BASIC ASSESSMENT FOR THE PROPOSED AGGENEYS 1 SEF AND ASSOCIATED INFRASTRUCTURE:

FAUNA & FLORA SPECIALIST STUDY

savannah environmental

PRODUCED FOR SAVANNAH ENVIRONMENTAL

BY

3Foxes Biodiversity Solutions

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EXECUTIVE SUMMARY

ABO Wind Aggeneys 1 PV (Pty) Ltd is proposing the establishment of a 100MW commercial Photovoltaic (PV) solar energy facility (SEF) and associated infrastructure, called Aggeneys 1, on the Remainder of the Farm Bloemhoek 61, situated in the Namakwa Municipality in the Northern Cape Province near Aggeneys. As the site falls within the Springbok REDZ, a Basic Assessment (BA) process is required for authorisation. Savannah Environmental has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial biodiversity EIA study of the project site as part of the required BA process.

A field assessment as well as a desktop review of the available ecological information for the area was conducted in order to identify and characterise the ecological features of the project site. The vegetation of the Aggeneys project site consists of Bushmanland Arid grassland which is a very extensive vegetation type. As Bushmanland Arid Grassland is one of the most extensive vegetation types in South Africa, the loss of habitat within this vegetation type due to renewable energy development is not considered a significant threat at this point. However, as there are numerous planned renewable energy facilities in the area, a major concern associated with the development would be around the impacts on landscape connectivity more locally. The major corridors of the area, such as the Koa River valley south of the site and the mountain chain north of the site would however not be impacted by the current development and are also still largely free from development impact more generally. The location of the current project adjacent to the Loop 10 road is also a mitigating circumstance which would serve to reduce the cumulative impact associated with the current development.

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 some habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur as a result of the Aggeneys 1 development. Overall, there are no potential impacts associated with the proposed development that are considered to be of high significance and which cannot be mitigated to an acceptable level. As such, there are no fatal flaws or other major impediments from an ecological perspective that should prevent the development from going ahead.

<u>Impact Statement</u>

The development footprint of the Aggeneys 1 facility is restricted to low and moderate sensitivity habitat associated with Bushmanland Arid Grassland which is a highly extensive vegetation type typically with low levels of diversity. There are no highly sensitive features within the development footprint and the affected area is considered suitable for development. As such, there are no impacts associated with the Aggeneys 1 facility that cannot be mitigated to a low level. Although cumulative impacts in the wider Aggeneys area are currently on the increase due to the expansion of the mine at Black Mountain and

the proliferation of solar PV facilities in the area, these still occupy a small proportion of the wider area and the contribution of the current development to cumulative impact would be low and is considered acceptable. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, the Aggeneys 1 facility can be supported from a terrestrial ecology point of view.

CONTENTS

COMPLIANCE WITH APPENDIX 6 OF THE 2014 EIA REGULATIONS, AS AMENDED

Requirements of Appendix 6 – GN R326 2014 EIA Regulations, 7 April 2017	**Addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	6
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	7
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 3
g) an identification of any areas to be avoided, including buffers;	Section 3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2.3
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 3
k) any mitigation measures for inclusion in the EMPr;	Section 5
l) any conditions for inclusion in the environmental authorisation;	Section 5
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 5
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	See Main Report
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Main Report
q) any other information requested by the competent authority.	
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

SHORT CV/SUMMARY OF EXPERTISE – SIMON TODD

3Foxes Biodiversity Solutions
ECOLOGICAL SPECIALIST SERVICES
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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 Solar 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

- Kathu Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Mogobe Solar PV Facility. Fauna and Flora EIA Proces. Cape EAPrac 2015.
- Logoko Solar PV Facility. Fauna and Flora EIA Proces. Cape EAPrac 2015.
- RE Capital 10 Solar Power Plant, Postmasburg. Fauna and Flora EIA Proces. Cape EAPrac 2015.
- Walk-through study of Kumba Iron Ore expansion area at Dingleton, Northern Cape. MSA Group. 2017.
- Adams PV Project – EIA process and follow-up vegetation survey. Aurora Power Solutions. 2016.
- Mamatwane Compilation Yard. Fauna and Flora EIA process. ERM. 2013.
- Olifantshoek-Emil 132kV power line. Fauna and Flora BA process. Savannah Environmental 2017.

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: ____20 March 2019_____

1 INTRODUCTION

ABO Wind Aggeneys 1 PV (Pty) Ltd is proposing the establishment of a 100MW commercial Photovoltaic (PV) solar energy facility (SEF) and associated infrastructure, called Aggeneys 1, on the Remainder of Farm Bloemhoek 61, in the Northern Cape Province. As the development area falls within the Springbok REDZ, a Basic Assessment (BA) process would be required for authorisation. A grid connection to the nearby Aggeneys Substation would also be required, but this will be assessed through an independent BA process. Savannah Environmental (Pty) Ltd has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial biodiversity BA study of the project site as part of the required BA process.

The purpose of the Aggeneys 1 Terrestrial Biodiversity BA Specialist Report is to describe and detail the ecological features of the project site; provide an assessment of the ecological sensitivity of the project site; and identify the likely impacts that would be associated with the development of a solar energy facility on the project site. Two site visits as well as a desktop review of the available ecological information for the area were conducted in order to identify and characterise the ecological features of the project area. This information is used to derive an ecological sensitivity map which has been used to inform the layout of the development. 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 EMPr for the development. The full scope of study is detailed below.

SCOPE OF STUDY

The scope of the study includes the following activities:

- 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 development
- 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 the proposed 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
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (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 (EIS) which contains:
  - a summary of the key findings of the EIA;
  - an assessment of the positive and negative implications of the proposed development;
  - 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 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:

- Preconstruction and Construction
- Operational Phase
- Decommissioning Phase

1.1 ASSESSMENT APPROACH & PHILOSOPHY

This assessment is conducted according to the 2014 EIA Regulations (Government Notice Regulation 326, as amended) 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 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 the proposed development 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:

- A description of 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 project 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 project 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 project site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the project site or in 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 EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the proposed development will be identified.
- The opportunities and constraints for proposed 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

ABO Wind Aggeneys 1 PV (Pty) Ltd is proposing to develop a 100MW solar energy facility on the Remaining Extent of the Farm Bloemhoek 61 (the project site), which is located

approximately 16km east of Aggeneys in the Namakwa District Municipality in the Northern Cape Province.

The proposed project will comprise the following key infrastructure and components:

- Arrays of PV panels (static or tracking PV system) with a contracted capacity of up to 100MW.
- Mounting structures to support the PV panels.
- On-site inverters (to convert the power from Direct Current (DC) to Alternating Current (AC)), and distribution power transformers.
- An on-site substation to facilitate the connection between the project and the Eskom electricity grid.
- Cabling between the project's components (to be laid underground where practical).
- Site Offices and Maintenance Buildings, including workshop areas for maintenance and storage.
- Temporary laydown area.
- Main access road to the site, internal access roads and fencing around the development 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 2012 Powrie 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 project site, but this is necessary to ensure a conservative approach as well as counter the fact that the project 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 (2018).

Ecosystem

- Critical Biodiversity Areas (CBAs) were extracted from the Northern Cape Critical Biodiversity Areas Map (Oosthuysen & Holness 2016).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment (NFEPA) (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the project 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.
- Apart from the literature sources, additional information on fauna was extracted from the Animal Demography Unit (ADU) web portal http://vmus.adu.org.za
- 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 project 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 (2018).

2.2 Site Visits & Field Assessment

The site was visited initially on the 16th of June 2018 and then several site condition checks were conducted at the site to verify the field conditions and ensure that the site could be sampled at an optimal time of year as per DEA requirement. The final site visit was conducted on the 5th to 8th of April 2019. During the site visits, the different biodiversity features, habitat, and landscape units present at the site were identified and mapped in the field. Specific features visible on the satellite imagery of the site were also marked for field inspection and were verified and assessed during the site visit. Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such. The presence of sensitive habitats such as stands of large trees, pans or rocky outcrops were noted in the field where present and recorded on a GPS.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery as well as personal knowledge of the project site. 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/No-Go** – 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 as much as possible.

2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

The current study included two sites visits with associated field assessment which took place across different seasons as well as a desktop study. This serves to significantly reduce the limitations and assumptions required for the study. During the period of the current assessment, the vegetation was in a reasonably good condition for sampling at the time of the first field assessment as there had been some late season rainfall prior to the initial field assessment. Although the second field assessment took place during the typical wet season for the area, conditions were relatively poor as there has been a prolonged drought in the area with very little rain in the preceding period. Although it is likely that some forbs and

annuals were missed during the field assessment, there are few species of concern within the affected area and this is not seen as a significant limitation of the current study. In addition, the species of concern which occur in the area are associated with specific habitats such as quartz patches and these were not observed within the development footprint or where present were inspected in the field and were not observed to have any species of concern. Although conditions were not ideal for the field assessment, the consultant has extensive experience in the area, having worked on most of the adjacent properties on solar or mining projects over the past few years. This information is used to inform the current study where appropriate. This serves to reduce the required assumptions for the study to an acceptable level.

In terms of fauna, there are always some limitations present due to the relatively short duration of the site visits and the difficultly in confirming the presence of many species. However, the consultant is very familiar with the fauna of the area, having worked extensively in the area on various projects over the course of several years. This includes camera trapping surveys on the adjacent properties and within similar habitats to those affected by the current study. In terms of the available databases, many remote areas have not been well-sampled in the past with the result that the species lists derived from the available spatial databases for the area do not always adequately reflect the actual fauna present at the project site. This is acknowledged as a limitation of the study, however, it is substantially reduced given the previous experience in the area. In order to further reduce this limitation, and ensure a conservative approach, the species lists derived for the project site from the literature were obtained from an area significantly larger than the project site and are likely to include a much wider array of species than actually occur at the project site. This is a cautious and conservative approach which takes the study limitations into account.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006, 2012 Powrie Update), the project site is restricted to the Bushmanland Sandy Grassland vegetation type (Figure 1). However, according to the as yet unpublished 2017 Vegmap, the affected area has been reclassified as falling within the Bushmanland Arid Grassland vegetation type. As the Bushmanland Sandy Grassland vegetation type characteristically occurs on dunes or deep red sands dominated by *Stipagrostis brevifolia*, this does not align well with the features and vegetation of the development footprint and it is clear that the most recent reclassification to Bushmanland Arid Grassland can be considered the most representative interpretation of the vegetation of the affected area. Bushmanland Sandy Grassland is still

present at the site but is restricted to the area south of the development footprint within the Koa River valley.

The Bushmanland Arid Grassland vegetation type is an extensive vegetation type and is the second most extensive vegetation type in South Africa, occupying an area of 45 478 km^2. It extends from the study area around Aggeneys in the east to Prieska in the west. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300mm deep. Due to the arid nature of the unit which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact. Mucina & Rutherford (2006) list 6 endemic species for the vegetation type which is a relatively low number given the extensive nature of the vegetation type. Although a description of the dominant and characteristic species associated with this vegetation type is provided in Mucina & Rutherford, this is not repeated here, as the actual vegetation as observed at the site is described in Section 3.2. Given the large extent of Bushmanland Arid Grassland, the development would not significantly impact the extent of intact habitat of this vegetation type.

Although there are a variety of other vegetation types in the area, these are outside of the development footprint and would not be directly affected by the development and as a result are not considered in any further detail here.

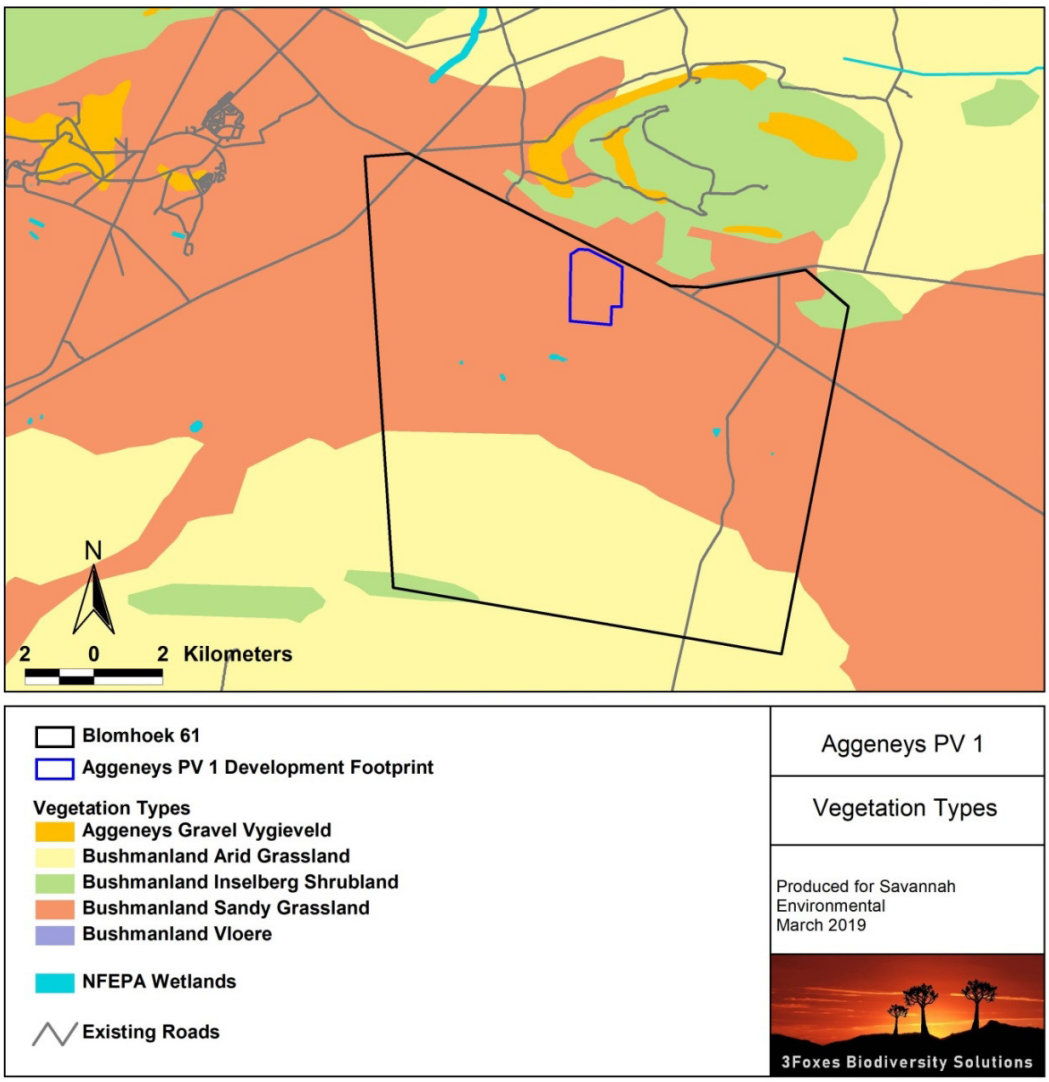

Figure 1. Broad-scale overview of the vegetation in and around the Aggeneys 1 site. The vegetation map is an extract of the national vegetation map as produced by Mucina and Rutherford (2006/2012), and also includes drainage lines and wetlands delineated under the NFEPA assessment (Nel et al. 2011). Although the map indicates that the site falls within the Bushmanland Sandy Grassland vegetation type, this is not correct and the vegetation rather consists of Bushmanland Arid Grassland.

3.2 Habitats & Plant Communities

The habitats of the broader site are described and illustrated below. This includes habitats that are not within the development footprint. These are included here in order to provide the broader context of the site and place the affected area within the proper context of the surrounding landscape.

Bushmanland Sandy Grassland Dunes

To the south of the site is the Koa River valley which consists largely of undulating red dunes. Dominant species include grasses such as *Stipagrostis ciliata*, *S.brevifolia*, *Cladoraphis spinosa*, *Leucophrys mesocoma* and *Brachiaria glomerata*; shrubs such as *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Hermannia gariepina* and forbs such as *Limeum sulcatum*, *Requienia sphaerosperma*, *Sesamum capense*, *Tribulis cristatus*, *Citrullus lanatus*, *Asparagus retrofractus* and *Gisekia pharnacioides* var *pharnacioides*. This is considered to be a sensitive habitat that is not suitable for development, firstly due to the general sensitivity of the habitat to disturbance and secondly as this is the known habitat of the Red Lark. Under the final layout assessed, the dunes are more than 1km from the development footprint and would not be affected by the development.

Figure 2. The red dunes which occur south of the development area are sensitive and not considered suitable for development and would not be affected.

Rocky Outcrops

Figure 3. The small rocky outcrop which occurs east of the Aggeneys 1 footprint area.

There is a small rocky outcrop east of the Aggeneys 1 footprint area. Although this is small and not considered to be of particular importance within the context of the local landscape, it contributes to the diversity of the plains as it represents a small isolated island of rocky habitat that is not available elsewhere south of the Loop 10 road. It is considered to be of higher sensitivity than the surrounding plains as it is likely to be hotspot of reptile and small mammal diversity.

Sandy Plains

Between the deep sands of the Koa River valley and the shallow pediments which occur around the base of the Gamsberg and adjacent inselbergs north of the site, is a band of shallow, relatively coarse red sands dominated by perennial grasses with scattered shrubs. This includes the southern parts of the Aggeneys 1 footprint. Dominant species include the grasses *Stipagrostis ciliata*, *S.obtusa*, *S.anomala* and *Aristida adscenionis*, and low woody shrubs such as *Hermannia spinosa*, *Lycium cinereum*, *Salsola rabieana*, *Asparagus capensis*, *Galenia africana*, *Melolobium candicans*, *Eriocephalus spinescens*, *Zygophyllum retrofractum*, *Pteronia glomerata*, *Rhigozum trichotomum* and *Aptosimum spinescens.* The abundance of listed or protected species within this habitat is low and apart from a low density of *Hoodia gordonii*, no other significant species were observed. As this habitat is widely available in the area, it is not considered sensitive and the development of the affected area would generate low ecological impacts on local fauna and flora.

Figure 4. The southern parts of the Aggeneys 1 footprint consist of open plains dominated by a sparse cover of perennial grasses with scattered woody shrubs. This is not considered to be a sensitive habitat.

Gravel Plains

Towards the Loop 10 road the soils of the site are shallow and usually skeletal over ferricrete, which is often exposed. The vegetation cover in this area is usually low, with large bare areas where the ferricrete is exposed. Common and dominant species include grasses such as *Stipagrostis ciliata*, *S.obtusa*, *S.anomala*, *Aristida adscenionis* and *Enneapogon scaber*, and low woody shrubs such as *Hermannia spinosa*, *Lycium cinereum*, *Salsola rabieana*, *Asparagus capensis*, *Galenia africana*, *Tetragonia arbuscula*, *Eriocephalus spinescens*, *Zygophyllum retrofractum*, *Pteronia glomerata*, *Rhigozum trichotomum* and *Aptosimum spinescens* as well as forbs such as *Zygophyllum simplex*, *Tribulis zeyheri*, *Leysera tenella*, *Galenia sarcophylla*, *Hypertelis salsoloides*, *Sesamum capense*, *Gazania lichtensteinii*, *Augea capensis* and *Mesembryanthemum crystalinum*. Areas of exposed ferricrete in the Agggeneys area may contain soil pockets with species of concern present such as various *Conophytum* or *Lithops* species. However, the areas of exposed ferricrete at the site were inspected in the field and no such species were observed within the development footprint, although *Lithops julii* subsp *fulleri* was observed near the Loop 10 road west of the development footprint. The abundance of listed or protected species within this habitat is low and no species of concern were observed within the development footprint within this habitat.

Figure 5. Looking south from near the northern boundary of the Aggeneys 1 site, showing the low vegetation cover that typically occurs on the shallow soils along the northern margin of the site.

3.3 Listed and Protected Plant Species

Although there are a large number of listed and protected plant species known from the wider area, these are associated with specific habitats and vegetation types which do not occur within the study area. The Gamsberg as well as the other massifs and hills in the area generally contain a high abundance of species of concern, and these are often associated with the Aggeneys Gravel Vygieveld vegetation type or specific habitats such as quartzite outcrops and gravel plains. Within the site no such habitats were observed to occur and species of conservation concern present are restricted to more widespread species such as the provincially protected *Boscia foetida* subsp *foetida*, and *Hoodia gordonii*. The areas of exposed ferricrete can also frequently contain species of concern such as various *Lithops* and *Conophytum*, but no such species were observed within the development footprint, although *Lithops julii* subsp *fulleri* was observed west of the Aggeneys 1 footprint area (Figure 6). Overall, the abundance of plant species of conservation concern within the site is low and no significant impacts on such species can be expected.

Figure 6. *Lithops julii* subsp *fulleri* was observed on the gravel plains near to the Loop 10 road. This area was however demarcated as a no-go area for development and the current layout avoids this area entirely.

3.4 FAUNAL COMMUNITIES

3.4.1 Mammals

The mammalian community at the project site is likely to be of moderate to low diversity. Although more than 50 species of terrestrial mammals are known from the wider area, the extent and habitat diversity of the project site is too low to support a very wide range of mammals. Species that can be confirmed present in the area based on camera trapping and previous site visits to the area include Caracal, Black-backed Jackal, African Wildcat, Cape Fox, Chacma Baboon, Rock Hyrax, South African Ground Squirrel, Steenbok, Duiker, Springbok, Gemsbok, Cape Porcupine, Yellow Mongoose, Cape Grey Mongoose, Small-spotted Genet, Striped Polecat, Cape Hare, Springhare, Aardvark, Aardwolf and Round-eared Elephant Shrew.

Species associated with the rocky outcrops of the area include Rock Hyrax, Klipspringer, Pygmy Rock Mouse, Namaqua Rock Mouse and Western Rock Elephant Shrew. The open plains which characterise the development area are likely to be dominated by species associated with open hard or sandy ground such as various gerbils including the Hairy-footed Gerbil, Cape Hare, Steenbok, Cape Fox, Bat-eared Fox, Aardvark and Aardwolf. There are also burrows of Ground Squirrels and Yellow Mongoose at the site and these appear to be the most common fauna within the development area. There are no areas of particular significance for mammals at the site as the habitat is repetitive and broadly homogenous.

Two listed species may occur in the area, the Black-footed Cat *Felis nigripes* (Vulnerable) and Leopard *Panthera pardus* (Vulnerable). Given the extremely low cover at the site it is not likely that Leopard are present within the affected area. The habitat is however broadly suitable for the Black-footed Cat, which favours a mix of open and more densely vegetated areas. This species is however widely distributed across the arid and semi-arid areas of South Africa and the development would not amount to a significant amount of habitat loss for this species.

The major impact associated with the development of the site for mammals would be habitat loss for resident species and potentially some disruption of the broad-scale connectivity of the landscape.

3.4.2 Reptiles

Although reptile diversity in the broader area is high with as many as 60 species known from the area, only a fraction of this is likely to be present within the site. A large proportion of the reptiles of the area consist of species associated with the inselbergs and rocky hills along the Orange River and would not occur on the open plains characteristic of the site. More typical plains species are likely to dominate the study area such as Verrox's Tent Tortoise *Psammobates tentorius verroxii*, Namaqua Sand Lizard *Pedioplanis namaquensis*, Spotted Desert Lizard *Meroles suborbitalis*, Southern Rock Agama *Agama atra* and Plain Sand Lizard *Pedioplanis inornata*.

As with mammals, there are not likely to be any highly significant impacts on reptiles outside of some habitat loss resulting from the development. There are no specialized reptile habitats within the development footprint which is restricted to the open plains habitat which is widespread in the area. Some species such as geckos will probably increase within the development on account of the increased vertical structure and shelter provided by the panels and their supports and other associated buildings of the development.

3.4.3 Amphibians

Only eight frog species are known from the area around the site and even this is a gross overestimate of the number of amphibian species likely to be present within the site. There are few freshwater features present and only species able to live independently of water will be present at the site. As such the only species likely to be present within the site would be the Karoo Toad *Vandijkophrynus gariepensis*. Given the very low likely abundance of amphibians at the site, impacts on amphibians are likely to be local in extent and of low significance.

3.5 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

An extract of the Northern Cape Critical Biodiversity Areas map for the study area is depicted below in Figure 7. The development area lies within an Ecological Support Area, which are generally areas identified as important buffer areas for CBAs or which may be important for ecological processes such as landscape connectivity. Development within these areas should take cognisance of these factors and ensure that the overall functioning of the ESA is not compromised. In the current case, it is not clear why the area has been identified as an ESA, but presumably this is due to the large amount of CBAs in the area and the need to buffer these areas and ensure connectivity of the landscape. The area to the west of the site is the Vedanta Black Mountain "Game Camp" and is a CBA2 as is the dune system of the Koa River south of the site. To the north of the site is the Gamsberg massif and the other adjacent mountains, which are all classified as CBA1 on account of the high biodiversity value of this area. The proposed development site lies adjacent to the Loop 10 road, which would decrease its value for fauna and is within an area with low flora diversity and low abundance of species of conservation concern. As there are still extensive intact areas in the immediate area that would not be affected by development, it is highly unlikely that the development of the Aggeneys 1 development would impact the functioning of the adjacent CBAs. As such, the development is considered acceptable in terms of its potential impact on CBAs and the broad-scale ecological functioning of the area.

In terms of conservation planning, the site does not fall within a Northern Cape Protected Area Expansion Strategy Focus Area (NC-PAES) and as such is not currently considered important for meeting conservation targets. The site does fall within the older Kamiesberg-Bushmanland-Augrabies Focus Area of the 2011 NPAES. This has however been superseded by the 2016 NPAES. While the draft 2016 NPAES policy document is publically available, the associated spatial coverages are still not currently available for public download and as result it is difficult to tell whether the site falls within the current focus areas, although it appears to fall within a gap within these areas. While there are certainly a large amount of significant biodiversity features within the wider Aggeneys area that have been earmarked for conservation area expansion, the development area falls within a low-value habitat that in its own right is clearly not a local or regional priority.

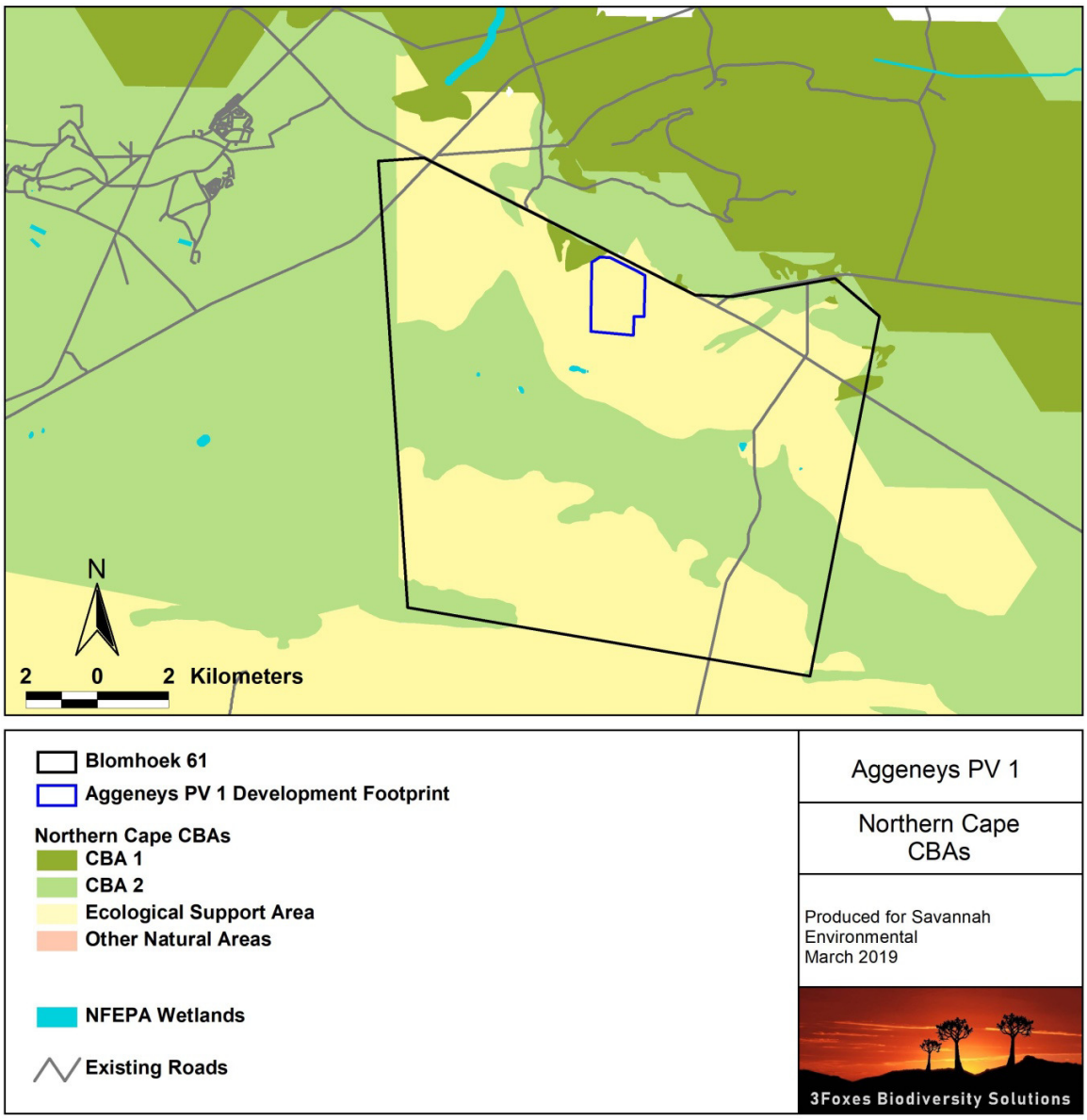

Figure 7. Extract of the Northern Cape Critical Biodiversity Areas map for the study area, showing that the site falls within an ESA but does not impact any CBAs.

3.6 CURRENT BASELINE & CUMULATIVE IMPACT

The potential for cumulative impact in the area is a potential concern given the large number of different proposed renewable energy developments in the area and the status of the area as a REDZ. Although there are currently few preferred bidders, the projects are concentrated around the Aggeneys area and in the longer-term a node of development is likely to occur in this area (Figure 88). The total estimated direct footprint of the existing approved projects is estimated at as much as 9000ha, should all proposed projects in the area get built. This is largely concentrated within the open plains habitat of the Bushmanland Arid Grassland vegetation type, which is a widespread habitat of low fauna and flora diversity. As Bushmanland Arid Grassland is one of the most extensive vegetation types in South Africa, the loss of 9000ha of this vegetation type is not significant regionally and the major concern would be around the impacts on landscape connectivity more locally. The location of the current project adjacent to the Loop 10 road is certainly a mitigating circumstance which would serve to reduce the cumulative impact associated with the development. In addition, the major corridors of the area, such as the Koa River valley south of the site and the mountain chain north of the site would not be impacted by the current development and are also still largely free from development impact more generally. As the wider area is still largely free from development, the capacity of the area to support development is still considered generally quite high and given the broad-scale that most ecological processes in this area operate over, the current levels of habitat fragmentation are still considered low and not a threat to ecological processes in the area. The contribution of the current project at 250ha is considered relatively low and would result in a low additional contribution to cumulative impact in the area and as such is considered acceptable.

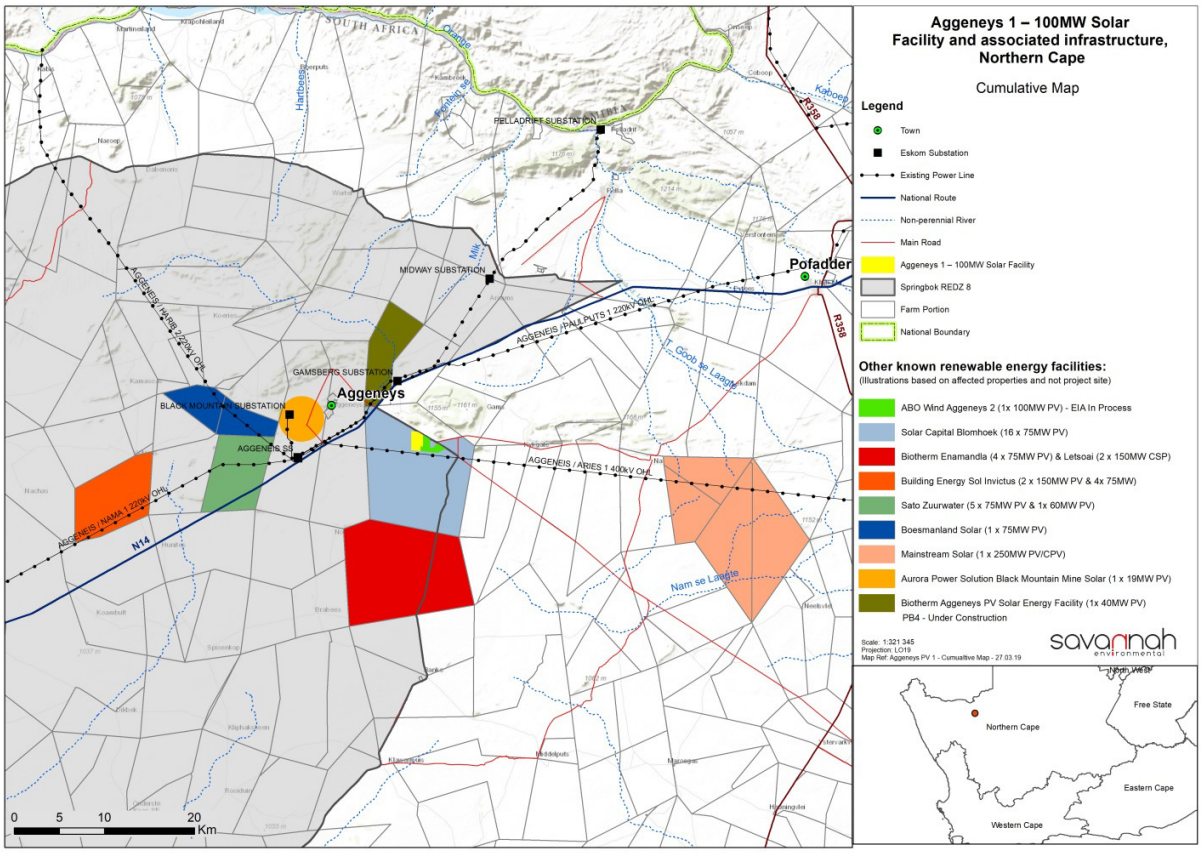

Figure 8. Map of renewable energy development facilities as well as current applications for the wider study area. It is important to note that the map indicates the affected properties and not the extent of the facilities themselves.

3.7 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the development area associated with Aggeneys 1 is illustrated below in Figure 7. The development footprint is restricted to low sensitivity areas with a very small extent of medium sensitivity areas associated with some small ephemeral washes in the northeast of the site. The development area has low diversity of fauna and flora, with a low abundance of species of conservation concern and is considered suitable for the development. It is important to note that the final development area was identified based on a site screening exercise that included the whole Bloemhoek 61 property with the aim of identifying those areas where there were the least conflict with biodiversity pattern and process. Sensitive features present in the area that would not be impacted include the dune system and deep sands of the Koa River valley south of the site, the mountains north of the site and several areas of Aggeneys Gravel Vygieveld on the plains and lower slopes of the hills north and west of the site. There are no highly significant biodiversity features within the development footprint and no likely impacts associated with the development that cannot be mitigated to a low level.

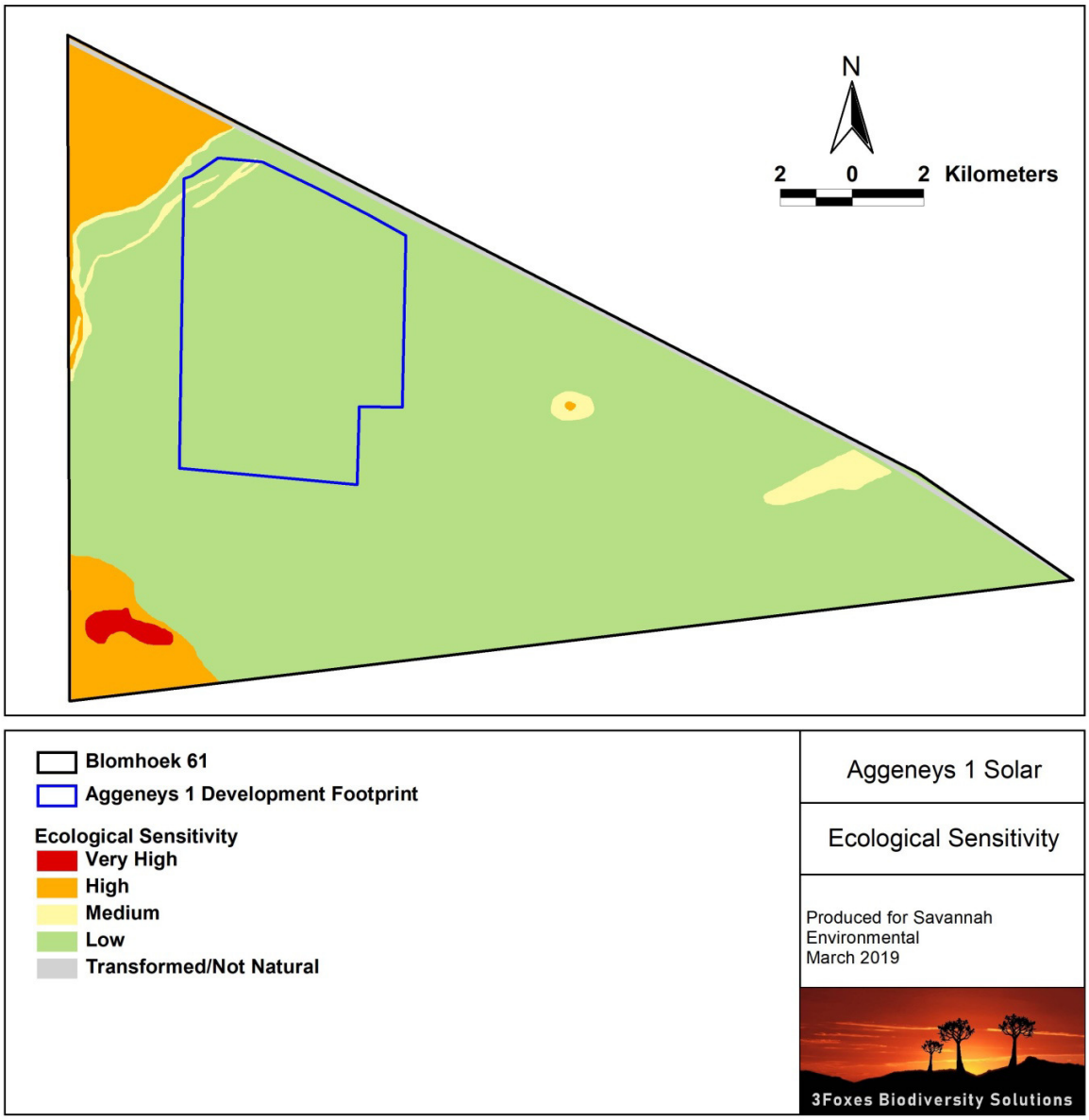

Figure 9. Sensitivity map for the Aggeneys 1 development area and immediate surroundings.

4 IDENTIFICATION & NATURE OF IMPACTS

In this section, the potential impacts and associated risk factors that may be generated by the proposed development are identified. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the proposed development are listed. The relevance and applicability of each potential impact to the current situation are then examined in more detail in the next section.

4.1 IDENTIFICATION OF POTENTIAL IMPACTS AND DAMAGING ACTIVITIES

Potential ecological impacts resulting from the proposed development of the Aggeneys 1 development and associated infrastructure would stem from a variety of different activities and risk factors associated with the preconstruction, construction and operational phases of the project including the following:

Impacts on vegetation and protected plant species

Several protected species occur at the project site and would be impacted by the proposed development. Vegetation clearing during construction will lead to the loss of currently intact habitat within the proposed development footprint and is an inevitable consequence of the proposed development. As this impact is certain to occur it will be assessed for the construction phase as this is when the impact will occur, although the consequences will persist for a long time after construction.

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna would move away from the 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 construction as well as operation and this impact will therefore be assessed for the construction phase and operational phase.

Impact on CBAs and broad-scale ecological processes

Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. Due to the presence of a number of other renewable energy and mining developments in the area, this is a potential cumulative impact of the development that is assessed.

5 ASSESSMENT OF IMPACTS

The various identified potential impacts are assessed below for the different phases of the proposed development. It is important to note that this is contingent on the layout as provided and any changes to the layout or project description would potentially invalidate the assessment.

5.1 AGGENEYS 1

The following is an assessment of the Aggeneys 1 development and associated infrastructure, for the planning and construction, operational and decommissioning phases of the proposed development.

5.1.1 Planning & Construction Phase

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

Impact Nature: Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the facility. In addition, there will be some loss of individuals of protected plant species.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (5)	Moderate (4)
Probability	Definite (5)	Definite (5)
Significance	Medium (50)	Medium (45)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation and any individuals of protected species is unavoidable and is a certain outcome of the development.	
Mitigation	• Pre-construction walk-through of the facility's 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 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, remaining within demarcated construction areas etc. • Contractor's Environmental Officer (EO) to provide supervision and	

	oversight of vegetation clearing activities within sensitive areas. • Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. • 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 or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.
Cumulative Impacts	The development will contribute to cumulative impacts on habitat loss and transformation in the area. The affected vegetation type is however widespread and the contribution would be low.
Residual Risks	As the loss of currently intact vegetation is an unavoidable consequence of the development, the habitat loss associated with the development remains a moderate residual impact even after mitigation and avoidance of more sensitive areas.

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. Due to noise and operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. 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 to Medium (5)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (32)	Low (28)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Although noise and disturbance generated at the site during construction is largely unavoidable, impacts such as those resulting from the presence of construction personnel at the site can be readily 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 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 trenches need to be dug for electrical cabling or other purpose, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.
Cumulative Impacts	During the construction phase the activity would contribute to cumulative fauna disturbance and disruption in the area, but as there are still tracts of intact habitat in the area, it is likely that displaced fauna will have space to move about the site to avoid areas of high activity.
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.

5.1.2 Operational Phase Impacts

Impact 1. Faunal Impacts due to Operation

Impact Nature: The operation and presence of the facility may lead to disturbance or persecution of fauna within or adjacent to the facility.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (21)
Status	Negative	Negative
Reversibility	Moderate	Moderate
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 during maintenance is likely.
Mitigation	• Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. • 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 (30km/h max for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises. • If the facility is to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.
Cumulative Impacts	The development would contribute to cumulative disturbance for fauna, but the contribution would be low for most species and is not considered highly significant.
Residual Risks	Disturbance from maintenance activities will occur at a low level with the result that disturbance would be largely restricted to the site.

Operational Phase Impact 2. Habitat Degradation due to Erosion and Alien Plant Invasion

Impact Nature: Disturbance created during construction will leave the site and its immediate surroundings vulnerable to erosion and alien plant invasion for several years into the operational phase.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (2)	Short-term (1)
Magnitude	Medium (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	Low (28)	Low (15)
Status	Negative	Negative

Reversibility	Medium	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 at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for annual monitoring and rehabilitation. • 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. • Alien management at the site should take place according to the Alien Invasive Management Plan. • Regular (annual) monitoring for alien plants during operation to ensure that no alien invasive problems have developed as result of the disturbance, as per the Alien Management Plan for the project. • Woody aliens 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 if effectively managed.	

5.1.3 Decommissioning Phase

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

Impact Nature: Disturbance created during decommissioning will leave the site 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 (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	Medium (32)	Low (21)

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 at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for monitoring of the site for at least 5 years after decommissioning. • 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. • Alien management at the site should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management for at least 5 years after decommissioning. • Regular (annual) monitoring for alien plant during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan for the project. • Woody aliens 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 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 (2)	Short-term (2)
Magnitude	Low (4)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (28)	Low (18)
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 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.	

5.1.4 Cumulative Impacts

The following are the cumulative impacts that are assessed as being a likely consequence of the development of the Aggeneys 1 facility. This is assessed in context of the extent of the

current site, other developments in the area as well as general habitat loss and transformation resulting from mining, agriculture and other activities in the area.

Cumulative Impact 1. Reduced ability to meet conservation obligations & targets due to cumulative habitat loss

Nature: The development of Aggeneys 1 will contribute to cumulative habitat loss and other cumulative impacts in the wider Aggeneys 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 (3)	Low (5)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Medium (33)
Status	Negative	Negative
Reversibility	Moderate	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 facility which cannot be mitigated.	
Mitigation: • Ensure that the fencing around the facility is friendly with fauna and avifauna. This includes not having any electrified strands within 30cm of the ground as well as implementing a design that prevents fauna and avifauna from becoming trapped between the inner and outer layer of the fence as this has been demonstrated to be a common impact associated with existing PV plants. • Ensure that an alien management plan and erosion management plan compiled for each project are effectively implemented at the site.		

Cumulative Impact 2. Negative impact on broad-scale ecological processes

Impact Nature: Development of the Aggeneys 1 plant may impact on broad-scale ecological processes such as the ability of fauna to disperse.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)

Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Low (5)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (30)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Only partly as a significant proportion of the impact results from the presence and operation of the facility which cannot be well mitigated.	
Mitigation	• Ensure that the mitigation hierarchy is applied with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and minimising degradation around the site. • An open space management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent areas around the facility under the control of the developer.	
Residual Risks	The presence of the facility will represent an obstacle for some fauna which would contribute to fragmentation in the area.	

6 CONCLUSION & RECOMMENDATIONS

Although there is variety of sensitive features within the wider area, the vegetation of the Aggeneys 1 project site consists of Bushmanland Arid Grassland which is an extensive vegetation type which is not threatened and has experienced little transformation to date. The potential for cumulative impact in the area is however a concern given the large number of different proposed renewable energy developments in the area. As Bushmanland Arid Grassland is one of the most extensive vegetation types in South Africa, the loss of habitat within this vegetation type due to renewable energy development is not significant regionally and the major concern would be around the impacts on landscape connectivity more locally. The major corridors of the area, such as the Koa River valley south of the site and the mountain chain north of the site would not be impacted by the current development and are also still largely free from development impact more generally. As a result, the current levels of habitat fragmentation are still considered low and not a threat to ecological processes in the area. The location of the current project adjacent to the Loop 10 road is also a mitigating circumstance which would serve to reduce the cumulative impact associated with the current development.

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 some habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur as a result of the Aggeneys 1 development. Overall, there are no potential impacts associated with the proposed development that are considered to be of high significance and which cannot be mitigated to an acceptable level. As such, there are no fatal flaws or other major impediments that should prevent the development from going ahead.

In terms of the on-site substation locations, both are situated within very similar plains habitat. As a result, there are no specific preferences with regards to the two substation alternatives. As a result, the direct, indirect and cumulative impacts associated with both alternatives will be similar. Both alternatives are located within a relatively uniform habitat type with no identified sensitive ecological features and, as such, both alternatives will have low ecological impacts.

Impact Statement

The development footprint of Aggeneys 1 is restricted to low and moderate sensitivity habitat associated with Bushmanland Arid Grassland which is a highly extensive vegetation type typically with low levels of diversity. There are no highly sensitive features within the development footprint and the affected area is considered suitable for development. As such, there are no impacts associated with the Aggeneys 1 facility that cannot be mitigated to a low level. Although cumulative impacts in the wider Aggeneys area are currently on the increase due to the expansion of the mine at Black Mountain and the proliferation of solar PV facilities in the area, these still occupy a small proportion of the wider area and the contribution of the current development to cumulative impact would be low and is considered acceptable. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, the Aggeneys 1 facility can be supported from a terrestrial ecology point of view.

7 Activities for Inclusion In the Draft EMPr

An Environmental Management Programme (EMPr) provides a link between the predicted impacts and mitigation measures recommended within the EIA and the implementation and operational activities of a project. As the construction and operation of the Aggeneys 1 PV plant may impact the environment, activities which 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 EIA 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 EIA. 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 wind farm 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 EIA 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

<table>
<tr><th colspan="4">Objective: Limit disturbance of vegetation and loss of protected flora during construction</th></tr>
<tr><td>Potential Impact</td><td colspan="3">Loss of plant cover leading to erosion as well as loss of faunal habitat and loss of specimens of protected plants.</td></tr>
<tr><td>Activity/risk source</td><td colspan="3">Vegetation clearing for the following
» Clearing for infrastructure establishment.
» Access roads.
» Laydown areas.
» Construction Camps.</td></tr>
<tr><td>Mitigation: Target/Objective</td><td colspan="3">» Low footprint and low impact on terrestrial environment.
» Low impact on protected plant species.</td></tr>
<tr><td colspan="2">Mitigation: Action/control</td><td>Responsibility</td><td>Timeframe</td></tr>
<tr><td colspan="2">» Preconstruction walk-through of PV Plant and access road footprints to identify protected species and obtain information to inform a preconstruction Search and Rescue operation.
» 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 (i.e. those that are of high conservation value or which have a high probability of surviving translocation) 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 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.</td><td>Management/ECO</td><td>Construction & Operation</td></tr>
<tr><td>Performance Indicator</td><td colspan="3">» Vegetation loss restricted to infrastructure footprint.
» Impact on protected plant species reduced to some degree through Search and Rescue.
» Permit obtained to destroy or translocate affected individuals of protected species.</td></tr>
</table>

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 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 ECO 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 most LEDs), which do not attract insects. The lights should also be of types which are directed downward and 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 PV Plant		
Project component/s	Presence and operation of the facility including » Movement of vehicles to and from the site. » Presence of the PV infrastructure and site fencing.	
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 PV Plant 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 at 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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9 Annex 1. List of Plants

List of plant species known from the broad area around the Enamandla site, based on observations from the site as well as the SANBI SIBIS database.

Family	Species	IUCN	Family	Species	IUCN
ACANTHACEAE	*Acanthopsis hoffmannseggiana*	LC	ACANTHACEAE	*Barleria rigida*	LC
ACANTHACEAE	*Blepharis mitrata*	LC	ACANTHACEAE	*Justicia thymifolia*	LC
ACANTHACEAE	*Monechma mollissimum*	LC	ACANTHACEAE	*Monechma spartioides*	LC
ACANTHACEAE	*Petalidium setosum*	LC	AIZOACEAE	*Aizoon asbestinum*	LC
AIZOACEAE	*Galenia africana*	LC	AIZOACEAE	*Galenia crystallina var. crystallina*	LC
AIZOACEAE	*Galenia fruticosa*	LC	AIZOACEAE	*Galenia papulosa*	LC
AIZOACEAE	*Galenia sarcophylla*	LC	AIZOACEAE	*Tetragonia arbuscula*	LC
AIZOACEAE	*Tetragonia reduplicata*	LC	AIZOACEAE	*Trianthema parvifolia var. parvifolia*	LC
AMARANTHACEAE	*Amaranthus praetermissus*	LC	AMARANTHACEAE	*Hermbstaedtia glauca*	LC
AMARANTHACEAE	*Sericocoma avolans*	LC	AMARYLLIDACEAE	*Brunsvigia comptonii*	LC
AMARYLLIDACEAE	*Brunsvigia herrei*	VU	AMARYLLIDACEAE	*Brunsvigia namaquana*	DDT
AMARYLLIDACEAE	*Hessea speciosa*	LC	ANACARDIACEAE	*Ozoroa dispar*	LC
ANACARDIACEAE	*Searsia burchellii*	LC	ANACARDIACEAE	*Searsia populifolia*	LC
APOCYNACEAE	*Fockea comaru*	LC	APOCYNACEAE	*Hoodia alstonii*	LC
APOCYNACEAE	*Hoodia gordonii*	DDD	APOCYNACEAE	*Microloma incanum*	LC
APOCYNACEAE	*Microloma sagittatum*	LC	APOCYNACEAE	*Pachypodium namaquanum*	LC
APOCYNACEAE	*Sarcostemma pearsonii*	LC	APOCYNACEAE	*Stapelia similis*	LC
ASPARAGACEAE	*Asparagus capensis var. capensis*	LC	ASPHODELACEAE	*Haworthia venosa subsp. tessellata*	LC
ASPHODELACEAE	*Trachyandra jacquiniana*	LC	ASPHODELACEAE	*Trachyandra laxa var. laxa*	LC
ASTERACEAE	*Arctotis erosa*	LC	ASTERACEAE	*Arctotis hirsuta*	LC
ASTERACEAE	*Arctotis leiocarpa*	LC	ASTERACEAE	*Berkheya canescens*	LC
ASTERACEAE	*Berkheya fruticosa*	LC	ASTERACEAE	*Berkheya spinosissima subsp. spinosissima*	LC
ASTERACEAE	*Cineraria canescens var. canescens*	LC	ASTERACEAE	*Dicoma capensis*	LC
ASTERACEAE	*Didelta carnosa var. carnosa*	LC	ASTERACEAE	*Dimorphotheca polyptera*	LC
ASTERACEAE	*Dimorphotheca sinuata*	LC	ASTERACEAE	*Eriocephalus ambiguus*	LC
ASTERACEAE	*Eriocephalus microphyllus var. pubescens*	LC	ASTERACEAE	*Eriocephalus scariosus*	LC
ASTERACEAE	*Eriocephalus spinescens*	LC	ASTERACEAE	*Euryops multifidus*	LC
ASTERACEAE	*Euryops subcarnosus subsp. vulgaris*	LC	ASTERACEAE	*Felicia hirsuta*	LC
ASTERACEAE	*Felicia muricata subsp. muricata*	LC	ASTERACEAE	*Felicia namaquana*	LC
ASTERACEAE	*Foveolina dichotoma*	LC	ASTERACEAE	*Gazania lichtensteinii*	LC
ASTERACEAE	*Geigeria pectidea*	LC	ASTERACEAE	*Geigeria vigintisquamea*	LC
ASTERACEAE	*Gorteria corymbosa*	LC	ASTERACEAE	*Gorteria diffusa subsp. diffusa*	LC
ASTERACEAE	*Gymnodiscus linearifolia*	LC	ASTERACEAE	*Helichrysum herniarioides*	LC
ASTERACEAE	*Helichrysum micropoides*	LC	ASTERACEAE	*Helichrysum pulchellum*	LC
ASTERACEAE	*Helichrysum pumilio subsp. pumilio*	LC	ASTERACEAE	*Helichrysum tomentosulum subsp. aromaticum*	LC
ASTERACEAE	*Helichrysum zeyheri*	LC	ASTERACEAE	*Hirpicium alienatum*	LC
ASTERACEAE	*Hirpicium echinus*	LC	ASTERACEAE	*Hirpicium integrifolium*	LC
ASTERACEAE	*Ifloga molluginoides*	LC	ASTERACEAE	*Kleinia cephalophora*	LC
ASTERACEAE	*Kleinia longiflora*	LC	ASTERACEAE	*Nidorella resedifolia subsp. resedifolia*	LC

ASTERACEAE	*Oncosiphon piluliferum*	LC	ASTERACEAE	*Osteospermum karrooicum*	LC
ASTERACEAE	*Osteospermum muricatum subsp. muricatum*	LC	ASTERACEAE	*Osteospermum pinnatum var. pinnatum*	LC
ASTERACEAE	*Othonna abrotanifolia*	LC	ASTERACEAE	*Othonna arbuscula*	LC
ASTERACEAE	*Othonna furcata*	LC	ASTERACEAE	*Othonna sedifolia*	LC
ASTERACEAE	*Pegolettia retrofracta*	LC	ASTERACEAE	*Pentzia argentea*	LC
ASTERACEAE	*Pentzia globosa*	LC	ASTERACEAE	*Pentzia lanata*	LC
ASTERACEAE	*Pteronia glauca*	LC	ASTERACEAE	*Pteronia glomerata*	LC
ASTERACEAE	*Pteronia mucronata*	LC	ASTERACEAE	*Pteronia scariosa*	LC
ASTERACEAE	*Pteronia sordida*	LC	ASTERACEAE	*Pteronia unguiculata*	LC
ASTERACEAE	*Senecio bulbinifolius*	LC	ASTERACEAE	*Senecio eenii*	LC
ASTERACEAE	*Senecio niveus*	LC	ASTERACEAE	*Senecio pinguifolius*	LC
ASTERACEAE	*Senecio sarcoides*	LC	ASTERACEAE	*Senecio sisymbriifolius*	LC
ASTERACEAE	*Tripteris aghillana var. aghillana*	LC	ASTERACEAE	*Tripteris sinuata var. sinuata*	LC
ASTERACEAE	*Ursinia nana subsp. nana*	LC	ASTERACEAE	*Ursinia speciosa*	LC
ASTERACEAE	*Vernonia obionifolia subsp. obionifolia*	LC	BIGNONIACEAE	*Rhigozum trichotomum*	LC
BORAGINACEAE	*Codon royenii*	LC	BORAGINACEAE	*Heliotropium tubulosum*	LC
BORAGINACEAE	*Trichodesma africanum*	LC	BRASSICACEAE	*Heliophila carnosa*	LC
BRASSICACEAE	*Heliophila deserticola var. deserticola*	LC	BRASSICACEAE	*Heliophila deserticola var. micrantha*	LC
BRASSICACEAE	*Heliophila lactea*	LC	BRASSICACEAE	*Heliophila trifurca*	LC
BRASSICACEAE	*Lepidium trifurcum*	LC	BURSERACEAE	*Commiphora gracilifrondosa*	LC
CAMPANULACEAE	*Wahlenbergia meyeri*	LC	CAMPANULACEAE	*Wahlenbergia prostrata*	LC
CAPPARACEAE	*Boscia foetida subsp. foetida*	LC	CAPPARACEAE	*Cleome paxii*	LC
CARYOPHYLLACEAE	*Dianthus micropetalus*	LC	CARYOPHYLLACEAE	*Dianthus namaensis var. dinteri*	LC
CHENOPODIACEAE	*Salsola kalaharica*	LC	CHENOPODIACEAE	*Salsola rabieana*	LC
CHENOPODIACEAE	*Salsola tuberculata*	LC	COLCHICACEAE	*Ornithoglossum dinteri*	LC
COLCHICACEAE	*Ornithoglossum vulgare*	LC	CRASSULACEAE	*Adromischus diabolicus*	Rare
CRASSULACEAE	*Adromischus nanus*	LC	CRASSULACEAE	*Cotyledon orbiculata var. oblonga*	LC
CRASSULACEAE	*Cotyledon orbiculata var. orbiculata*	LC	CRASSULACEAE	*Crassula brevifolia subsp. brevifolia*	LC
CRASSULACEAE	*Crassula campestris*	LC	CRASSULACEAE	*Crassula corallina subsp. macrorrhiza*	LC
CRASSULACEAE	*Crassula cotyledonis*	LC	CRASSULACEAE	*Crassula deltoidea*	LC
CRASSULACEAE	*Crassula exilis subsp. exilis*	Rare	CRASSULACEAE	*Crassula exilis subsp. sedifolia*	LC
CRASSULACEAE	*Crassula garibina subsp. garibina*	LC	CRASSULACEAE	*Crassula macowaniana*	LC
CRASSULACEAE	*Crassula muscosa var. muscosa*	LC	CRASSULACEAE	*Crassula sericea var. sericea*	LC
CRASSULACEAE	*Crassula subaphylla var. subaphylla*	LC	CRASSULACEAE	*Crassula tenuipedicellata*	LC
CRASSULACEAE	*Crassula tomentosa var. glabrifolia*	LC	CRASSULACEAE	*Tylecodon reticulatus subsp. phyllopodium*	LC
CRASSULACEAE	*Tylecodon reticulatus subsp. reticulatus*	LC	CRASSULACEAE	*Tylecodon rubrovenosus*	LC
CUCURBITACEAE	*Coccinia rehmannii*	LC	CUCURBITACEAE	*Corallocarpus dissectus*	LC
CUCURBITACEAE	*Cucumis rigidus*	LC	CUCURBITACEAE	*Trochomeria debilis*	LC
CYPERACEAE	*Cyperus indecorus var. namaquensis*	LC	CYPERACEAE	*Isolepis hemiuncialis*	LC
EBENACEAE	*Diospyros austro-africana var. rubriflora*	LC	EBENACEAE	*Diospyros ramulosa*	LC
EUPHORBIACEAE	*Euphorbia dregeana*	LC	EUPHORBIACEAE	*Euphorbia gariepina subsp. gariepina*	LC
EUPHORBIACEAE	*Euphorbia mauritanica var. mauritanica*	LC	EUPHORBIACEAE	*Euphorbia spinea*	LC
FABACEAE	*Acacia erioloba*	Declining	FABACEAE	*Crotalaria meyeriana*	LC
FABACEAE	*Crotalaria pearsonii*	Rare	FABACEAE	*Crotalaria virgultalis*	LC

FABACEAE	*Indigastrum argyroides*	LC	FABACEAE	*Indigofera pechuelii*	LC
FABACEAE	*Lessertia depressa*	LC	FABACEAE	*Lotononis falcata*	LC
FABACEAE	*Lotononis fruticoides*	LC	FABACEAE	*Lotononis platycarpa*	LC
FABACEAE	*Lotononis rabenaviana*	LC	FABACEAE	*Melolobium microphyllum*	LC
FABACEAE	*Parkinsonia africana*	LC	FABACEAE	*Pomaria lactea*	LC
FABACEAE	*Requienia sphaerosperma*	LC	FABACEAE	*Tephrosia dregeana var. dregeana*	LC
FABACEAE	*Tephrosia limpopoensis*	LC	GERANIACEAE	*Monsonia parvifolia*	LC
GERANIACEAE	*Pelargonium carnosum subsp. carnosum*	LC	GERANIACEAE	*Pelargonium crithmifolium*	LC
GERANIACEAE	*Pelargonium spinosum*	LC	GERANIACEAE	*Pelargonium xerophyton*	LC
GERANIACEAE	*Sarcocaulon crassicaule*	LC	GISEKIACEAE	*Gisekia africana var. africana*	LC
HYACINTHACEAE	*Albuca namaquensis*	LC	HYACINTHACEAE	*Albuca setosa*	LC
HYACINTHACEAE	*Albuca spiralis*	LC	HYACINTHACEAE	*Daubenya namaquensis*	Thr*
HYACINTHACEAE	*Dipcadi gracillimum*	LC	HYACINTHACEAE	*Drimia intricata*	LC
HYACINTHACEAE	*Lachenalia polypodantha*	Rare	HYACINTHACEAE	*Lachenalia undulata*	LC
HYACINTHACEAE	*Massonia bifolia*	LC	HYACINTHACEAE	*Ornithogalum glandulosum*	LC
HYACINTHACEAE	*Ornithogalum pruinosum*	LC	HYACINTHACEAE	*Ornithogalum subcoriaceum*	LC
HYDNORACEAE	*Hydnora africana*	LC	IRIDACEAE	*Ferraria variabilis*	LC
IRIDACEAE	*Gladiolus orchidiflorus*	LC	IRIDACEAE	*Gladiolus saccatus*	LC
IRIDACEAE	*Hesperantha rupicola*	LC	IRIDACEAE	*Lapeirousia littoralis subsp. littoralis*	LC
IRIDACEAE	*Lapeirousia plicata subsp. plicata*	LC	IRIDACEAE	*Moraea unguiculata*	LC
IRIDACEAE	*Tritonia karooica*	LC	LAMIACEAE	*Acrotome pallescens*	LC
LAMIACEAE	*Salvia garipensis*	LC	LAMIACEAE	*Stachys flavescens*	LC
LAMIACEAE	*Stachys rugosa*	LC	MALVACEAE	*Hermannia affinis*	LC
MALVACEAE	*Hermannia confusa*	LC	MALVACEAE	*Hermannia disermifolia*	LC
MALVACEAE	*Hermannia gariepina*	LC	MALVACEAE	*Hermannia minutiflora*	LC
MALVACEAE	*Hermannia spinosa*	LC	MALVACEAE	*Hermannia stricta*	LC
MALVACEAE	*Hermannia tomentosa*	LC	MALVACEAE	*Hermannia vestita*	LC
MALVACEAE	*Hibiscus elliottiae*	LC	MENISPERMACEAE	*Antizoma miersiana*	LC
MESEMBRYANTHEMACEAE	*Antimima tuberculosa*	LC	MESEMBRYANTHEMACEAE	*Arenifera stylosa*	LC
MESEMBRYANTHEMACEAE	*Aridaria noctiflora subsp. straminea*	LC	MESEMBRYANTHEMACEAE	*Aspazoma amplectens*	LC
MESEMBRYANTHEMACEAE	*Brownanthus arenosus*	LC	MESEMBRYANTHEMACEAE	*Brownanthus nucifer*	LC
MESEMBRYANTHEMACEAE	*Brownanthus schenckii*	LC	MESEMBRYANTHEMACEAE	*Cephalophyllum fulleri*	Rare
MESEMBRYANTHEMACEAE	*Cephalophyllum parvibracteatum*	LC	MESEMBRYANTHEMACEAE	*Cephalophyllum staminodiosum*	Rare
MESEMBRYANTHEMACEAE	*Cheiridopsis denticulata*	LC	MESEMBRYANTHEMACEAE	*Conicosia elongata*	LC
MESEMBRYANTHEMACEAE	*Conophytum burgeri*	EN	MESEMBRYANTHEMACEAE	*Conophytum calculus subsp. vanzylii*	LC
MESEMBRYANTHEMACEAE	*Conophytum limpidum*	NT	MESEMBRYANTHEMACEAE	*Conophytum marginatum subsp. haramoepense*	LC
MESEMBRYANTHEMACEAE	*Conophytum maughanii subsp. maughanii*	LC	MESEMBRYANTHEMACEAE	*Conophytum praesectum*	LC
MESEMBRYANTHEMACEAE	*Conophytum ratum*	VU	MESEMBRYANTHEMACEAE	*Conophytum tantillum subsp. eenkokerense*	Rare
MESEMBRYANTHEMACEAE	*Delosperma subincanum*	LC	MESEMBRYANTHEMACEAE	*Dinteranthus puberulus*	LC
MESEMBRYANTHEMACEAE	*Drosanthemum albens*	LC	MESEMBRYANTHEMACEAE	*Drosanthemum breve*	DDT
MESEMBRYANTHEMACEAE	*Drosanthemum godmaniae*	DDT	MESEMBRYANTHEMACEAE	*Drosanthemum hispidum*	LC
MESEMBRYANTHEMACEAE	*Drosanthemum karrooense*	LC	MESEMBRYANTHEMACEAE	*Drosanthemum lique*	LC
MESEMBRYANTHEMACEAE	*Drosanthemum luederitzii*	LC	MESEMBRYANTHEMACEAE	*Drosanthemum subcompressum*	LC
MESEMBRYANTHEMACEAE	*Ebracteola fulleri*	LC	MESEMBRYANTHEMACEAE	*Hereroa pallens*	LC

MESEMBRYANTHEMACEAE	*Hereroa teretifolia*	LC
MESEMBRYANTHEMACEAE	*Ihlenfeldtia vanzylii*	LC
MESEMBRYANTHEMACEAE	*Lithops julii subsp. fulleri*	LC
MESEMBRYANTHEMACEAE	*Mesembryanthemum crystallinum*	LC
MESEMBRYANTHEMACEAE	*Phyllobolus latipetalus*	LC
MESEMBRYANTHEMACEAE	*Phyllobolus oculatus*	LC
MESEMBRYANTHEMACEAE	*Psilocaulon articulatum*	LC
MESEMBRYANTHEMACEAE	*Psilocaulon subnodosum*	LC
MESEMBRYANTHEMACEAE	*Ruschia centrocapsula*	LC
MESEMBRYANTHEMACEAE	*Ruschia divaricata*	LC
MESEMBRYANTHEMACEAE	*Ruschia muricata*	LC
MESEMBRYANTHEMACEAE	*Ruschia spinosa*	LC
MESEMBRYANTHEMACEAE	*Schwantesia ruedebuschii*	LC
MESEMBRYANTHEMACEAE	*Trichodiadema littlewoodii*	LC
MOLLUGINACEAE	*Hypertelis salsoloides var. salsoloides*	LC
MOLLUGINACEAE	*Limeum arenicolum*	LC
MOLLUGINACEAE	*Pharnaceum croceum*	LC
MOLLUGINACEAE	*Psammotropha obtusa*	LC
MONTINIACEAE	*Montinia caryophyllacea*	LC
MORACEAE	*Ficus ilicina*	LC
NEURADACEAE	*Grielum sinuatum*	LC
PEDALIACEAE	*Rogeria longiflora*	LC
POACEAE	*Aristida adscensionis*	LC
POACEAE	*Aristida diffusa subsp. burkei*	LC
POACEAE	*Brachiaria glomerata*	LC
POACEAE	*Cladoraphis spinosa*	LC
POACEAE	*Ehrharta pusilla*	LC
POACEAE	*Enneapogon desvauxii*	LC
POACEAE	*Eragrostis nindensis*	LC
POACEAE	*Leucophrys mesocoma*	LC
POACEAE	*Schmidtia kalahariensis*	LC
POACEAE	*Stipagrostis anomala*	LC
POACEAE	*Stipagrostis ciliata var. capensis*	LC
POACEAE	*Stipagrostis uniplumis var. uniplumis*	LC
POLYGALACEAE	*Polygala pungens*	LC
PORTULACACEAE	*Anacampseros baeseckei*	LC
PORTULACACEAE	*Avonia albissima*	LC
PORTULACACEAE	*Avonia papyracea subsp. namaensis*	LC
PORTULACACEAE	*Avonia quinaria subsp. alstonii*	LC
PORTULACACEAE	*Ceraria fruticulosa*	LC
PORTULACACEAE	*Portulaca kermesina*	LC
RUBIACEAE	*Kohautia caespitosa subsp. brachyloba*	LC
SAPINDACEAE	*Pappea capensis*	LC
SCROPHULARIACEAE	*Aptosimum spinescens*	LC
MESEMBRYANTHEMACEAE	*Ihlenfeldtia excavata*	LC
MESEMBRYANTHEMACEAE	*Lapidaria margaretae*	LC
MESEMBRYANTHEMACEAE	*Lithops olivacea*	VU
MESEMBRYANTHEMACEAE	*Mesembryanthemum guerichianum*	LC
MESEMBRYANTHEMACEAE	*Phyllobolus lignescens*	LC
MESEMBRYANTHEMACEAE	*Prenia tetragona*	LC
MESEMBRYANTHEMACEAE	*Psilocaulon coriarium*	LC
MESEMBRYANTHEMACEAE	*Ruschia aggregata*	DDT
MESEMBRYANTHEMACEAE	*Ruschia cradockensis subsp. triticiformis*	LC
MESEMBRYANTHEMACEAE	*Ruschia kenhardtensis*	LC
MESEMBRYANTHEMACEAE	*Ruschia robusta*	LC
MESEMBRYANTHEMACEAE	*Schwantesia marlothii*	LC
MESEMBRYANTHEMACEAE	*Stomatium fulleri*	LC
MESEMBRYANTHEMACEAE	*Trichodiadema obliquum*	DDT
MOLLUGINACEAE	*Limeum aethiopicum var. intermedium*	LC
MOLLUGINACEAE	*Limeum myosotis var. myosotis*	LC
MOLLUGINACEAE	*Pharnaceum viride*	LC
MOLLUGINACEAE	*Suessenguthiella scleranthoides*	LC
MORACEAE	*Ficus cordata subsp. cordata*	LC
NEURADACEAE	*Grielum humifusum var. humifusum*	LC
OXALIDACEAE	*Oxalis annae*	LC
PLUMBAGINACEAE	*Dyerophytum africanum*	LC
POACEAE	*Aristida congesta subsp. congesta*	LC
POACEAE	*Aristida engleri var. engleri*	LC
POACEAE	*Cenchrus ciliaris*	LC
POACEAE	*Ehrharta calycina*	LC
POACEAE	*Enneapogon cenchroides*	LC
POACEAE	*Enneapogon scaber*	LC
POACEAE	*Fingerhuthia africana*	LC
POACEAE	*Panicum arbusculum*	LC
POACEAE	*Stipagrostis amabilis*	LC
POACEAE	*Stipagrostis brevifolia*	LC
POACEAE	*Stipagrostis obtusa*	LC
POLYGALACEAE	*Polygala leptophylla var. armata*	LC
POLYGALACEAE	*Polygala seminuda*	LC
PORTULACACEAE	*Anacampseros filamentosa subsp. namaquensis*	LC
PORTULACACEAE	*Avonia herreana*	VU
PORTULACACEAE	*Avonia papyracea subsp. papyracea*	LC
PORTULACACEAE	*Avonia recurvata subsp. recurvata*	LC
PORTULACACEAE	*Ceraria namaquensis*	LC
RUBIACEAE	*Anthospermum spathulatum subsp. spathulatum*	LC
SANTALACEAE	*Thesium lineatum*	LC
SCROPHULARIACEAE	*Aptosimum procumbens*	LC
SCROPHULARIACEAE	*Aptosimum tragacanthoides*	LC

SCROPHULARIACEAE	*Hebenstretia parviflora*	LC	SCROPHULARIACEAE	*Jamesbrittenia aridicola*	LC
SCROPHULARIACEAE	*Jamesbrittenia ramosissima*	LC	SCROPHULARIACEAE	*Manulea nervosa*	LC
SCROPHULARIACEAE	*Peliostomum leucorrhizum*	LC	SCROPHULARIACEAE	*Zaluzianskya diandra*	LC
SCROPHULARIACEAE	*Zaluzianskya sanorum*	LC	SOLANACEAE	*Lycium cinereum*	LC
SOLANACEAE	*Solanum burchellii*	LC	SOLANACEAE	*Solanum giftbergense*	LC
SOLANACEAE	*Solanum namaquense*	LC	URTICACEAE	*Forsskaolea candida*	LC
VERBENACEAE	*Chascanum garipense*	LC	VISCACEAE	*Viscum rotundifolium*	LC
ZYGOPHYLLACEAE	*Augea capensis*	LC	ZYGOPHYLLACEAE	*Sisyndite spartea*	LC
ZYGOPHYLLACEAE	*Tribulus pterophorus*	LC	ZYGOPHYLLACEAE	*Tribulus terrestris*	LC
ZYGOPHYLLACEAE	*Zygophyllum retrofractum*	LC	ZYGOPHYLLACEAE	*Zygophyllum simplex*	LC

10 Annex 2. List of Mammals

List of mammals which are likely to occur in the vicinity of the Enamandla site based on the literature. Habitat notes and distribution records are based on Skinner & Chimimba (2005), while conservation status is from the IUCN Red Lists 2015 and South African Red Data Book for Mammals (Friedmann & Daly 2004).

Scientific Name	Common Name	Status	Habitat	Likelihood
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 rupestris	Western Rock Elephant Shrew	LC	Rocky koppies, rocky outcrops or piles of boulders where these offer sufficient holes and crannies for refuge.	Low
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	Low
Lagomorpha (Hares and Rabbits):				
Pronolagus rupestris	Smith's Red Rock Rabbit	LC	Confined to areas of krantzes, rocky hillsides, boulder-strewn koppies and rocky ravines	Low
Lepus capensis	Cape Hare	LC	Dry, open regions, with palatable bush and grass	High
Rodentia (Rodents):				
Hystrix africaeaustralis	Cape Porcupine	LC	Catholic in habitat requirements.	Confirmed
Petromus typicus	Dassie Rat	LC	Mountainous regions and inselbergs, where they are confined to rocky outcrops and live in crevices or piles of boulders	High
Xerus inauris	South African Ground Squirrel	LC	Open terrain with a sparse bush cover and a hard substrate	Confirmed
Graphiurus platyops	Rock Dormouse	LC	Rocky terrain, under the exfoliation on granite bosses, and in piles of boulders	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
Thallomys paedulcus	Acacia Tree Rat	LC	Associated with stands of Acacia woodland	Low

Thallomys nigricauda	Black-tailed Tree Rat	LC	Associated with stands of Acacia woodland	Low
Aethomys 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	Low
Parotomys brantsii	Brants' 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	High
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
Gerbillurus tytonis	Dune Hairy-footed Gerbil	LC	Hot dry areas on shifting red sand dunes	High
Gerbilliscus leucogaster	Bushveld Gerbil	LC	Predominantly associated with light sandy soils or sandy alluvium	Moderate
Gerbilliscus brantsii	Higheld Gerbil	LC	Sandy soils or sandy alluvium with some cover of grass, scrub or open woodland	Moderate
Saccostomus campestris	Pouched Mouse	LC	Catholic habitat requirements, commoner in areas where there is a sandy substrate.	High
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
Petromyscus collinus	Pygmy Rock Mouse	LC	Arid areas on rocky outcrops or koppies with a high rock cover	Low
Primates:				
Papio ursinus	Chacma Baboon	LC	Can exploit fynbos, montane grasslands, riverine courses in deserts, and simply need water and access to refuges.	Low
Cercopithecus mitis	Vervet Monkey	LC	Most abundant in and near riparian vegetation of savannahs	Low
Eulipotyphla (Shrews):				
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 cristata	Aardwolf	LC	Common in the 100-600mm rainfall range of country, Nama-Karoo, Succulent Karoo Grassland and Savanna biomes	High
Caracal caracal	Caracal	LC	Caracals tolerate arid regions, occur in semi-desert and karroid conditions	High
Felis silvestris	African Wild Cat	LC	Wide habitat tolerance.	High
Panthera pardus	Leopard	NT	Wide habitat tolerance, associated with areas of rocky koppies and hills, mountain ranges and forest	Low
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
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
Herpestes pulverulentus	Cape Grey Mongoose	LC	Wide habitat tolerance	High
Atilax paludinosus	Marsh Mongoose	LC	Associated with well-watered terrain, living in close association with rivers, streams, marshes, etc.	Low
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.	High
Otocyon megalotis	Bat-eared Fox	LC	Open country with mean annual rainfall of 100-600 mm	High
Aonyx capensis	African Clawless Otter	LC	Predominantly aquatic and do not occur far from permanenet water	Low
Ictonyx striatus	Striped Polecat	LC	Widely distributed throughout the sub-region	High
Rumanantia (Antelope):				
Tragelaphus strepsiceros	Greater Kudu	LC	Broken, rocky terrain with a cover of woodland and a nearby water supply.	Low
Oryx gazella	Gemsbok	LC	Open arid country	Confirmed
Sylvicapra grimmia	Common Duiker	LC	Presence of bushes is essential	High
Antidorcas marsupialis	Springbok	LC	Arid regions and open grassland.	Confirmed
Raphicerus campestris	Steenbok	LC	Inhabits open country,	Confirmed
Oreotragus oreotragus	Klipspringer	LC	Closely confined to rocky habitat.	Low

11 Annex 3. List of Reptiles

List of reptiles which are likely to occur at the Enamandla site, based on the ReptileMap database of the ADU. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern	2
Agamidae	*Agama*	*knobeli*		Knobel's Rock Agama	Not listed	1
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	2
Colubridae	*Dipsina*	*multimaculata*		Dwarf Beaked Snake	Least Concern	3
Colubridae	*Telescopus*	*beetzii*		Beetz's Tiger Snake	Least Concern	2
Cordylidae	*Karusasaurus*	*polyzonus*		Karoo Girdled Lizard	Least Concern	2
Cordylidae	*Platysaurus*	*capensis*		Namaqua Flat Lizard	Least Concern	1
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not listed	6
Elapidae	*Naja*	*nigricincta*	*woodi*	Black Spitting Cobra	Least Concern	1
Elapidae	*Naja*	*nivea*		Cape Cobra	Least Concern	2
Gekkonidae	*Chondrodactylus*	*angulifer*	*angulifer*	Common Giant Ground Gecko	Least Concern	4
Gekkonidae	*Chondrodactylus*	*bibronii*		Bibron's Gecko	Least Concern	7
Gekkonidae	*Goggia*	*lineata*		Striped Pygmy Gecko	Least Concern	4
Gekkonidae	*Pachydactylus*	*goodi*		Good's Gecko	Vulnerable	1
Gekkonidae	*Pachydactylus*	*latirostris*		Quartz Gecko	Least Concern	8
Gekkonidae	*Pachydactylus*	*weberi*		Weber's Gecko	Least Concern	1
Gerrhosauridae	*Cordylosaurus*	*subtessellatus*		Dwarf Plated Lizard	Least Concern	1
Lacertidae	*Meroles*	*suborbitalis*		Spotted Desert Lizard	Least Concern	7
Lacertidae	*Nucras*	*tessellata*		Western Sandveld Lizard	Least Concern	1
Lacertidae	*Pedioplanis*	*lineoocellata*	*lineoocellata*	Spotted Sand Lizard	Least Concern	1
Lacertidae	*Pedioplanis*	*namaquensis*		Namaqua Sand Lizard	Least Concern	8
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	3
Lamprophiidae	*Psammophis*	*namibensis*		Namib Sand Snake	Least Concern	1
Lamprophiidae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern	1
Lamprophiidae	*Pseudaspis*	*cana*		Mole Snake	Least Concern	1
Scincidae	*Acontias*	*namaquensis*		Namaqua Legless Skink	Least Concern	1
Scincidae	*Acontias*	*tristis*		Namaqua Dwarf Legless Skink	Least Concern	23
Scincidae	*Trachylepis*	*occidentalis*		Western Three-striped Skink	Least Concern	1
Scincidae	*Trachylepis*	*sulcata*	*sulcata*	Western Rock Skink	Least Concern	2

Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern	2
Testudinidae	*Homopus*	*signatus*		Speckled Padloper	Vulnerable	1
Testudinidae	*Psammobates*	*tentorius*	*verroxii*	Verrox's Tent Tortoise	Not listed	13
Typhlopidae	*Rhinotyphlops*	*schinzi*		Schinz's Beaked Blind Snake	Least Concern	1
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	1
Viperidae	*Bitis*	*caudalis*		Horned Adder	Least Concern	2

12 Annex 4. List of Amphibians

List of amphibians which are likely to occur in the vicinity of the site. Based on the Frogmap database, while conservation status is from the IUCN Red Lists 2014 and Minter et al. (2004).

Family	Genus	Species	Common name	Red list category	No. records
Bufonidae	*Vandijkophrynus*	*gariepensis*	Karoo Toad (subsp. gariepensis)	Not listed	2
Bufonidae	*Vandijkophrynus*	*robinsoni*	Paradise Toad	Least Concern	10
Microhylidae	*Phrynomantis*	*annectens*	Marbled Rubber Frog	Least Concern	7
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern	1
Pyxicephalidae	*Amietia*	*fuscigula*	Cape River Frog	Least Concern	4
Pyxicephalidae	*Cacosternum*	*namaquense*	Namaqua Caco	Least Concern	3
Pyxicephalidae	*Strongylopus*	*springbokensis*	Namaqua Stream Frog	Vulnerable	2
Pyxicephalidae	*Tomopterna*	*delalandii*	Cape Sand Frog	Least Concern	3