BASIC ASSESSMENT FOR THE GREAT KAROO BATTERY ENERGY STORAGE SYSTEM (BESS), NORTHERN CAPE PROVINCE:

FAUNA, AVIFAUNA & FLORA BASIC ASSESSMENT SPECIALIST REPORT

PRODUCED FOR SAVANNAH ENVIRONMENTAL (Pty) Ltd

BY

3Foxes Biodiversity Solutions

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September 2020

EXECUTIVE SUMMARY

Great Karoo Wind Farm (Pty) Ltd would like to provide for the installation of a Battery Energy Storage System (BESS) at the authorised Great Karoo WEF in the Northern Cape. The BESS is proposed to be located near to the facility substation, and will be up to 4ha in total extent. MV underground cabling or overhead power lines (33kV or less) will connect the BESS to the substation (whichever is most suitable). An area of ~500m around the boundary of the authorised Great Karoo WEF substation was assessed, to allow for the optimization of the placement of the BESS anywhere within the assessment region. Savannah Environmental is conducting the required Basic Assessment (BA) process for the Great Karoo BESS and has appointed 3Foxes Biodiversity Solutions to provide a specialist biodiversity (fauna – including avifauna - and flora) impact assessment study of the proposed BESS.

A field assessment as well as a review of the available ecological information for the area was conducted. The vegetation within the Great Karoo BESS 500m assessment region consists entirely of Central Mountains Shale Renosterveld which is considered to represent a moderately sensitive vegetation type due to its low total extent and relatively high abundance of plant Species of Conservation Concern (SCC). A low impact on plant SCC is expected to occur as a result of habitat loss associated with the development, but with the appropriate mitigation (pre-construction walk-through), this is highly unlikely to compromise the local populations of any species. In terms of fauna, there are few species of conservation concern that are likely to be present or abundant at the site and the primary impact of the development on fauna would be minor habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur. Although several avifaunal species of concern are confirmed present in the area and likely use the BESS location for foraging at least on occasion, the extent of the development is sufficiently low such that it would not generate significant habitat loss for any species of concern. Furthermore, there are no nesting sites or other important habitats within the affected area, with the result that overall impact on avifauna would be low. Consequently, the impacts of the development on avifauna, fauna and flora are considered acceptable and would be of low significance after mitigation.

Although direct impacts on fauna and flora are considered acceptable with mitigation, the BESS falls within an area that has been classified as CBA 1 and CBA 2. As these are areas that have been identified as being of significance for biodiversity maintenance and ecological processes, development in these areas is generally not preferred. However, the footprint of the development would be less than 5ha and would also be adjacent to the approved Great Karoo WEF substation and within the Great Karoo WEF site, with the result that the additional extent of disturbance and habitat loss would be low. As a result, the low overall footprint of the BESS would be very unlikely to compromise the ecological functioning of the affected CBAs in any way.

Cumulative impacts within the broader study area are of potential concern due to the proliferation of WEF energy development in the wider Roggeveld area. The contribution of the BESS would however be very minor and is not considered to represent a significant contributor to cumulative impact in the area. Cumulative impacts associated with the development of the BESS are therefore considered acceptable.

Ecological Impact Statement

There are no impacts associated with the establishment of Great Karoo BESS that cannot be mitigated to a low significance. Although cumulative impacts in the area are a concern due to the high density of wind energy developments in the area, the contribution of the Great Karoo BESS would be low and is not considered to be of significance. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding with the BESS at the current location, or any other low and/or medium sensitivity area within the 500m assessment zone. Where drainage lines are crossed for MV cabling, these should preferably be above-ground and resulting potential avifaunal impacts are considered acceptable given the short length of the proposed cabling. Based on the location of the BESS as provided for this assessment and the sensitivity determined on site, the Great Karoo BESS can be supported from a terrestrial and avifaunal ecology point of view.

CONTENTS

LIST OF FIGURES

COMPLIANCE WITH GNR 320 OF 20 MARCH 2020.

Requirements of a Terrestrial Biodiversity Specialist Assessment as per GNR 320 of 20 March, 2020.	**Addressed in the Specialist Report**
2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Page 9
2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.	Chapter 1
2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	Section 3.5
2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;	Section 3.5
2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;	Section 3.5
2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Section 3.5
2.3.4. the description of any significant terrestrial landscape features (including rare or important flora- faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;	Chapter 3
2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types;	Chapter 3
(b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;	Chapter 3
(c) ecological connectivity, habitat fragmentation, ecological processes and fine - scale habitats; and	Chapter 3
(d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;	Section 3
2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Section 3.7
2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	Section 2.2
2.3.7.1. terrestrial critical biodiversity areas (CBAs), including: (a) the reasons why an area has been identified as a CBA;	Section 3.5
(b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;	Section 3.5
(c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);	Section 3.5
(d) the impact on ecosystem threat status;	Section 3.5
(e) the impact on explicit subtypes in the vegetation;	Section 3.2
(f) the impact on overall species and ecosystem diversity of the site; and	Chapter 3
(g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;	Section 3.5
2.3.7.2. terrestrial ecological support areas (ESAs), including: (a) the impact on the ecological processes that operate within or across the site;	N/A – CBA only, refer Section 3.5
(b) the extent the proposed development will impact on the functionality of the ESA; and	N/A – CBA only, refer Section 3.5
(c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;	N/A – CBA only, refer Section 3.5
2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-	Section 3.5, Table 1 onwards

(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;	
2.3.7.4. priority areas for protected area expansion, including- (a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;	Section 3.5 and 4.1
2.3.7.5. SWSAs including: (a) the impact(s) on the terrestrial habitat of a SWSA; and	N/A – please refer section 3.5
(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);	N/A – please refer section 3.5
2.3.7.6. FEPA sub catchments, including- (a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;	N/A – please refer section 3.5
2.3.7.7. indigenous forests, including:	N/A – no indigenous forests within 500m assessment zone
(a) impact on the ecological integrity of the forest; and	N/A – no indigenous forests within 500m assessment zone
(b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas	N/A – no indigenous forests within 500m assessment zone
2.4. The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	This report

SHORT CV/SUMMARY OF EXPERTISE – SIMON TODD

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Ecological Solutions for People & the Environment

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He has provided specialist ecological input on more than 200 different developments distributed widely across the country. This includes input on the Wind and WEF SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman and current deputy chair of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

A selection of recent work is as follows:

Strategic Environmental Assessments

Co-Author. Chapter 7 – Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.
Co-Author. Chapter 1 – Scenarios and Activities – Shale Gas SEA. CSIR 2016.
Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.
Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.
Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

Recent Specialist Ecological Studies in the Vicinity of the Current Site

- Esizayo Wind Energy Facility, Roggeveld. WSP 2017.
- Maralla East & Maralla West WEFS, Roggeveld. WSP. 2017.
- Gunstfontein Wind Energy Facility, Sutherland. Savannah Environmental. 2016.
- Brandvalley Wind Energy Facility, Roggeveld. EOH. 2016.
- Kareebosch Wind Energy Facility, Roggeveld. Savannah Environmental 2015.
- Roggeveld Wind Energy Facility. 2013.
- Komsberg East & Komsberg West WEFs. Arcus Consulting. 2016

SPECIALIST DECLARATION

I, ..Simon Todd....., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

-
- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: ____Simon Todd_____

Date: ____30 September 2020_____

1 INTRODUCTION

Great Karoo Wind Farm (Pty) Ltd would like to provide for the installation of a Battery Energy Storage System (BESS) at the authorised Great Karoo WEF in the Northern Cape. The BESS is proposed to be located near to the facility substation, and will be up to 5ha in total extent. MV underground cabling and/or overhead powerlines (33kV or less) will connect the BESS to the substation (whichever is most suitable). An area of ~500m around the boundary of the authorised Great Karoo WEF substation was assessed, to allow for the optimization of the placement of the BESS. A Basic Assessment process is therefore required for Environmental Authorisation, requiring a Terrestrial Biodiversity Specialist Assessment as per GNR 320 of 20 March 2020.

The purpose of the Great Karoo Terrestrial Biodiversity Specialist Assessment is to describe and detail the ecological features of the proposed BESS site, provide an assessment of the ecological sensitivity of the affected area, and identify the likely impacts associated with the development of the proposed BESS infrastructure. A field assessment and desktop review of the available ecological information for the proposed BESS site and adjacent areas was conducted in order to identify and characterise the ecological features of the affected area. Impacts are assessed for the pre-construction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the Environmental Management Programme (EMPr) for the development. The full scope of study is detailed below.

SCOPE OF STUDY

The scope of the study includes the following activities, as it relates to the minimum requirements of GNR 320 of 20 March 2020 (please refer page 6 for a detailing of the contents of this report against the protocol requirements).

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project.
- a description and evaluation of environmental issues and potential impacts (incl. using direct, indirect and cumulative impacts) that have been identified.
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.
- an indication of the methodology used in determining the significance of potential environmental impacts.
- an assessment of the significance of direct, indirect, and cumulative impacts in terms of the following criteria:
    - the nature of the impact, which shall include a description of what causes the

effect, what will be affected, and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity), or permanent
    - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (impact will occur regardless of any preventable measures)
    - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit), severe/beneficial (long-term impact that could be mitigated/long-term benefit), moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight, or have no effect
    - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
    - the status which will be described as either positive, negative or neutral
    - the degree to which the impact can be reversed
    - the degree to which the impact may cause irreplaceable loss of resources
    - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives (where applicable)
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the EMPr.
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures.
- a description of any assumptions, uncertainties and gaps in knowledge.
- an environmental impact statement which contains:
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of the positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives.

General Considerations:

- Disclose any gaps in information or assumptions made.
- Identify recommendations for mitigatory measures to minimise impacts.

- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Programme (EMPr) for faunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided, which will be separated into the following project phases:

- Pre-construction
- Construction
- Operation Phase
- Decommissioning

1.1 ASSESSMENT APPROACH & PHILOSOPHY

This assessment is conducted according to the 2014 EIA Regulations (Government Notice Regulation 326) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005). This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends on complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should:

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and

- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:

The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography.
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc.*).

Species level

- Red Data Book (RDB) species (giving location if possible using GPS).
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, Low 0-40% confident).
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;

- that are in commercial trade (CITES listed species); or
- are of cultural significance.

- Provide monitoring requirements as input into the EMPr for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur within the grid connection corridor or within its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries).
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the BA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.2 RELEVANT ASPECTS OF THE DEVELOPMENT

The BESS would be located near to the authorised Great Karoo WEF substation, and would be up to 5ha in total extent. MV underground cabling (33kV or less) will connect the BESS to the adjacent substation. Although, overhead powerlines could be used if underground cabling is not possible (geotechnical limitations) or to avoid trenching impacts to watercourses.

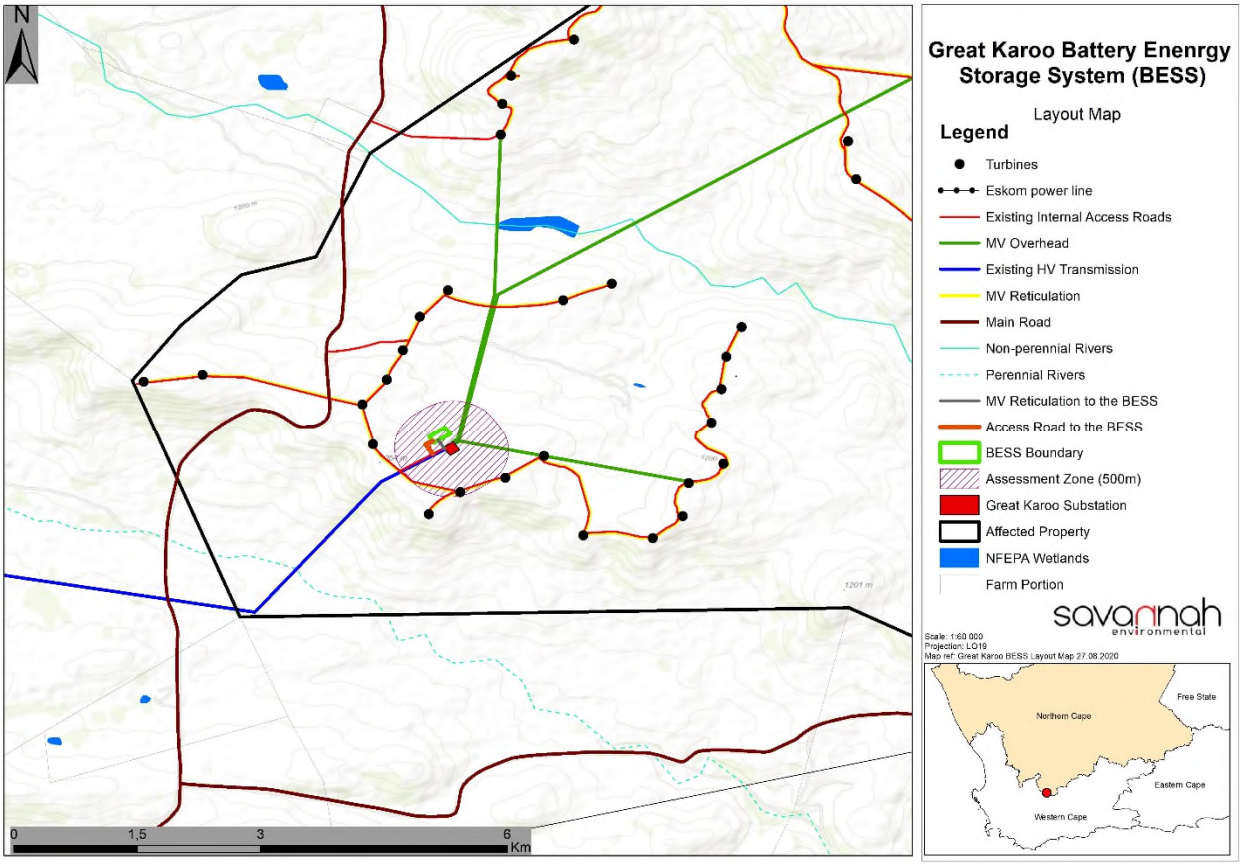

Figure 1. Map showing the location of the BESS 500m assessment area adjacent to the substation within the authorised Great Karoo WEF area.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina & Rutherford 2006 and 2018 update) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Information on plant species recorded for the broad area around the site was extracted from the SANBI POSA database hosted by SANBI. The species list was derived from a considerably larger area than the study site, but this is necessary

to ensure a conservative approach as well as counter the fact that the site itself or the immediate area has not been well sampled in the past.

- The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2020).

Ecosystem

- Critical Biodiversity Areas (CBAs) were extracted from the Northern Cape Critical Biodiversity Areas Map (Oosthuysen & Holness 2016 (latest update as available on BGIS)).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment (NFEPA) (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the Northern Cape Protected Areas Expansion Strategy 2016 (NC-PAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and Animal Demography Unit (ADU) Virtual Museum spatial database (http://vmus.adu.org.za/).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of mammals is based on the IUCN Red List Categories (EWT/SANBI 2016), while reptiles are based on the South African Reptile Conservation Assessment (Bates et al. 2013) and amphibians on Minter et al. (2004) as well as the IUCN (2020).
- The Southern African Bird Atlas Project 1 (SABAP1; Harrison *et al*., 1997), which obtained bird distribution data between 1987 and 1992, was consulted to determine the bird species likely to occur within the broader project site. The relevant quarter-degree grid cell (QDGC) that covers the broader area is 3220DC (17 cards, 98 species). More recent bird distribution data were also obtained from the second bird atlas project, which has been on-going since its inception in 2007 (SABAP 2; http://sabap2.adu.org.za/). SABAP2 employs a finer resolution using the pentad scale (5' latitude x 5' longitude), of which the following two pentads were used, 3245_2040 (3 cards, 67 species), 3250_2040 (9 cards, 76 species).
- The Pre-construction Bird Monitoring Report and Updated Avifaunal Assessment for the Three Phased Hidden Valley Wind Energy Facility (EWT, 2014) was consulted

to obtain additional information on flight paths and abundances of priority species. As were the specialist reports for the Soetwater OHL Basic Assessment, and the recent site-walkthroughs for Karusa WEF, Soetwater WEF and the Soetwater OHL.

- The Important Bird Areas of South Africa (IBA; Marnewick *et al*., 2015) was consulted to determine the location of the nearest IBAs to the project site.
- The conservation status, endemism and biology of all species considered likely to occur within the broader project site were determined from Hockey *et al.* (2005) and Taylor *et al.* (2015).

2.2 SITE VISIT

The site was visited and sampled on the 7th of August 2020. During the site visit, all plant and animal species observed on walked transects through the veld within the study area were recorded. As the Komsberg/Roggeveld area is known to have a high abundance of plant species of conservation concern, a list of these was generated prior to the site visit and used for targeted searching of the site for these species. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops were confirmed in the field if present and recorded on a GPS and mapped onto satellite imagery of the site and included in the sensitivity map where necessary.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the development area was produced by integrating data collected during the site survey with the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery and personal knowledge of the area. This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.

- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided.

2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

This study is based on a field assessment as well as a desktop review of the available information. The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated.

The site visit for the current study took place in spring, near the optimal time for such a visit. As such, the abundance of geophytes, annuals and forbs was high and the presence of species of conservation concern at the site could be well documented. It is not likely that additional site visits and field assessment would significantly alter the results of the study as the current baseline is adequate to describe the site at an appropriate level of detail. The timing and duration of the site visit, is therefore not seen as a significant limitation for the current study and is not considered to be a limiting factor which might compromise the results in any way.

The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. Several site visits have been conducted during various seasons to the broader area and information on fauna observed in the area is included where relevant. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION DESCRIPTION

According to the national vegetation map (Mucina & Rutherford 2006/2018), there are two vegetation types within the affected area Central Mountain Shale Renosterveld and Koedesberge-Moordenaars Karoo (Figure 2). The BESS 500m assessment region is however restricted entirely to the Central Mountains Shale Renosterveld vegetation type. Central

Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and southeastern slopes of the Klein Roggeveldberge and Komsberg, below the Komsberg section of the Great Escarpment, as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area. It is associated with clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones with land types mostly Ib and Fc. Although this vegetation type is classified as Least Threatened, it has a very limited extent of 1236km^2 and is not formally conserved anywhere. Levels of transformation are however low and it is considered to be 99% intact. Although no endemic species are known to occur within this vegetation type, little is known about this Renosterveld type and it has been poorly sampled. Experience from this and other projects in the area indicate that this should be considered to be a relatively sensitive vegetation type with a relatively high abundance of species of conservation concern.

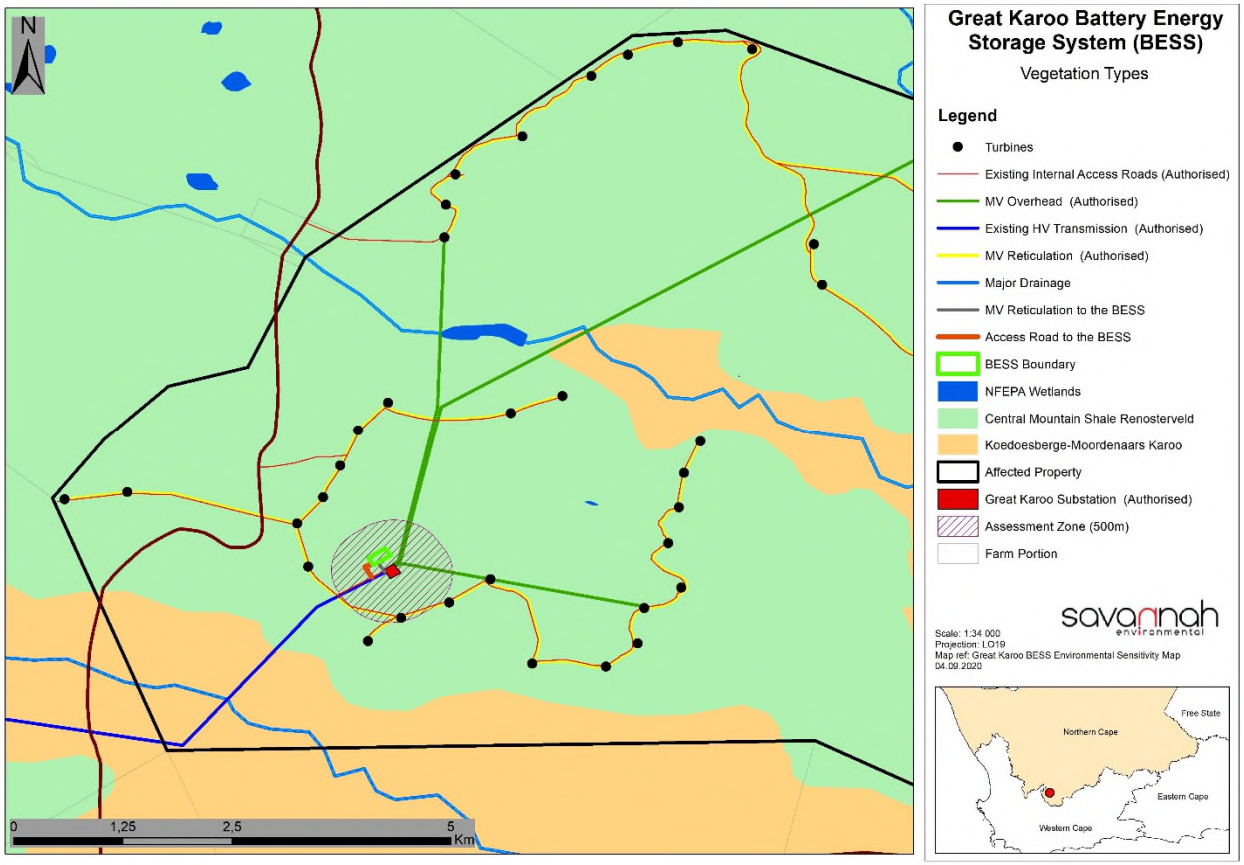

Figure 2. Broad-scale overview of the vegetation in and around the Great Karoo substation and BESS study area. The vegetation map is an extract of the national vegetation map (Mucina & Rutherford 2006 & 2018 update) and also includes drainage lines delineated by the NFEPA assessment (Nel et al. 2011).

3.2 FINE-SCALE VEGETATION DESCRIPTION

The 500m BESS assessment area consists of fairly typical Central Mountain Shale Renosterveld. There are however several different habitats present within the 500m assessment region around the substation site which are illustrated and described below (Figure 3).

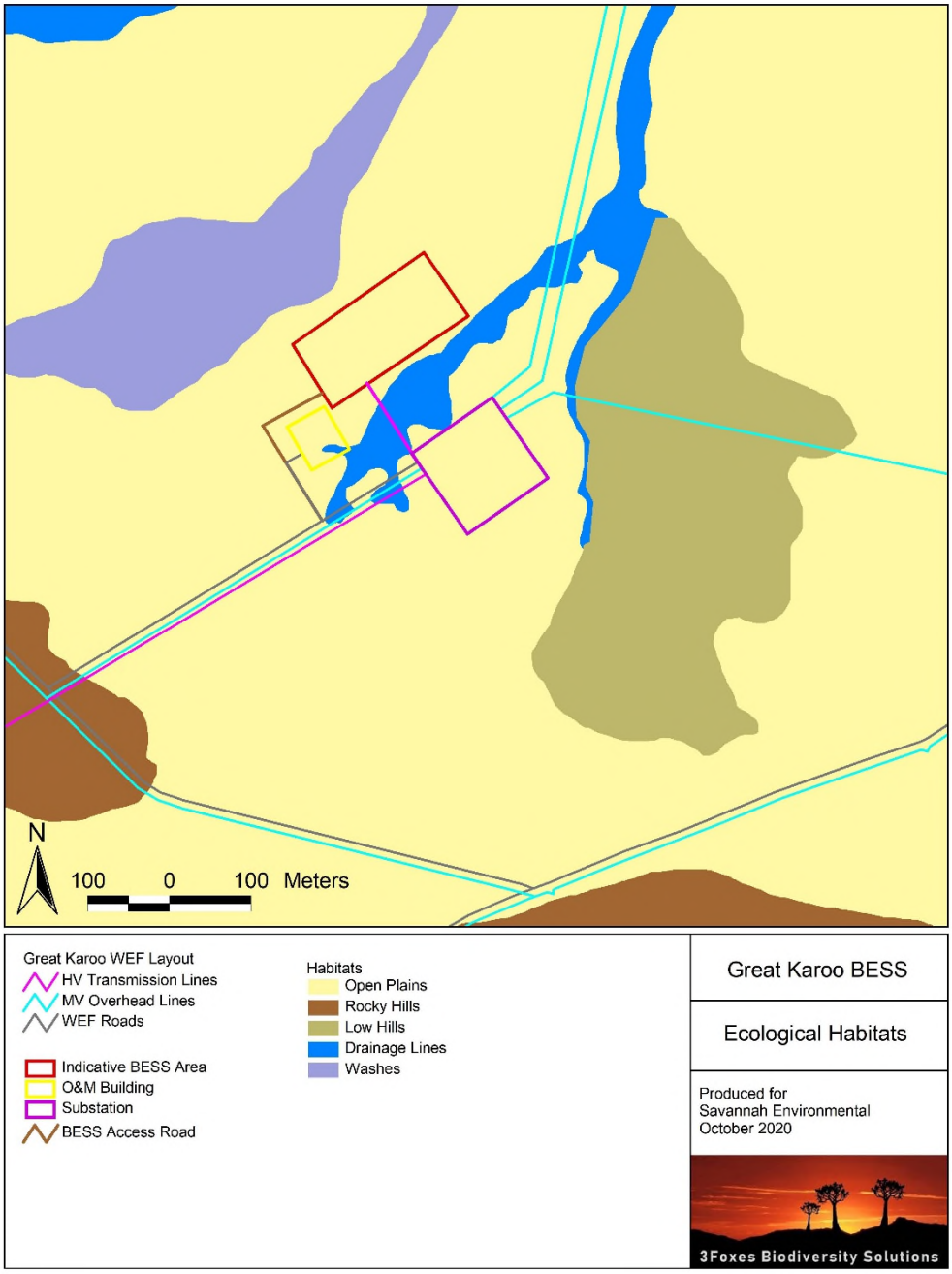

Figure 3. Ecological habitats observed within the Great Karoo BESS 500m assessment region and which are described in detail below.

The majority of the study area consists of typical low shrubland on shallow soils, with some rocky ground and occasional areas of exposed bedrock. Although diversity within this habitat is quite high, the abundance of species of conservation concern within this habitat was observed to be low. Typical and dominant species within the site include *Ruschia intricata*, *Wiborgia sericea, Eriocephalus microphyllus* var. *pubescens*, *Eriocephalus ericoides* subsp. *ericoides*, *Asparagus capensis*, *Berkheya spinosa*, *Cheiridopsis namaquensis*, *Chrysocoma ciliata*, *Cleretum lyratifolium* (Rare), *Colchicum coloratum* subsp. *burchellii*, *Cyanella hyacinthoides, Dicerothamnus rhinocerotis, Dimorphotheca cuneata, Ehrharta calycina, Euphorbia caterviflora, Euryops lateriflorus, Galenia africana, Gazania krebsiana* subsp. *krebsiana, Hermannia cuneifolia, Ixia rapunculoides* var. *rapunculoides, Moraea pritzeliana, Lycium cinereum, Moraea miniata, Oxalis obtusa*, *Pelargonium rapaceum, Poa bulbosa, Pteronia sordida, Pteronia pallens, Romulea atrandra* var. *atrandra, Romulea tortuosa* subsp. *tortuosa, Senecio erosus* and *Zygophyllum pygmaeum*. Based on the final layout provided for this assessment, the BESS would be located within this habitat.

Figure 4. The typical Central Mountain Shale Renosterveld on shallow soils within the BESS 500m study region. This habitat is considered relatively low sensitivity and is considered acceptable for the location of the BESS.

Figure 5. There is an old earth dam within the BESS 500m study region that has become largely silted up and is now dominated by *Galenia africana* and *Chrysocoma cilliata*. This may have been built to slow runoff and combat erosion in the area. The small annual forb *Cleretum lyratifolium* (Rare) was observed in this area.

Figure 6. There is a small drainage line within the BESS study area which includes the small dam illustrated above in Figure 5 and which flows northwards out of the study area. The drainage feature is however fairly degraded and there are no species which appear to be specifically associated with the drainage line and it is dominated by similar species to the adjacent plains shrubland. Common shrubs found along the drainage line and near the earth dam include *Galenia africana*, *Dimorphotheca cuneata* and *Euryops lateriflorus*. Geophytes are more common around the dam where silt and deeper soils are present and include species such as *Romulea atrandra*, *Romulea tortuosa*, *Colchicum coloratum* and *Oxalis obtusa*.

Figure 7. Towards the west of the BESS study area is an area of deeper sandy soils that have historically been disturbed and is now dominated by large *Galenia africana* shrubs with a ground layer of forbs and annuals. This area is not considered very sensitive on account of the previous disturbance.

3.3 Listed and Protected Plant Species

It is important to note that the site falls within the Komsberg Centre of Diversity and Endemism and as such is an area with a known high abundance of species of concern and endemism. A list of species of conservation concern recorded from the wider area is provided in Annex 1. Species of concern observed at the site includes *Eriocephalus grandiflorus* (Rare) and *Cleretum lyratifolium* (Rare) which are both quite widespread species that have healthy populations outside of the affected area. Although it is possible that the development would generate some impact on these species, this would be minor as it is highly unlikely that the local populations would be compromised in any way by the development. Overall, the abundance of plant SCC within the site is low and the impact of the development on SCC would be acceptable and low.

In terms of the provincial legislation the following species and genera are protected and would require specific consideration during the pre-construction walk-through of the BESS footprint. The example species provided are to illustrate the typical species present and is not intended as an exhaustive list.

Schedule 1 (Specially Protected Species):

- All species of the genus Pelargonium (Family: Geraniaceae) (e.g. *Pelargonium rapaceum*)

Schedule 2 (Protected Species):

- All species of the family Mesembryanthemaceae: (e.g. *Antimima pumila, Hammeria salteri, Cheiridopsis namaquensis, Lampranthus spp., Cleretum papulosum subsp. papulosum, Drosanthemum spp., Ruschia centrocapsula*)
- All species of the family *Amaryllidaceae*: (e.g. *Brunsvigia* spp (*B. bosmaniae*), *Haemanthus coccineus*)
- All species of the genus *Colchicum* (Family Colchicaceae): e.g. (*Colchicum coloratum, C.*
- *Cuspidatum).*
- All species of the family *Crassulaceae*; e.g. (*Tylecodon wallichii, T. ventricosus, Crassula deltoidea, C. columnaris, C. muscosa, C. umbella, C. glomerata*, *Adromischus filicaulis*)
- All species of the family *Iridaceae*: (e.g. *Romulea atrandra, R. tortuosa, komsbergensis, Hesperantha acuta, Moraea fugax)*
- All species of the genus *Oxalis* (Family: *Oxalidaceae*): (e.g. *Oxalis obtusa, O. melanostica, O.palmifrons*)
- All species of the genus Lachenalia (Family: *Hyacinthaceae*): (e.g.*Lachenalia aurioliae*)

It is recommended that a Pre-construction Walk-Through Survey is conducted within the final BESS footprint, to inform search-and-rescue efforts. Species of concern should be recorded and may only be removed, transplanted, destroyed (or any other form of disturbance) after the necessary approval (permits) has been obtained from the relevant authority, i.e. the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform. It is also important to note that species of ecological importance, local endemics and red-listed species should be translocated out of the development footprint, where these have a high probability of survival.

3.4 FAUNAL COMMUNITIES

Mammals

The Great Karoo BESS site is likely to have moderate to low mammalian species richness. The BESS site falls within or near the edge of the distribution range of at least 44 terrestrial mammals. Within the broader area, the ridges, hills and uplands, with rocky outcrops, rocky bluffs and cliffs provide suitable habitat for species which require or prefer rock cover such as Cape Rock Elephant Shrew, *Elephantulus edwardii*, Hewitt's Red Rock Hare *Pronolagus*

saundersiae, Namaqua Rock Mouse *Micaelamys namaquensis* and Rock Hyrax, *Procavia capensis*. However, there is not sufficient rock cover within the BESS site itself to support most of these species. Larger species commonly observed on the high-lying ground of the area include Grey Rhebok, *Pelea capreolus* (Near Threatened) which is likely to use the area on a fairly regular basis and Klipspringer, *Oreotragus oreotragus* which are not likely to be resident in the BESS area as the habitat is not rugged enough to provide cover for this species. The introduced Fallow Deer, *Dama dama* is also common in the area and is likely to occur at the site. The lower-lying parts of the area are home to species associated with more densely-vegetated lowland habitats on deeper soils and along drainage lines and floodplains, which includes Brants's Whistling Rat *Parotomys brantsii*, the Bush Vlei Rat *Otomys unisulcatus*, Hairy-footed Gerbil *Gerbillurus paeba* and Common Duiker *Sylvicapra grimmia*. Most of these species are likely to be resident within the BESS area or would be using this area on a fairly regular basis.

Listed species which do or may occur at the site include the, Grey Rhebok (Near Threatened) Black-footed Cat *Felis nigripes* (Vulnerable), Leopard *Panthera pardus* (Near Threatened) and Riverine Rabbit *Bunolagus monticularis* (Critically Endangered). All of these species have relatively large ranges across South Africa and the development of the BESS would result in an insignificant extent of habitat loss for these species. Although the Riverine Rabbit *Bunolagus monticularis* is known to occur in the wider area, it is not currently known from the affected area and it is considered highly unlikely to be present within the BESS study area. Due to the small footprint of the BESS and its proximity to the approved substation infrastructure, it is not likely that there would be any significant degree of habitat loss for mammals as a result of the construction and operation of the BESS.

Overall there do not appear to be any significant issues regarding mammals and the development of Great Karoo BESS. In general, the major impact associated with the development of Great Karoo BESS for mammals would be some localised and minor habitat loss and disturbance during construction and operation.

Reptiles

According to the distribution maps available in the literature, as many as 50 reptiles could occur within the broad area around the BESS. However, according to the records within the Virtual Museum database, only 35 species have been recorded within the 3220 degree square, suggesting that the actual number of reptile species present at the site is likely to be relatively low. In terms of species of conservation concern, the only listed species recorded in the area is the Karoo Padloper *Homopus boulengeri* which is listed as Near Threatened. Although it is possible that this species moves through the BESS area on occasion, it is highly unlikely to be present within the affected area as there is not sufficient rock cover for shelter for this species and so it is considered highly unlikely to present or be affected by the BESS.

Species commonly observed in the wider area on previous field assessments include the Karoo Tent Tortoise *Psammobates tentorius tentorius*, Angulate Tortoise *Chersina angulata*, Puff Adder *Bitis arietans*, Karoo Girdled Lizard *Cordylus polyzonus*, Southern Rock Agama *Agama atra*, Namaqua Plated Lizard *Gerrhosaurus typicus*, Cape Skink *Mabuya capensis*, Variegated Skink *Trachylepis variegata*, Common Sand Lizard *Pedioplanis lineoocellata pulchella* and Cape Cobra *Naja nivea*. While the BESS is likely to result in some localised habitat loss for such typical resident species, there are no parts of the BESS study area that are considered to be especially important or sensitive in terms of reptile abundance or diversity. In terms of impacts of the development on reptiles, the major impact is likely to come from disturbance during the construction phase which would be transient and localised and consequently of low long-term consequence.

Figure 8. Common reptiles observed at the site include, from top left, the Variegated Skink, Common Sand Lizard, Ground Agama and Karoo Girdled Lizard.

Amphibians

Only seven amphibians are likely to occur in the area, indicating that the frog diversity of the site is likely to be low. No listed species are likely to occur in the area. All of the species recorded in the area are widespread species of low conservation concern. Species such the Cape River Frog *Amietia fuscigula* occur along the larger drainage lines in pools and in the farm dams of the area. Species such as Karoo Caco *Cacosternum karooicum*, Karoo Toad *Vandijkophrynus gariepensis* and Cape Sand Frog *Tomopterna delalandii* are less dependent on water and are likely to be more widespread. Although there is an old earth dam within

the site, this was silted up and does not appear to be useful as a breeding site for any amphibians. Given the general aridity and low likely abundance of amphibians within the area, impacts on amphibians are likely to be localised and of a low significance.

Avifauna

Approximately 140 bird species are known to occur within the broader project area (Appendix 5). Seven (7) of these species are listed as threatened, and another four (4) are considered Near Threatened (Taylor *et al*., 2015). With regards to endemism, two (2) species are considered endemic and twenty-four (24) near-endemic to South Africa (BirdLife South Africa, 2019). Fifteen (15) species are considered biome-restricted (Marnewick *et al*., 2015). The bird assemblage of the study area and surrounds is fairly typical of the Succulent Karoo Biome. A number of small passerines that are considered common within the renosterveld and succulent karoo scrub that characterises the area and are considered endemic/near-endemic and biome-restricted (Table 1). Some of these species are nomadic, such as the Black-headed Canary *Serinus alario* and Lark-like Bunting *Emberiza impetuani*, which may be absent in some years. Seemingly cryptic species such as Cinnamon-breasted Warbler is not uncommon along the Great Escarpment and is usually restricted to rocky ridges and scree with vegetation cover. Other species of some importance include the Karoo Lark *Calendulauda albescens*, Cape Clapper Lark *Mirafra apiata,* and Karoo Long-billed Lark *Certhilauda subcoronata.* While many of these and other species are endemic/near-endemic and biome-restricted, all of these species are widely distributed in the Karoo and Fynbos Biomes.

Species of concern present in the area (Table 1) includes three Endangered species, namely Ludwig's Bustard *Neotis ludwigii,* Martial Eagle *Polemaetus bellicosus* and Black Harrier *Circus maurus*. Species of secondary concern which have also been recorded on site include Verreaux's Eagle *Aquila verreauxii,* Lanner Falcon *Falco biarmicus* and Black Stork (*Ciconia nigra).* Verreaux's Eagle is the most abundant of the large raptor species in the area, while the latter two species are significantly scarcer. Black Stork often frequent farm dams, not only singly but also in small congregations. The Vulnerable Southern Black Korhaan *Afrotis afra* and the Near-Threatened Karoo Korhaan *Eupodotis vigorsii* are found throughout the region and have also been recorded at the project site (EWT, 2014).

Table 1. Priority species identified in the project site and surrounds based on their conservation status (Taylor *et al*.,2015), regional endemism (Birdlife South Africa, 2019), and priority score (Retief *et al*., 2011).

Species	Cons. Status	Endemic/Near-endemic	Priority Score	SABAP1 reporting rate (%)	Susceptible to
Bustard, Ludwig's	EN		320	6	Collisions
Buzzard, Common (Steppe)			210	18	Collisions/disturbance
Buzzard, Jackal		NE	250	6	Collisions/disturbance
Crane, Blue	NT		320		Collisions
Eagle, Black-chested Snake			230		Collisions/disturbance
Eagle, Booted			230	6	Collisions/disturbance
Eagle, Martial	EN		350	6	Collisions/electrocution
Eagle, Verreaux's	VU		360	6	Collisions/electrocution
Falcon, Lanner	VU		300		Collisions/disturbance
Flamingo, Greater	NT		290		Collisions
Francolin, Grey-winged		SLS	190	6	Disturbance/habitat loss
Goshawk, Pale Chanting			200	41	Disturbance/habitat loss
Harrier, Black	EN	NE	345	12	Collisions/disturbance/habitat loss
Harrier-hawk, African			190		Disturbance/habitat loss
Kestrel, Rock				59	Disturbance/habitat loss
Kite, Black-winged			174	29	Disturbance/habitat loss
Korhaan, Karoo	NT		240		Collisions/disturbance/habitat loss
Korhaan, Southern Black	VU	E	270	18	Collisions/disturbance/habitat loss
Owl, Cape Eagle-			250		Disturbance/habitat loss
Owl, Spotted Eagle-			170	6	Disturbance/habitat loss
Pipit, African Rock	NT	SLS	200		Disturbance/habitat loss
Sparrowhawk, Rufous-breasted			170		Disturbance/habitat loss
Stork, Black	VU		330	6	Collisions/electrocutions

The Near-Threatened Blue Crane *Grus paradisea* and Greater Flamingo *Phoenicopterus ruber* are both rare in the region, although the former has been recorded during the pre-construction monitoring (EWT, 2014) of the Great Karoo WEF. According to SABAP2 records, Blue Crane has only been recorded in a few pentads within a 50km radius of the project site, while Greater

Flamingo have been recorded in a number of pentads, particularly on the plateau of the Great Escarpment where they frequent large farm dams. Both species may however pass through the area *en route* between focal sites, with flamingos possibly commuting in small flocks. African Rock Pipit is not uncommon along the escarpment to the north of the site, and have also been recorded at the project site (EWT, 2014).

Species that are not red-listed, but that were frequently observed in the area during the pre-construction bird monitoring for the nearby Soetwater WEF (EWT, 2014), include Jackal Buzzard, Rock Kestrel *Falco rupicolus*, and to a lesser extent Grey-winged Francolin *Scleroptila africanus,* Pale Chanting Goshawk *Melierax canorus,* and Booted Eagle *Aquila pennatus.*

In conclusion, the avifauna of the project site and broader area appears fairly typical of the Succulent Karoo Biome. However, due to the presence of a fair number of priority species, the sensitivity of the avifauna can be considered to be of medium significance. In terms of impact, the group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as Ludwig's Bustard, Martial eagle, and Black Stork. Most of these species are susceptible to collisions with power lines owing to reduced ability to see the power lines and reduced manoeuvrability in flight to avoid collisions (Martin & Shaw, 2010; Jenkins *et al.*, 2010; Jenkin *et al*., 2011; Shaw, 2013). However, the only species which are highly susceptible include Ludwig's Bustard and Black Stork (Jenkins *et al.*, 2010). An additional threat faced by the large raptors is electrocution when perched or attempting to perch on power line structures (Lehman *et al*., 2007), but this depends largely on the type of pylons or towers used. Electrocutions can further be avoided to a large extent by employing suitable mitigation methods. Disturbances during construction of the substation and BESS is also expected to have a negative impact by temporarily displacing birds from foraging habitat.

3.5 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

An extract of the Northern Cape Critical Biodiversity Areas map for the broader study area is depicted below in Figure 9. The north western corner of the BESS study area falls within an area classified as CBA 1, while the remainder is classified as CBA 2. Development within CBAs is undesirable and can potentially lead to loss of biodiversity and negatively affect ecological processes. The impact of the current proposed BESS would be mediated by the proximity of the BESS to the facility substation and the low overall footprint of the BESS.

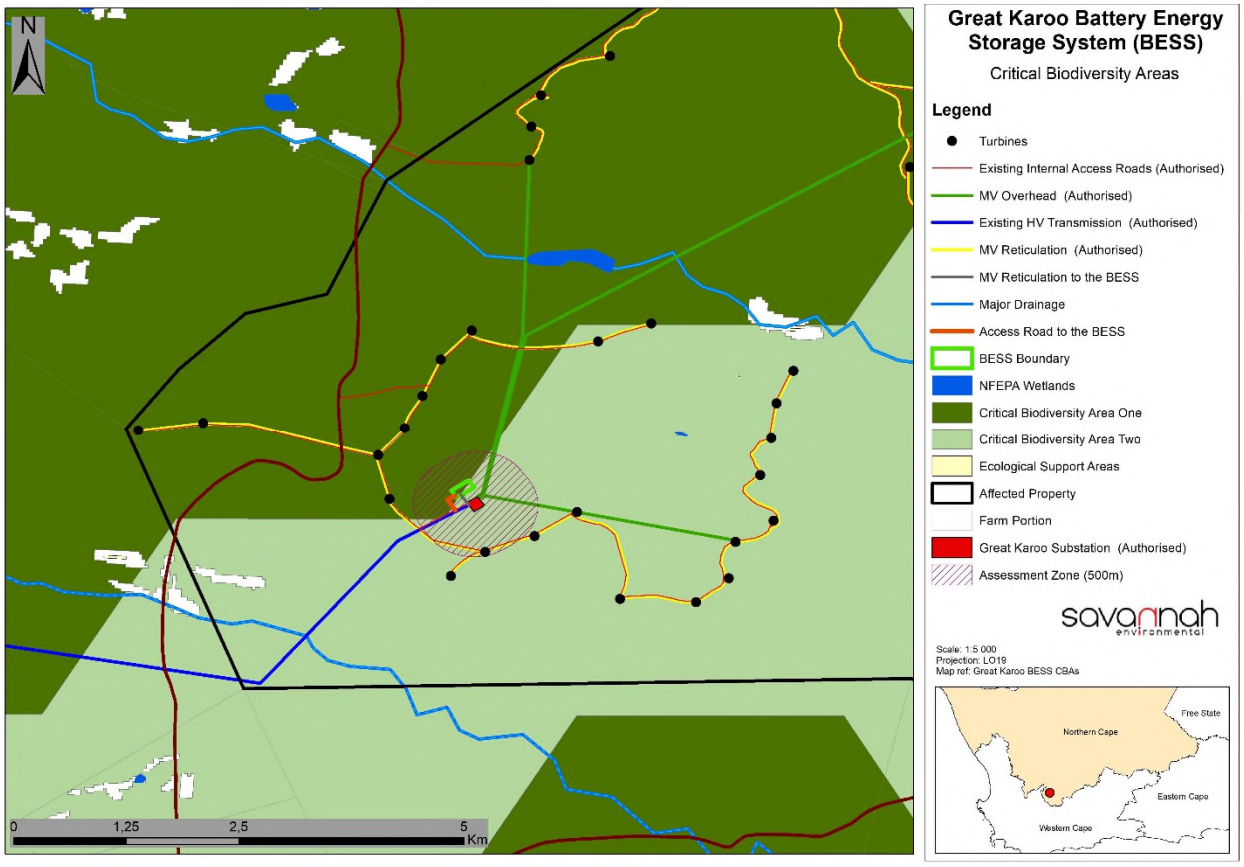

Figure 9. Extract of the Northern Cape Critical Biodiversity Areas map for the broader study area around the Great Karoo BESS, showing that the BESS occurs within an area classified as CBA 1 and CBA 2.

The loss of an additional 5ha (as the worst-case scenario, although it is likely to be much less) of habitat adjacent to the approved substation would be very unlikely to compromise the ecological functioning of the affected CBAs in any way. A summary of the underlying features associated with the CBAs within the site is provided below in Table 1. It is important to note that apart from the process and representivity roles of the CBAs, the features of concern underlying the CBAs are not located within the 500m assessment zone. In terms of the representivity of vegetation types, only Central Mountains Shale Renosterveld is within the site and the loss of less than 5ha of this vegetation type would not be significant, especially given that the field assessment indicated that the abundance of SCC within this area was low. In terms of the process features, the development would contribute to cumulative habitat loss and fragmentation in the area to some degree, but the specific contribution of the BESS (a maximum of 5ha) would not be sufficient to significantly compromise the functioning of these broad-scale ecological processes. Given the small footprint of the BESS and the avoidance of hydrological features at the site, the impact on the BESS on water runoff quality and quantity would be minimal and the overall impact on the affected catchment would be negligible. In terms of the Strategic Water Source Areas (SWSAs) and Freshwater Ecosystem Priority Areas

(FEPAs), it is important to note that the 500m assessment region does not occur with either of the SWSA or NFEPA delineated wetland or river systems, and therefore these do not apply to this development. As such, the development of the BESS is considered acceptable in terms of CBAs and ecological processes.

Table 1. Reasons underlying the CBA 1and CBA 2 status of the site. The features are obtained from the reasons database available on the BGIS database.

Feature	CBA 1	CBA 2	Remarks
Central Mountains Shale Renosterveld	1	1	The development is less than 5ha in extent and would not contribute significantly to the loss of habitat within the Central Mountains Shale Renosterveld vegetation type which is still largely intact.
Threatened Species	1		Although there are threatened species in the area, the BESS development would not compromise the local populations of any species of concern.
Natural Wetlands	1		There are no significant wetlands within the 500m assessment region. The wetlands underlying the CBA 1 are not within the 500m BESS assessment region.
Rivers	1	1	There is a small drainage line within the 500m assessment region, but this can be avoided. The CBA 1 and CBA 2 status of the area is based on the presence of the larger drainage lines present in the wider area such as the Komsberg and Meintjiesplaas rivers.
Large high value climate resilience areas	1	1	The rugged topography of the area and intact nature of the landscape provides it with climate change resilience. The footprint of the development at less than 5ha would not compromise this function of the landscape. The development would however contribute some degree towards cumulative habitat loss and fragmentation in the area. The specific contribution of the BESS is however insignificant compared to the existing or approved developments.
NPAES PA and Focus	1	1	These have changed since the 2011 NPAES and a new NPAES layer has been developed but has not been released as yet. However, the site is not within a Northern Cape PAES, indicating that it has not been identified as a priority area for conservation expansion. The loss of less than 5ha to the BESS would not change conservation options in the area as it is already affected by approved and under construction wind farms.
Landscape structural elements	1		As with climate change resilience, this feature of the CBA 1 would not be significantly altered by the presence of the BESS. Based on the results of the field assessment it is unlikely that the affected area represents an important movement or migration corridor for any fauna and the presence of the BESS

			would be very unlikely to compromise the ability of fauna, flora or avifauna to move about the landscape.
Koedoesberge-Moordenaars Karoo		1	The CBA 2 area provides some representivity of the Koedoesberge-Moordenaars Karoo vegetation type. This vegetation type is however outside of the development footprint and would not be affected by the BESS.
PA distance buffers 5km & 10km		1	There are no mapped protected areas within 10km of the BESS 500m assessment region. There are no known formal protected areas in the vicinity of the 500m assessment region that would be affected by the BESS.

3.6 CURRENT BASELINE & CUMULATIVE IMPACT

The BESS is part of the Great Karoo WEF and there are also several other approved wind energy facilities in the area, which together represent a significant potential negative impact on the local environment. The Great Karoo site is adjacent to the Karusa and Soetwater wind farms which are currently under construction. As these are existing developments, they are considered to represent part of the cumulative impact baseline for the area. The primary concern associated with the current development would be the additional contribution of the BESS to cumulative impacts in the area. The footprint of the BESS is estimated at approximately 5ha. In context of the generally intact nature of the area, this is seen as a very low contribution. The medium voltage connection from the BESS to the nearby substation would less than 500m in length and as this would likely be underground, the risk of collisions or electrocution of avifauna would be minimal. Should some or all of the line be overhead cabling, the presence of the BESS itself and the substation would deter many larger species from the immediate area and along with other associated avifaunal mitigation, the additional risk to avifauna from the BESS would be very low. As a result, the contribution of the current proposed BESS infrastructure to overall cumulative impact from wind farm and grid infrastructure development in the wider area is very low and is considered acceptable.

3.7 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the BESS 500m assessment region is illustrated below in Figure 10. The majority of the 500m assessment region is typical, open plains Central Mountain Shale Renosterveld, considered to be low ecological sensitivity. There are however some drainage features within the BESS 500m assessment region that are considered to be high ecological sensitivity and unsuitable for development. There are also some low hills in the south and west which are considered high sensitivity on account of the vulnerability of these habitats to disturbance. A sensitive drainage line is also present within the assessment area. However, under the layout provided for the assessment, the BESS would be restricted to the lower sensitivity typical low renosterveld of the area. In instance where the BESS MV cabling cross

this drainage line and cannot be avoided, overhead lines should be employed to reduce impact. However, considering the short length of the cabling planned, the use of overhead MV cabling across the drainage line will be acceptable. Access roads related to the BESS should not however be located within high or very high areas.

Given the avoidance of the sensitive features present and the short length of MV cabling across the drainage line, the BESS would generate a low overall impact on flora, fauna and avifauna and there are no fatal flaws or high impacts associated with the project.

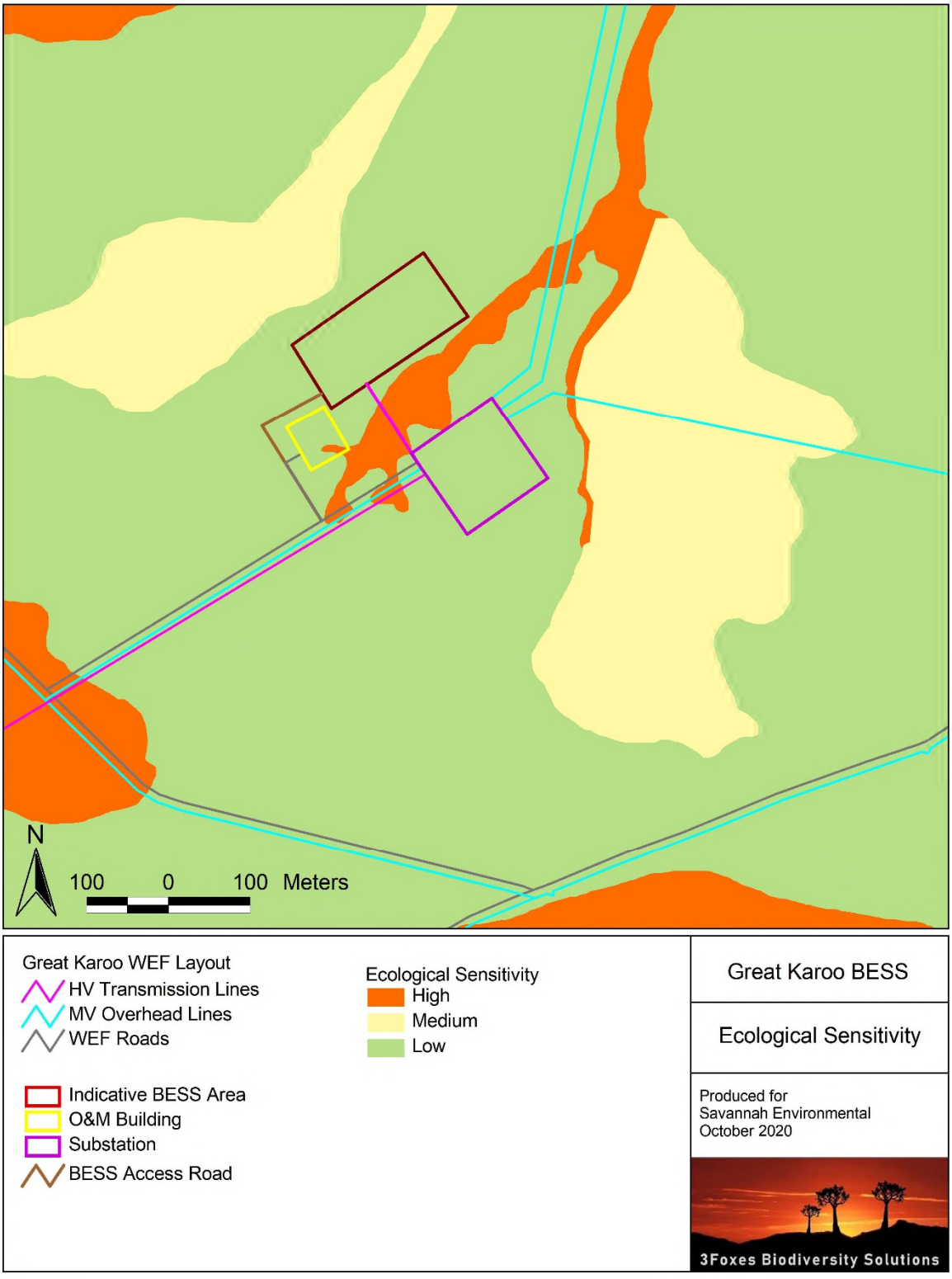

Figure 10. Sensitivity map for the Great Karoo BESS 500m assessment region.

4 IDENTIFICATION & NATURE OF IMPACTS

In this section, the potential impacts and associated risk factors that may be generated by the development are identified and discussed before being assessed in the next section.

4.1 IDENTIFICATION OF IMPACTS

In this section the potential impacts associated with the establishment of the Great Karoo BESS are explored in context of the features and characteristics of the development area, the likelihood and extent to which each impact would occur given the characteristics of the development area, and the extent and nature of the development.

Impacts on vegetation and protected plant species

Several protected species occur in the area and which would potentially be impacted by the development of the Great Karoo BESS. Vegetation clearing during the construction phase will lead to the loss of currently intact habitat within the footprint and is an inevitable consequence of the establishment of the BESS. As this impact is certain to occur during the construction phase, it is assessed for the construction phase only, as this is when the impact will occur, although the consequences will persist for some time after construction has been completed.

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during the construction phase will be detrimental to fauna. Sensitive and shy fauna would move away from the development area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during the construction phase and this impact is therefore assessed for the construction phase only.

Direct Avifaunal impacts

Vegetation clearing for the BESS and associated infrastructure will impact the local avifauna directly through habitat loss. The presence and operation of construction machinery on site would create a physical impact as well as generate noise, pollution and other forms of disturbance, while increased human presence could lead to poaching, illegal fauna collecting and other forms of disturbance such as fire. Impacts on avifauna during the operational phase would be reduced and the operation of the BESS would generate minor disturbance during maintenance of infrastructure, which may deter some avifauna from the area, especially red-listed avifaunal species which are less tolerant of disturbances. Should the connection between the BESS and the

substation require an overhead line, there would be a small risk of collisions with the power line and electrocution from the power line infrastructure (Lehman et al., 2007, Jenkins et al., 2010).

Habitat Degradation due to Erosion and Alien Plant Invasion

Disturbance within and near the BESS site generated during the construction phase will leave the area vulnerable to erosion and alien plant invasion, which would lead to degradation of the local environment. Although, the disturbance would be created during the construction phase, the major impacts would manifest during the operation phase.

Impact on CBAs and NPAES Focus Areas

The development would have an impact on an area classified as CBA 1 and CBA 2. However, the grid connection corridor is not within an NPAES Focus Area, indicating that it has not been identified as being of high significance for future conservation expansion. The impact on the CBAs is assessed as part of the cumulative impacts associated with the development.

5 ASSESSMENT OF IMPACTS

The various identified impacts are assessed below for the different phases of the development.

5.1 PLANNING & CONSTRUCTION PHASE

Impact 1. Impacts on vegetation and listed or protected plant species resulting from the BESS construction activities

Impact Nature: Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the BESS and associated infrastructure.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (3)	Long-term (3)
Magnitude	Low (3)	Low (2)
Probability	Highly Likely (4)	Highly Likely (4)
Significance	Low (28)	Low (24)
Status	Negative	Negative
Reversibility	Moderate	Moderate

Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because some loss of vegetation is unavoidable and is a certain outcome of the development.	
Mitigation	• Pre-construction walk-through of the final layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions. • Search and rescue for identified species of concern before construction. • Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained. • Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc. • Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the drainage lines and wetlands. • Vegetation clearing should be kept to a minimum and restricted to the BESS footprint as closely as possible. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary laydown areas should be located within previously transformed areas (as far as possible) or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	
Cumulative Impacts	The Great Karoo BESS will contribute to cumulative impacts on habitat loss and transformation in the area, but the contribution would be very low.	
Residual Risks	The loss of currently intact vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would however be low.	

Impact 2. Direct Faunal Impacts Due to Construction Activities

Impact Nature: Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. This will however be transient and restricted to the construction phase.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)

Duration	Short-term (2)	Short-term (2)
Magnitude	Low (3)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Partly, although noise and disturbance cannot be well mitigated, impacts on fauna due to human presence such as poaching can be mitigated.	
Mitigation	• All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition. • Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If holes or trenches need to be dug for electrical cabling or other facility infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter, or alternately the excavation must be monitored daily so that trapped fauna can be freed.	
Cumulative Impacts	During the construction phase the activity would contribute to cumulative fauna disturbance and disruption in the area, but this would be short lived and little long-term impact would be generated.	
Residual Risks	It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.	

Impact 3. Avifaunal Impact due to Construction Activities

Impact Nature: Direct Avifaunal Impacts During Construction – habitat loss and disturbance		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Low to Moderate (4)	Low (3)
Probability	Highly likely (4)	Probable (3)
Significance	Low (24)	Low (15)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Although there will be some habitat loss that cannot be well mitigated, impacts on avifauna will be transient and of low magnitude during construction.	
Mitigation	• If the connection to the substation is an overhead line then the design of the proposed power line must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, taking into account the mitigation guidelines recommended by Birdlife South Africa (Jenkins et al., 2017). • Where necessary, deterrent devices such as bird guards should be mounted on relevant parts of the pylons to further reduce the possibility of electrocutions. • The power line should be marked with bird diverters in order to make the lines as visible as possible to collision-susceptible species. Recommended bird diverters such as brightly coloured 'aviation' balls, thickened wire spirals, or flapping devices that increase the visibility of the lines should be fitted. • All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g. bustards, korhaans, francolin), and owls, which are often persecuted out of superstition. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • The use of laydown areas within the footprint of the development should be used where feasible, to avoid habitat loss and disturbance to adjoining areas. • Any avifauna threatened by the construction activities should be removed to safety by the Environmental Officer (EO).	

	• If lights are to be used at night for ensuring that infrastructure on site is lit, this should be done with downward-directed low-UV type lights (such as most HPS bulbs), which do not attract insects and their avian predators., so as to minimise disturbance to birds flying over the site at night. • All vehicles (construction or other) accessing the site should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible avifauna, such as nocturnal and crepuscular species (e.g. nightjars and owls) which sometimes forage or rest on roads, especially at night. • If holes or trenches need to be dug for cabling or pylons, these should not be left open and unattended for extended periods (> 1 week) of time as terrestrial avifauna or their flightless young may become entrapped therein. Holes should only be dug when they are required and should be used and filled shortly thereafter, alternately, excavated areas should be checked frequently for trapped fauna/ avifauna that require assistance to exit the excavated area.
Cumulative Impacts	The Great karoo BESS will contribute to cumulative impacts on avifaunal habitat loss and fragmentation, as well as collision risk with power line infrastructure in the area. However, given the small footprint of the development and proximity to the approved substation, the contribution would be insignificant.
Residual Risks	There would be some residual habitat loss associated with the development that cannot be avoided.

5.2 OPERATIONAL PHASE IMPACTS

Impact 1. Faunal Impacts due to Operation

Impact Nature: The operation and maintenance of the Great Karoo BESS may lead to disturbance or persecution of fauna in the vicinity of the development.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (21)	Low (14)
Status	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To a large extent, but some low-level residual impact due to noise and human disturbance may occur during maintenance activities.	
Mitigation	• Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit on site (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	
Cumulative Impacts	The development would contribute to cumulative disturbance for fauna, but the contribution would be very low and is not considered significant.	
Residual Risks	Disturbance from maintenance activities will occur at a low and infrequent level with the result that no long-term impacts are expected to occur.	

Impact 2. Avifaunal Impacts due to Operation

Impact Nature: Direct Avifaunal Impacts During Operation – collisions, electrocution and disturbance		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
Probability	Likely (3)	Improbable (2)
Significance	Low (27)	Low (16)
Status	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	To a large extent, although bird flappers and other bird diverters are not 100% effective in reducing bird collisions and electrocutions, hence there would still be a low residual impact.	
Mitigation	• Any injuries or mortalities of avifauna observed at the BESS should be reported to the EO and recorded for monitoring purposes. Should repeated injuries or fatalities occur, an avifaunal expert should be consulted to identify and remedy the cause of the problem.	

	• movements by vehicles and personnel should remain within the BESS and substation area and should not stray from the approved access and maintenance routes. • Any raptor nests that are discovered on the power line structures should be reported to the Environmental Officer, while utmost care should be taken to not disturb these nests during routine maintenance procedures.
Cumulative Impacts	The development will contribute to cumulative impacts on avifaunal habitat loss as well as collision and electrocution risk with power line infrastructure in the area, but given the extent of the development, the contribution would be minimal.
Residual Risks	Deterrent devices such as bird guards to reduce electrocutions, and flight diverters to reduce the risk of collisions with power lines are not 100% effective and some residual impact is likely to occur.

Impact 3. Habitat Degradation due to Erosion and Alien Plant Invasion

Impact Nature: Disturbance created during the construction phase will leave the site and immediate surroundings vulnerable to erosion and alien plant invasion for several years into the operation phase.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (2)	Long-term (3)
Magnitude	Medium Low (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (18)	Low (12)
Status	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation	• Erosion management within the development area should take place according to an Erosion Management Plan and Rehabilitation Plan. • The site access road should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion during operation to ensure that no erosion problems have developed as a result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.	

	• All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and re-vegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area post-construction. • Alien management at the site should take place in accordance with an Alien Invasive Management Plan • Regular monitoring for alien plant proliferation during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance, as per the Alien Invasive Management Plan for the project. • If required, woody alien plant species where present should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.
Cumulative Impacts	Erosion and alien plant invasion would contribute to degradation in the area, but as this can be well-mitigated, the contribution can be minimised.
Residual Risks	Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact.

5.3 DECOMMISSIONING PHASE

Decommissioning Phase Impact 1. Habitat Degradation due to Erosion and Alien Plant Invasion

Impact Nature: Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (12)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation	• Erosion management within the development area should take place in accordance with the Erosion Management and Rehabilitation Plan. This	

	should make provision for monitoring of the development area for at least 3 years after the decommissioning phase. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area, for at least 3 years after decommissioning. • Alien management at the site should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management annually for at least 3 years after decommissioning. Woody aliens should be controlled using the appropriate alien control techniques as determined by the species present. This might include use of herbicides where no practical manual means are feasible.
Cumulative Impacts	Erosion and alien plant invasion would contribute to degradation in the area, but as this can be well-mitigated, the contribution can be minimised.
Residual Risks	Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact if effectively managed.

Decommissioning Phase Impact 2. Direct Faunal Impacts Due to Decommissioning Activities

Impact Nature: Due to disturbance, noise and the operation of heavy machinery, faunal disturbance due to decommissioning will extend beyond the footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (1)	Short-term (1)
Magnitude	Low (4)	Minor (3)
Probability	Probable (3)	Probable (3)
Significance	Low (18)	Low (15)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Although the noise and disturbance generated at the site during decommissioning is probably largely unavoidable, this will be transient	

	and ultimately the habitat should be restored to something useable by the local fauna.
Mitigation	• All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition. • Any fauna threatened by the decommissioning activities should be removed to safety by an appropriately qualified environmental officer. • All vehicles should adhere to a low speed limit on site (30km/h for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site and ultimately removed from the site as part of decommissioning. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • The site should be rehabilitated with locally occurring species to restore ecosystem structure and function.
Cumulative Impacts	During the decommissioning, the associated disturbance would contribute to cumulative fauna disturbance and disruption in the area, but this would be transient and not of long-term impact.
Residual Risks	Although some components of disturbance cannot be avoided, the site itself would have low faunal abundance at decommissioning and no significant residual impacts are likely.

5.4 CUMULATIVE IMPACTS

The following are the cumulative impacts assessed as being a likely consequence of the development of the Great Karoo BESS. This is assessed in context of the extent of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from agriculture and other activities in the area.

Cumulative Impact 1. Impact on CBAs and broad-scale ecological processes

Nature: The development of Great Karoo BESS will contribute to cumulative habitat loss within CBAs and other broad-scale cumulative impacts on ecological processes in the wider Roggeveld area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Moderate (6)
Probability	Improbable (2)	Probable (3)
Significance	Low (14)	Medium (36)
Status	Negative	Negative
Reversibility	High	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated	To some degree, but the majority of the impact results from the presence of the various already approved WEFs which cannot be well mitigated.	
Mitigation: • Ensure that sensitive habitats such as drainage features, are not within the development footprint of the BESS. • Ensure that the fencing around the facility is wildlife friendly and does not impede fauna from moving through the area or result in electrocutions. • Ensure that an alien invasive management plan and erosion management plan compiled for the project is effectively implemented at the site.		

6 CONCLUSION & RECOMMENDATIONS

The vegetation within the Great Karoo BESS consists of typical Central Mountains Shale Renosterveld which is considered to represent a moderately sensitive vegetation type due to its low total extent and relatively high abundance of plant SCC. The abundance of plant SCC within the site was however low and no species of very high concern were observed. The footprint of the BESS is small and it is highly unlikely to compromise the local populations of any species of concern. In terms of terrestrial fauna, there are few species of conservation concern that are known to be present in the wider area, and based on the location and extent of the BESS impact on such species would be minimal. The primary impact of the development on terrestrial fauna would be minor habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on terrestrial fauna are expected to occur. Although several avifaunal species of concern are confirmed present in the area and likely use the BESS location for foraging at least on occasion, the extent of the development is sufficiently low such that it would not generate significant habitat loss for any species of concern. Furthermore, there are no nesting sites or other important habitats within the affected area, with the result that overall impact on avifauna would be low. Consequently, the impacts of the development on avifauna, fauna and flora are considered acceptable and would be of low significance after mitigation.

Although direct impacts on avifauna, fauna and flora are considered potentially acceptable, the BESS assessment zone falls within an area that has been classified as CBA 1 and CBA 2. As these are areas that have been identified as being of significance for biodiversity maintenance and ecological processes, development in these areas is undesirable. The footprint of the development would be 5ha or less and would also be located adjacent to the approved facility substation, with the result that the additional extent of disturbance and habitat loss would be low. As a result, the small overall footprint of the BESS would be very unlikely to compromise the ecological functioning of the affected CBAs in any way.

Cumulative impacts within the broader study area are of potential concern due to the proliferation of WEF energy development in the wider Roggeveld area. The contribution of the BESS would however be very minor and is not considered to represent a significant contributor to cumulative impact in the area. Cumulative impacts associated with the development of the BESS are therefore considered acceptable.

Impact Statement

There are no impacts associated with the establishment of Great Karoo BESS that cannot be mitigated to a low significance. Although cumulative impacts in the area are a concern due to the high density of wind energy developments in the area, the contribution of the Great Karoo BESS would be low and is not considered to be of significance. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding with the BESS at the current location, or any other low and/or medium sensitivity area within the 500m assessment zone. Where drainage lines are crossed for MV cabling, these should preferably be above-ground and resulting potential avifaunal impacts are considered acceptable given the short length of the proposed cabling. Based on the location of the BESS as provided for this assessment and the sensitivity determined on site, the Great Karoo BESS can be supported from a terrestrial and avifaunal ecology point of view.

7 Activities for Inclusion into the EMPr

An Environmental Management Programme (EMPr) provides a link between the predicted impacts and mitigation measures recommended within the BA and the implementation and operational activities of a project. As the construction and operation of the Great Karoo BESS may impact the environment, activities that pose a threat should be managed and mitigated so that unnecessary or preventable environmental impacts do not result. The primary objective of the EMPr is to detail actions required to address the impacts identified in the BA during the establishment, operation and rehabilitation of the proposed infrastructure. The EMPr provides an elaboration of how to implement the mitigation measures documented in the BA. As such the purpose of the EMPr can be outlined as follows:

- To outline mitigation measures and environmental specifications which are required to be implemented for the planning, establishment, rehabilitation and operation/maintenance phases of the project in order to minimise and manage the extent of environmental impacts.
- To ensure that the establishment and operation phases of the project do not result in undue or reasonably avoidable adverse environmental impacts, and ensure that any potential environmental benefits are enhanced.
- To identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- To propose mechanisms for monitoring compliance, and preventing long-term or permanent environmental degradation.
- To facilitate appropriate and proactive response to unforeseen events or changes in project implementation that were not considered in the BA process

Below are the ecologically-orientated measures that should be implemented as part of the EMPr for the development to reduce the significance or extent of the above impacts. The measures below do not exactly match with the impacts that have been identified, as certain mitigation measures, such as limiting the loss of vegetation may be effective at combating several different impacts, such as erosion, faunal impact etc.

Construction Phase Activities

Objective: Limit disturbance of vegetation and loss of protected flora during construction			
Potential Impact	Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants.		
Activity/risk source	Vegetation clearing for the following » Clearing for infrastructure establishment (BESS, cabling, overhead lines and associated infrastructure). » Access roads. » Laydown areas. » Construction Camps.		
Mitigation: Target/Objective	» Low footprint and low impact on terrestrial environment. » Low impact on protected plant species.		
Mitigation: Action/control		Responsibility	Timeframe
» Preconstruction walk-through of powerline routing must inform final micro-siting and search-and-rescue efforts. » Obtain relevant permits from the Department of Agriculture, Forestry and Fisheries (DAFF) and the Northern Cape Department of Environment and Nature Conservation (DENC) prior to any construction activities at the site. » Affected individuals of selected protected species which cannot be avoided should be translocated to a safe area on the site prior to construction. This does not include woody species which cannot be translocated and where these are protected by DAFF and a permit for their destruction would be required. » Erosion control measures should be implemented in areas where slopes have been disturbed. » Revegetation of cleared areas or monitoring to ensure that recovery is taking place. » Alien plant clearing where necessary.		Management/EO	Construction & Operation
Performance Indicator	» Vegetation loss restricted to infrastructure footprint. » Low impact on protected plant species. » Permit obtained to destroy or translocate affected individuals of protected species.		

Monitoring	ECO to monitor construction to ensure that: » Vegetation is cleared only within essential areas. » Erosion risk is maintained at an acceptable level through flow regulation structures where appropriate and the maintenance of plant cover wherever possible.

Objective: Limit direct and indirect terrestrial faunal impacts during construction		
Project component/s	Construction activities especially the following: » Vegetation clearing. » Human presence. » Operation of heavy machinery.	
Potential Impact	Disturbance of faunal communities due to construction as well as poaching and hunting risk from construction staff.	
Activity/risk source	» Habitat transformation during construction. » Presence of construction crews. » Operation of heavy vehicles.	
Mitigation: Target/Objective	Low faunal impact during construction.	
Mitigation: Action/control	Responsibility	Timeframe
» Environmental induction for all construction staff » ECO to monitor and enforce a ban on hunting, collecting etc. of all plants and animals or their products. » Any fauna encountered during construction should be removed to safety by the EO or other suitably qualified person, or allowed to passively vacate the area. » All vehicles to adhere to low speed limits (40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust. » All night-lighting should use low-UV type lights (such as HPS bulbs or similar), which do not attract insects. The lights should also be directed downward to ensure they do not result in large amounts of light pollution.	Management/ECO	Construction
Performance Indicator	» Low mortality of fauna due to construction machinery and activities. » No poaching etc of fauna by construction personnel during construction. » Removal to safety of fauna encountered during construction.	
Monitoring	Monitoring for compliance during the construction phase. All incidents to be noted.	

Operational Phase Activities

OBJECTIVE: Limit the ecological footprint of the Great Karoo BESS			
Project component/s	Presence and operation of the facility including » Movement of vehicles to and from the site.		
Potential Impact	» Alien plant invasion » Erosion » Pollution » Faunal Impacts		
Activity/risk source	» Alien plant invasion in and around the road. » Unregulated runoff from the access road. » Human presence during road maintenance activities » Pollution from maintenance vehicles due to oil or fuel leaks etc. » Maintenance activities which may lead to negative impacts such as pollution, herbicide drift etc.		
Mitigation: Target/Objective	Low ecological footprint of the grid connection infrastructure during operation.		
Mitigation: Action/control		Responsibility	Timeframe
Vegetation control should be by manual clearing and herbicides should not be used except to control alien plants in the prescribed manner.		Management/ Contractor	Operation
Annual monitoring for alien plant species - with follow up clearing as needed – or as per the frequency stated in the alien invasive management plan to be developed for the site		Management/ Contractor	Operation
Annual site inspection for erosion or water flow regulation problems – with follow up remedial action where problems are identified.		Management/ Contractor	Operation
Performance Indicator	» No erosion problems experience on the site » Low abundance of alien plants.		
Monitoring	» Annual monitoring with records of alien species presence and clearing actions. » Annual monitoring with records of erosion problems and mitigation actions taken with photographs.		

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Appendix 1. Listed Plant Species

List of plant species of conservation concern which are known to occur in the broad vicinity of the Great Karoo BESS. The list is derived from the SIBIS:SABIF website. Only two of these species can be confirmed present within the BESS 500 assessment region.

Family	Species	Threat status
AMARYLLIDACEAE	*Brunsvigia josephinae (Redouté) Ker Gawl.*	VU
	Strumaria karooica (W.F.Barker) Snijman	Rare
	Strumaria pubescens W.F.Barker	Rare
ANTHERICACEAE	*Chlorophytum lewisiae Oberm.*	Rare
APOCYNACEAE	*Duvalia parviflora N.E.Br.*	VU
	Hoodia pilifera (L.f.) Plowes subsp. pilifera	NT
ASPHODELACEAE	*Astroloba herrei Uitewaal*	VU
	Bulbine torta N.E.Br.	Rare
	Haworthia fasciata (Willd.) Haw.	NT
	Gasteria disticha	CR
	Haworthia serrata	CR
	Haworthia pulchella M.B.Bayer var. pulchella	Rare
ASTERACEAE	*Cineraria lobata L'Hér. subsp. lasiocaulis Cron*	Rare
	Antithrixia flavicoma	VU
	Euryops namaquensis	VU
	Eriocephalus grandiflorus M.A.N.Müll.	Rare
	Phymaspermum thymelaeoides	LC
	Pteronia hutchinsoniana Compton	Rare
	Relhania tricephala (DC.) K.Bremer	NT
COLCHICACEA	*Wurmbea capensis*	VU
CRASSULACEAE	*Adromischus humilis (Marloth) Poelln.*	Rare
	Adromischus phillipsiae (Marloth) Poelln.	Rare
	Adromischus mammillaris	EN
	Crassula alpestris Thunb. subsp. massonii (Britten & Baker f.) Toelken	Rare
EUPHORBIACEAE	*Euphorbia nesemannii R.A.Dyer*	NT
FABACEAE	*Amphithalea spinosa (Harv.) A.L.Schutte*	VU
	Amphithalea villosa Schltr.	VU
	Lotononis comptonii B.-E.van Wyk	EN
	Lotononis gracilifolia B.-E.van Wyk	EN
	Lotononis venosa B.-E.van Wyk	VU
GERANIACEAE	*Pelargonium denticulatum Jacq.*	Rare
	Pelargonium torulosum E.M.Marais	Rare
HYACINTHACEAE	*Lachenalia maximiliani Schltr. ex W.F.Barker*	Rare
IRIDACEAE	*Geissorhiza inaequalis L.Bolus*	Rare
	Geissorhiza karooica Goldblatt	NT

	Ixia linearifolia Goldblatt & J.C.Manning	Rare
	Ixia parva Goldblatt & J.C.Manning	VU
	Moraea aspera Goldblatt	VU
	Romulea eburnea J.C.Manning & Goldblatt	VU
	Romulea syringodeoflora M.P.de Vos	VU
MESEMBRYANTHEMACEAE	***Cleretum lyratifolium Ihlenf. & Struck***	Rare
	Lampranthus amoenus (Salm-Dyck ex DC.) N.E.Br.	EN
OXALIDACEAE	*Oxalis tenuipes T.M.Salter var. tenuipes*	Rare
POACEAE	*Ehrharta eburnea Gibbs Russ.*	NT
POLYGALACEAE	*Muraltia karroica Levyns*	VU
RUTACEAE	*Acmadenia argillophila I.Williams*	NT
SCROPHULARIACEAE	*Globulariopsis wittebergensis Compton*	Rare
	Oftia glabra Compton	Rare
	Selago albomontana Hilliard	Rare

Appendix 2. List of Mammals

List of Mammals which potentially occur in or near the Great Karoo BESS site. Taxonomy and habitat notes are derived from Skinner & Chimimba (2005), while conservation status is according to the EWT/SANBI 2016 listing. Confirmed sightings are those for the area and not the site *per se*.

Scientific Name	Common Name	Status	Habitat	Likelihood
Afrosoricida (Golden Moles):				
Chlorotalpa sclateri	Sclater's Golden Mole	LC	Montane grasslands, scrub and forested kloofs of the Nama Karoo and grassland biomes	High
Chrysochloris asiatica	Cape Golden Mole	LC	Coastal parts of the Northern and Western Cape	High
Macroscledidea (Elephant Shrews):				
Macroscelides proboscideus	Round-eared Elephant Shrew	LC	Species of open country, with preference for shrub bush and sparse grass cover, also occur on hard gravel plains with sparse boulders for shelter, and on loose sandy soil provided there is some bush cover	High
Elephantulus edwardii	Cape Rock Elephant Shrew	LC	From rocky slopes, with or without vegetation, from hard sandy ground bearing little vegetation, quite small rocky outcrops	Confirmed
Tubulentata:				
Orycteropus afer	Aardvark	LC	Wide habitat tolerance, being found in open woodland, scrub and grassland, especially associated with sandy soil	Confirmed
Hyracoidea (Hyraxes)				
Procavia capensis	Rock Hyrax	LC	Outcrops of rocks, especially granite formations and dolomite intrusions in the Karoo. Also erosion gullies	Confirmed
Lagomorpha (Hares and Rabbits):				
Bunolagus monticularis	Riverine Rabbit	CR	Confined to riparian bush on the narrow alluvial fringe of seasonally dry watercourses in the Central Karoo.	V.Low
Pronolagus saundersiae	Hewitt's Red Rock Hare	LC	Confined to areas of krantzes, rocky hillsides, boulder-strewn koppies and rocky ravines	Confirmed
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	Confirmed
Lepus saxatilis	Scrub Hare	LC	Common in agriculturally developed areas, especially in crop-growing areas or in fallow lands where there is some bush development.	High
Rodentia (Rodents):				
Cryptomys hottentotus	African Mole Rat	LC	Wide diversity of substrates, from sandy soils to heavier compact substrates such as decomposed schists and stony soils	Confirmed
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Confirmed

Graphiurus ocularis	Spectacled Dormouse	LC	Associated with sandstones of Cape Fold mountains, which have many vertical and horizontal crevices.	High
Acomys subspinosus	Cape Spiny Mouse	LC	Associated with rocky areas on mountain slopes in Fynbos	Low
Rhabdomys pumilio	Four-striped Grass Mouse	LC	Essentially a grassland species, occurs in wide variety of habitats where there is good grass cover.	High
Mus minutoides	Pygmy Mouse	LC	Wide habitat tolerance	High
Steatomys krebsii	Kreb's African Fat Mouse	LC		
Micaelamys namaquensis	Namaqua Rock Mouse	LC	Catholic in their habitat requirements, but where there are rocky koppies, outcrops or boulder-strewn hillsides they use these preferentially	Confirmed
Micaelamys granti	Grant's Rock Mouse	LC	Restricted to the karoo where they are associated with rocky terrain.	High
Parotomys brantsii	Brants's Whistling Rat	LC	Associated with a dry sandy substrate in more arid parts of the Nama-karoo and Succulent Karoo. Species selects areas of low percentage of plant cover and areas with deep sands.	High
Parotomys littledalei	Littledale's Whistling Rat	LC	Riverine associations or associated with Lycium bushes or Psilocaulon absimile	Low
Otomys unisulcatus	Bush Vlei Rat	LC	Shrub and fynbos associations in areas with rocky outcrops Tend to avoid damp situations but exploit the semi-arid Karoo through behavioural adaptation.	Confirmed
Desmodillus auricularis	Cape Short-tailed Gerbil	LC	Tend to occur on hard ground, unlike other gerbil species, with some cover of grass or karroid bush	High
Gerbillurus paeba	Hairy-footed Gerbil	LC	Gerbils associated with Nama and Succulent Karoo preferring sandy soil or sandy alluvium with a grass, scrub or light woodland cover	High
Tatera afra	Cape Gerbil	LC	Confined to areas of loose, sandy soils of sandy alluvium. Common on cultivated lands.	Low
Malacothrix typica	Gerbil Mouse	LC	Found predominantly in Nama and Succulent Karoo biomes, in areas with a mean annual rainfall of 150-500 mm.	High
Dendromus melanotis	Grey Climbing Mouse	LC	Often associated with stands of tall grass especially if thickened with bushes and other vegetation	High
Primates:				
Papio hamadryas	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Confirmed
Eulipotyphla (Shrews):				
Myosorex varius	Forest Shrew	LC	Prefers moist, densely vegetated habitat	High

Crocidura cyanea	Reddish-Grey Musk Shrew	LC	Occurs in relatively dry terrain, with a mean annual rainfall of less than 500 mm. Occur in karroid scrub and in fynbos often in association with rocks.	High
Carnivora:				
Proteles cristatus	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	Confirmed
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	Confirmed
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	Confirmed
Panthera pardus	Leopard	VU	Wide habitat tolerance, associated with areas of rocky koppies and hills, mountain ranges and forest	Low/Moderate
Felis nigripes	Black-footed cat	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub.	High
Genetta genetta	Small-spotted genet	LC	Occur in open arid associations	High
Genetta tigrina	Large-spotted genet	LC	Fynbos and savanna particularly along riverine areas	Low
Suricata suricatta	Meerkat	LC	Open arid country where substrate is hard and stony. Occur in Nama and Succulent Karoo but also fynbos	Confirmed
Cynictis penicillata	Yellow Mongoose	LC	Semi-arid country on a sandy substrate	Confirmed
Galerella pulverulenta	Cape Grey Mongoose	LC	Wide habitat tolerance	Confirmed
Vulpes chama	Cape Fox	LC	Associated with open country, open grassland, grassland with scattered thickets and coastal or semi-desert scrub	High
Canis mesomelas	Black-backed Jackal	LC	Wide habitat tolerance, more common in drier areas.	Confirmed
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	Confirmed
Aonyx capensis	Cape Clawless Otter	NT	Predominantly aquatic and do not occur far from permanent water	Medium
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	Confirmed
Mellivora capensis	Ratel/Honey Badger	LC	Catholic habitat requirements	High
Rumanantia (Antelope):				
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	Confirmed
Pelea capreolus	Grey Rhebok	NT	Associated with rocky hills, rocky mountainsides, mountain plateaux with good grass cover.	Confirmed
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Confirmed
Raphicerus campestris	Steenbok	LC	Inhabits open country,	Confirmed

Raphicerus melanotis	Cape Grysbok	LC	Thick scrub bush, particularly along the lower levels of hills	Medium
Oreotragus oreotragus	Klipspringer	LC	Closely confined to rocky habitat.	Confirmed

Appendix 3. List of Reptiles.

List of reptiles which are known from the broad area around the Great Karoo BESS site, according to the SARCA database. Species in bold are those observed at or near the site.

Family	Genus	Species	Subspecies	Common name	Red list category
Agamidae	***Agama***	***atra***		**Southern Rock Agama**	**Least Concern**
Agamidae	*Agama*	*hispida*		Spiny Ground Agama	Least Concern
Atractaspididae	*Homoroselaps*	*lacteus*		Spotted Harlequin Snake	Least Concern
Chamaeleonidae	*Bradypodion*	*gutturale*		Little Karoo Dwarf Chameleon	Least Concern
Chamaeleonidae	*Chamaeleo*	*namaquensis*		Namaqua Chameleon	Least Concern
Colubridae	*Psammophis*	*crucifer*		Cross-marked Grass Snake	Least Concern
Colubridae	*Pseudaspis*	*cana*		Mole Snake	Least Concern
Colubridae	Dasypeltis	scabra		Rhombic Egg-eater	Least Concern
Colubridae	*Dipsina*	*multimaculata*		Dwarf Beaked Snake	Least Concern
Cordylidae	*Cordylus*	*minor*		Western Dwarf Girdled Lizard	Least Concern
Cordylidae	*Hemicordylus*	*capensis*		Graceful Crag Lizard	Least Concern
Cordylidae	***Karusasaurus***	***polyzonus***		**Karoo Girdled Lizard**	**Least Concern**
Cordylidae	*Pseudocordylus*	*microlepidotus*	*namaquensis*	Nuweveldberg Crag Lizard	Least Concern
Elapidae	*Hemachatus*	*haemachatus*		Rinkhals	Least Concern
Elapidae	*Naja*	*nigricincta*	*woodi*	Black Spitting Cobra	Least Concern
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not Listed
Gekkonidae	*Chondrodactylus*	*angulifer*	*angulifer*	Common Giant Ground Gecko	Least Concern
Gekkonidae	***Chondrodactylus***	***bibronii***		**Bibron's Gecko**	**Least Concern**
Gekkonidae	***Pachydactylus***	***capensis***		**Cape Gecko**	**Least Concern**
Gekkonidae	*Pachydactylus*	*formosus*		Southern Rough Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*geitje*		Ocellated Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*kladaroderma*		Thin-skinned Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*maculatus*		Spotted Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*mariquensis*		Marico Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*oculatus*		Golden Spotted Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*purcelli*		Purcell's Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*weberi*		Weber's Gecko	Least Concern

Gerrhosauridae	*Cordylosaurus*	*subtessellatus*		Dwarf Plated Lizard	Least Concern
Gerrhosauridae	*Tetradactylus*	*tetradactylus*		Cape Long-tailed Seps	Least Concern
Lacertidae	*Nucras*	*tessellata*		Western Sandveld Lizard	Least Concern
Lacertidae	*Pedioplanis*	*burchelli*		Burchell's Sand Lizard	Least Concern
Lacertidae	***Pedioplanis***	***laticeps***		**Karoo Sand Lizard**	**Least Concern**
Lacertidae	***Pedioplanis***	***lineoocellata***	***pulchella***	**Common Sand Lizard**	**Least Concern**
Leptotyphlopidae	*Namibiana*	*gracilior*		Slender Thread Snake	Least Concern
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern
Lamprophiidae	*Prosymna*	*sundevallii*		Sundevall's Shovel-snout	Least Concern
Lamprophiidae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern
Lamprophiidae	*Psammophylax*	*rhombeatus*	*rhombeatus*	Spotted Grass Snake	Least Concern
Scincidae	***Trachylepis***	***capensis***		**Cape Skink**	**Least Concern**
Scincidae	***Trachylepis***	***sulcata***	***sulcata***	**Western Rock Skink**	**Least Concern**
Scincidae	***Trachylepis***	***variegata***		**Variegated Skink**	**Least Concern**
Testudinidae	***Chersina***	***angulata***		**Angulate Tortoise**	**Least Concern**
Testudinidae	*Homopus*	*areolatus*		Parrot-beaked Tortoise	Least Concern
Testudinidae	*Homopus*	*boulengeri*		Karoo Padloper	Near Threatened
Testudinidae	*Homopus*	*femoralis*		Greater Padloper	Least Concern
Testudinidae	***Psammobates***	***tentorius***	***tentorius***	**Karoo Tent Tortoise**	**Not listed**
Testudinidae	*Psammobates*	*tentorius*	*verroxii*	Verrox's Tent Tortoise	Not listed
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern
Viperidae	***Bitis***	***arietans***	***arietans***	**Puff Adder**	**Least Concern**

Appendix 4. List of Amphibians

List of amphibians which potentially occur in or near the Great Karoo BESS site. Taxonomy and habitat notes are from du Preez and Carruthers (2009) and conservation status from the IUCN 2020. (Status: LC = Least Concern, DD = Data Deficient).

Scientific Name	Common Name	Status	Habitat	Distribution	Likelihood
Amietophrynus rangeri	Raucous Toad	Not Threatened	Rivers and stream in grassland and fynbos	Endemic	High
Vandijkophrynus gariepensis	Karoo Toad	Not Threatened	Karoo Scrub	Widespread	High
Xenopus laevis	Common Platanna	Not Threatened	Any more or less permanent water	Widespread	High
Cacosternum boettgeri	Common Caco	Not Threatened	Marshy areas, vleis and shallow pans	Widespread	High
Amietia fuscigula	Cape River Frog	Not Threatened	Large still bodies of water or permanent streams and rivers.	Widespread	Confirmed
Cacosternum karooicum	Karoo Caco	DD	Dry kloofs and valleys in the Karoo	Endemic	High
Cacosternum karooicum	Karoo Dainty Frog	DD	Arid areas with unpredictable rainfall. Breeds in small streams as well as man-made dams.	Karoo Endemic	High
Tomopterna delalandii	Cape Sand Frog	Not Threatened	Lowlands in fynbos and Succulent Karoo	Endemic	High
Tomopterna tandyi	Tandy's Sand Frog	Not Threatened	Nama karoo grassland and savanna	Widespread	High

Appendix 5. List of Avifauna

A consolidated avifaunal list for the Great Karoo BESS project site and surrounds, including conservation status (Taylor et al., 2015), regional endemism (BirdLife South Africa, 2019), biome-restriction (Taylor et al., 2015), and SABAP1 and SABAP2 reporting rates (%). Codes for conservation status are: EN=Endangered; V = Vulnerable; NT = Near-threatened, and codes for endemism: E=Endemic, NE=Near-endemic.

Species	Conservation Status	Endemic/ Near-endemic	Biome-restricted	SABAP1 Reporting Rate (%)	SABAP 2 Reporting Rate	
				3220DC	3245_2040	3250_2040
Number of cards submitted				17	3	9
Number of species recorded				98	67	76
Avocet, Pied				6	33	
Barbet, Acacia Pied				29		11
Batis, Pririt				12		
Bee-eater, European				12		
Bishop, Southern Red					33	Ad hoc
Bokmakierie				59	100	89
Bulbul, Cape		E	X	71		11
Bunting, Cape					100	44
Bunting, Lark-like					33	
Bustard, Ludwig's	EN		X	6		
Buzzard, Common (Steppe)				18		
Buzzard, Jackal		NE		6	67	56
Canary, Black-headed		NE	X	24	67	11
Canary, Cape						22
Canary, White-throated				53	67	11
Canary, Yellow				59	67	44
Chat, Anteating				18	100	11
Chat, Familiar				35	33	78
Chat, Karoo			X	71	33	11
Chat, Sickle-winged		NE	X	24	33	22
Chat, Tractrac			X		33	
Cisticola, Grey-backed				47	100	11

Coot, Red-knobbed				6		Ad hoc
Cormorant, Reed						
Cormorant, White-breasted						
Crane, Blue	NT					
Crombec, Long-billed				12		
Crow, Cape				18		
Crow, Pied				29	67	78
Dove, Cape Turtle (Ring-necked)				59	67	22
Dove, Laughing				29	33	33
Dove, Namaqua					33	11
Dove, Red-eyed						
Duck, African Black				12		11
Duck, Maccoa						
Duck, Yellow-billed				24		11
Eagle, Black-chested Snake						
Eagle, Booted				6	33	
Eagle, Martial	EN			6		22
Eagle, Verreaux's	VU			6	67	
Egret, Western Cattle				6		
Eremomela, Karoo		NE	X			
Eremomela, Yellow-bellied				12	67	
Falcon, Lanner	VU					
Fiscal, Southern (Common)				88	100	89
Flamingo, Greater	NT					
Flycatcher, Fairy		NE				11
Flycatcher, Fiscal		NE		6		11
Francolin, Grey-winged		SLS		6	33	
Goose, Egyptian				41	100	78
Goose, Spur-winged					67	44
Goshawk, Pale Chanting				41		22
Grebe, Little						
Greenshank, Common				6	33	
Guineafowl, Helmeted				6		100
Harrier, Black	EN	NE		12		

Heron, Black-headed				12	33	
Heron, Grey				12		
Honeyguide, Lesser						11
Hoopoe, African				6		
Ibis, African Sacred				12		22
Ibis, Hadeda				18	67	78
Kestrel, Rock				59	67	56
Kite, Black-winged				29		
Korhaan, Karoo	NT		X			11
Korhaan, Southern Black	VU	E		18	33	
Lapwing, Blacksmith				29		22
Lapwing, Crowned				6	33	22
Lark, Cape Clapper		NE		12	33	
Lark, Karoo		NE	X	6	100	
Lark, Karoo Long-billed			X	18	100	11
Lark, Large-billed		NE		41	67	22
Lark, Red-capped				12	67	11
Lark, Spike-heeled				24		11
Martin, Brown-throated				24		
Martin, Rock				47	100	56
Moorhen, Common					33	
Mousebird, Red-faced						11
Mousebird, White-backed				29	100	56
Nightjar, Rufous-cheeked						11
Owl, Cape Eagle-						
Owl, Spotted Eagle-				6		100
Penduline-tit, Cape					33	
Pigeon, Speckled				35		56
Pipit, African				12	67	11
Pipit, African Rock	NT	SLS				
Pipit, Long-billed				6		
Plover, Kittlitz's					33	
Plover, Three-banded				24	67	11
Prinia, Karoo		NE		53	67	33

Raven, White-necked				18	33	22
Robin-chat, Cape				18		89
Robin, Karoo Scrub				59	100	11
Sandgrouse, Namaqua				6	33	33
Sandpiper, Wood				6		
Shelduck, South African				53	100	78
Shoveler, Cape						
Sparrow, Cape				71	100	78
Sparrow, House				29		56
Sparrow, Southern Grey-headed						11
Sparrowhawk, Rufous-breasted					Ad hoc	22
Spoonbill, African				18		
Spurfowl, Cape		NE	X	35	100	56
Starling, Common						67
Starling, Pale-winged			X	18		
Starling, Pied		SLS		59	100	100
Starling, Wattled				6		11
Stilt, Black-winged						Ad hoc
Stint, Little						
Stonechat, African					33	
Stork, Black	VU			6		
Sunbird, Dusky						
Sunbird, Malachite				18	67	22
Sunbird, Southern Double-collared		NE		18		22
Swallow, Barn				18		
Swallow, Greater Striped				18	33	44
Swift, African Black				6		
Swift, Alpine				6		
Swift, Common				6		
Swift, Little						11
Swift, White-rumped				6		22
Teal, Cape				6	33	
Thick-knee, Spotted						11

Thrush, Karoo		NE				44
Thrush, Olive						22
Tit-babbler (Warbler), Chestnut-vented				18	33	
Tit-babbler (Warbler), Layard's		NE	X	6		
Tit, Grey		NE		35	33	
Wagtail, Cape				71	67	44
Warbler, Cinnamon-breasted		NE	X			
Warbler, Lesser Swamp					33	
Warbler, Namaqua		NE	X	18	33	11
Warbler, Rufous-eared				18	33	
Waxbill, Common				24	67	11
Weaver, Cape		NE		18	100	56
Weaver, Southern Masked				47	67	44
Wheatear, Capped				12	33	
Wheatear, Mountain				41	100	22
White-eye, Cape		NE				11
Woodpecker, Ground		SLS		6		