NAMAS WIND FARM NEAR KLEINSEE:

FAUNA & FLORA SPECIALIST IMPACT ASSESSMENT REPORT

savannah environmental

PRODUCED FOR SAVANNAH ENVIRONMENTAL

ON BEHALF OF GENESIS NAMAS WIND (PTY) LTD

BY

3Foxes Biodiversity Solutions

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CONTENTS

EXECUTIVE SUMMARY

Genesis Namas Wind (Pty) Ltd is proposing the development of the Namas Wind Farm and associated infrastructure on a site located approximately 20 km south-east of Kleinsee in the Northern Cape Province. The wind farm would have a capacity of 140MW generated by up to 43 wind turbines. Savannah Environmental is conducting the required authorisation process and has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial fauna and flora specialist impact assessment study of the proposed development as part of the BA process.

A desktop review of the available information as well as several site visits were conducted in order to characterise and map the ecological features of the site and derive an ecological sensitivity map for the site. The assessement revealed that the Namas site consists of three broad habitats, the Coastal Duneveld in the west, so called Namaqualand Salt Pans in the centre and the more typical Namaqualand Strandveld in the east. The far-western part of the Coastal Duneveld is considered to represent the most sensitive part of the site due to the higher abundance of plant species of concern in this area as well as its likely importance for fauna. While some development in this area is conssdiered acceptable , this should be restricted as far as possible as this area is considered more vulnerable to cumulative impact the total footprint in this area should not exceed 5% of area.. The field assessment indicates that the Namaqualand Salt Pans unit as mapped by the VegMap, does not represent this unit but rather a strandveld community associated with the coarse white sands that characterise this area. As a result, it is clear that this habitat is not currently operating as a hyrological feature and it is not considered as sensitive as it would be if it represented a more typical salt pan habitat. While some development in this area is considered acceptable, it is a relatively restricted habitat with the result that the total footprint within this habitat should be kept in proportion to its abundance to ensure that cumulative impacts on this habitat remain acceptable. The layout assessed has a relatively low footprint in this area with few turbines and the assessed impact is considered acceptable.

In terms of fauna, there are relatively few species of concern that are likely to be present at the site. This is in part due to the low range of habitats present at the site, most notably the lack of rocky outcrops. The major impact on fauna would be direct habitat loss of approximately ~35.46ha as well as some low-level operation phase disturbance resulting from maintenance activities and turbine noise. There are no local populations of fauna within the site that are likely to be compromised by the development as the total footprint is relatively low in proportion to the overall extent of the site and there are still extensive areas within and adjacent to the site that would not be affected.

An area of potential concern regarding the development is the fact that the majority of the development footprint is located within an Ecological Support Area (ESA) and part of the

site falls within a CBA 2. Given the low overall footprint of the wind farm, which occupies less than 5% of the landscape, the development is considered to be broadly compatible with the aims of Ecological Support Areas provided that impacts such as erosion can be properly mitigated. The development footprint within the CBA is less than 16 ha of the 685 ha portion of the CBA that is within the site. This is less than 2.5% of the CBA within the site and an insignificant proportion of the overall CBA 2 area. As the habitat within the CBA is homogenous, there are no specific species or ecological processes that would be disproportionately impacted by the development within the CBA. Furthermore, as the CBA is not a Northern Cape Protected Area Expansion Stategy Focus Area and does not contain any species or habitats that are not widely available in the adjacent areas, an offset is not considered necessary for development in this area and the on-site mitigation and avoidance measures that have been recommended are considered sufficient to reduce the impacts of the development on the CBA to an acceptable level.

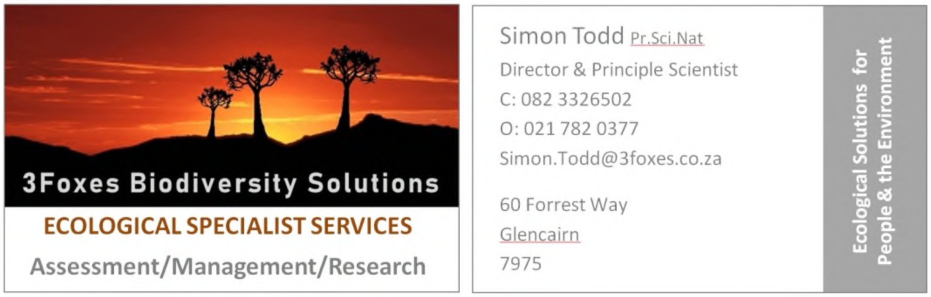
The Namas Wind Farm site is considered to represent a broadly suitable environment for wind farm development. There are no specific long-term impacts likely to be associated with the wind farm that cannot be reduced to an acceptable level through mitigation and avoidance, including a low post-mitigation impact on ESAs and CBAs. Consequently, there are no high residual impacts or fatal flaws associated with the development and it can be supported from a terrestrial ecology perspective. It is therefore the reasoned opinion of the specialist that the Namas Wind Farm should therefore be authorised, subject to the implementation of the recommended mitigation measures.

NEMA 2014 Checklist - Appendix 6 of the EIA Regulations, 2014 (as amended)

Section		*NEMA 2014 Regulations (as amended) for Specialist Studies*	Position in report (pg.)	check
1	1	A specialist report prepared in terms of these Regulations must contain—		
	(a)	details of-		
		(i) the specialist who prepared the report; and	5	✓
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	7	✓
	(b)	a declaration that the person 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 1.1	✓
		(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.3	✓
		(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 3.4	✓
	(d)	the duration, date and season of the site investigationand the relevance of the season to the outcome of the assessment	Section 1.3	✓
	(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 3.7	✓
	(g)	an identification of any areas to be avoided, including buffers;	Section 3.7	✓
	(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 3.7	✓
	(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3	✓
	(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;;	Section 3	✓
	(k)	any mitigation measures fir inclusion in the EMPr	Section 6	✓
	(l)	any conditions for inclusion in the environmental authorisation;	N/A	
	(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 6	✓
	(n)	a reasoned opinion		
		(i) whether the proposed activity, activities or portions thereof should be authorised; and	Section 7	✓

Section		NEMA 2014 Regulations (as amended) for Specialist Studies	Position in report (pg.)	check
		(iA) regarding the acceptability of the proposed activity or activities	Section 7	✓
		(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mititgation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7	✓
	(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	See main EIA report	✓
	(p)	a summary and copies of any comments that were received during any consultation process and where applicable all responses thereto; and	See main EIA report	✓
	(q)	any other information requested by the competent authority.	N/A	
	2	Where a proposed development and the geographical area within which it is located has been subjected to a pre-assessment using a spatial development tool, and the output of the pre-assessment in the form of a site specific development protocol has been adopted in the prescribed manner, the content of a specialist report may be determined by the adopted site specific development protocol applicable to the specific proposed development in the specific geographical area it is proposed in.	N/A	✓

SHORT CV/SUMMARY OF EXPERTISE – SIMON TODD



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, but with a focus on the three Cape provinces. 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.

Recent experience and relevant projects include the following:

- Kap Vley Wind Energy Facility near Kleinzee. CSIR, 2018.
- Eskom Kleinsee 300MW WEF. Savannah Environmental, 2012.
- Project Blue Wind and Solar Energy Facility, Near Kleinsee. Savannah Environmental, 2012.
- G7 Richtersveld Wind Farm. Environmental Resources Management (ERM), 2011.
- Preconstruction Walk-Through of the Juno-Gromis 400kV Power Line. Nsovo Environmental 2016.
- West Coast Resources Mine Expansion. Myezo Environmental. 2016.
- Tormin Mineral Sands Inland and Coastal Mining expansion. SRK. 2016.

SPECIALIST DECLARATION

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

-
- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: ______________________________

Name of Specialist: ____Simon Todd______________________

Date: ____24 August 2018____________________________

1 INTRODUCTION

Genesis Namas Wind (Pty) Ltd is proposing the development of the Namas Wind Farm and associated infrastructure on a site located approximately 20 km south-east of Kleinsee within the Nama Khoi Local Municipality and the Namakwa District Municipality in the Northern Cape Province. The wind farm will have a contracted capacity of up to 140MW generated by up to 43 wind turbines. Genesis Namas Wind (Pty) Ltd has appointed Savannah Environmental as the independent Environmental Assessment Practitioner (EAP) to undertake the required environmental authorisation process for the proposed Namas Wind Farm. As the site falls within the Springbok REDZ, a Basic Assessment process is required for authorisation in accordance with GN114. Savannah Environmental has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial fauna and flora specialist impact assessment study of the proposed development as part of the BA process.

The purpose of the terrestrial fauna and flora specialist Basic Assessment study is to describe and detail the ecological features of the proposed site, provide an assessment of the ecological sensitivity of the site, and identify and assess the likely impacts associated with the proposed development on the site. A desktop review of the available ecological information for the area as well as a number of site visits and a field assessment is used to identify and characterise the ecological features of the site. This information is used to derive an ecological sensitivity map that presents the ecological constraints for development at the site. Impacts are assessed for the construction, operation, and decommissioning phases of the development. Cumulative impacts on the broader area are also considered and assessed. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development, which should be included in the Environmental Management Programme (EMPr) for the development. The full scope of the study is detailed below and is in accordance with Appendix 6 - GN R326 of the EIA Regulations of 2014 as amended (which came into effect on 7 April 2017).

1.1 SCOPE OF STUDY

The study includes the following activities:

- a description of the environment that may be affected by a specific activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of environmental issues and potential impacts (including the assessment of 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 of the development;
- a description and comparative assessment of all alternatives including cumulative impacts;
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the EMPr;
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- a description of any assumptions uncertainties, limitations and gaps in knowledge; and
- an environmental impact statement which contains:
  - a summary of the key findings of the environmental impact assessment;
  - an assessment of the positive and negative implications of the proposed activity; and
  - a comparative assessment of the positive and negative implications of identified alternatives.

General considerations for the study included the following:

- Disclose any gaps in information (and limitations in the study) or assumptions made.
- Identify recommendations for mitigation 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 or flora related issues.
- The assessment of the potential impacts of the development and the recommended mitigation measures provided have been separated into the following project phases:
  - Planning and Construction
  - Operation
  - Decommissioning

1.2 Assessment Approach

This assessment is conducted according to Appendix 6 – GN R326 EIA Regulations, 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 assessments as outlined by Brownlie (2005) and De Villiers *et al*. (2005).

In terms of NEMA, this assessment demonstrates how the proponent intends to comply with the principles contained in Section 2 of 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 (Figure 1);

- 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.

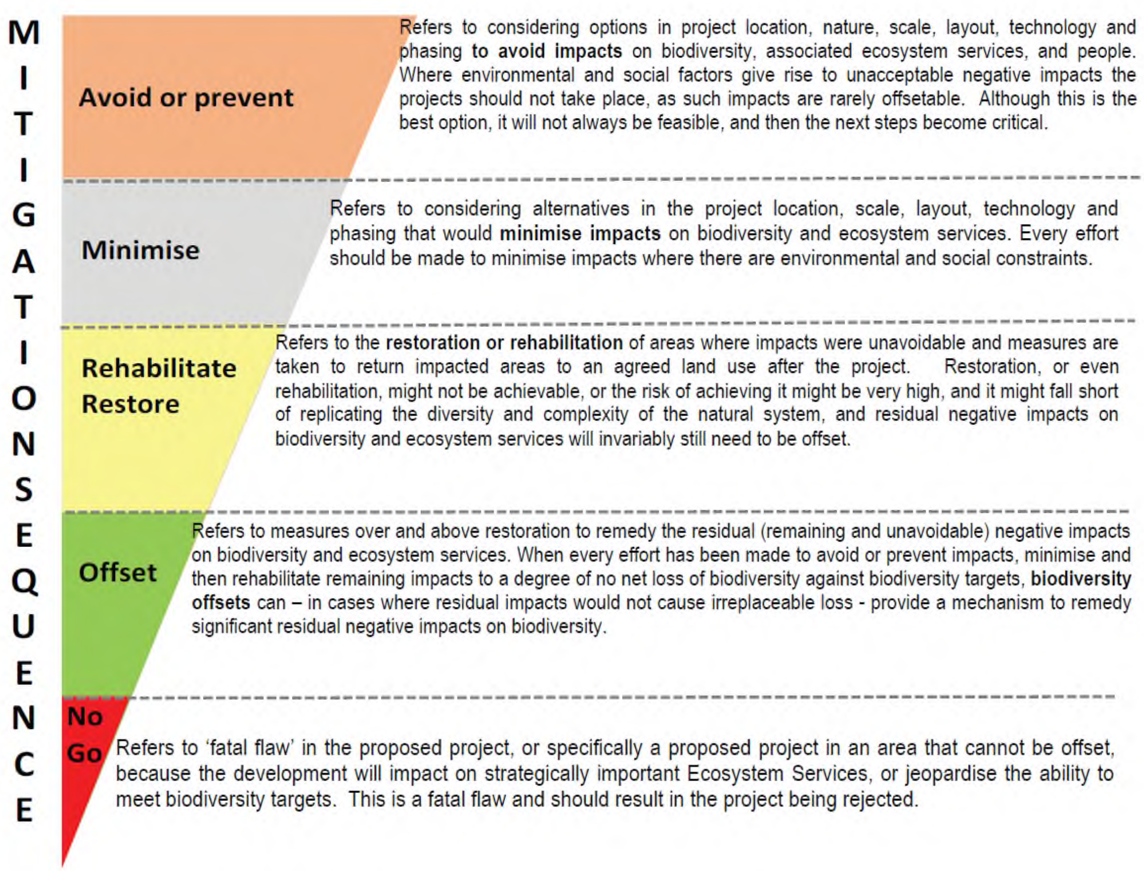


Figure 1. The mitigation hierarchy that is used to guide the study in terms of the priority of different mitigation and avoidance strategies.

Furthermore, in terms of best practice guidelines as outlined by Brownlie (2005) and De Villiers et al. (2005), a precautionary and risk-averse approach should be adopted for 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 (CBAs) (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

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 includes data searches, desktop studies, site walkovers / field survey of the site and baseline data collection, including:
    - 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 neighboring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc.*).

Species level

- Species of Conservation Concern (SCC) (giving location if possible using GPS)
- The viability of an estimated population size of the SCC that are present (including 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 Red Data Book species, or SCC, occurring in the vicinity (including 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 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 for 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 on the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

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

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the 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 development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 Relevant Aspects of the Development

A preferred project site with an extent of ~5092ha has been identified by Genesis Namas Wind (Pty) Ltd as a technically suitable area for the development of the Namas Wind Farm with a contracted capacity of up to 140MW that can accommodate up to 43 turbines. The project site comprises the following four farm portions:

- » Portion 3 of the Farm Zonnekwa 328
- » Portion 4 of the Farm Zonnekwa 328
- » Remaining Extent of the Farm Rooivlei 327
- » Portion 3 of the Farm Rooivlei 327

The Namas Wind Farm project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 140MW:

- Up to 43 wind turbines with a maximum hub height of up to 130m. The tip height of the turbines will be up to 205m;

- Concrete turbine foundations and turbine hardstands;
- Temporary laydown areas which will accommodate the boom erection, storage and assembly area;
- Cabling between the turbines, to be laid underground where practical;
- An on-site substation of up to 100m x 100m (1ha) in extent to facilitate the connection between the wind farm and the electricity grid;
- An overhead 132kV power line (assessed as a 300m power line corridor), with a servitude of 32m, to connect the wind farm to the existing Gromis Substation;
- Access roads to the site (with a width of up to 10m) and between project components (with a width of approximately 8m);
- A temporary concrete batching plant; and
- Operation and maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

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 and Rutherford 2012 and Powrie 2012 update).
- Information on plant and animal species recorded for the wider area was extracted from the SABIF/SIBIS database hosted by SANBI. Data was extracted for a significantly larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself 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:

- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important protected areas expansion areas were extracted from the Northern Cape Protected Areas Expansion Strategy (NC-NPAES 2017).

- Critical Biodiversity Areas in the study area were obtained from the Northern Cape Conservation Plan (Oosthuysen & Holness 2016).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and the ADU databases (ReptileMap, Frogmap and MammalMap) http://vmus.adu.org.za.
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, EWT & SANBI (2016) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as an assessment of the availability and quality of suitable habitat at the site.
- The conservation status of mammals is based on the IUCN Red List Categories (EWT/SANBI 2016), while reptiles are based on the South African Reptile Conservation Assessment (Bates et al. 2013) and amphibians on Minter et al. (2004) as well as the IUCN (2018).

2.2 SITE VISITS & FIELD ASSESSMENT

The site was visited numerous times for the study. An initial site visit was conducted on the 28th and 29th of October 2017, with a follow-up visit from 7-8 July 2018. 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.

In order to obtain greater insight into the faunal community and use of the site, 12 camera traps were distributed across the Namas site and the adjacent Zonnequa site during the October 2017 site visit and retrieved in March 2018. The conditions at the time of the October 2017 site visit were fairly dry as it was a low rainfall season and while conditions were adequate to assess the perennial component of the vegetation, annuals and geophytes were scarce and could not be adequely sampled. During the July 2018 site visit, the conditions were very good for annuals and geophytes and the previous shortcomings with the 2017 field assessment could be addressed. As a result of these different site visits, there are few limitations with regards to the field assessment and the results are considered reliable and comprehensive.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the results of the site visit with the available ecological and biodiversity information in the literature and various spatial databases as described above. As a starting point, mapped sensitive features such as wetlands, drainage lines, rocky hills and pans were collated and buffered where appropriate to comply with legislative requirements or ecological considerations. Additional sensitive areas were then identified from the satellite imagery of the site and delineated. All the different layers created were then merged to create a single coverage. Features that were specifically captured in the sensitivity map include drainage features, wetlands and pans, as well as rocky outcrops and intact vegetation remnants. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a low impact on ecological processes and terrestrial biodiversity. This category represents transformed or natural areas where the impact of development is likely to be local in nature and of low significance with standard mitigation measures.
- **Medium** - Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impacts such as erosion low. 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. 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.

In some situations, areas where also categorised between the above categories, such as Moderately High, where an area appeared to be of intermediate sensitivity with respect to the two defining categories. However, it is important to note that there are no sensitivities that are identified as “Medium to High” or similar ranged categories because this adds uncertainty to the mapping as it is not clear if an area falls at the bottom or top of such a range.

2.4 LIMITATIONS & ASSUMPTIONS

The current study consisted of several site visits across different seasons and times of year, which serves to reduce the limitations associated with the field assessment. In addition, extensive fieldwork has also been conducted on the adjacent proposed Kap Vlei Wind Farm as well as the Eskom 300MW Kleinsee Wind Farm and this information is used to inform the current study where relevant. Consequently, the vegetation of the site is considered well-characterised and there are few limitations in this regard.

In terms of fauna, active searches were conducted for reptiles and amphibians while camera trapping over more than four months was conducted for mammals. In addition, the faunal community of the area is informed by the results of previous work on adjacant sites as described above. Some fauna are rare or difficult to observe in the field, with the result that their potential presence at the site was evaluated based on the literature, their habitat preferences and distribution in the wider area according to the available databases. In order to ensure a conservative approach in this regard, the species lists derived for the site from the literature were obtained from an area significantly larger than the study site.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION PATTERNS

The national vegetation types which occur at the site are briefly described below. The common and characterisitic species associated with each as described in Mucina & Rutherford (2006) is not repeated here as the actual vegetation as observed at the site is described in Section 3.6.

Namaqualand Coastal Duneveld

Namaqualand Coastal Duneveld occurs on the coastal plain in the Northern and Western Cape from south of Port Nolloth to near the Groen Rivier mouth. It occupies the coastal peneplain with semi-mobile sand plains to highly mobile, sharp, angular dune plumes usually north of the esturies. The vegetation consists of a dwarf shrubland dominated by erect succulent shrubs as well as non-succulent shrubs. Spiny grasses (*Cladoraphis*) are common on wind-blown semi-stable dunes. Namaqualand Coastal Duneveld is classified as Least Concern and about 8% of this unit has been lost to coastal diamond mining. The conservation target for this unit is 26% and some extent is currently conserved within the Namaqua National Park. The abundance of vegetation-type endemic species within this unit is low and the unit shares a high proportion of species with the adjacent vegetation types. Although the abundance of plant species of conservation concern within these areas is not exceptional, this unit is associated with the coastal forelands and the presence of fairly mobile or vegetated dunes that are vulnerable to disturbance. Within the site, this vegetation type occupies the western third of the site, but in practice it is only the western margin of the site that is well-differentiated from the areas further inland.

Namaqualand Strandveld

Namaqualand Strandveld occurs in the Northern and Western Cape Provinces from the southern Richtersveld as far south as Donkins Bay. Especially in the north of this unit it penetrates up to 40km inland and approaches the coast only near the river mouths of the Buffels, Swartlintjies, Spoeg, Bitter and Groen Rivers. In the south of the unit it is variably narrow and approaches the coast more closely. It consists of flat to undulating coastal peneplain. The vegetation consists of a low species richness shrubland dominated by a plethora of erect and creeping succulent shrubs as well as woody shrubs and in wet years annuals are also abundant. It is associated with deep red or yellowish-red Aeolian dunes and deep sand overlying marine sediments and granite gneisses. The area is a combination of Ah, Ae, Af, Ai and Ag land types. Mucina and Rutherford list eight endemic species for this vegetation type. Namaqualand Strandveld is classified as Least Threatened and about 10% of this vegetation type has been lost mainly to coastal mining for heavy metals and it is not currently listed. In general, this is not considered to be a highly sensitive vegetation type as it is fairly extensive and generally has a low abundance of species of conservation concern. There may however be specific habitats present that are of limited extent and contain specialised associated species. Within the site, this unit occurs in two broad bands seperated by the low-lying valley which traverses the centre of the site and which is classified as Namaqualand Salt Pans.

Namaqualand Salt Pans

The Namaqualand Salt Pans vegetation type occurs in the Northern and Western Cape on the coastal plain including the Sonnekwa, Hindevlei, Bloupan, Dryerspan, and Soutpan as well as parts of the Olifants River mouth. This unit occupies the flat surfaces of depressions, mostly without vegetation and only occasionally covered with sparse salt-tolerant succulent shrubs. Namaqualand Salt Pans are nearly permanently dry and especially in the Kleinsee area they disappear and are buried under layers of wind-borne sand. This vegetation type is considered to be Least Threatened and has experienced limited impact resulting in transformation to date. While the low-lying valley that traverses the site may have had its origin as a salt pan type feature, it clearly does not correspond to this feature today and cannot be considered to be a salt pan any longer as it is well-vegetated and the original basement is no longer apparent, except where it has been uncovered by excavation. As this is not a common vegetation unit in the area and offers different habitat to the surrounding sandy areas, it is considered more sensitive than the surrounding areas. While some development in this unit is considered acceptable, it is vulnerable to cumulative impact due to its' low extent and the development footprint in this unit should be in proportion to its abundance at the site and not higher.

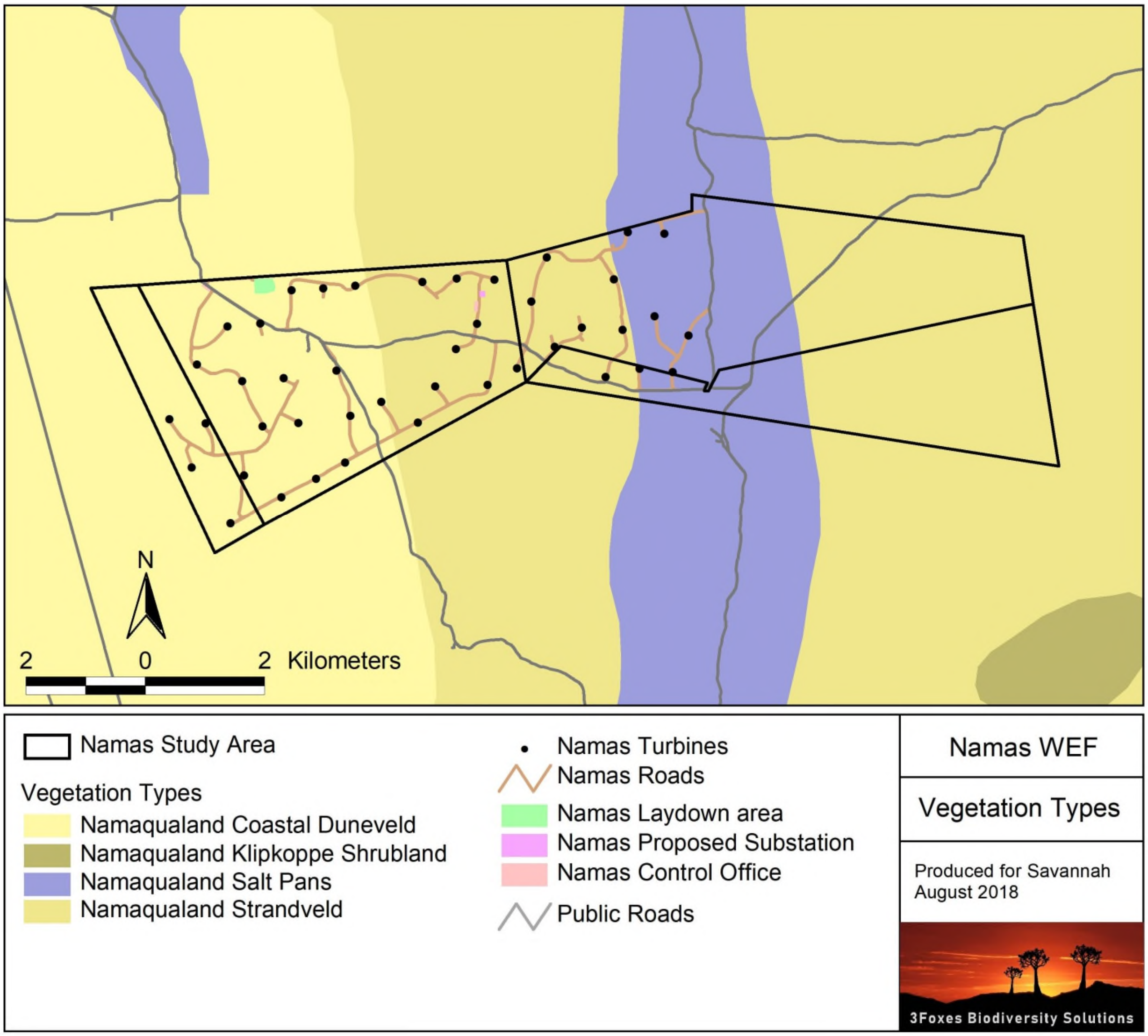


Figure 2. The national vegetation map (Mucina & Rutherford, 2006 & 2012 Powrie update) for the Namas Wind Farm project site.

3.2 LISTED PLANT SPECIES

More than 500 plant species have been recorded from the broader area from Komaggas in the east to Kleinsee in the west. This includes 25 species of conservation concern of which four can be confirmed present at the site. This includes *Aloe arenicola* (NT), *Leucoptera nodosa* (NT), *Wahlenbergia asparagoides* (VU) and *Babiana hirsuta* (NT). However, the abundance of these species is low across most of the site and the local populations would not be compromised by the development.

Figure 3. Common plant species of concern present at the site include *Aloe arenicola* which is common along the western margin of the site, *Babiana hirsuta* which occurs on deep sands and *Leucoptera nodosa* which occurs in the western half of the site.

3.3 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

The extract of the Northern Cape Critical Biodiversity Areas Map for the study area is illustrated below in Figure 4. Such biodiversity assessments identify Critical Biodiversity Areas (CBAs) which represents biodiversity priority areas, and are considered to be areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to maintain ecosystem functioning and meet national biodiversity objectives. The majority of the site lies within an Ecological Support Area, with some CBA 2 in the southwest. While there are also some areas of CBA in the eastern part of the study area, these are outside of the development footprint. The Northern Cape CBA map does not include any information on why a specific area has been included as a CBA with the result that it is not possible to interrogate the map to establish the underlying reasons why the areas within the study area have been classified as CBA 2.

As the primary purpose of CBAs is to try and secure the broad-scale ecological functioning and resilience of landscapes, it is important to consider the impact that the development may have on ecological processes. As the area is relatively homogenous, it is not likely that there are any specific directional movement corridors within the area that is classified as a CBA. It is however likely that the low-lying area that is classified as Namaqualand Salt Pans represents a north-south corridor for species associated with firmer substrates. However, the footprint of the wind farm in this area is low and unlikely to compromise this function. At a broader level, there are also still extensive tracts of similar intact habitat east and west as well as north and south of the site with the result that it is not likely that the development would result in significant disruption of ecological processes. Wind energy development typically occupies less than 5% of the landscape and as the size of the turbines increases with advances in turbine technology, so the distance between turbines also increases, resulting in lower overall noise and disturbance impacts. Given this low footprint, wind energy development is seen as compatible with Ecological Support Areas and provided that measures are implemented to reduce erosion and similar risks, then it is highly unlikely that the wind farm development would compromise the functioning of the ESA.

Based on the above considerations, the overall impact of the development on CBAs and broader scale ecological processes is considered to be relatively low and no major impacts to dispersal ability or faunal movement patterns are likely to be generated by the development. As such, an offset to counter the potential impact of the development on the CBA 2 affected in the southwest of the site does not seem warranted as there is sufficient scope to reduce on-site impacts to an acceptable level and there are no features present in this area that are not widely available outside of the study area. In addition, this area has not been identified as falling within a Northern Cape Protected Area Expansion Strategy (NC-PAES) focus area and has therefore not been identified as an important area for future conservation area expansion, which further supports the above statement regarding the potential need for an offset at the site.

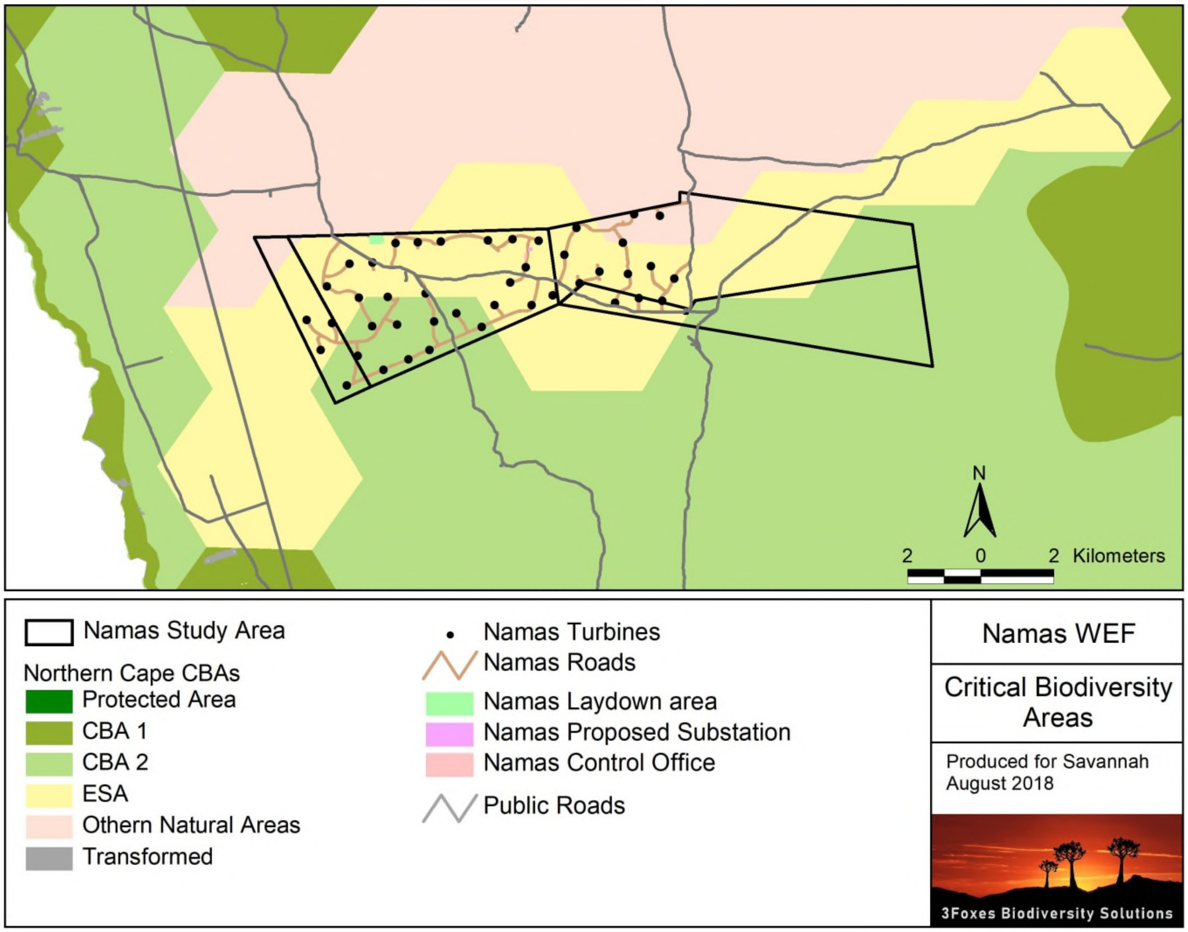


Figure 4. Extract of the Northern Cape Critical Biodiversity Areas map (2017) for the project site, showing that the majority of the site is within a ESA, with some CBA2 in the southwest.

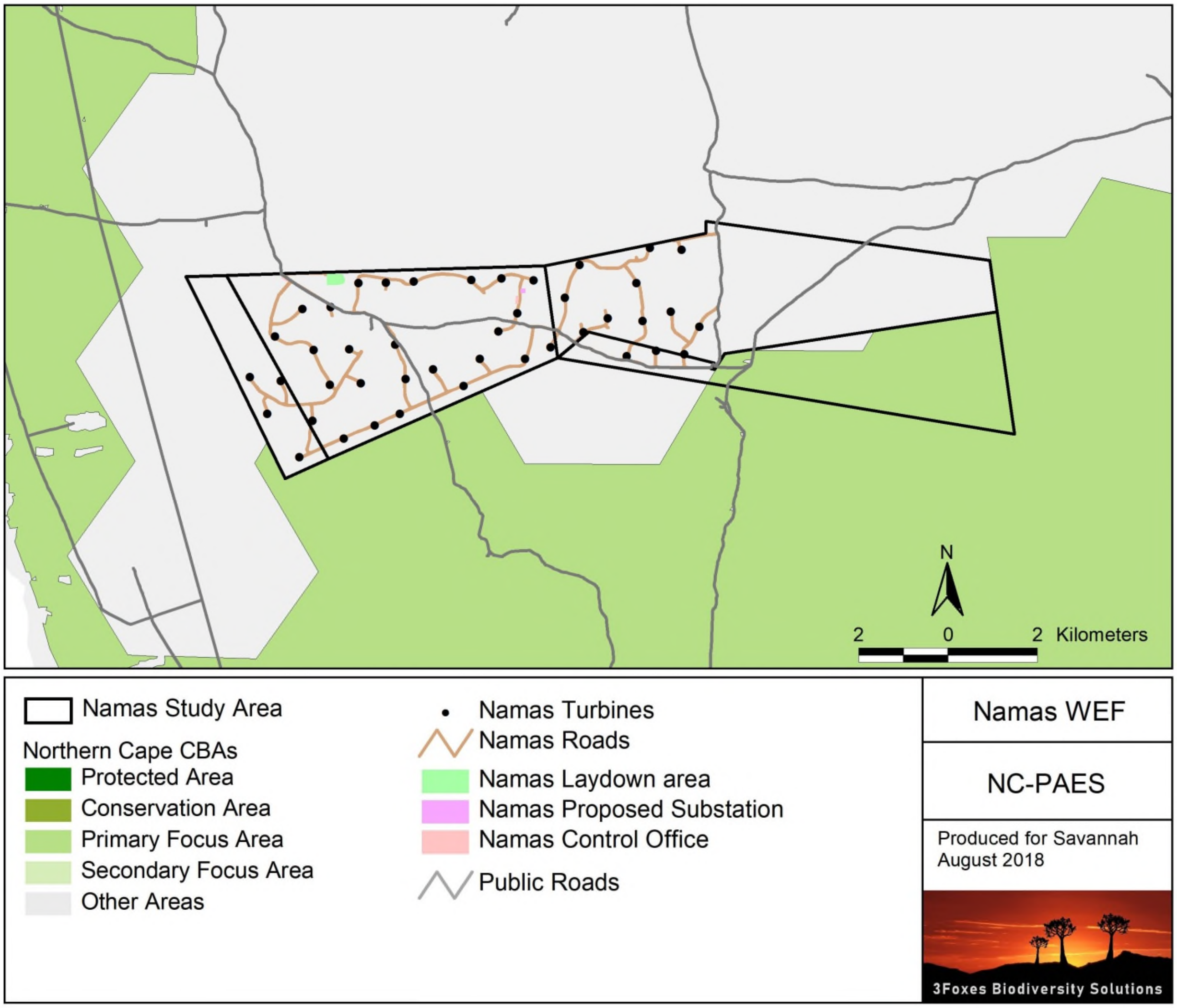


Figure 5. Northern Cape Protected Area Expansion Strategy Focus Areas map for the broader study area, showing that development does not impact on areas identified as priorities for future conservation expansion.

3.4 CUMULATIVE IMPACTS

Although there are a number of the different proposed renewable energy facilities in the broader area around the Namas site (Figure 6), not all of these are within a similar environment and would not affect the same range of habitats as present at Namas. To the east of Namas is the Kap Vley wind farm which has a footprint of approximately 130ha which is distributed between sand fynbos, strandveld and Namaqualand Klipkoppe habitat types. The Kap Vley site is considered considerably more sensitive than the Namas site due to the exceptional habitat diversity present in the Kap Vley area associated with the rocky hills and presence of dunes overlying rocky areas and the very high abundance of species of conservation concern in that area, which is not replicated on Namas, which is restricted to the lower sensitivity sandy strandveld habitats. To the west of Namas is the Eskom Kleinzee 300MW wind farm which would have an approximate footprint of 250ha, restricted largely to the Namaqualand Coastal Duneveld vegetation type. Adjacent and to the north of the Namas site is the Zonnequa Wind Farm which would have a similar footprint to the Namas Wind Farm, but would be restricted largely to the Namaqualand Strandveld and Namaqualand Salt Pans habitat types. However, none of these projects have been built and existing impact in the area is largely restricted to the coastal forelands where diamond mining has had a significant impact on this environment. There are also a number of diamond mines on ancient alluvial terraces along the Buffels River north of the site. Overall, existing impacts on the coastal plain away from the actual coastline are relatively low and the contribution of the anticipated ~35.46ha footprint of the Namas WEF is not considered highly significant in context of the receiving environment.

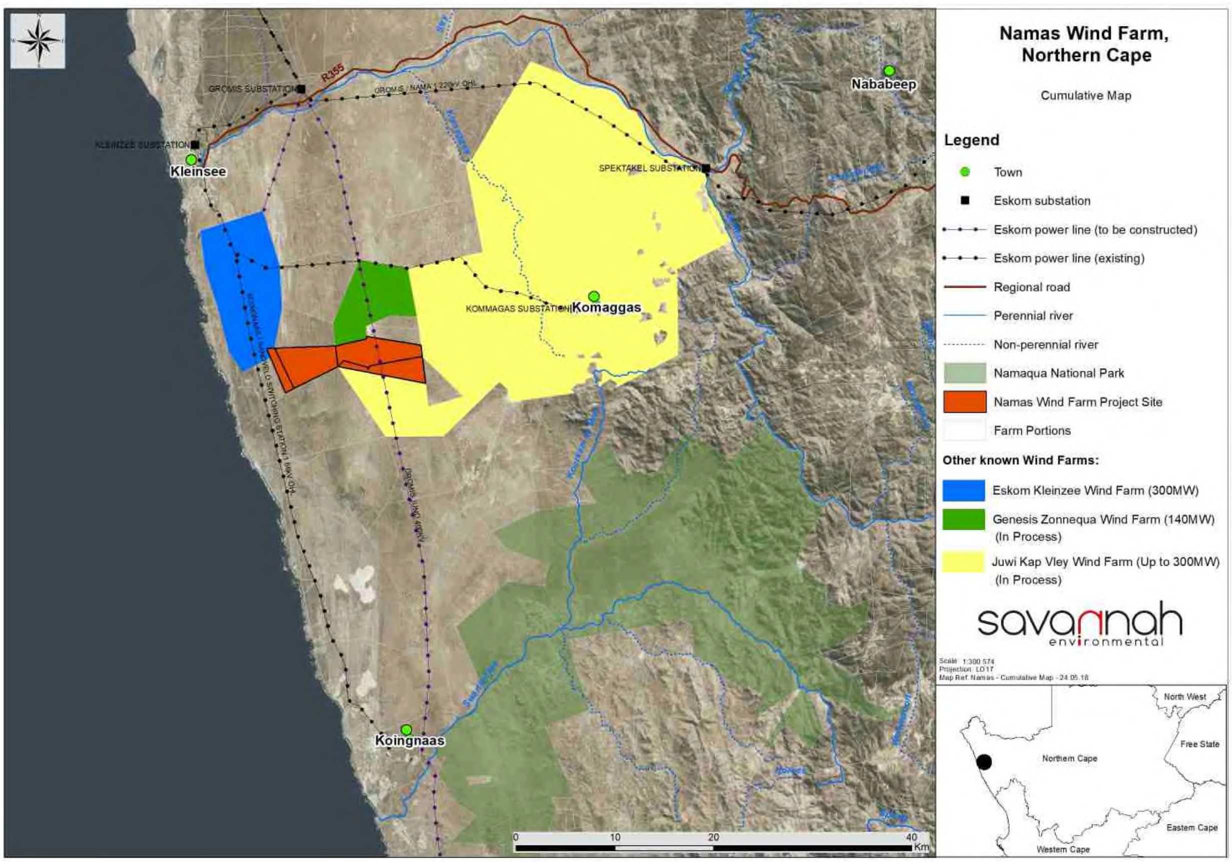


Figure 6. Map illustrating the affected farm portions of known and approved wind energy projects within 30km radius of the Namas Wind Farm site (provided by Savannah Environmental).

3.5 FAUNAL COMMUNITIES

Mammals

Mammals captured by the camera traps include, in order of decreasing abundance, Steenbok, Cape Hare, Cape Fox, Bat-eared fox, Striped Polecat, Suricate, Cape Porcupine, Common Duiker, Honey Badger, Small Spotted Genet, Grey Mongoose, Caracal, Yellow Mongoose, African Wild Cat and Slender Mongoose (Figure 7, Figure 8). More than half the observations are from Steenbok and Cape Hare, with Cape Fox, Bat-eared fox, Striped Polecat, Suricate and Cape Porcupine being moderately abundant and the remaining species uncommon. This represents a fairly typical mammalian community and is similar to that obtained at other sites along the West Coast. A notable absence is the Black-backed Jackal which occurs in the area but is likely absent as a result of persecution. Small mammals observed or caught in the area with Sherman traps include Hairy-footed Gerbil, Western Rock Elephant Shrew, Namaqua Rock Mouse, Four-striped Mouse, Karoo Bush Rats and Brants' Whistling Rat.

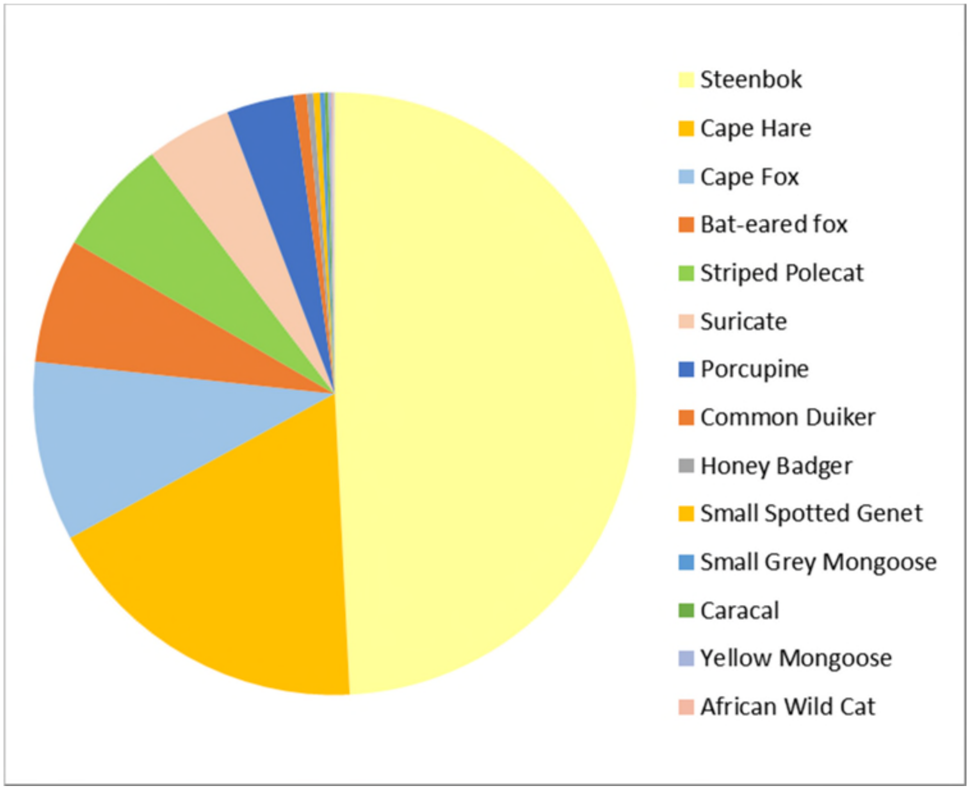


Figure 7. Pie chart showing the relative abundance of mammals at the Namas site based on more than 1100 camera trap observations at the site.

Apart from the species that were observed and can be confirmed present at the site, four red-listed SCC are known from the wider area. This includes the Leopard *Panthera pardus* (Vulnerable), Littledale's Whistling Rat *Parotomys littledalei* (Near Threatened), African Clawless Otter *Aonyx capensis* (Near Threatened) and Grants' Golden Mole *Eremitalpa granti granti* (Vulnerable). It is not likely that either the Leopard or Otter are present at the site on account of human disturbance or lack of suitable habitat. Golden Moles are confirmed present at the site, but it is not clear if these are the more common Cape Golden Mole or Grants' Golden Mole. These subterranean animals 'swim' through the soft sand and hardened surfaces such as roads would pose a significant obstacle for movement. In addition, they also use subtle vibrations in the soil to detect their prey and it is possible that noise and vibration transferred from the turbines to the soil would have a negative impact on the local populations of golden moles. There have however been no studies to date on the impacts of vibration and noise on golden moles and so this remains an unknown.

The major impacts on mammals would occur during the construction phase when there would be significant noise and disturbance generated at the site. However, in the long-term, impacts on mammals would be low as additional habitat loss would be minimal and the resident species would be those that are tolerant of human activity and a modified landscape and it is unlikely that any species would be significantly affected by the wind farm development.

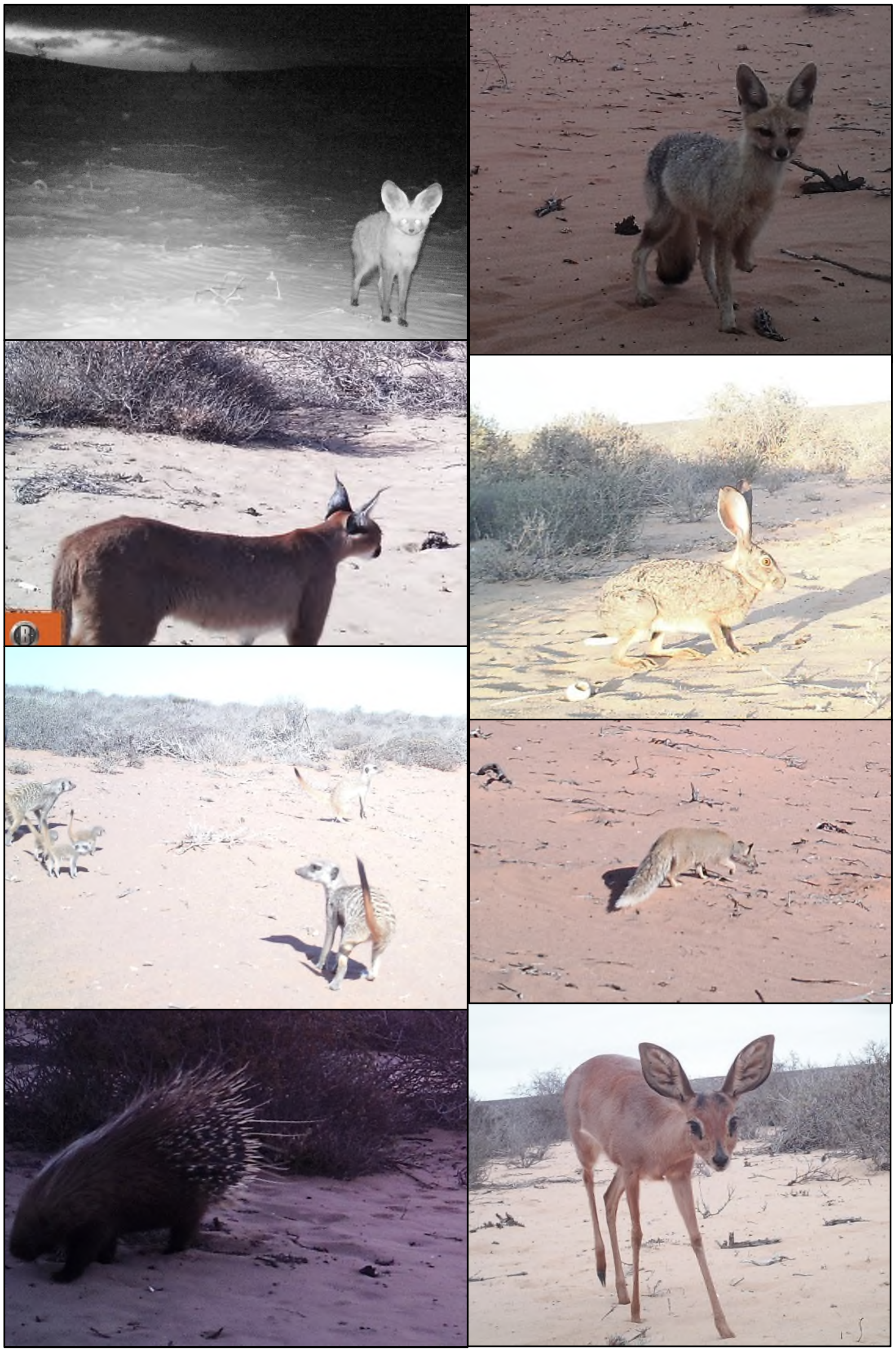


Figure 8. Examples of camera trap images from the site. Clockwise from bottom left, cape Porcupine, Suricate, Caracal, Bat-eared Fox, Cape Fox, Cape Hare, Yellow Mongoose and Steenbok. The Cape Fox pictured top right has an amputated front leg, likely the result of being caught in a gin trap.

Reptiles

A list of Reptiles known from the vicinity of the Namas site, based on records from the ReptileMap database is provided in Appendix 3 of this report and indicates that as many as 45 species are known to occur in the wider area. No SCC have however been recorded from the area although it is possible that the Speckled Padloper *Chersobius signatus* (Vulnerable) is present in the area, there is very little rocky habitat available at the site for this species and as a result it is not likely to be present. Namaqualand is however known as a centre of endemism and diversity for reptiles and the wider area has a high diversity and abundance of local endemics. This appears to be generated at least partly through the high habitat diversity of the area, which includes rocky hills, heuweltjie veld on fine-textured firm soils, loose sands and dunes, stable and vegetated dunes, well-vegetated drainage lines etc. Within the Namas site, habitat diversity is however low and restricted to various sandy substrates from firm sand lowlands to fairly loose dunes, with the result that species associated with rocky outcrops are likely to be absent from the site.

Species observed at the site (Figure 9) include Angulate Tortoise, Giant Desert Lizard, Common Giant Ground Gecko, Knox's Desert Lizard, Common Sand Lizard, Cape Skink, Coastal Dwarf Legless Skink, Namaqua Sand Lizard, Pink Blind Legless Skink, Dwarf Beaked Snake and Many-horned Adder. For most species the major impact of the development would be loss of habitat equivalent to the footprint of the development. For most species this is not considered highly significant as there are large intact tracts of similar habitat available in the area. Subterranean species associated with sandy substrates may be vulnerable to habitat disruption due to the construction of roads which may fragment the continuity of the sandy substrate. However, overall, the impacts of the development on reptiles are likely to be of local significance only as there are no species with a very narrow distribution range or of high conservation concern present at the site which may be compromised by the development.

Figure 9. Common reptiles at the Namas site include the Angulate Tortoise, Giant Desert Lizard and two colour morphs of the Coastal Dwarf Legless Skink *Acontias litoralis*, a West Coast endemic.

Amphibians

There is no natural permanent or even seasonal standing water at the Namas site, which is due to the sandy substrate and consequent lack of drainage features where water can gather. As a result, the amphibian community at the site is restricted to species which are relatively independent of water and is consequently of low diversity. The only species confirmed present in the immediate area is the Namaqua Rain Frog which appears to be relatively widespread within the coastal strandveld vegetation types on sandy soils. Other species which are possibly present include the Cape Sand Frog *Tomopterna delalandii* and the Desert Rain Frog *Breviceps macrops* which is classified as Vulnerable. The Desert Rain Frog is however restricted to the coastline and is not known to occur so far inland and as a result is unlikely to occur at the site, although this cannot be discounted as the area has not been well investigated. Given the paucity of important amphibian habitats at the site and the low diversity of amphibians, a significant impact on amphibians is not likely.

3.6 NAMAS WIND FARM SITE DESCRIPTION

It is difficult to map the different habitats or plant communities present at the Namas site based on satellite imagery alone due to the homogenous sands of the area and the similar cover and structure of the vegetation. There are some exceptions such as the areas which are mapped as Namaqualand Salt Pans, which in the study area have been overlain with marine sands, but are still easily visible on account of the underlying white sands and calcrete. In order to better inform the vegetation baseline of the site, 30 vegetation samples were collected from a broader study area which includes the Namas site as well as the adjacent Zonnequa site. This is considered a useful approach as it allows the vegetation of the site to be interpreted in a broader context.

Although the specific sites that were sampled in the field were chosen randomly, the sample points where purposely distributed across the wider area to capture the range of habitats present and ensure spatial representivity. In order to identify and understand the different plant communities present, the information from the 30 sample sites was subject to cluster analysis, which identifies and groups plots with similar species composition together in a hierarchical structure. The groups resulting from the cluster analysis were then mapped to illustrate the spatial distribution of the communities identified. The cluster analysis and map are illustrated below in Figure 10 and Figure 11.

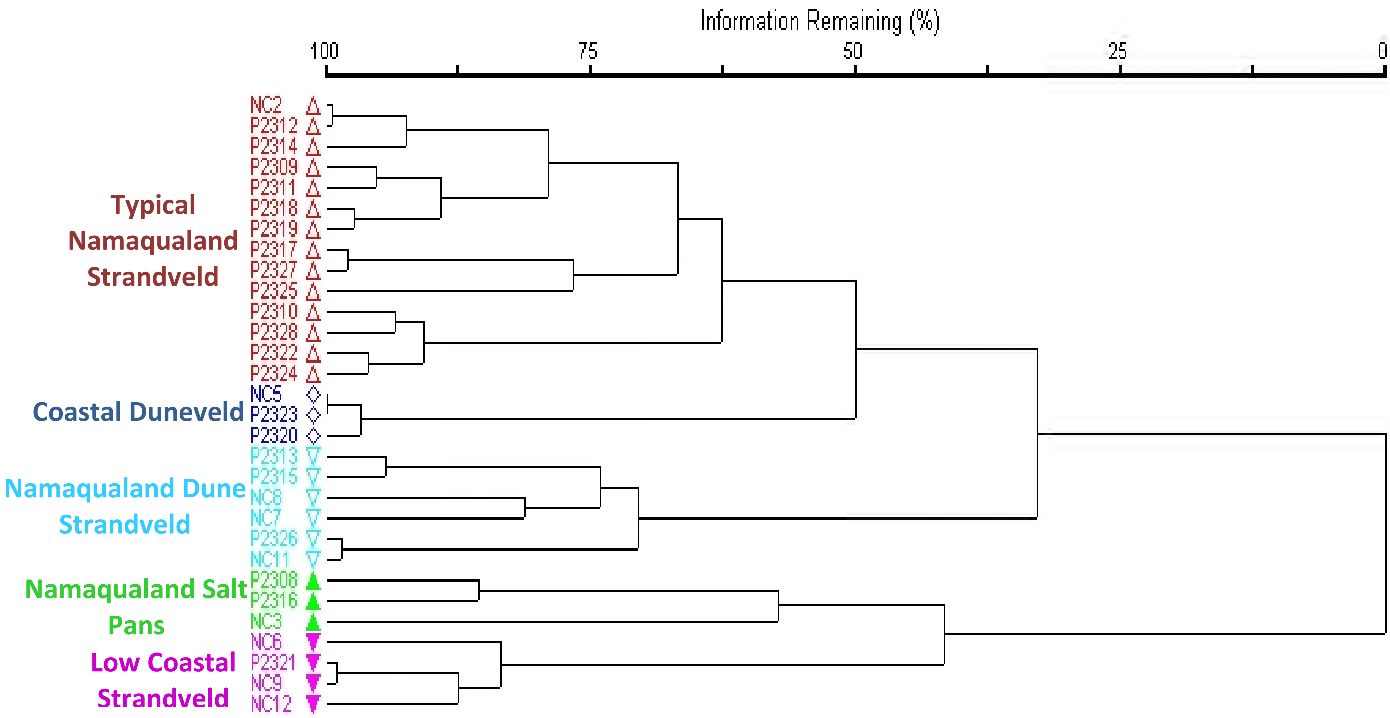


Figure 10. Cluster analysis showing the different plant communities that were identified among the plots that were sampled at the Namas site and in the adjacent areas. The number of communities that can be recognised is essentially arbitrary and the main difference among the plots lies at the first level division. For the current purposes, five communities were recognised and named as above.

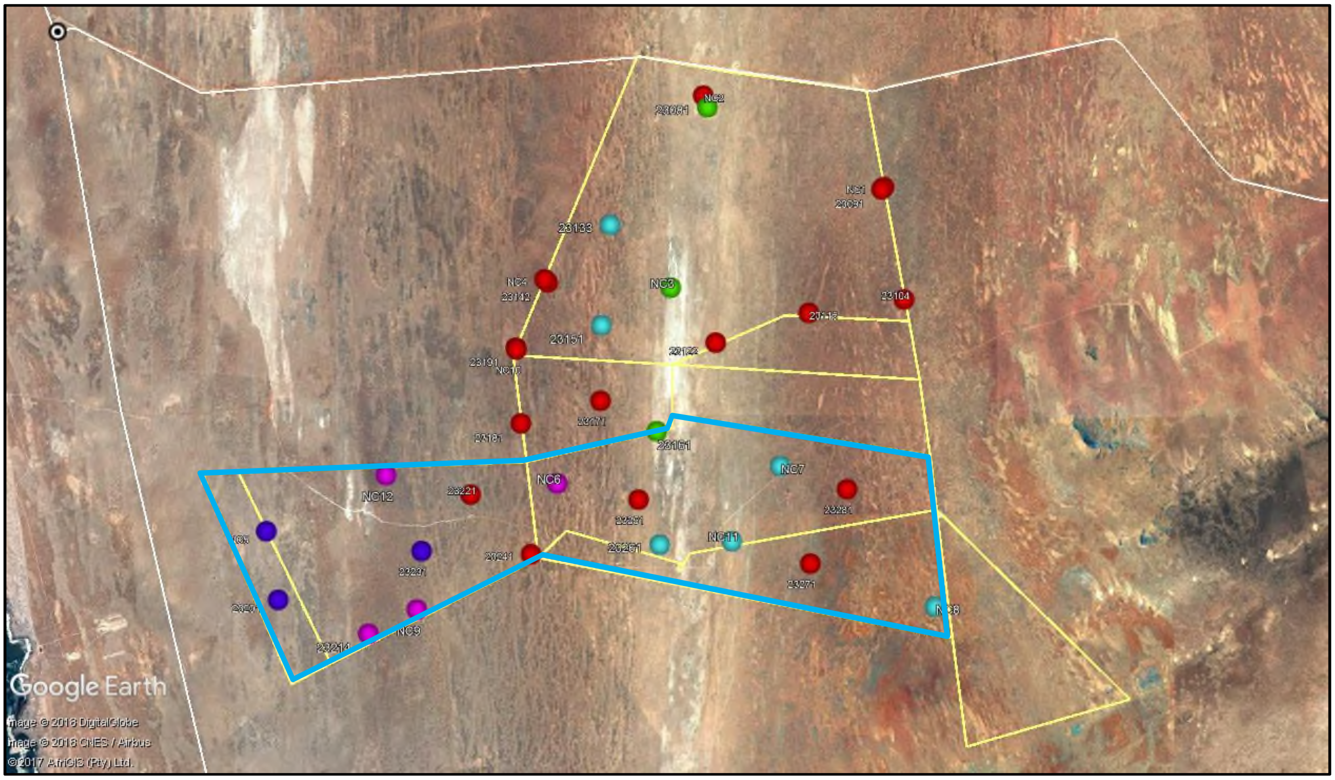


Figure 11. Map showing the distribution of the different plant communities or groups identified above in the cluster analysis.

The cluster analysis illustrates a few patterns of note that can be observed on the above map (Figure 11). The plots from the western part of the site form two relatively distinct clusters (blue and purple), while there is also clearly a cluster associated with the shallow sands overlying calcrete in the mid-section of the site (green) as well as a cluster on large dunes (blue) and the remaining cluster (red) which represents more typical strandveld on flatter areas. Each of the habitats identified above is illustrated with pictures of these habitats from the Namas site and described in more detail below.

Community 1. Coastal Duneveld

The western part of the site falls within the Coastal Duneveld vegetation type and this vegetation unit is at least partly supported by the current study, which identified two plant communities associated with the western parts of the site. The sample sites mapped in Blue in Figure 11 occur on pale sands with relatively low vegetation compared to the adjacent Namaqualand Strandveld. Typical species include *Zygophyllum morgsana*, *Tripteris oppositifolia*, *Asparagus capensis*, *Lycium cinereum*, *Tetragonia spicata*, *Othonna sedifolia*, *Hermannia sp*., *Stoberia utilis*, *Lebeckia halenbergensis*, *Pteronia divaricata*, *Hermannia cuneifolia*, *Salvia lanceolata*, *Manochamys albicans*, *Asparagus fasciculatus*, *Searsia longispina* and *Aloe arenicola*. The abundance of plant species of conservation concern was observed to be moderate with *Aloe arenicola*, *Leucoptera nodosa* and *Babiana hirsuta* observed to the present. This area is considered to be somewhat more sensitive than the adjacent Namaqualand Strandveld due to the greater vulnerability of this area to wind erosion as well as the potential greater importance of this area for fauna associated with the coastal plain, many of which do not penetrate far inland and would not occur further east within the site.

Community 2. Low Coastal Strandveld

Adjacent to the areas of Coastal Duneveld, are some areas of finer-textured soils dominated by low succulents. These areas are generally flat and not subject to significant sand movement. Dominant and typical species include *Othonna sedifolia*, *Asparagus capensis*, *Amphibolia rupis-arcuatae*, *Tripteris oppositifolia*, *Jordaaniella spongiosa*, *Ruschia goodiae*, *Tylecodon pearsonii*, *Tetragonia spicata*, *Manochamys albicans*, Ruschia sp. and *Euphorbia brachiata*. This is not considered to be a highly sensitive habitat type, but as it is of limited extent it is considered more vulnerable to cumulative habitat loss. No specific avoidance of this habitat is recommended as it does not have a high abundance of species of concern.

Community 3. Strandveld on Namaqualand Salt Pans

The vegetation of the areas classified as Namaqualand Salt Pans is well supported as an independent unit in this study, however, it is also clear that the naming is not appropriate and the unit should be called something else as the vegetation does not correspond with a salt pan environment. These areas occur on shallow white sands overlaying weathered calcrete or lime. Water does not collect in these areas as evidenced by observation and the fact that most of the farm houses in the study area are located within this habitat. Although they are currently freely drained they may once have represented salt pans that have been overlain with wind-blown sands. Typical and dominant species include *Amphibolia rupis-arcuatae*, *Euphorbia brachiata*, *Othonna sedifolia*, *Asparagus capensis*, *Zygophyllum morgsana*, *Ruschia goodiae*, *Cheirodopsis denticulata*, *Aridaria nociflora*, *Othonna cylindrica* and *Ruschia sp.*. As this is a habitat of limited extent and offers features that are not found elsewhere in the area, it is considered more sensitive than the surrounding Strandveld and the overall development footprint in this habitat should be kept low, but some development in these areas is considered acceptable.

Community 4. Namaqualand Dune Strandveld

There is a distinct plant community associated with the larger, more mobile dune fields of the site (mapped as light blue sites in Figure 11). These areas are more dynamic than the areas of flatter strandveld and have areas of alternating low cover associated with areas of greater sand movement and areas of taller vegetation occurring in the dune slacks and other more stable situations. Typical and dominant species include *Zygophyllum morgsana*, *Searsia longispina*, *Tripteris oppositifolia*, *Cladoraphis cyperoides*, *Othonna sedifolia*, *Conicosia pugioniformis*, *Asparagus lignosus*, *Hermannia sp. nov.*, *Babiana hirsuta*, *Leucoptera nodosa*, *Eriocephalus racemosus*, *Asparagus capensis*, *Lycium cinereum*, *Lebeckia spinescens*, *Tetragonia spicata* and *Diospyros ramulosa*. These areas are considered somewhat more sensitive than the typical surrounding Strandveld due to the large dunes which are vulnerable to disturbance. No specific avoidance of this habitat is recommended, but some additional mitigation is likely to be required to reduce wind erosion risk during the construction phase.

Community 5. Typical Namaqualand Strandveld

The majority of the site consists of typical Namaqualand Strandveld on gently undulating plains. These areas are fairly homogenous but there are some shifts in the dominance of the different plant species present depending on soil texture, depth etc. Typical and dominant species include *Zygophyllum morgsana*, *Tripteris oppositifolia*, *Asparagus capensis*, *Othonna sedifolia*, *Hermannia sp.*, *Lebeckia spinescens*, *Eriocephalus racemosus*, *Searsia longispina*, *Leipoldtia sp.*, *Cladoraphis cyperoides*, *Salvia lanceolata*, *Anthospermum spathulatum*, *Tetragonia spicata*, *Ruschia sp.*, *Helichrysum hebelepis*, *Wahlenbergia asparagoides*, *Asparagus lignosus* and *Euphorbia burmannii*. This is the dominant habitat at the site and comprises the majority of the study area. This is not considered to be a sensitive habitat and while some SCC are present, a significant impact on the local populations of these species is not likely as this is a widespread vegetation type.

3.7 NAMAS WIND FARM SENSITIVITY ASSESSMENT

The sensitivity map for the project site is depicted below in Figure 12. The majority of the site consists of Namaqualand Strandveld considered to be of Low or Moderate sensitivity. Development in these areas would generate low ecological impacts as these habitats are widely available in the area. The areas classified as Namaqualand Salt Pans are clearly not salt pans and while the vegetation survey confirmed that they are well-differentiated from the adjacent strandveld, they are not currently acting as hydrological features and hence they are not considered to be as sensitive as pans would be. Development within these areas is considered acceptable, but should be limited to some degree as this is not a very extensive habitat type with the result that it is considered more vulnerable to cumulative impacts. In the west, the coastal duneveld is considered of moderately high sensitivity. There are six turbines and their associated internal access roads located within this area, which are considered to be an acceptable impact to this area. The main risks associated with development within this moderately high sensitivity area is wind erosion of the sandy soils as well as potential impacts on plant species of conservation concern. Both these impacts can be mitigated to low levels, with the result that this is considered to represent an acceptable risk and impact. Overall the development is likely to generate moderate pre-mitigation impacts which in most cases can be reduced to low or moderate impacts after the implementation of the recommended mitigation.

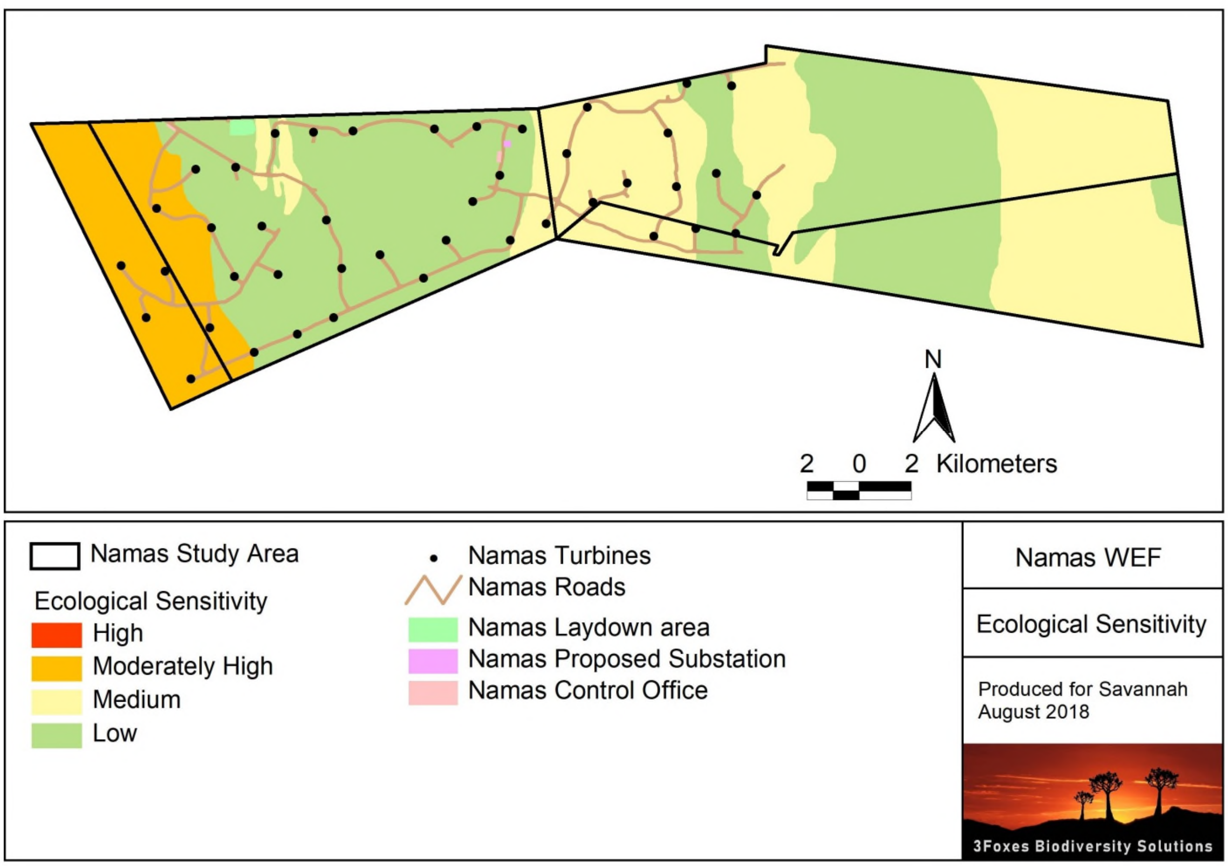


Figure 12. Ecological sensitivity map for the Namas Wind Farm project site.

4 ASSESSMENT & SIGNIFICANCE CRITERIA

Direct, indirect and cumulative impacts of the issues identified in this report are assessed in terms of the following criteria:

- The **nature** which includes a description of what causes the effect what will be affected and how it will be affected.

- The **extent** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high):

- The **duration** wherein it is indicated whether:

  - the lifetime of the impact will be of a very short duration (0- 1 years) - assigned a score of 1.
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2.
  - medium-term (5-15 years) - assigned a score of 3
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5

- The **magnitude** quantified on a scale from 0-10 where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but of low likelihood), 3 is probable (distinct possibility) , 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a syntheses of the characteristics described above and can be assessed as low, medium or high;
and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

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

S = (E + D + M)P

Where

S = significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

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

5 ASSESSMENT OF IMPACTS

5.1 PLANNING AND CONSTRUCTION PHASE IMPACTS

An assessment of the likely extent and significance of each impact identified above is made below.

Impact 1: Impacts on vegetation due to construction activities

The development of the Namas Wind Farm would require vegetation clearing for turbines, roads, on-site substation, internal power lines or cable trenches and other hard infrastructure. Apart from the direct loss of vegetation within the development footprint, listed and protected species are also highly likely to be impacted. The total extent of habitat loss is expected to be in the order of ~35.46ha. As the abundance of species of conservation concern in the area is moderate to low, the impact on SCC is likely to be relatively low and the primary impact would be on gross habitat loss of the affected Strandveld and Duneveld vegetation types. As the surrounding landscape is still largely intact and there are no very high value plant habitats within the development footprint, post-mitigation impacts are likely to be of a Medium Significance.

Impact Nature: Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the facility. In addition, it is highly likely that some loss of individuals of plants of SCC will occur.

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Medium (6)	Medium (5)
Probability	Certain (5)	Highly Likely (4)
Significance	Medium (55)	Medium (40)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	This impact can only be mitigated to a certain extent as the loss of vegetation is unavoidable and is a certain outcome of the development.	
Mitigation	• The final layout including roads and underground cables should be subject to a preconstruction walk-through before construction commences and adjusted where required to reduce impacts on SCC and habitats of concern. • Search and Rescue of species of conservation concern (SCCs) should be conducted prior to clearing activities. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within the demarcated construction areas etc. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving is to be allowed once the site has been pegged for construction. • Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. • Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operation phase of the development.	
Cumulative Impacts	The development will contribute to cumulative impacts on habitat loss and transformation in the area.	
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 residual impact even after mitigation and avoidance of more sensitive areas.	

Impact 2. Faunal impacts due to construction activities.

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna. Sensitive and shy fauna are likely to 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. Traffic during construction will be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. Many of these impacts can however be effectively managed or mitigated. However, faunal habitat loss cannot be mitigated and would persist for the operational lifetime of the facility. After mitigation, faunal impacts are likely to be of a <u>Low Significance</u>.

<table>
<tr><td colspan="3">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.</td></tr>
<tr><td></td><td>Without Mitigation</td><td>With Mitigation</td></tr>
<tr><td>Extent</td><td>Local (1)</td><td>Local (1)</td></tr>
<tr><td>Duration</td><td>Short-term (2)</td><td>Short-term (2)</td></tr>
<tr><td>Magnitude</td><td>Medium (6)</td><td>Low (4)</td></tr>
<tr><td>Probability</td><td>Highly Probable (4)</td><td>Highly Probable (4)</td></tr>
<tr><td>Significance</td><td>Medium (36)</td><td>Low (28)</td></tr>
<tr><td>Status</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>Irreplaceable loss of resources</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td colspan="2">Although the large amounts of 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 easily mitigated.</td></tr>
<tr><td>Mitigation</td><td colspan="2">• Site access should be controlled and no unauthorised persons should be allowed onto the site.
• Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
• The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the demarcated construction site.
• Fires should not be allowed on site.</td></tr>
</table>

	• 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 construction vehicles should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • If any parts of the facility are 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 as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks.
Cumulative Impacts	During the construction phase the activity would contribute to cumulative fauna disturbance and disruption in the area, but as there are large 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.

Impact 3. Increased Soil Erosion Risk during Construction

The large amount of disturbance created during construction would leave the site vulnerable to soil erosion, especially given the sandy soils and high winds the area experiences. Normal dust suppression techniques do not work well in this environment as the major agent of erosion is wind and the soil binders that are usually used for dust supression may not be very effective on the sandy soils. Once mobilised, the sand may suffocate the vegetation, creating additional sources of sand, allowing such erosion to propagate in the dominant wind direction. Measures to limit erosion will need to be a key element of mitigation measures at the site during construction as well as operation. Although this impact is a potentially an impact of concern it is likely that it can be mitigated to a Low Significance.

Impact Nature: Disturbance created during construction will leave the site vulnerable to erosion.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (7)	Low (4)
Probability	Certain (5)	Likely (3)

Significance	Medium (60)	Low (24)
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. • All roads and other hardened surfaces should have runoff control features which redirects water flow and dissipate any energy in the water that may pose an erosion risk. • Regular monitoring for erosion during construction to ensure that no erosion problems are developing as a result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas should be revegetated with indigenous perennial species from the local area.	
Cumulative Impacts	Erosion would contribute to degradation in the area, but as this can be well-mitigated, the contribution can be minimised.	
Residual Risks	Some erosion is likely to occur even with the implementation of erosion control measures, due to the strong winds the area experiences and the likely in difficulty in re-establising vegetation cover in cleared areas.	

5.2 OPERATION PHASE IMPACTS

Impact 1. Faunal impacts due to operation

Although noise and disturbance levels during operation will be significantly reduced compared to construction, some noise and disturbance impacts will persist due to operational activities on the wind farm as well as noise generated by the turbines themselves. Although most fauna are likely to quickly become habituated to the presence of the turbines, some fauna may be negatively affected due to noise or other reasons and may avoid the proximity of the turbines and would therefore experience greater long-term habitat loss. This is however likely to be a small subset of the species present and this effect has not been documented in Namaqualand or elsewhere for wind farms. As the affected areas are not considered to be of a very high faunal sensitivity, the post-mitigation operational impacts on fauna are likely to be of a <u>Low Significance</u>.

Impact Nature: The operation and presence of the facility may lead to disturbance or persecution of fauna within or the areas adjacent to the facility.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Minor (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	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 turbine noise and human disturbance is likely.	
Mitigation	• No unauthorised persons should be allowed onto the site. • Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site or in the surrounding areas should be strictly forbidden. • If the site must be lit at night for security purposes, this should be done with 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) to avoid collisions with susceptible species such as snakes and tortoises.	
Cumulative Impacts	The development would contribute to the cumulative disturbance for fauna, but the contribution would be low for most species and is not considered highly significant.	
Residual Risks	Turbine noise and disturbance from maintenance activities cannot be fully mitigated but occur at a low level with the result that most species are likely to be able to adapt to the new environment.	

Impact 2. Negative impact on ESAs, CBAs and broad-scale ecological processes.

The development lies in large partly within an ESA and partly within a CBA. The development of the Namas Wind Farm will potentially negatively impact the biodiversity value and ecological functioning of these areas. Development of a wind farm within the ESA is seen as acceptable provided that the impacts can be effectively mitigated. The footprint within the CBA is low and highly unlikely to signficantly affect either the functioning or biodiversity value of the CBA. However, the presence of the development would impact habitat quality to some degree within the affected areas, which would potentially have a low-intensity, long-term impact on some species. With mitigation, this impact is likely to be of a Low Significance.

Impact Nature: Development of the wind farm may impact ESAs, CBAs and broad-scale ecological processes such as the ability of fauna to disperse.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low-Minor (3)
Probability	Probable (3)	Probable (3)
Significance	Low (30)	Low (24)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Only partly, as a significant proportion of the impact results from the presence and operation of the wind farm which cannot be mitigated.	
Mitigation	• An open space management plan should be developed for the site, which should include the management of biodiversity within the affected areas, as well as that in the adjacent intact strandveld on the affected land portions.	
Cumulative Impacts	The development would potentially contribute to habitat degradation and the loss of landscape connectivity and ecosystem function within the area, but this is likely to be relatively low as most species are likely to be able to modify their behaviour to account for this and only a small proportion of species is likely to be sensitive to the presence of the turbines.	
Residual Risks	The presence and operation of the facility will generate a continuous low-level impact on some fauna, but this is not likely to be of high consequence.	

Impact 3. Increased Soil Erosion Risk during Operation

The large amount of disturbance created during construction would leave the site vulnerable to soil erosion for many years into the operation phase, especially given the sandy soils and high winds the area experiences. The soil disturbance associated with the development will render the impacted areas vulnerable to wind erosion and measures to limit erosion will need to be a key element of mitigation measures at the site. Although this impact is of potential concern it can be mitigated to a Low Significance.

Impact Nature: Disturbance created during construction will leave the site vulnerable to erosion for several years into the operarion phase.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (6)	Low (4)
Probability	Certain (5)	Likely (3)
Significance	Medium (55)	Low (24)
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. • All roads and other hardened surfaces should have runoff control features which redirects water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There should be follow-up rehabilitation and revegetated of any remaining bare areas with indigenous perennial shrubs and succulents from the local area.	
Cumulative Impacts	Erosion would contribute to degradation in the area, but as this can be well-mitigated, the contribution can be minimised.	
Residual Risks	Some erosion is likely to occur even with the implementation of erosion control measures, due to the strong winds the area experiences and the likely difficulty in re-establising vegetation cover in cleared areas.	

5.3 DECOMMISSIONING PHASE IMPACTS

Impact 1. Faunal Impacts due to decommissioning

The impacts on fauna at decommissioning would be similar to those at construction, but of a lower severity as the activity will be taking place within the development footprint. The increased levels of noise, pollution, disturbance and human presence during decommissioning will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during this period as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the decommissioning activities and might be killed. Vehicular traffic would be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the decommissioning phase as a result of the large number of personnel that are likely to be present. This would however be a transient impact which would ultimately result in an increase in available habitat for some fauna. After mitigation, faunal impacts due to decommissioning are likely to be of a Low Significance.

Impact Nature: The decommissioning of the facility may lead to disturbance or persecution of fauna within or the areas adjacent to the facility.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To a large extent, but disturbance will occur regardless.	
Mitigation	• No unauthorised persons should be allowed onto the site. • Any potentially dangerous fauna such snakes or fauna threatened by the decommissioning activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site or in the surrounding areas should be strictly forbidden. • If the site must be lit at night for security purposes, this should be done with 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) to avoid collisions with susceptible species such as snakes and tortoises.
Cumulative Impacts	Ultimately, decomissioing would restore some habitat for fauna and so in the long-term this would provide a positive outcome for fauna.
Residual Risks	As the intact habitats at the site will not be significantly affected, residual risks on fauna would be very low.

Impact 2. Soil Erosion Risk due to Decommisioning.

The removal and clearing of the site infrastructure would create some soil disturbance which would leave these areas vulnerable to erosion, which if left unchecked could spread significantly. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk. Although this is an impact of potential concern it can be well mitigated to a Low Significance.

Impact Nature: Decomossioning of the site will create a lot of disturbance at the site which will leave the site vulnerable to erosion.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (5)	Low (4)
Probability	Highly Probable (4)	Improbable (3)
Significance	Medium (40)	Low (24)
Status	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources	Low	No
Can impacts be mitigated?	Yes, with the proper erosion control and management, erosion can be reduced to a low level.	
Mitigation	• Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. • Regular monitoring for erosion after decommissioning for at least 5 years to ensure that no erosion problems have developed as a result of the disturbance, as per the Erosion Management and	

	Rehabilitation Plans for the project. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas resulting from decommissioning should be revegetated with indigenous perennial sepcies from the local area.
Cumulative Impacts	The decommissioning of the development would potentially result in some erosion which would contribute to habitat degradation in the area, but this risk can be reduced to a low level.
Residual Risks	It is likely that some soil erosion will occur regardless of the mitigation implemented, due to the high winds that the area experiences. However, this can be reduced to a low level and residual risks can be reduced to an acceptable level.

5.4 Cumulative Impacts

Cumulative Impact on Habitat loss and ecological functioning

The Namas WEF will result in approximately ~35.46ha of habitat loss and fragmentation of the receiving environment. In addition, there are several other planned wind energy developments in the wider area. Although each may generate an acceptable, low impact when considered alone, this does not account for the potential for cumulative impacts to generate significant impacts on fauna and flora as well as future conservation-use options for the wider area. Although the affected vegetation types are not listed ecosystems, they are not well protected. With mitigation, this impact is likely to be of a <u>Low Significance</u>.

<table>
<tr><td colspan="3">Nature: The development of the Namas Wind Farm will potentially contribute to cumulative habitat loss and other cumulative impacts in the wider Kleinsee-coastal plain area.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects in the area</td></tr>
<tr><td>Extent</td><td>Local (1)</td><td>Local (2)</td></tr>
<tr><td>Duration</td><td>Long-term (4)</td><td>Long-term (4)</td></tr>
<tr><td>Magnitude</td><td>Low(4)</td><td>Medium (5)</td></tr>
<tr><td>Probability</td><td>Improbable (2)</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Low (18)</td><td>Medium (33)</td></tr>
<tr><td>Status</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Moderate</td><td>Moderate</td></tr>
<tr><td>Irreplaceable loss of resources</td><td>Low</td><td>Low</td></tr>
<tr><td>Can impacts be mitigated</td><td colspan="2">Yes, to a large degree, but through direct avoidance with little other avenue for mitigation.</td></tr>
<tr><td colspan="3">Mitigation:
• Promote sustainable land use practices in the area and especially on wind farm properties to improve the quality of the habitat for fauna and flora. Reducing grazing pressure on the wind farm properties is identified as a particularly important mitigation measure to improve habitat quality.
• Ensure that the alien management plan and erosion management plan are effectively implemented at the site.</td></tr>
</table>

6 CONCLUSION & RECOMMENDATIONS

The Namas site consists of three broad habitats, the Coastal Duneveld in the west, the so called Namaqualand Salt Pans in the centre and the more typical Namaqualand Strandveld in the east. The far-western part of the Coastal Duneveld is considered to represent the most sensitive part of the site due to the higher abundance of plant species of concern in this area as well as its likely importance for fauna. The field assessment indicates that the Namaqualand Salt Pans unit as mapped by the VegMap, does not represent this unit but rather a strandveld community associated with the coarse white sands that characterise this area. As a result, it is clear that this habitat is not currently operating as a hyrological feature and it is not considered as sensitive as it would be if it represented a more typical salt pan habitat. While some development in this area is considered acceptable, it is a relatively restricted habitat with the result that the total footprint within this habitat should be kept in proportion to its abundance.

In terms of fauna, there are relatively few species of concern that are likely to be present at the site. This is in part at least due to the low range of habitats present at the site, most notably the lack of rocky outcrops. The major impact on fauna would be direct habitat loss of approximately ~35.46ha as well as some low-level operation phase disturbance resulting from maintenance activities and turbine noise. There are no local populations of fauna within the site that are likely to be compromised by the development as the total footprint is relatively low in proportion to the overall extent of the site and there are still extensive areas within and adjacent to the site that would not be affected.

Perhaps the greatest area of potential concern regarding the development is the fact that the majority of the development footprint is located within an Ecological Support Area (ESA) and part of the site is within a CBA 2. Given the low overall footprint of the wind farm, which occupies less than 5% of the landscape, the development is considered to be broadly compatible with the aims of Ecological Support Areas provided that impacts such as erosion can be properly mitigated. The development footprint within the CBA is less than 16 ha of the 685 ha portion of the CBA that is within the site. This is less than 2.5% of the CBA within the site and an insignificant proportion of the overall CBA 2 area. As the habitat within the CBA is homogenous, there are no specific species or ecological processes that would be disproportionately impacted by the development within the CBA. Furthermore, as the CBA is not a Northern Cape Protected Area Expansion Stategy Focus Area and does not contain any species or habitats that are not widely available in the adjacent areas, an offset is not deemed necessary for development in this area and the on-site mitigation and avoidance measures that have been recommended are considered sufficient to reduce the impacts of the development on the CBA to an acceptable level.

Ecological Impact Statement:

The Namas Wind Farm site is considered to represent a broadly suitable environment for wind farm development. There are no specific long-term impacts likely to be associated with the wind farm that cannot be reduced to an acceptable level through mitigation and avoidance, including a low post-mitigation impact on ESAs and CBAs. Consequently, there are no high residual impacts or fatal flaws associated with the development and it can be supported from a terrestrial ecology perspective. It is therefore the reasoned opinion of the specialist that the Namas Wind Farm should therefore be authorised, subject to the implementation of the recommended mitigation measures.

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8 ANNEX 1. LIST OF PLANT SPECIES

Species List of plants known from the broader area around the Namas Wind Farm.

Family	Genus	Sp1	IUCN	Family	Genus	Sp1	IUCN
Acanthaceae	Acanthopsis	glabra		Acanthaceae	Justicia	cuneata	
Acanthaceae	Justicia	spartioides		Acanthaceae	Petalidium	parvifolium	
Agavaceae	Chlorophytum	undulatum		Aizoaceae	Amphibolia	rupis-arcuatae	
Aizoaceae	Amphibolia	succulenta		Aizoaceae	Antimima	alborubra	LC
Aizoaceae	Antimima	compacta	LC	Aizoaceae	Antimima	microphylla	DD
Aizoaceae	Antimima	oviformis	DD	Aizoaceae	Antimima	paripetala	LC
Aizoaceae	Antimima	schlechteri	LC	Aizoaceae	Arenifera	pungens	LC
Aizoaceae	Arenifera	stylosa	LC	Aizoaceae	Cephalophyllum	ebracteatum	LC
Aizoaceae	Cephalophyllum	herrei	VU	Aizoaceae	Cephalophyllum	inaequale	LC
Aizoaceae	Cephalophyllum	regale	LC	Aizoaceae	Cephalophyllum	rigidum	LC
Aizoaceae	Cheiridopsis	denticulata	LC	Aizoaceae	Cheiridopsis	robusta	LC
Aizoaceae	Cleretum	bellidiforme	LC	Aizoaceae	Cleretum	rourkei	LC
Aizoaceae	Conicosia	elongata	LC	Aizoaceae	Conicosia	pugioniformis	LC
Aizoaceae	Conophytum	auriflorum	LC	Aizoaceae	Conophytum	bilobum	NE
Aizoaceae	Conophytum	frutescens	LC	Aizoaceae	Conophytum	hians	LC
Aizoaceae	Conophytum	meyeri	LC	Aizoaceae	Conophytum	pageae	LC
Aizoaceae	Conophytum	saxetanum	LC	Aizoaceae	Conophytum	uviforme	LC
Aizoaceae	Drosanthemum	floribundum	LC	Aizoaceae	Drosanthemum	hispidum	LC
Aizoaceae	Drosanthemum	inornatum	LC	Aizoaceae	Drosanthemum	luederitzii	LC
Aizoaceae	Drosanthemum	oculatum	LC	Aizoaceae	Eberlanzia	cyathiformis	LC
Aizoaceae	Eberlanzia	dichotoma	LC	Aizoaceae	Eberlanzia	gravida	LC
Aizoaceae	Eberlanzia	schneideriana	LC	Aizoaceae	Galenia	collina	LC
Aizoaceae	Galenia	crystallina		Aizoaceae	Galenia	crystallina	LC
Aizoaceae	Galenia	fruticosa	LC	Aizoaceae	Galenia	meziana	LC
Aizoaceae	Galenia	namaensis	LC	Aizoaceae	Galenia	papulosa	LC
Aizoaceae	Galenia	pubescens	LC	Aizoaceae	Galenia	sarcophylla	LC
Aizoaceae	Galenia	secunda	LC	Aizoaceae	Hallianthus	planus	LC
Aizoaceae	Jordaaniella	cuprea	LC	Aizoaceae	Jordaaniella	dubia	LC
Aizoaceae	Jordaaniella	spongiosa	LC	Aizoaceae	Jordaaniella	uniflora	NT
Aizoaceae	Lampranthus	brachyandrus	DD	Aizoaceae	Lampranthus	densipetalus	LC
Aizoaceae	Lampranthus	otzenianus	LC	Aizoaceae	Lampranthus	suavissimus	DD
Aizoaceae	Leipoldtia	alborosea	LC	Aizoaceae	Leipoldtia	calandra	LC
Aizoaceae	Leipoldtia	frutescens	VU	Aizoaceae	Leipoldtia	laxa	LC
Aizoaceae	Leipoldtia	schultzei	LC	Aizoaceae	Leipoldtia	uniflora	LC
Aizoaceae	Malephora	framesii	LC	Aizoaceae	Malephora	purpureo-crocea	LC
Aizoaceae	Mesembryanthemum	amplectens		Aizoaceae	Mesembryanthemum	brevicarpum	
Aizoaceae	Mesembryanthemum	deciduum		Aizoaceae	Mesembryanthemum	dinteri	
Aizoaceae	Mesembryanthemum	hypertrophicum		Aizoaceae	Mesembryanthemum	junceum	
Aizoaceae	Mesembryanthemum	neglectum		Aizoaceae	Mesembryanthemum	neofoliosum	

Aizoaceae	Mesembryanthemum	oculatum		Aizoaceae	Mesembryanthemum	pellitum	LC
Aizoaceae	Mesembryanthemum	prasinum		Aizoaceae	Mesembryanthemum	quartziticola	
Aizoaceae	Mesembryanthemum	serotinum		Aizoaceae	Mesembryanthemum	sinuosum	
Aizoaceae	Mesembryanthemum	spinuliferum		Aizoaceae	Mesembryanthemum	subnodosum	
Aizoaceae	Mesembryanthemum	trichotomum		Aizoaceae	Meyerophytum	meyeri	LC
Aizoaceae	Mitrophyllum	clivorum	LC	Aizoaceae	Nelia	pillansii	LC
Aizoaceae	Ruschia	breekpoortensis	LC	Aizoaceae	Ruschia	brevibracteata	DD
Aizoaceae	Ruschia	caroli	LC	Aizoaceae	Ruschia	fugitans	DD
Aizoaceae	Ruschia	geminiflora	VU	Aizoaceae	Ruschia	goodiae	LC
Aizoaceae	Ruschia	lerouxiae	LC	Aizoaceae	Ruschia	leucosperma	LC
Aizoaceae	Ruschia	nieuwerustensis	LC	Aizoaceae	Ruschia	subpaniculata	LC
Aizoaceae	Ruschia	versicolor	LC	Aizoaceae	Stoeberia	beetzii	LC
Aizoaceae	Stoeberia	frutescens	LC	Aizoaceae	Stoeberia	utilis	
Aizoaceae	Tetragonia	distorta	DD	Aizoaceae	Tetragonia	echinata	LC
Aizoaceae	Tetragonia	fruticosa	LC	Aizoaceae	Tetragonia	microptera	LC
Aizoaceae	Tetragonia	pillansii	VU	Aizoaceae	Tetragonia	sarcophylla	LC
Aizoaceae	Tetragonia	spicata	LC	Aizoaceae	Tetragonia	verrucosa	LC
Aizoaceae	Tetragonia	virgata	LC	Aizoaceae	Wooleya	farinosa	VU
Amaranthaceae	Atriplex	cinerea	NE	Amaranthaceae	Atriplex	vestita	LC
Amaranthaceae	Hermbstaedtia	glauca	LC	Amaranthaceae	Manochlamys	albicans	LC
Amaranthaceae	Salsola	aphylla	LC	Amaranthaceae	Salsola	sericata	LC
Amaranthaceae	Salsola	zeyheri	LC	Amaranthaceae	Sarcocornia	natalensis	LC
Amaranthaceae	Sarcocornia	pillansii	LC	Amaryllidaceae	Brunsvigia	bosmaniae	LC
Amaryllidaceae	Gethyllis	britteniana		Amaryllidaceae	Gethyllis	britteniana	DD
Amaryllidaceae	Gethyllis	britteniana	LC	Amaryllidaceae	Gethyllis	grandiflora	LC
Amaryllidaceae	Haemanthus	coccineus	LC	Amaryllidaceae	Haemanthus	crispus	LC
Amaryllidaceae	Haemanthus	pubescens	LC	Amaryllidaceae	Haemanthus	unifoliatus	LC
Amaryllidaceae	Hessea	breviflora	LC	Amaryllidaceae	Strumaria	prolifera	LC
Amaryllidaceae	Strumaria	truncata	LC	Anacampserotaceae	Anacampseros	bayeriana	
Anacampserotaceae	Anacampseros	filamentosa		Anacampserotaceae	Anacampseros	lanceolata	
Anacampserotaceae	Avonia	albissima		Anacardiaceae	Searsia	glauca	
Anacardiaceae	Searsia	incisa		Anacardiaceae	Searsia	laevigata	
Anacardiaceae	Searsia	populifolia		Anacardiaceae	Searsia	undulata	
Apiaceae	Capnophyllum	africanum	NT	Apiaceae	Cynorhiza	typica	LC
Apocynaceae	Ceropegia	occidentalis	NT	Apocynaceae	Microloma	namaquense	LC
Apocynaceae	Microloma	sagittatum	LC	Apocynaceae	Microloma	tenuifolium	LC
Apocynaceae	Quaqua	armata	LC	Apocynaceae	Tromotriche	aperta	LC
Asparagaceae	Asparagus	capensis	LC	Asparagaceae	Asparagus	capensis	LC
Asparagaceae	Asparagus	fasciculatus	LC	Asparagaceae	Asparagus	juniperoides	LC
Asphodelaceae	**Aloe**	**arenicola**	**NT**	Asphodelaceae	Aloe	framesii	NT
Asphodelaceae	Bulbine	mesembryanthoides	LC	Asphodelaceae	Bulbine	praemorsa	LC
Asphodelaceae	Bulbinella	divaginata	LC	Asphodelaceae	Bulbinella	gracilis	LC
Asphodelaceae	Gasteria	pillansii	LC	Asphodelaceae	Trachyandra	bulbinifolia	LC
Asphodelaceae	Trachyandra	ciliata	LC	Asphodelaceae	Trachyandra	involucrata	LC

Asphodelaceae	Trachyandra	paniculata	LC	Asphodelaceae	Trachyandra	patens	LC
Asphodelaceae	Trachyandra	revoluta	LC	Asphodelaceae	Trachyandra	zebrina	LC
Asteraceae	Adenoglossa	decurrens	LC	Asteraceae	Amellus	alternifolius	LC
Asteraceae	Amellus	coilopodius	LC	Asteraceae	Amellus	flosculosus	LC
Asteraceae	Amellus	microglossus	LC	Asteraceae	Amellus	tenuifolius	LC
Asteraceae	Amphiglossa	tomentosa	LC	Asteraceae	Arctotheca	calendula	LC
Asteraceae	Arctotis	auriculata	LC	Asteraceae	Arctotis	decurrens	DD
Asteraceae	Arctotis	diffusa	LC	Asteraceae	Arctotis	fastuosa	LC
Asteraceae	Arctotis	leiocarpa	LC	Asteraceae	Arctotis	revoluta	LC
Asteraceae	Athanasia	flexuosa	LC	Asteraceae	Berkheya	fruticosa	LC
Asteraceae	Bolandia	elongata	LC	Asteraceae	Chrysocoma	longifolia	LC
Asteraceae	Chrysocoma	puberula	LC	Asteraceae	Chrysocoma	schlechteri	LC
Asteraceae	Cotula	barbata	LC	Asteraceae	Cotula	coronopifolia	LC
Asteraceae	Cotula	leptalea	LC	Asteraceae	Crassothonna	cacalioides	LC
Asteraceae	Crassothonna	cylindrica	LC	Asteraceae	Crassothonna	floribunda	LC
Asteraceae	Crassothonna	sedifolia	LC	Asteraceae	Didelta	carnosa	LC
Asteraceae	Dimorphotheca	pluvialis	LC	Asteraceae	Dimorphotheca	polyptera	LC
Asteraceae	Dimorphotheca	sinuata	LC	Asteraceae	Eriocephalus	microphyllus	LC
Asteraceae	Eriocephalus	racemosus	LC	Asteraceae	Eriocephalus	racemosus	LC
Asteraceae	Eriocephalus	scariosus	LC	Asteraceae	Euryops	dregeanus	LC
Asteraceae	Felicia	dregei	LC	Asteraceae	Felicia	dubia	LC
Asteraceae	Felicia	hyssopifolia	LC	Asteraceae	Felicia	merxmuelleri	LC
Asteraceae	Felicia	tenella	LC	Asteraceae	Gazania	heterochaeta	LC
Asteraceae	Gazania	leiopoda	LC	Asteraceae	Gazania	rigida	LC
Asteraceae	Gazania	splendidissima	NT	Asteraceae	Gorteria	diffusa	
Asteraceae	Gorteria	diffusa	LC	Asteraceae	Helichrysum	hebelepis	LC
Asteraceae	Helichrysum	leontonyx	LC	Asteraceae	Helichrysum	marmarolepis	NT
Asteraceae	Helichrysum	micropoides	LC	Asteraceae	Helichrysum	pumilio	
Asteraceae	Helichrysum	pumilio	LC	Asteraceae	Hirpicium	echinus	LC
Asteraceae	Kleinia	cephalophora	LC	Asteraceae	Lasiopogon	muscoides	LC
Asteraceae	Lasiospermum	brachyglossum	LC	**Asteraceae**	**Leucoptera**	**nodosa**	**VU**
Asteraceae	Leysera	gnaphalodes	LC	Asteraceae	Leysera	tenella	LC
Asteraceae	Lopholaena	cneorifolia	LC	Asteraceae	Oncosiphon	grandiflorus	LC
Asteraceae	Oncosiphon	suffruticosus	LC	Asteraceae	Osteospermum	amplectens	LC
Asteraceae	Osteospermum	grandiflorum	LC	Asteraceae	Osteospermum	hyoseroides	LC
Asteraceae	Osteospermum	incanum	LC	Asteraceae	Osteospermum	monstrosum	LC
Asteraceae	Osteospermum	oppositifolium	LC	Asteraceae	Othonna	coronopifolia	LC
Asteraceae	Othonna	perfoliata	LC	Asteraceae	Othonna	retrorsa	LC
Asteraceae	Pegolettia	retrofracta	LC	Asteraceae	Pentatrichia	petrosa	LC
Asteraceae	Pentzia	incana	LC	Asteraceae	Pteronia	ciliata	LC
Asteraceae	Pteronia	divaricata	LC	Asteraceae	Pteronia	glabrata	LC
Asteraceae	Pteronia	glauca	LC	Asteraceae	Pteronia	incana	LC
Asteraceae	Pteronia	onobromoides	LC	Asteraceae	Pteronia	undulata	LC
Asteraceae	Rhynchopsidium	pumilum	LC	Asteraceae	Senecio	abbreviatus	LC

Asteraceae	Senecio	aloides	LC	Asteraceae	Senecio	arenarius	LC
Asteraceae	Senecio	cinerascens	LC	Asteraceae	Senecio	niveus	LC
Asteraceae	Senecio	sarcoides	LC	Asteraceae	Stoebe	nervigera	LC
Asteraceae	Ursinia	cakilefolia	LC	Asteraceae	Ursinia	calenduliflora	LC
Asteraceae	Ursinia	chrysanthemoides	LC	Boraginaceae	Lobostemon	glaucophyllus	LC
Brassicaceae	Heliophila	arenaria	LC	Brassicaceae	Heliophila	juncea	LC
Brassicaceae	Heliophila	lactea	LC	Brassicaceae	Heliophila	seselifolia	NE
Campanulaceae	Wahlenbergia	annularis	LC	**Campanulaceae**	**Wahlenbergia**	**asparagoides**	**VU**
Campanulaceae	Wahlenbergia	buseriana	DD	Campanulaceae	Wahlenbergia	capensis	LC
Campanulaceae	Wahlenbergia	oxyphylla	LC	Campanulaceae	Wahlenbergia	prostrata	LC
Campanulaceae	Wahlenbergia	thunbergiana	LC	Caryophyllaceae	Dianthus	namaensis	
Caryophyllaceae	Dianthus	namaensis		Caryophyllaceae	Dianthus	namaensis	
Caryophyllaceae	Pollichia	campestris		Caryophyllaceae	Silene	burchellii	
Celastraceae	Gymnosporia	buxifolia	LC	Crassulaceae	Adromischus	alstonii	
Crassulaceae	Adromischus	filicaulis		Crassulaceae	Adromischus	marianiae	
Crassulaceae	Cotyledon	orbiculata	LC	Crassulaceae	Cotyledon	orbiculata	LC
Crassulaceae	Cotyledon	papillaris	LC	Crassulaceae	Crassula	atropurpurea	LC
Crassulaceae	Crassula	barklyi		Crassulaceae	Crassula	campestris	
Crassulaceae	Crassula	cotyledonis		Crassulaceae	Crassula	elegans	
Crassulaceae	Crassula	elegans		Crassulaceae	Crassula	expansa	
Crassulaceae	Crassula	expansa		Crassulaceae	Crassula	lanceolata	
Crassulaceae	Crassula	macowaniana	LC	Crassulaceae	Crassula	muscosa	
Crassulaceae	Crassula	muscosa		Crassulaceae	Crassula	nudicaulis	
Crassulaceae	Crassula	subaphylla		Crassulaceae	Crassula	subaphylla	
Crassulaceae	Crassula	tetragona		Crassulaceae	Crassula	tomentosa	
Crassulaceae	Crassula	whiteheadii	LC	Crassulaceae	Tylecodon	buchholzianus	
Crassulaceae	Tylecodon	buchholzianus		Crassulaceae	Tylecodon	decipiens	
Crassulaceae	Tylecodon	grandiflorus		Crassulaceae	Tylecodon	pearsonii	LC
Crassulaceae	Tylecodon	reticulatus		Crassulaceae	Tylecodon	reticulatus	LC
Crassulaceae	Tylecodon	similis		Cyperaceae	Ficinia	laevis	LC
Ebenaceae	Diospyros	austro-africana		Ebenaceae	Euclea	tomentosa	
Euphorbiaceae	Euphorbia	caput-medusae	LC	Euphorbiaceae	Euphorbia	dregeana	LC
Euphorbiaceae	Euphorbia	hamata	LC	Euphorbiaceae	Euphorbia	mauritanica	LC
Euphorbiaceae	Euphorbia	phylloclada	LC	Euphorbiaceae	Euphorbia	rhombifolia	LC
Euphorbiaceae	Euphorbia	spartaria	LC	Fabaceae	Argyrolobium	velutinum	VU
Fabaceae	Aspalathus	acocksii	LC	Fabaceae	Aspalathus	acuminata	LC
Fabaceae	Aspalathus	petersonii	LC	Fabaceae	Aspalathus	pulicifolia	LC
Fabaceae	Aspalathus	quinquefolia	LC	Fabaceae	Aspalathus	spinescens	LC
Fabaceae	Calobota	angustifolia	LC	Fabaceae	Calobota	halenbergensis	LC
Fabaceae	Calobota	lotononoides	NT	Fabaceae	Crotalaria	excisa	LC
Fabaceae	Cullen	tomentosum	LC	Fabaceae	Faidherbia	albida	LC
Fabaceae	Indigofera	nigromontana	LC	Fabaceae	Lebeckia	ambigua	LC
Fabaceae	Lessertia	diffusa	LC	Fabaceae	Lessertia	falciformis	LC
Fabaceae	Lessertia	frutescens	LC	Fabaceae	Lessertia	globosa	DD

Fabaceae	Lessertia	incana	LC	Fabaceae	Lotononis	densa	DD
Fabaceae	Lotononis	falcata	LC	Fabaceae	Lotononis	parviflora	LC
Fabaceae	Melolobium	adenodes	LC	Fabaceae	Vachellia	erioloba	LC
Fabaceae	Vachellia	karroo	LC	Fabaceae	Wiborgia	fusca	LC
Fabaceae	Wiborgia	monoptera	LC	Fabaceae	Wiborgia	obcordata	LC
Fabaceae	Wiborgia	sericea	LC	Fabaceae	Wiborgia	tetraptera	LC
Frankeniaceae	Frankenia	pulverulenta	LC	Frankeniaceae	Frankenia	repens	LC
Geraniaceae	Monsonia	ciliata	LC	Geraniaceae	Pelargonium	adriaanii	VU
Geraniaceae	Pelargonium	echinatum	LC	Geraniaceae	Pelargonium	fulgidum	LC
Geraniaceae	Pelargonium	gibbosum	LC	Geraniaceae	Pelargonium	laxum	
Geraniaceae	Pelargonium	longiflorum	LC	Geraniaceae	Pelargonium	pulchellum	LC
Hyacinthaceae	Albuca	leucantha		Hyacinthaceae	Albuca	namaquensis	
Hyacinthaceae	Albuca	unifolia		Hyacinthaceae	Dipcadi	crispum	
Hyacinthaceae	Drimia	nana		Hyacinthaceae	Lachenalia	framesii	
Hyacinthaceae	Lachenalia	krugeri		Hyacinthaceae	Lachenalia	undulata	
Hyacinthaceae	Lachenalia	valeriae		Hyacinthaceae	Lachenalia	xerophila	
Hyacinthaceae	Ornithogalum	pruinosum		Hyacinthaceae	Veltheimia	capensis	LC
Hypoxidaceae	Pauridia	scullyi	LC	Iridaceae	Aristea	dichotoma	LC
Iridaceae	Babiana	curviscapa	LC	Iridaceae	Babiana	hirsuta	NT
Iridaceae	Babiana	lanata	VU	Iridaceae	Babiana	namaquensis	VU
Iridaceae	Babiana	pubescens	LC	Iridaceae	Babiana	striata	LC
Iridaceae	Babiana	tritonioides	VU	Iridaceae	Ferraria	ferrariola	LC
Iridaceae	Ferraria	macrochlamys	LC	Iridaceae	Ferraria	schaeferi	LC
Iridaceae	Ferraria	variabilis	LC	Iridaceae	Gladiolus	scullyi	LC
Iridaceae	Gladiolus	viridiflorus	LC	Iridaceae	Lapeirousia	fabricii	LC
Iridaceae	Lapeirousia	macrospatha	LC	Iridaceae	Lapeirousia	silenoides	LC
Iridaceae	Lapeirousia	spinosa	LC	Iridaceae	Lapeirousia	tenuis	LC
Iridaceae	Moraea	fugax	LC	Iridaceae	Moraea	gawleri	LC
Iridaceae	Moraea	margaretae	LC	Iridaceae	Moraea	miniata	LC
Iridaceae	Moraea	rivulicola	LC	Iridaceae	Moraea	saxicola	LC
Iridaceae	Moraea	schlechteri	LC	Iridaceae	Watsonia	meriana	LC
Juncaceae	Juncus	acutus	LC	Lamiaceae	Ballota	africana	LC
Lamiaceae	Salvia	africana-lutea	LC	Lamiaceae	Salvia	dentata	LC
Lamiaceae	Salvia	lanceolata	LC	Lamiaceae	Stachys	flavescens	LC
Lamiaceae	Stachys	rugosa	LC	Limeaceae	Limeum	africanum	LC
Limeaceae	Limeum	africanum	LC	Limeaceae	Limeum	fenestratum	LC
Lobeliaceae	Monopsis	debilis	NE	Loranthaceae	Tapinanthus	oleifolius	LC
Malvaceae	Hermannia	amoena	LC	Malvaceae	Hermannia	cuneifolia	LC
Malvaceae	Hermannia	disermifolia	LC	Malvaceae	Hermannia	incana	LC
Malvaceae	Hermannia	paucifolia	LC	Malvaceae	Hermannia	pfeilii	LC
Malvaceae	Hermannia	tomentosa	LC	Malvaceae	Hermannia	trifurca	LC
Melianthaceae	Melianthus	elongatus	LC	Molluginaceae	Adenogramma	glomerata	LC
Molluginaceae	Pharnaceum	albens	LC	Molluginaceae	Pharnaceum	confertum	LC
Moraceae	Ficus	ilicina	LC	Neuradaceae	Grielum	grandiflorum	LC

Neuradaceae	Grielum	humifusum		Neuradaceae	Grielum	humifusum	LC
Neuradaceae	Grielum	sinuatum	LC	Oleaceae	Menodora	juncea	LC
Orchidaceae	Holothrix	grandiflora	DD	Orchidaceae	Satyrium	erectum	LC
Orobanchaceae	Harveya	squamosa	LC	Orobanchaceae	Hyobanche	rubra	LC
Orobanchaceae	Hyobanche	sanguinea	LC	Oxalidaceae	Oxalis	crocea	VU
Oxalidaceae	Oxalis	exserta	LC	Oxalidaceae	Oxalis	flava	
Oxalidaceae	Oxalis	obtusa	LC	Plumbaginaceae	Dyerophytum	africanum	LC
Plumbaginaceae	Limonium	dregeanum	LC	Poaceae	Chaetobromus	involucratus	LC
Poaceae	Chaetobromus	involucratus	LC	Poaceae	Chaetobromus	involucratus	LC
Poaceae	Cladoraphis	cyperoides	LC	Poaceae	Cladoraphis	spinosa	LC
Poaceae	Ehrharta	barbinodis	LC	Poaceae	Ehrharta	brevifolia	LC
Poaceae	Ehrharta	calycina	LC	Poaceae	Ehrharta	delicatula	LC
Poaceae	Ehrharta	longiflora	LC	Poaceae	Ehrharta	longifolia	LC
Poaceae	Ehrharta	pusilla	LC	Poaceae	Eragrostis	curvula	LC
Poaceae	Fingerhuthia	africana	LC	Poaceae	Pentameris	patula	LC
Poaceae	Pentameris	tomentella	LC	Poaceae	Phragmites	australis	LC
Poaceae	Schismus	barbatus	LC	Poaceae	Schismus	schismoides	LC
Poaceae	Schmidtia	kalahariensis	LC	Poaceae	Sporobolus	ioclados	LC
Poaceae	Sporobolus	virginicus	LC	Poaceae	Stipagrostis	ciliata	LC
Poaceae	Stipagrostis	geminifolia	NT	Poaceae	Stipagrostis	obtusa	LC
Poaceae	Stipagrostis	zeyheri	LC	Poaceae	Tribolium	utriculosum	LC
Poaceae	Tricholaena	capensis	LC	Polygalaceae	Polygala	ephedroides	LC
Polygalaceae	Polygala	scabra	LC	Polygonaceae	Emex	australis	LC
Proteaceae	Leucadendron	brunioides		Proteaceae	Leucospermum	praemorsum	VU
Ptychomitriaceae	Ptychomitrium	crispatum		Restionaceae	Thamnochortus	bachmannii	LC
Restionaceae	Willdenowia	incurvata	LC	Rubiaceae	Galium	spurium-aparine	NE
Rubiaceae	Nenax	arenicola	LC	Ruscaceae	Eriospermum	aphyllum	LC
Rutaceae	Diosma	acmaeophylla	LC	Santalaceae	Lacomucinaea	lineata	
Santalaceae	Thesium	microcarpum	DD	Santalaceae	Viscum	capense	
Sapindaceae	Dodonaea	viscosa		Scrophulariaceae	Diascia	batteniana	LC
Scrophulariaceae	Diascia	namaquensis	LC	Scrophulariaceae	Hebenstretia	namaquensis	LC
Scrophulariaceae	Hebenstretia	repens	LC	Scrophulariaceae	Hebenstretia	robusta	LC
Scrophulariaceae	Jamesbrittenia	fruticosa	LC	Scrophulariaceae	Jamesbrittenia	merxmuelleri	LC
Scrophulariaceae	Jamesbrittenia	racemosa	LC	Scrophulariaceae	Lyperia	tristis	LC
Scrophulariaceae	Manulea	androsacea	LC	Scrophulariaceae	Manulea	nervosa	LC
Scrophulariaceae	Nemesia	bicornis	LC	Scrophulariaceae	Nemesia	lanceolata	LC
Scrophulariaceae	Nemesia	saccata	VU	Scrophulariaceae	Peliostomum	virgatum	LC
Scrophulariaceae	Phyllopodium	pumilum	LC	Scrophulariaceae	Zaluzianskya	affinis	LC
Scrophulariaceae	Zaluzianskya	benthamiana	LC	Solanaceae	Lycium	amoenum	LC
Solanaceae	Lycium	cinereum	LC	Tecophilaeaceae	Cyanella	hyacinthoides	
Tecophilaeaceae	Cyanella	orchidiformis		Thymelaeaceae	Passerina	truncata	LC
Urticaceae	Forsskaolea	candida		Zygophyllaceae	Roepera	cordifolia	
Zygophyllaceae	Roepera	morgsana		Zygophyllaceae	Roepera	spinosa	
Zygophyllaceae	Sisyndite	spartea	LC				

Amaranthaceae	Atriplex	eardleyae		Boraginaceae	Amsinckia	menziesii	
Caryophyllaceae	Spergularia	media		Amaranthaceae	Atriplex	cinerea	
Fabaceae	Medicago	laciniata	NE	Geraniaceae	Erodium	cicutarium	
Poaceae	Phalaris	minor	NE	Poaceae	Hordeum	murinum	NE
Amaranthaceae	Atriplex	lindleyi		Amaranthaceae	Atriplex	semibaccata	
Geraniaceae	Erodium	moschatum		Brassicaceae	Brassica	tournefortii	

9 APPENDIX 2 LIST OF MAMMALS

List of Mammals know from the broad area around the Namas site, based on the MammalMap Database (http://vmus.adu.org.za) as well as observations in the area. Species on bold are those that can be confirmed present in the area.

Family	Genus	Species	Common name	Red list category
Bathyergidae	*Bathyergus*	*janetta*	Namaqua Dune Mole-rat	Least Concern
Bathyergidae	*Bathyergus*	*suillus*	Cape Dune Mole-rat	Least Concern
Bathyergidae	***Cryptomys***	***hottentotus***	**Southern African Mole-rat**	**Least Concern**
Bovidae	*Antidorcas*	*marsupialis*	Springbok	Least Concern
Bovidae	*Oreotragus*	*oreotragus*	Klipspringer	Least Concern
Bovidae	***Raphicerus***	***campestris***	**Steenbok**	**Least Concern**
Bovidae	***Sylvicapra***	***grimmia***	**Bush Duiker**	**Least Concern**
Canidae	***Canis***	***mesomelas***	**Black-backed Jackal**	**Least Concern**
Canidae	***Otocyon***	***megalotis***	**Bat-eared Fox**	**Least Concern**
Canidae	***Vulpes***	***chama***	**Cape Fox**	**Least Concern**
Cercopithecidae	*Papio*	*ursinus*	Chacma Baboon	Least Concern
Felidae	***Caracal***	***caracal***	**Caracal**	**Least Concern**
Felidae	***Felis***	***silvestris***	**African Wildcat**	**Least Concern**
Felidae	*Panthera*	*pardus*	Leopard	Vulnerable
Herpestidae	***Cynictis***	***penicillata***	**Yellow Mongoose**	**Least Concern**
Herpestidae	***Herpestes***	***pulverulentus***	**Cape Gray Mongoose**	**Least Concern**
Herpestidae	***Suricata***	***suricatta***	**Meerkat**	**Least Concern**
Hyaenidae	*Proteles*	*cristata*	Aardwolf	Least Concern
Hystricidae	***Hystrix***	***africaeaustralis***	**Cape Porcupine**	**Least Concern**
Leporidae	*Lepus*	*capensis*	Cape Hare	Least Concern
Leporidae	***Lepus***	***saxatilis***	**Scrub Hare**	**Least Concern**
Leporidae	***Pronolagus***	***rupestris***	**Smith's Red Rock Hare**	**Least Concern**
Macroscelididae	***Elephantulus***	***rupestris***	**Western Rock Elephant Shrew**	**Least Concern**
Macroscelididae	*Macroscelides*	*proboscideus*	Short-eared Elephant Shrew	Least Concern
Muridae	***Aethomys***	***namaquensis***	**Namaqua Rock Mouse**	**Least Concern**
Muridae	*Desmodillus*	*auricularis*	Cape Short-tailed Gerbil	Least Concern
Muridae	***Gerbilliscus***	***paeba***	**Paeba Hairy-footed Gerbil**	**Least Concern**
Muridae	*Otomys*	*auratus*	Southern African Vlei Rat	Least Concern
Muridae	***Otomys***	***unisulcatus***	**Karoo Bush Rat**	**Least Concern**

Muridae	***Parotomys***	***brantsii***	**Brants's Whistling Rat**	**Least Concern**
Muridae	*Parotomys*	*littledalei*	Littledale's Whistling Rat	Near Threatened
Muridae	***Rhabdomys***	***pumilio***	**Xeric Four-striped Grass Rat**	**Least Concern**
Mustelidae	*Aonyx*	*capensis*	African Clawless Otter	Near Threatened
Mustelidae	***Ictonyx***	***striatus***	**Striped Polecat**	**Least Concern**
Mustelidae	***Mellivora***	***capensis***	**Honey Badger**	**Least Concern**
Orycteropodidae	***Orycteropus***	***afer***	**Aardvark**	**Least Concern**
Petromuridae	*Petromus*	*typicus*	Dassie Rat	Least Concern
Procaviidae	***Procavia***	***capensis***	**Rock Hyrax**	**Least Concern**
Sciuridae	***Xerus***	***inauris***	**South African Ground Squirrel**	**Least Concern**
Soricidae	*Crocidura*	*cyanea*	Reddish-gray Musk Shrew	Least Concern
Soricidae	***Suncus***	***varilla***	**Lesser Dwarf Shrew**	**Least Concern**
Viverridae	*Genetta*	*genetta*	Common Genet	Least Concern

10 APPENDIX 3. LIST OF REPTILES

List of Reptiles known from the vicinity of the Namas site, based on records from the ReptileMap database and observations from the area. Conservation status is from Bates et al. 2013. Species in bold are confirmed present in the area.

Family	Genus	Species	Subspecies	Common name	Red list category
Agamidae	***Agama***	***atra***		**Southern Rock Agama**	**Least Concern**
Agamidae	*Agama*	*hispida*		Spiny Ground Agama	Least Concern
Chamaeleonidae	*Bradypodion*	*occidentale*		Western Dwarf Chameleon	Least Concern
Chamaeleonidae	***Chamaeleo***	***namaquensis***		**Namaqua Chameleon**	**Least Concern**
Colubridae	*Dipsina*	*multimaculata*		Dwarf Beaked Snake	Least Concern
Colubridae	*Telescopus*	*beetzii*		Beetz's Tiger Snake	Least Concern
Cordylidae	***Karusasaurus***	***polyzonus***		**Karoo Girdled Lizard**	**Least Concern**
Elapidae	*Aspidelaps*	*lubricus*	*lubricus*	Coral Shield Cobra	Not listed
Elapidae	*Naja*	*nivea*		Cape Cobra	Least Concern
Gekkonidae	***Chondrodactylus***	***angulifer***	***angulifer***	**Common Giant Ground Gecko**	**Least Concern**
Gekkonidae	***Chondrodactylus***	***bibronii***		**Bibron's Gecko**	**Least Concern**
Gekkonidae	*Goggia*	*lineata*		Northern Striped Pygmy Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*austeni*		Austen's Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*barnardi*		Barnard's Rough Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*labialis*		Western Cape Gecko	Least Concern
Gekkonidae	*Pachydactylus*	*weberi*		Weber's Gecko	Least Concern
Gekkonidae	***Phelsuma***	***ocellata***		**Namaqua Day Gecko**	**Least Concern**
Gekkonidae	*Ptenopus*	*garrulus*	*maculatus*	Spotted Barking Gecko	Least Concern
Gerrhosauridae	*Cordylosaurus*	*subtessellatus*		Dwarf Plated Lizard	Least Concern
Gerrhosauridae	*Gerrhosaurus*	*typicus*		Karoo Plated Lizard	Least Concern
Lacertidae	***Meroles***	***ctenodactylus***		**Giant Desert Lizard**	**Least Concern**
Lacertidae	***Meroles***	***knoxii***		**Knox's Desert Lizard**	**Least Concern**
Lacertidae	***Meroles***	***suborbitalis***		**Spotted Desert Lizard**	**Least Concern**
Lacertidae	*Nucras*	*tessellata*		Western Sandveld Lizard	Least Concern
Lamprophiidae	*Lamprophis*	*guttatus*		Spotted House Snake	Least Concern

Lamprophiidae	*Prosymna*	*frontalis*		Southwestern Shovel-snout	Least Concern
Lamprophiidae	*Psammophis*	*crucifer*		Cross-marked Grass Snake	Least Concern
Lamprophiidae	*Psammophis*	*namibensis*		Namib Sand Snake	Least Concern
Lamprophiidae	*Psammophis*	*notostictus*		Karoo Sand Snake	Least Concern
Lamprophiidae	*Psammophylax*	*rhombeatus*	*rhombeatus*	Spotted Grass Snake	Least Concern
Lamprophiidae	*Pseudaspis*	*cana*		Mole Snake	Least Concern
Scincidae	*Acontias*	*litoralis*		Coastal Dwarf Legless Skink	Least Concern
Scincidae	***Acontias***	***tristis***		**Namaqua Dwarf Legless Skink**	**Least Concern**
Scincidae	*Scelotes*	*caffer*		Cape Dwarf Burrowing Skink	Least Concern
Scincidae	*Scelotes*	*sexlineatus*		Striped Dwarf Burrowing Skink	Least Concern
Scincidae	***Trachylepis***	***capensis***		**Cape Skink**	**Least Concern**
Scincidae	*Trachylepis*	*variegata*		Variegated Skink	Least Concern
Scincidae	*Typhlosaurus*	*vermis*		Pink Blind Legless Skink	Least Concern
Testudinidae	***Chersina***	***angulata***		**Angulate Tortoise**	**Least Concern**
Testudinidae	*Psammobates*	*tentorius*	*trimeni*	Namaqua Tent Tortoise	Not listed
Viperidae	***Bitis***	***cornuta***		**Many-horned Adder**	**Least Concern**
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern

11 APPENDIX 4. LIST OF AMPHIBIANS

List of Amphibians known from the vicinity of the Namas site, based on records from the FrogMap database and observations from the area. Conservation status is from Minter et al. 2004.

Family	Genus	Species	Subspecies	Common name	Red list category
Brevicepitidae	*Breviceps*	*macrops*		Desert Rain Frog	Vulnerable
Brevicepitidae	***Breviceps***	***namaquensis***		**Namaqua Rain Frog**	**Least Concern**
Bufonidae	*Vandijkophrynus*	*gariepensis*	*gariepensis*	Karoo Toad (subsp. gariepensis)	Not listed
Bufonidae	*Vandijkophrynus*	*robinsoni*		Paradise Toad	Least Concern
Pipidae	*Xenopus*	*laevis*		Common Platanna	Least Concern
Pyxicephalidae	*Amietia*	*fuscigula*		Cape River Frog	Least Concern
Pyxicephalidae	*Tomopterna*	*delalandii*		Cape Sand Frog	Least Concern