolor</i>	EN		SC4
	<i>Romulea barkerae</i>	EN		SC4
	<i>Romulea elliptica</i>	EN		SC4
	<i>Romulea flava</i> var. <i>flava</i>	LC		SC4
	<i>Romulea flava</i> var. <i>viridiflora</i>	LC		SC4
	<i>Romulea hirsuta</i> var. <i>hirsuta</i>	LC		SC4
	<i>Romulea minutiflora</i>	LC		SC4
	<i>Romulea obscura</i>	LC		SC4
	<i>Romulea rosea</i>	LC		SC4
	<i>Romulea saldanhensis</i>	EN		SC4
	<i>Romulea tabularis</i>	LC		SC4
	<i>Sparaxis grandiflora</i> subsp. <i>Violacea</i>	EN		SC4
	<i>Sparaxis parviflora</i>	VU		SC4
	<i>Sparaxis</i> sp.			SC4
	<i>Watsonia hysterantha</i>	NT		SC4
	<i>Watsonia meriana</i> var. <i>meriana</i>	LC		SC4
Juncaginaceae	<i>Triglochin bulbosa</i> subsp. <i>calcicola</i>	NT		
Orchidaceae	<i>Disa obliqua</i> subsp. <i>clavigera</i>	LC		SC4
	<i>Pterygodium hallii</i>	LC		SC4
	<i>Pterygodium volucris</i>	LC		SC4
	<i>Satyrium coriifolium</i>	LC		SC4
	<i>Satyrium odorum</i>	LC		SC4

Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
Oxalidaceae	<i>Oxalis burtoniae</i>	VU		
	<i>Oxalis hirsuta</i>	DDD		
	<i>Oxalis suavis</i>	VU		
Plumbaginaceae	<i>Afrolimon capense</i>	NT		
	<i>Limonium acuminatum</i>	VU		
	<i>Limonium capense</i>	NT		
	<i>Limonium decumbens</i>	DDD		
	<i>Limonium depauperatum</i>	EN		
	<i>Limonium purpuratum</i>	CR		
Polygalaceae	<i>Muraltia harveyana</i>	VU		
	<i>Muraltia macropetala</i>	VU		
Proteaceae	<i>Leucadendron cinereum</i>	VU		SC4
	<i>Leucadendron foedum</i>	VU		SC4
	<i>Leucadendron pubescens</i>	LC		SC4
	<i>Leucadendron salignum</i>	LC		SC4
	<i>Leucadendron stellare</i>	CR		SC4
	<i>Leucospermum hypophyllocarpodendron</i> subsp. <i>canaliculatum</i>	VU		SC4
	<i>Leucospermum parile</i>	EN		SC4
	<i>Leucospermum rodolentum</i>	VU		SC4
	<i>Leucospermum tomentosum</i>	VU		SC4
	<i>Serruria adscendens</i>	NT		SC4
	<i>Serruria cygnea</i>	LC		SC4
	<i>Serruria decipiens</i>	VU		SC4
	<i>Serruria fucifolia</i>	EN		SC4
Restionaceae	<i>Elegia recta</i>	NT		
	<i>Elegia verreauxii</i>	VU		
	<i>Thamnochortus punctatus</i>	DE		
Rhamnaceae	<i>Phylica greyii</i>	EN		
	<i>Phylica harveyi</i>	VU		
	<i>Phylica stenopetala</i>	VU		
Rosaceae	<i>Cliffortia longifolia</i>	VU		
Rubiaceae	<i>Nenax hirta</i> subsp. <i>calciphila</i>	NT		
Rutaceae	<i>Agathosma bifida</i>	LC		SC4
	<i>Agathosma bisulca</i>	LC		SC4
	<i>Agathosma glabrata</i>	EN		SC4
	<i>Agathosma imbricata</i>	LC		SC4
	<i>Agathosma</i> sp.			SC4
	<i>Agathosma thymifolia</i>	VU		SC4
	<i>Diosma acmaeophylla</i>	LC		SC4
<i>Diosma aspalathoides</i>	NT		SC4	



Family	Species	Conservation status		
		SA redlist	Nemba species list	Nature Conservation Ordinance
	<i>Diosma dichotoma</i>	EN		SC4
	<i>Diosma guthriei</i>	NT		SC4
	<i>Diosma hirsuta</i>	LC		SC4
	<i>Diosma ramosissima</i>	LC		SC4
	<i>Macrostylis crassifolia</i>	VU		SC4
	<i>Macrostylis squarrosa</i>	LC		SC4
Scrophulariaceae	<i>Diascia capensis</i>	LC		SC4
	<i>Diascia collina</i>	VU		SC4
	<i>Diascia diffusa</i>	LC		SC4
	<i>Diascia longicornis</i>	LC		SC4
	<i>Diascia</i> sp.			SC4
	<i>Freylinia visseri</i>	CR		
	<i>Manulea augei</i>	EN		
	<i>Manulea corymbosa</i>	VU		
	<i>Phyllopodium capillare</i>	NT		
	<i>Polycarena capensis</i>	NT		
	<i>Zaluzianskya parviflora</i>	NT		
Thymelaeaceae	<i>Lachnaea capitata</i>	VU		
	<i>Lachnaea grandiflora</i>	VU		
	<i>Passerina filiformis</i> subsp. <i>glutinosa</i>	NT		

**APPENDIX D:** Mammalian and plant species present within the Thali Thali Game Lodge, located within the study area.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS
Eland	<i>Taurotragus oryx</i>	Least Concern
Oryx	<i>Oryx gazella</i>	Least Concern
Red Hartebeest	<i>Alcelaphus caama</i>	Least Concern
Black Wildebeest	<i>Connochaetes gnou</i>	Least Concern
Giraffe	<i>Giraffa camelopardalis</i>	Least Concern
Kudu	<i>Tragelaphus strepsicero</i>	Least Concern
Bontebok	<i>Damaliscus pygargus</i>	Least Concern
Springbok	<i>Antidorcas marsupialis</i>	Least Concern
Plains Zebra	<i>Equus quagga</i>	Least Concern
Common Duiker	<i>Sylvicapra grimmia</i>	Least Concern
Porcupine	<i>Hystrix africaeaustralis</i>	Least Concern
Cape Fox	<i>Vulpes chama</i>	Least Concern
Bat-eared Fox	<i>Otocyon megalotis</i>	Least Concern
Caracal	<i>Caracal caracal</i>	Least Concern
Scrub Hare	<i>Lepus saxatilis</i>	Least Concern
Rock Hyrax	<i>Procavia capensis</i>	Least Concern

This information was extracted from <http://www.thalithali.co.za/index.php?nav=habitats>.

**APPENDIX E:** Reptile species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS
Spiny Ground Agama	<i>Agama hispida</i>	Least Concern
Spotted Harlequin Snake	<i>Homoroselaps lacteus</i>	Least Concern
Western Dwarf Chameleon	<i>Bradypodion occidentale</i>	Least Concern
Cape Dwarf Chameleon	<i>Bradypodion pumilum</i>	Vulnerable
Red-lipped Herald Snake	<i>Crotaphopeltis hotamboeia</i>	Least Concern
Rhombic Egg-eater	<i>Dasypeltis scabra</i>	Least Concern
Boomslang	<i>Dispholidus typus</i>	Least Concern
Cross-marked Grass Snake	<i>Psammophis crucifer</i>	Least Concern
Cape Sand Snake	<i>Psammophis leightoni</i>	Vulnerable
Karoo Sand Snake	<i>Psammophis notostictus</i>	Least Concern
Spotted Grass Snake	<i>Psammophylax rhombeatus</i>	Least Concern
Mole Snake	<i>Pseudaspis cana</i>	Least Concern
Cape Grass Lizard	<i>Chamaesaura anguina</i>	Least Concern
Cape Girdled Lizard	<i>Cordylus cordylus</i>	Least Concern
Large-scaled Girdled Lizard	<i>Cordylus macropholis</i>	Near Threatened
Black Girdled Lizard	<i>Cordylus niger</i>	Near Threatened
Karoo Girdled Lizard	<i>Karusasaurus polyzonus</i>	Least Concern
Cape Cobra	<i>Naja nivea</i>	Least Concern
Marbled Leaf-toed Gecko	<i>Afrogecko porphyreus</i>	Least Concern
Striped Pygmy Gecko	<i>Goggia lineata</i>	Least Concern
Austen's Gecko	<i>Pachydactylus austeni</i>	Least Concern
Ocellated Gecko	<i>Pachydactylus geitje</i>	Least Concern
Knox's Desert Lizard	<i>Meroles knoxii</i>	Least Concern
Common Sand Lizard	<i>Pedioplanis lineoocellata</i>	Least Concern
Black Thread Snake	<i>Leptotyphlops nigricans</i>	Least Concern
Cape Legless Skink	<i>Acontias meleagris</i>	Least Concern
Silvery Dwarf Burrowing Skink	<i>Scelotes bipes</i>	Least Concern
Gronovi's Dwarf Burrowing Skink	<i>Scelotes gronovii</i>	Near Threatened
Bloubergstrand Dwarf Burrowing Skink	<i>Scelotes montispectus</i>	Near Threatened
Cape Skink	<i>Trachylepis capensis</i>	Least Concern
Red-sided Skink	<i>Trachylepis homalocephala</i>	Least Concern
Variegated Skink	<i>Trachylepis variegata</i>	Least Concern
Angulate Tortoise	<i>Chersina angulata</i>	Least Concern
Puff Adder	<i>Bitis arietans</i>	Least Concern

**APPENDIX F.** Mammal species recorded in the 3218CC and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS
Karoo Bush Rat	<i>Otomys unisulcatus</i>	Least Concern
Xeric Four-striped Grass Mouse	<i>Rhabdomys pumilio</i>	Least Concern
Southern African Pygmy Mouse	<i>Mus minutoides</i>	Least Concern
Southern African Vlei Rat	<i>Otomys irroratus</i>	Least Concern
Lesser Dwarf Shrew	<i>Suncus varilla</i>	Least Concern
Cape Dune Mole-rat	<i>Bathyergus suillus</i>	Least Concern
Cape Golden Mole	<i>Chrysochloris asiatica</i>	Data Deficient
Southern African Mole-rat	<i>Cryptomys hottentotus</i>	Least Concern
Cape Gerbil	<i>Gerbilliscus afra</i>	Least Concern
Steenbok	<i>Raphicerus campestris</i>	Least Concern
Cape Grysbok	<i>Raphicerus melanotis</i>	Least Concern
Common Eland	<i>Tragelaphus oryx</i>	Least Concern
Common Duiker	<i>Sylvicapra grimmia</i>	Least Concern
Grey Rhebok	<i>Pelea capreolus</i>	Least Concern
Red Hartebeest	<i>Alcelaphus caama</i>	Least Concern
Kudu	<i>Tragelaphus strepsiceros</i>	Least Concern
Springbok	<i>Antidorcas marsupialis</i>	Least Concern
Caracal	<i>Caracal caracal</i>	Least Concern
Bat-eared Fox	<i>Otocyon megalotis</i>	Least Concern
Rock Hyrax	<i>Procavia capensis</i>	Least Concern
Small Grey Mongoose	<i>Herpestes pulverulenta</i>	Least Concern
Honey Badger	<i>Mellivora capensis</i>	Near Threatened
Yellow Mongoose	<i>Cynictis penicillata</i>	Least Concern
Cape Hare	<i>Lepus capensis</i>	Least Concern
Striped Polecat	<i>Ictonyx striatus</i>	Least Concern
Cape Fox	<i>Vulpes chama</i>	Least Concern
Large Grey Mongoose	<i>Herpestes ichneumon</i>	Least Concern
Marsh Mongoose	<i>Atilax paludinosus</i>	Least Concern
Cape Golden Mole	<i>Chrysochloris asiatica</i>	Least Concern
Black-backed Jackal	<i>Canis mesomelas</i>	Least Concern
Chacma Baboon	<i>Papio ursinus</i>	Least Concern
Brown Hyena	<i>Hyaena brunnea</i>	Near Threatened
Cape Horseshoe Bat	<i>Rhinolophus capensis</i>	Near Threatened
Cape Serotine	<i>Neoromicia capensis</i>	Least Concern