POFADDER WIND FACILITY 3 (PTY) LTD

Pofadder WEF 3

Bat (Chiroptera) EIA Report

DEA Reference: *(or applicable)*
Report Prepared by: Jonathan Aronson
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POFADDER WIND FACILITY 3 (PTY) LTD
POFADDER WEF 3
EIA REPORT

EXECUTIVE SUMMARY

The applicant, Pofadder Wind Energy Facility 3 (Pty) Ltd, is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure called Pofadder WEF 3 ("the project"). The site is located approximately 20 km Southeast of Pofadder within the Kai !Garib Local Municipality and the Z F Mgcawu District Municipality in the Northern Cape Province, South Africa.

Collisions with wind turbine blades are one of the leading causes of bat mortality globally (Cryan, 2011; O'Shea et al., 2016) and therefore specialist studies are required to assess potential impacts of such infrastructure on bats (MacEwan et al. 2020, SANBI2020). This report presents a Bat (Chiroptera) Specialist Assessment for the Pofadder WEF 3, forming part of the EIA phase for Environmental Authorisation of the project. The objectives of this assessment are to present the baseline ecological condition of the project for bats, and to use these characterisations to predict and assess the potential impact of Pofadder WEF 3 on bat species and their habitats as well as to provide actions to mitigate impacts if required.

The baseline was determined by using acoustic monitoring to record spatio-temporal bat activity patterns, and roost surveys to locate used or potentially used bat roosting sites. This assessment is based on the data collected between 29 June 2021 and 21 June 2022 (358 nights). Bat acoustic activity was sampled at five locations within the study area by recording bats at 50 m and 100 m at three locations, and at 10 m at two locations. The monitoring period spanned all four seasons therefore this assessment is based on a representative sample of annual bat activity.

Based on current taxonomic information and bat occurrence data, eight bat species could occur at the project, five of which have been confirmed based on the acoustic data recorded. No Threatened species were recorded or expected to occur on site but based on habitat suitability modelling (Monadjem et al. 2010), it is possible that the distribution of the nationally Near Threatened Angolan Wing-gland Bat (*Cistugo seabrae*) may overlap with the project although the project is at the southern extreme extent of its distribution. Over the 358 nights of sampling, 68,104 bat passes were recorded from five species. Approximately 82 % of total activity was attributed to Egyptian free-tailed bat, while approximately 17 % was attributed to Roberts's flat-headed bat. Natal long-fingered bat, Cape serotine and Long-tailed serotine were seldomly recorded and together accounted for less than 1 % of total activity. Activity varied seasonally with highest activity in summer and autumn, and lower activity in spring and winter. Egyptian free-tailed bat activity peaked in summer at all heights, with the magnitude of activity suggesting high risk during this period as well as during autumn. For Roberts's flat-headed bat, activity was lower and hence risk is expected to be at medium risk during summer and autumn overall but with high risk during certain months.

To assist in avoiding impacts to bats, buffers have been placed around key habitat features as per best practice resulting in the identification of several No-Go areas for turbine placement. The turbine layout

adheres to the bat constraints as no project infrastructure (except roads) are located in bat buffers. The turbines have been designed to reduce impacts to lower flying bat species by maintaining a minimum blade sweep of 35 m. For high flying bat species, blade feathering will be used to prevent free-wheeling of turbine blades below the turbine cut-in speed. Once operational, bat fatality monitoring must be undertaken to search for bat carcasses beneath wind turbines to measure the observed impact of the WEF on bats for a minimum of two years (Aronson et al. 2020). Mitigation measures that are known to reduce bat fatality if needed based on the fatality monitoring results include curtailment and acoustic deterrents (Arnett et al. 2013, Romano et al. 2019, Weaver et al. 2020). These techniques must be used if post-construction fatality monitoring indicates that species fatality thresholds have been exceeded (MacEwan et al. 2018) to reduce the impacts to bats to within acceptable limits of change and prevent declines in the impacted bat population. If these are adhered to, the Pofadder WEF 3 can be authorized without unacceptable levels of impacts to bats.

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.3, Appendix 2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	pages 4, 5 and 6
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1, Section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.4
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5, Page 14, Section 7.4
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.4
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 7
g) an identification of any areas to be avoided, including buffers;	Section 7.2, Figure 5
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;	Figure 5
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 6

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
k) any mitigation measures for inclusion in the EMPr;	Section 7, Section 8
l) any conditions for inclusion in the environmental authorisation;	Section 7, Section 8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	NA
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	NA
q) any other information requested by the competent authority.	NA
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Appendix 3: Site Verification Report

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed construction of the Pofadder Wind Energy Facility 3 and Associated Infrastructure, near Pofadder in the Northern Cape Province.

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Camissa Sustainability Consulting			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Jonathan Aronson			
Specialist Qualifications:	MSc (Zoology), MSc (Environment and Resource Management)			
Professional affiliation/registration:	SACNASP			
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E-mail:	jonathan@camissaconsulting.com			

2. DECLARATION BY THE SPECIALIST

I, Jonathan Aronson, declare that –

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

Camissa Sustainability Consulting

Name of Company:

Date:

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Jonathan Aronson, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Camissa Sustainability Consulting

Name of Company

Date

Signature of the Commissioner of Oaths

Date

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1. INTRODUCTION

The applicant, Pofadder Wind Energy Facility 3 (Pty) Ltd, is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure called Pofadder WEF 3 ("the project"). The site is located approximately 20 km Southeast of Pofadder within the Kai !Garib Local Municipality and the Z F Mgcawu District Municipality in the Northern Cape Province, South Africa.

A preferred project site with an extent of approximately 5 100 ha has been identified as a technically suitable area for the development of the Pofadder WEF 3, which will comprise of up to 31 turbines with a combined contracted capacity of up to 248 MW. The project site is located on the following properties:

- The Farm Ganna-Poort 202;
- The Farm Lovedale 201; and
- Portion 3 of the Farm Sand Gat 150.

Two additional WEF's are concurrently being considered on the properties and are assessed by way of separate impact assessment processes contained in the 2014 Environmental Impact Assessment Regulations (GN No. R982, as amended) for listed activities contained Listing Notices 1, 2 and 3 (GN R983, R984 and R985, as amended). These projects are known as Pofadder Wind Energy Facility 1 and Pofadder Wind Energy Facility 2.

1.1 Scope and Objectives

This report presents a Bat (Chiroptera) Specialist Assessment for the Pofadder WEF 3. Collisions with wind turbine blades are one of the leading causes of bat mortality globally (Cryan, 2011; O'Shea et al., 2016) and therefore specialist studies are required to assess potential impacts of such infrastructure on bats (MacEwan et al. 2020, SANBI2020). This assessment forms part of the EIA phase for Environmental Authorisation of the project.

The objectives of this assessment are to present the baseline ecological condition of the project for bats, and to use these characterisations to predict and assess the potential impact of Pofadder WEF 3 on bat species and their habitats as well as to provide actions to mitigate impacts if required.

1.2 Terms of Reference

The following terms of reference guided the compilation of this scoping report:

- Describe the baseline environment of the project and its sensitivity with regard to bats (Chiroptera);
- Describe the methodology and processes used to source information and collect baseline data;

- Identify the nature of potential impacts of the proposed project on bats during construction, operation and decommissioning;
- Conduct a significance rating and impact assessment of identified impacts under the pre-mitigation and post-mitigation scenarios;
- Conduct an assessment of any alternatives, where relevant, and the No Go alternative;
- Identify information gaps and limitations; and
- Identify potential mitigation or enhancement measures to minimise impacts to bats.

1.3 Specialist Credentials

The bat pre-construction monitoring and impact assessment is being undertaken by Jonathan Aronson, who has 13 years of experience working on wildlife and wind energy. A CV outlining this experience is available in Appendix 2.

1.4 Assessment Methodology

The Project Area of Influence (PAOI) was defined as the project boundary plus a 10 km buffer given that bats are volant mammals (Scottish Natural Heritage 2019). This area was studied at a desktop level to determine which bat species (i.e., impact receptors) are likely to occur at the project, to provide information on their natural history and conservation status, and to contextualise the project site within the larger social-ecological environment with respect to bats. Bats were also studied through field surveys in an Area of Interest encompassing all three Pofadder WEFs ("AoI"), covering an area of approximately 24,000 hectares (Figure 1). The field data from this AoI, as well as the desktop information from the PAOI, was used to assess impacts for each Pofadder WEF individually.

Bat acoustic activity was sampled at five locations within the AoI with Wildlife Acoustics, Inc. SM4 bat detectors (Figure 1 and Table 1). Since a preliminary turbine layout was available, the study design was focused on surveying areas within the project boundary where turbines were likely to be installed. In addition, the study design prioritised collecting bat activity at height because three 100 m meteorological towers were present. At two locations (PO1 and PO2), SMM-U2 microphones were fixed to the top of a 10 m aluminium mast. At three locations (PO3, PO4, and PO5), microphones were attached to a meteorological tower at 50 m and 100 m respectively.

This report is based on data collected between 29 June 2021 and 21 June 2022 (358 nights). The monitoring period therefore spans a full annual cycle and as such provides a representative sample of annual bat activity patterns and how this changes seasonally.

Acoustic data were retrieved from each bat detector and analysed using Kaleidoscope® Pro (Version 5.4.2, Wildlife Acoustics, Inc.). Bats were automatically identified using the embedded "Bats of South Africa Version 5.4.0" reference library and verified by inspecting echolocation files. The number of acoustic files recorded was used as a measure to quantify bat activity.

To locate features on site where bats maybe/are roosting, surveys were undertaken which first entailed discussions with landowners to locate any known roosts, or potential roosts with evidence of bats. Secondly, farmsteads and rocky outcrops within the project boundary were systematically surveyed for bats in August

2021, February 2022, and April 2022 (Figure 1). The surveys aimed to directly observe roosting bats, locate evidence of roosting bats (e.g., insect remains, fur-oil-stained exit and entry points, guano/droppings), and assess the potential for each building to support bats.

Table 1: Summary of the Bat Acoustic Monitoring Sampling Locations and Effort

Bat Detector	Coordinates	# Sample Nights	Vegetation Type	Altitude (m)	Habitat Features
PO1	19.74°E 29.37°S	358	Bushmanland Arid Grassland	997	1.2 km/205° from river, 1.3 km/80° from depression wetland, 1.9 km/312° from farm dam and trees
PO2	19.66°E 29.32°S	358	Bushmanland Arid Grassland	1,048	767 m/120° from depression wetland, 1.2 km/94° from depression wetland, 1.7 km/267° from farm dam, buildings, and trees
PO3	19.67°E 29.28°S	261	Bushmanland Inselberg Shrubland	1,005 (+ 50 m)	1.7 km/265° from farm dam, 2.5 km/265° from farmstead, 3.7 km/88° from farmstead, ridgeline (east-west)
		358		1,005 (+ 100 m)	
PO4	19.75°E 29.29°S	354	Bushmanland Basin Shrubland	1,014 (+ 50 m)	650 m/302° from farm dam, buildings, and trees, 540 m/145° from Karoep river
		354		1,014 (+ 100 m)	
PO5	19.79°E 29.35°S	354	Bushmanland Arid Grassland	1,002 (+ 50 m)	1 km /202° from depression wetland, 2 km m/54° from farm dam, buildings, and trees, 2 km/288° from farm dam and trees
		358		1,002 (+ 100 m)	

2. ASSUMPTIONS AND LIMITATIONS

The core techniques used to assess bat activity in this study are acoustic monitoring and roost surveys both of which have several limitations which will influence the findings and recommendations of this study.

Acoustic monitoring allows for rapid, passive collection of a large volume of bat activity data which can help identify the bat species present within a particular location and their associated relative spatio-temporal activity patterns. In the context of wildlife and wind energy interactions, acoustic monitoring is therefore a useful technique however, there are several constraints that must be acknowledged.

These are discussed in detail by Voigt et al. (2021), Adams et al. (2012), and Kunz et al. (2007) and fundamentally, include that acoustic monitoring cannot provide an indication of bat abundance or population size at a site. In addition, population demographics such as age and sex of bats cannot be determined from echolocation calls. Due to the large volume of data collected by bat detectors it is impractical and prohibitively time-consuming to inspect each file recorded by a bat detector for echolocation calls and to identify the associated bat species. Specialised statistical software uses bat call reference libraries to automate the identification process but developing such libraries is challenging given the variation individual species display in their echolocation call structure and overlap in these structures between species. This study used the

Wildlife Acoustics library “Bats of South Africa Version 5.4.0”, but this excludes reference calls for most South African species thus these may have been overlooked.

The major limitation with roost surveys is finding roosting bats. Bats use a diversity of roosting sites including trees, buildings, crevices, and underground sites (caves and mines). The presence of these features at a site can help to target roost searches but evidence of bats may not always be apparent even if bats are present. Importantly, the absence of bat evidence in these situations does not equate to evidence of bat absence (Collins, 2006). Thus, this study uses a precautionary approach and will apply buffers to roosts (largely buildings and rocky crevices) even if bats were not located given their potential role in supporting roosting bats.

Bat activity is notably variable in response to several factors such as land use change, climactic variability, variations in prey abundance and meteorological conditions which can vary over different time scales. Since this study is limited to 12 months, the baseline conditions presented here may not be representative of activity over longer time frames meaning risk may be misinterpreted.

Finally, it is difficult to assess the risk to bats during operation of the proposed facility based on acoustic data collected during pre-construction surveys. For example, Hein et al. (2013) showed that pre-construction bat activity was not a significant indicator of collision risk. Lintott et al. (2016) argued that environmental impact assessments do not predict the risks to bats accurately. This may partly be because it is hypothesized that bats may be attracted to wind turbines (Cryan and Barclay 2009, Guest et al. 2022) which some evidence suggests may be the case (Horn et al. 2008, Richardson et al. 2021). While this report makes predications about the potential risk to bats posed by the project, these carry a degree of uncertainty and must be verified by using post-construction surveys to ensure that the predictions are accurate and bat behaviour has not altered from pre-construction levels (Lintott et al. 2016).

3. TECHNICAL DESCRIPTION

3.1 Project Location

The project site comprises the following farm portions:

- The Farm Ganna-Poort 202;
- The Farm Lovedale 201; and
- Portion 3 of the Farm Sand Gat 150.

3.2 Project Description

The Pofadder WEF 3 project site is proposed to accommodate the following infrastructure, which will enable the wind farm to supply a contracted capacity of up to 248 MW:

- Up to 31 wind turbines with a 100 m blade length and hub height of 135 m ;
- A transformer at the base of each turbine;
- Concrete turbine foundations and turbine hardstands;

- Each turbine will have a circular foundation with a diameter of up to 32 m and this will be placed alongside the 45 m wide hardstand resulting in an area of about 45 m x 32 m that will be permanently disturbed for the turbine foundation. The combined permanent footprint for the turbines will be approximately 4.4 ha.
- Each turbine will have a crane hardstand of approximately 70 m x 45 m. The permanent footprint for turbine crane hardstands will be approximately 9.5 ha.
- Each turbine will have a blade hardstand of approximately 80 m x 45 m (3 600 m2). The combined permanent footprint for blade hardstands will be approximately 10.8 ha.
- The wind turbines will be connected to the proposed on-site substation via medium voltage (33 kV) underground cables, which will mainly run alongside the access roads. Where burying of cables is not possible due to technical, geological, environmental or topographical constraints, cables will be overhead via 33 kV monopoles.
- An on-site substation of up to 1.6 ha in extent to facilitate the connection between the wind farm and the electricity grid;
- An internal overhead 132 kV power line, with a servitude of 32 m, to connect the wind farm to the collector substation (this will be assessed in a separate Grid BAR);
- The main access road will be between 8 – 12 m wide (to allow vehicles to pass).
- Internal roads with a width of between 6 – 8 m will provide access to each wind turbine. Existing farm roads will be upgraded and used wherever possible, although new site roads will be constructed where necessary.
- A 12 m wide corridor may be temporarily impacted during construction and rehabilitated to 6 m wide corridor after construction. The internal gravel roads will have an approximate 6 – 8 m wide surface and there will be up to 12 m wide impacted during the construction phase, with additional space required for cut and fill, side drains and other stormwater control measures, turning areas and vertical and horizontal turning radii to ensure safe delivery of the turbine components.
- Pofadder WEF 3 will have a total road network of approximately 50 km.
- One (1) construction laydown / staging area of up to approximately 7 ha (to be rehabilitated following construction).
- A temporary site camp establishment and concrete batching plant occupying an area of up to 1.6 ha and;
- Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

In order to evacuate the energy generated by the WEF's to supplement the national grid, Pofadder Grid (Pty) Ltd is proposing to develop a ~58 km (132/400 kV) high voltage overhead transmission powerline to connect the three proposed wind farms to the new planned Eskom Korana Substation. Application for a corridor in which to situate the gridline is the subject of a separate EA application (Pofadder Grid for the Pofadder Wind Energy Facilities). The EA applications for the three wind farm projects and gridline are being undertaken in parallel as they are co-dependent, i.e. one will not be developed without the other.

4. LEGAL REQUIREMENTS AND GUIDELINES

There are various international, regional and local legislation, policies, regulations, guidelines, conventions, and treaties in place for the protection of biodiversity, under which bats would also be considered or protected. These include:

- Convention on the Conservation of Migratory Species of Wild Animals (1979)
- Convention on Biological Diversity (1993)
- Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (NEMA, Act No. 107 of 1998)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
- The Equator Principles (2013)
- The Red List of Mammals of South Africa, Swaziland and Lesotho (2016)
- National Biodiversity Strategy and Action Plan (2005)
- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2020)
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2020)

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The Project Area of Influence (PAOI) is situated in the arid Nama Karoo Biome and the landscape is characterised by open, relatively flat, and sparsely vegetated plains with mountainous terrain (inselbergs and koppies) in the north and northwest (Figure 1). The vegetation is dominated by Bushmanland Arid Grassland comprising low growing shrubs and bunch grasses at low density. Bushmanland Basin Shrubland and Bushmanland Inselberg Shrubland bisects the middle of the PAOI, and Eastern Gariep Rocky Desert vegetation occurs in the north. All of the vegetation types in the PAOI are classified as least concern (SANBI 2018). The vegetation structure has limited heterogeneity since grasses and shrubs dominate the landscape. However, the vegetation is more structurally complex in association with aquatic resources (rivers, drainage areas) and in isolated areas (e.g., at farmsteads and livestock watering points) where trees are present.

The climate in the PAOI is arid, with low, unreliable rain which falls mostly in late summer and early autumn, peaking in March, and droughts can occur, sometimes for prolonged periods (Mucina and Rutherford 2006). When rainfall is adequate annual herbs proliferate which tends to increase insect activity. These pulses could also result in periods of increased bat activity. Stock grazing is the primary land use and infrastructure within the project boundary is limited primarily to small farmsteads, other isolated buildings and ruins, farm roads, fences, farm dams, water pumps and livestock watering points.

Critical Biodiversity Areas (CBA2, Expert identified Important Terrestrial Habitat) are located in the northwest of the project boundary while Ecological Support Areas (ESA_T, Terrestrial Migration Corridors) cross the south and northwest of the project boundary (NCDENC 2010). The PAOI falls within a National Protected Areas Expansion Strategy (NPAES) Focus area (Kamiesberg Bushmanland Augrabies), areas targeted for protected area expansion for improved ecosystem representation, ecological sustainability and resilience to climate change (DEA 2016). The closest protected area to the PAOI is the Gamsberg Nature Reserve, located approximately 36 km west.

Bat roosting sites in the PAOI are relatively limited and unlikely to support large congregations of bats. The closest known major bat roosts are approximately 120 km northeast of the PAOI. Rocky outcrops are present primarily in the north and northwest and these geological features may provide roosting spaces for species such as Roberts's flat-headed bat, Egyptian free-tailed bat and Long-tailed serotine that roost in rocky crevices

(Monadjem et al. 2018). The Long-tailed serotine roosts in small groups of a few individuals while Roberts's Flat-headed Bat tends to roost communally in small groups of tens of individuals (Jacobs and Fenton 2002). Egyptian free-tailed bats can roost in groups of tens to a few hundred individuals (Herselman and Norton 1985). Bats are also likely to roost in buildings associated with farmsteads within and bordering the project especially Cape Serotine and Egyptian Free-tailed Bat (Monadjem et al. 2018). Trees growing at these farmsteads, and in limited places elsewhere on site usually at livestock water points, could also provide roosting spaces for bats although the extent of this is likely limited since these trees are typically not large and day-time temperatures may be too hot (Monadjem et al. 2018). The building inspections on site did not reveal any evidence of roosting bats.

Sensitive features in the PAOI at which bat foraging activity may be concentrated include farmsteads, farm dams, the livestock water points, rocky outcrops, and along drainage networks/riparian areas. The presence of water, vegetation and lighting at these features could promote insect activity and hence attract foraging bats. For example, Long-tailed serotine have been captured foraging for flies at a livestock kraal (Shortridge 1942). Activity could also be concentrated along the non-perennial Karoep and Soutputs se Laagte rivers which flow through the northeast and south of the project respectively.

Based on current taxonomic information and bat occurrence data, eight bat species could occur at the project, five of which have been confirmed based on the acoustic data recorded thus far (Table 2). No Threatened species were recorded or expected to occur on site but based on habitat suitability modelling (Monadjem et al. 2010), it is possible that the distribution of the nationally Near Threatened Angolan Wing-gland Bat (*Cistugo seabrae*) may overlap with the project but there is little information on the natural history of this species (Jacobs et al. 2016). It is endemic to the west coast of southern Africa from northern South Africa to southern Angola, and the PAOI is located at the extreme southern edge of its distribution (Figure 2). The closest known localities of this species to the PAOI are between 85 km and 100 km north of the project near the Orange River (ACR 2020). This species is currently considered to be at low risk of wind energy impacts (MacEwan et al. 2020).

Table 2: Bat Species Potentially Occurring in the PAOI

Family	Common Name	*Species Name*	Conservation Status		WEF Riskδ	Habitat Requirements*	Prob. of Occurrence	Rationale
			IUCN†	RSA*				
Miniopteridae	Natal Long-fingered Bat	*Miniopterus natalensis*	LC/ Unknown	LC	High	Temperate or subtropical species. Primarily in savannas and grasslands. Roosts in caves, mines, and road culverts. Clutter-edge forager.	**Confirmed (34 passes)**	Echolocation calls recorded.
Vespertilionidae	Cape Serotine	*Laephotis capensis*	LC/ Stable	LC	High	Arid semi-desert, montane grassland, forests, savanna and shrubland. Roosts in vegetation and human-made structures. Clutter-edge forager.	**Confirmed (37 passes)**	Echolocation calls recorded.
Molossidae	Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	LC/ Unknown	LC	High	Desert, semi-arid scrub, savanna, grassland, and agricultural land. Roosts in rocky crevices, caves, vegetation, and human-made structures. Open-air forager.	**Confirmed (55,679 passes)**	Echolocation calls recorded Suitable habitat and roosts.
Molossidae	Roberts's Flat-headed Bat	*Sauromys petrophilus*	LC/ Stable	LC	High	Wet and dry woodlands, shrublands and Acacia-wooded grasslands always in areas with rocky	**Confirmed (12,075 passes)**	Echolocation calls recorded

Family	Common Name	*Species Name*	Conservation Status		WEF Risk$^{\delta}$	Habitat Requirements*	Prob. of Occurrence	Rationale
			IUCN†	RSA*				
						outcrops and hills. Roosts in narrow rock crevices and fissures. Open-air forager.		Suitable habitat.
Vespertilionidae	Long-tailed Serotine	*Eptesicus hottentotus*	LC/ Unknown	LC	Medium	Montane grasslands, marshland and well-wooded riverbanks, mountainous terrain near water. Roosts in caves, mines, and rocky crevices. Clutter-edge forager.	**Confirmed (279 passes)**	Echolocation calls recorded. Suitable roosts.
Cistugidae	Angolan Wing-gland Bat	*Cistugo seabrae*	LC/ Unknown	NT	Low	Limited knowledge of habitat and ecology. All records are in arid areas with mean annual rainfall < 100 mm. Previously captured in riverine vegetation along dry riverbeds and close to open water. Clutter-edge forager.	Low	Edge of range (Figure 2)
Nycteridae	Egyptian Slit-faced Bat	*Nycteris thebaica*	LC/ Unknown	LC	Low	Savannah, desert, arid rocky areas, and riparian strips. Gregarious and roosts in caves but also in mine adits, Aardvark holes, rock crevices, road culverts, roofs, and hollow trees. Clutter forager.	High	Common throughout range. Closest record 38 km north of PAOI (ACR 2020).
Rhinolophidae	Damara Horseshoe Bat	*Rhinolophus damarensis*	LC/ Unknown	LC	Low	Arid savannah and shrubland habitats within the Nama-Karoo Biome. Roosts in caves and mine adits. Clutter forager. Little is known about abundance or population trends of this species.	Medium	Suitable habitat but no suitable roosts. Closest record 64 km west of PAOI (ACR 2020).

LC = Least Concern; NT = Near Threatened
*Based on Child et al. (2016)
†Based on IUCN (2021)
$^{\delta}$Based on MacEwan et al. (2020)

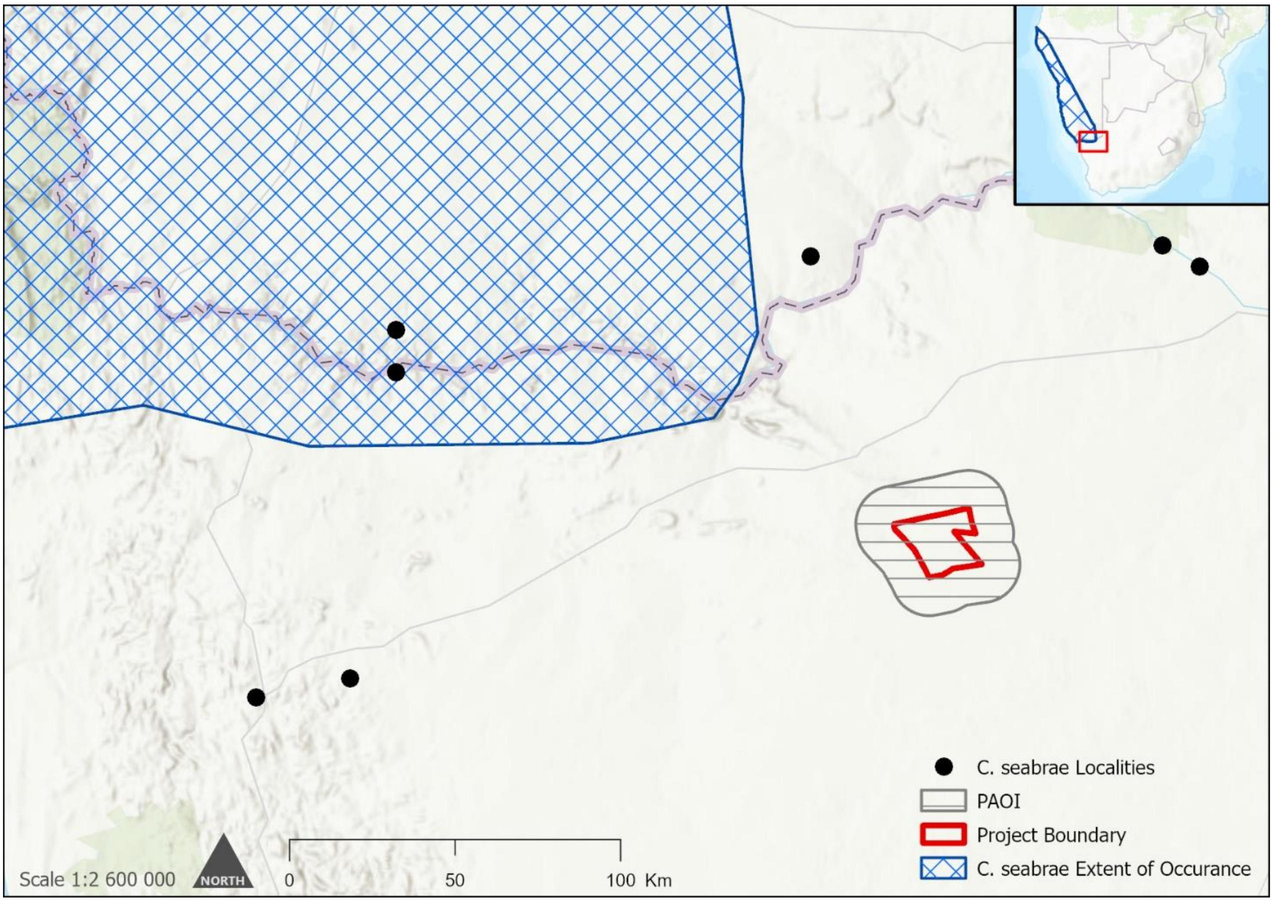

Figure 2: Extent of Occurrence and Locality Records of Angolan Wing-gland bat (*Cistugo seabrae*) relative to the Project Area of Influence (PAOI). Distribution data based on ACR (2020) and IUCN (2021).

6. SPECIALIST FINDINGS

6.1 Summary of Pre-Construction Bat Monitoring

Over the 358 nights of sampling, 68,104 bat passes were recorded from five species. Approximately 82 % of total activity was attributed to Egyptian free-tailed bat, while approximately 17 % was attributed to Roberts's flat-headed bat. Natal long-fingered bat, Cape serotine and Long-tailed serotine were seldomly recorded and together accounted for less than 1 % of total activity. Since most activity was attributed to the two free-tailed bat species, the following results are presented only for these two species. The acoustic activity data suggest that risk for the three remaining species will be low for all months and heights and hence these are not discussed in further detail.

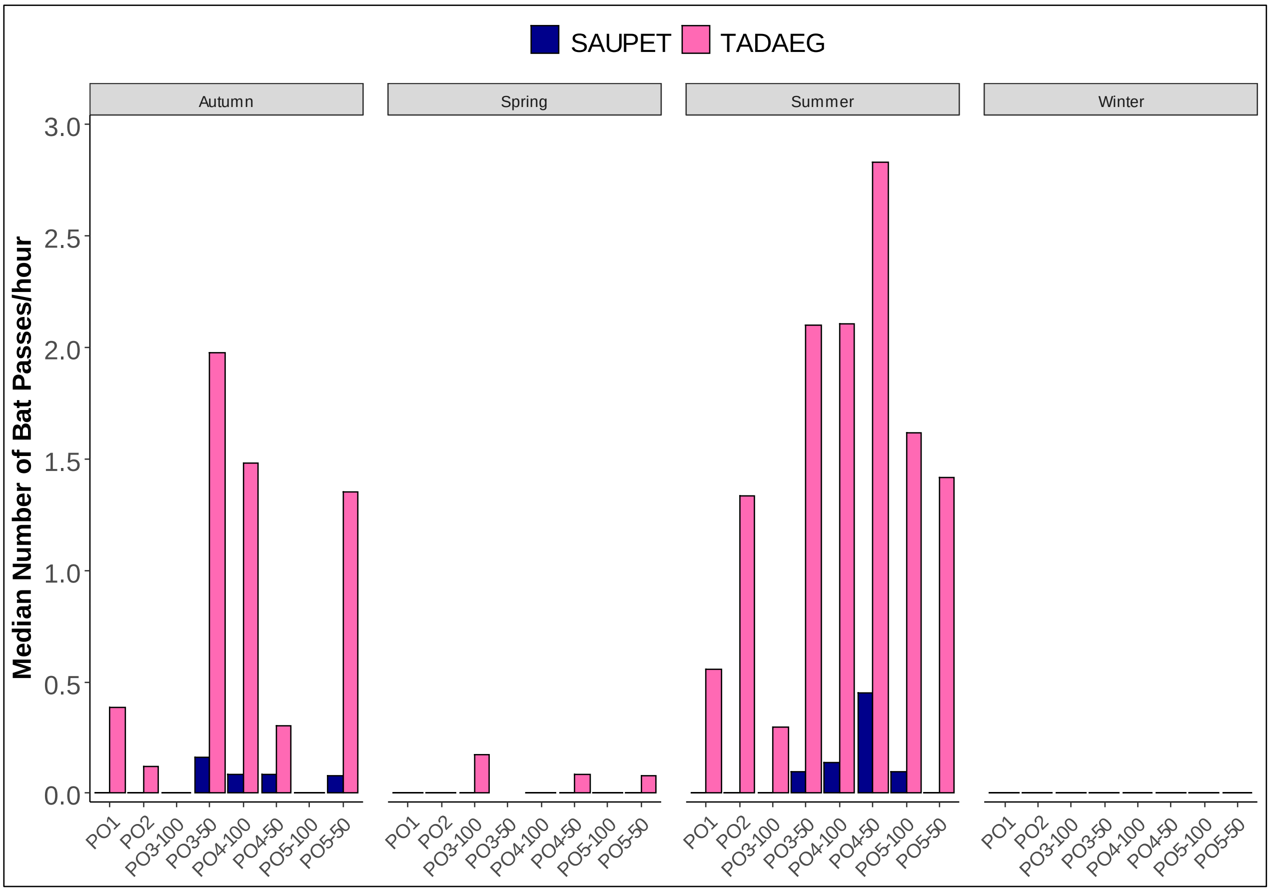

Figure 3: Median bat activity across monitoring locations per season for Roberts's flat-headed bat (SAUPET) and Egyptian free-tailed bat (TADAEG).

Spatially, median bat activity was highest at height (i.e., above 50 m) relative to ground level (Figure 3). Risk levels at PO3, PO4 and PO5 (where monitoring took place at 50 m and 100 m) are classified as high based on median bat activity when compared to reference values in MacEwan et al. (2020). This suggests that risk to bats may be high across the AoI given that these locations were distributed widely across the study area (Figure 1). Further, Roberts's flat-headed bat and Egyptian free-tailed bat are open-air foragers based on their morphology and echolocation (Norberg and Rayner 1987) which means they tend to forage high in the air. Thus, high risk is also expected vertically, across the air space occupied by the turbine rotor blades. This high risk would be limited to temporal periods during which bat activity was higher.

Bat activity varied seasonally with highest activity in summer and autumn, and lower activity in spring and winter. Egyptian free-tailed bat activity peaked in February (summer) at all heights, with the magnitude of activity suggesting high risk during this period (Table 3). High risk is also predicted across all heights in January, while in March and April risk is high at 50 m only. For Roberts's flat-headed bat, activity was lower and hence risk is expected to be high only in February at 50 m (Table 3). This species is predicted to be at medium risk during summer and autumn but only at 50 m and 100 m, with very little activity recorded at 10 m (Table 3).

Table 3: Spatial and Temporal Risk profile based on median bat passes/night (Risk = High, Medium, Low) for Roberts's flat-headed bat and Egyptian free-tailed bat.

Month	Roberts's flat-headed bat			Egyptian free-tailed bat		
	10m	50m	100m	10m	50m	100m
Jan	0	0.2	0.1	1.2	3.5	1.6
Feb	0.1	1.1	0.3	3.8	11.1	1.7
Mar	0	0.3	0	0.7	3.3	0.3
Apr	0	0.1	0	0.12	0.6	0
May	0	0	0	0.08	0.3	0
Jun	0	0	0	0	0	0
Jul	0	0	0	0	0	0
Aug	0	0	0	0	0	0
Sep	0	0	0	0.04	0.2	0.1
Oct	0	0	0	0.09	0.1	0.1
Nov	0	0	0	0	0	0
Dec	0	0	0	0.2	0.5	0.5

Temporal risk to bats would vary further across nightly time periods. During winter, autumn and spring, risk to bats is expected to be low for all time periods for all species except Egyptian free-tailed bat. During summer, at 50 m Roberts's flat-headed bat activity is expected to be high between 00:00 and 03:00, while at 10 m and 100 m activity is low for all time periods. For Egyptian free-tailed bat, activity in summer is predicted to be high between 22:00 and 05:00 at 100 m, between 21:00 and 05:00 at 50 m and between 22:00 and 04:00 at 10 m. In autumn, Egyptian free-tailed bat activity is predicted to be high between 21:00 and 01:00 at 100 m, between 19:00 and 03:00 at 50 m and between 22:00 and 01:00 at 10 m (Figure 4).

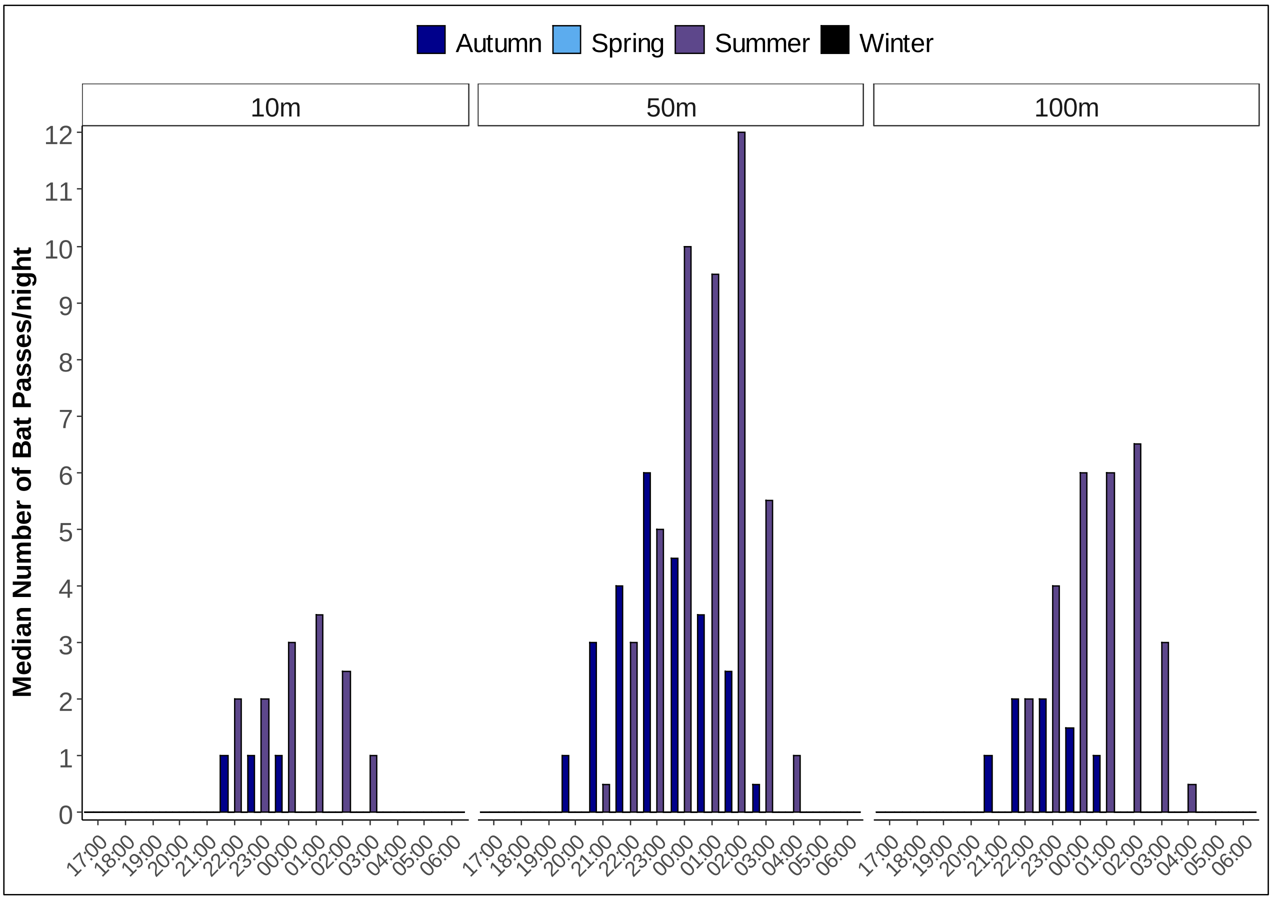

Figure 4: Median bat activity across time periods, by height and season for Egyptian free-tailed bat.

7. IDENTIFICATION AND ASSESSMENT OF IMPACTS

In preparing this impact assessment, the unit of analysis is the local bat community and their associated habitats within the PAOI. As such, impacts are not assessed relative to individual bats.

7.1 Construction Phase

Both indirect and direct impacts can occur during the construction phase. Indirect impacts include the removal of vegetation which can reduce foraging opportunities and alter commuting spaces for bats. Noise and dust generated through construction activities can also disturb bats. Construction activities near bat roosting spaces can indirectly impact bats, potentially resulting in roost abandonment. Direct impacts can occur if bat roosting spaces are destroyed. In addition, the installation of new infrastructure in the landscape (e.g., buildings, turbines, road culverts) can inadvertently provide new roosting spaces for some bat species, attracting them to areas with wind turbines and potentially increasing the likelihood of collisions.

These impacts must be mitigated by not placing project infrastructure (except roads) within No-Go areas (Figure 5), minimising the clearing of vegetation, rehabilitating all areas disturbed during construction (including aquatic habitat), avoiding construction activities at night, minimising disturbance and destruction of farm buildings on site, minimising the removal of trees, minimising blasting and removal of rocky habitat on site, and where this is required, these features must be examined for roosting bats. Project infrastructure (e.g., buildings, turbines, road culverts) must also be sealed to prevent bats from roosting.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction Phase																				
Bat habitat features (foraging/commuting habitat)	Vegetation clearing for access roads, turbines and their service areas and other infrastructure, as well as noise and dust generated during the construction phase, will indirectly impact bats by removing habitat used for foraging/commuting and through disturbance.	2	2	1	2	2	2	18	-	Low	Minimise clearing of vegetation, rehabilitate all areas disturbed during construction (including aquatic habitat), avoid construction activities at night. No infrastructure in No-Go areas (except roads)	1	1	1	2	1	1	6	-	Low
Bat habitat features (roost habitats)	Construction of WEF infrastructure could result in destruction (direct impact) of bat roosts (trees, rock crevices) and disturbance (indirect impact) of bat roosts (trees, buildings, rock crevices) potentially resulting in roost abandonment. Bats may also roost in project infrastructure (e.g., buildings, turbines, road culverts) potentially attracting them to risky locations.	2	2	3	2	2	2	22	-	Low	Minimise disturbance and destruction of farm buildings on site, minimise removal of trees, minimise blasting and removal of rocky habitat on site, and where this is required, these features should be examined for roosting bats. Limit potential for bats to roost in project infrastructure (e.g., buildings, turbines, road culverts).	1	1	1	1	1	1	5	-	Low

7.2 Operational Phase

Direct impacts to bats during the operational phase are mortality through collisions and/or barotrauma. An indirect impact is light pollution from artificial lighting associated with project infrastructure, primarily at operation and maintenance buildings, and not turbine aviation lighting. Lighting impacts are included in the operational phase since this is when these issues would occur even though the mitigation of this impact will need to be implemented during the construction phase via the installation of appropriate lighting infrastructure.

According to the mitigation hierarchy, measures that will be needed to reduce risk of the WEF should initially aim to avoid impacts to bats, and then mitigate residual impacts as needed. Avoidance is typically achieved by buffering key habitat and landscape features that bats use to spatially limit the potential for bats to interact with wind turbine blades. Habitat features present in the landscape that have been buffered by 200 m include rivers, livestock water points, wetlands, farms dams, buildings and rocky outcrops. Small streams and drainage lines have been buffered by 50 m. All buffers are then further adjusted to blade tip and account for the blade length and hub height of the assessed turbines in line with Mitchell-Jones and Carlin (2014) and based on the following equation:

[Eq. 1]

$$b = \sqrt{(buffer + bl)^2 - (hh - fh)^2}$$
$$b = \sqrt{(200 + 100)^2 - (135 - 0)^2}$$
$$b = 268\, m$$

Where:
b = adjusted/blade tip buffer
buffer = 200 m[1]
bl: Turbine blade length = 100 m
hh: Hub height = 135 m
fh: Feature height = 0 m

No turbines in the proposed layout are located within No-Go Areas (Figure 5) and as such the layout is acceptable in terms of risk to bats based on the specific dimensions of the turbines assessed. Should the turbine size change, the adjusted/blade tip buffers must be updated to account for any changes in the hub height or blade length.

Due to the characteristics of the species present on site, i.e., high risk, open-air foraging species, residual impacts could occur since buffers will be less effective for these species. In addition, some bats may be attracted to turbines (Horn et al. 2008, Cryan and Barclay 2009) once installed and operational and therefore additional mitigation measures are needed. Additional measures which were incorporated included the choice of turbine design (hub height and rotor diameter) and the application of a curtailment strategy.

It is prudent to consider the design of turbines since this has the potential to influence bat fatality [e.g., Barclay et al.(2007)] but the impact of turbine size on bat fatality is poorly understood. Generally, impacts may be reduced by limiting the size of the rotor swept area as much as feasible. Increasing the minimum blade sweep can also be effective in reducing bat fatality and therefore a minimum blade sweep of 35 m is being used (100 m blade length and 135 m hub height). Any future changes in the turbine size must adhere to this minimum blade sweep requirement. For high-flying species, this mitigation measures is less effective and to minimise risk, blade feathering must be used to prevent free-wheeling of turbine blades below the turbine cut-in speed. This has been shown to be effective in reducing bat fatality (Young et al. 2011, Good et al. 2012) with minimal interruption on turbine operation.

Once operational, bat fatality monitoring must be undertaken to search for bat carcasses beneath wind turbines to measure the observed impact of the WEF on bats for a minimum of two years (Aronson et al. 2020). Additional mitigation measures that are known to reduce bat fatality if needed based on the fatality monitoring results include curtailment and/or acoustic deterrents (Arnett et al. 2013, Romano et al. 2019, Weaver et al. 2020). These techniques must be used if post-construction fatality monitoring indicates that species fatality thresholds have been exceeded (MacEwan et al. 2018) to maintain the impacts to bats within acceptable limits of change and prevent declines in the impacted bat population.

According to the threshold guidance (MacEwan et al. 2018), the bias-adjusted threshold fatality value for Pofadder WEF 3 is 102 individuals per least concern bat species per annum based on an area of influence of

[1] 50 m for drainage lines, resulting in a buffer to blade tip of 65 m.

5,100 hectares and the spatial bat occupancy rates per hecatre in the Nama Karoo (0.2 bats per 10 hectares). Although predicated to have low probability of occurrence, one fatality of Angolan Wing-gland Bat (*Cistugo seabrae*) would trigger the need for mitigation because this species is nationally Near Threatened (Table 2).

To reduce impacts of light pollution, the lighting regime at the operation and maintenance buildings should be appropriately designed. This includes using as little lighting as possible, maximising the use of motion-sensor lighting, avoiding sky-glow by using hoods, and by using low pressure sodium and warm white lights. Not placing project infrastructure within bat No-Go areas will also reduce the impact of light pollution on important bat habitats and their prey.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operational Phase																				
Bat species	Bat mortality (direct impact) through collisions and/or barotrauma with wind turbine blades	2	4	2	3	3	3	42	-	Medium	No placement of turbines within No-Go areas, minimum blade sweep of 35 m, feather blades to prevent free-wheeling below the turbine cut-in speed, implement post-construction fatality monitoring, and apply curtailment or deterrents if fatality thresholds are exceeded.	1	3	1	3	3	1	11	-	Low
Bat and insect species	The installation of lighting in the landscape at non-turbine project infrastructure can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines. Insects can also die at lighting infrastructure, removing bat prey resources.	2	2	2	2	3	2	22	-	Low	Use as little lighting as possible, maximise use of motion-sensor lighting, avoid sky-glow by using hoods, use low pressure sodium and warm white lights. No infrastructure in No-Go areas (except roads).	1	1	1	1	3	1	7	-	Low

7.3 Decommissioning Phase

Impacts during the decommissioning phase will be indirect and involve disturbance to bats through excessive noise and dust, and damage to vegetation. This can be mitigated by avoiding decommissioning activities at nights, and rehabilitating vegetation once project infrastructure removed.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION	RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION

		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning Phase																				
Bat species	Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation	2	2	1	2	2	1	9	-	Low	Avoid decommissioning activities at nights, rehabilitate vegetation once project infrastructure removed.	1	1	1	2	1	1	6	-	Low

7.4 Cumulative Impacts

For the purposes of the cumulative impact assessment (CIA), cumulative impacts are defined as the total impacts resulting from the successive, incremental, and/or combined effects of a project when added to other existing, planned and/or reasonably anticipated future projects, as well as background pressures (IFC 2013). The project considered here is the Pofadder WEF 3, consisting of wind turbines, and the infrastructure needed to connect this technology to the distribution and transmission grid. The goal of this assessment was to evaluate the potential resulting impact to the vulnerability and/or risk to the sustainability of the bat species affected (IFC 2013).

7.4.1 Step 1: VECs and spatial-temporal boundary

Following guidance in IFC (2013), the first step in the CIA was to determine the Valued Environmental Components (VECs), the bat species most likely to be affected by cumulative impacts, and the temporal and geographic scope of the analysis. Of the species recorded in the AoI during the acoustic monitoring, and based on bat distribution records (ACR 2020), Cape serotine (*Laephotis capensis*), Egyptian free-tailed bat (*Tadarida aegyptiaca*) and Natal long-fingered bat (*Miniopterus natalensis*) are most likely to be impacted cumulatively. This is because they are the most widespread bat species in South Africa (Monadjem et al. 2020), classified as high risk species to wind energy impacts (MacEwan et al. 2020), and the most impacted by operating wind energy facilities in the country (Aronson 2022).

The temporal time frame over which cumulative impacts are considered was 25 years, the typical lifespan of a renewable energy facility. However, cumulative effects could extend beyond this timeframe since development is phased over time.

The Ecologically Appropriate Area of Analysis (EAAA) for the assessment was determined by considering the ecology of the identified species likely to be affected.

The acoustic monitoring confirmed the presence of Natal long-fingered bat in the PAOI, a migratory species which moves seasonally between winter hibernacula and summer maternity cave roosts in South Africa, over long distances (van der Merwe 1975, Miller-Butterworth et al. 2003). However, the long-distance migratory patterns of this species are largely unknown in north-western South Africa, and it is assumed that this species may only make smaller, regional movements.

Data on the spatial ecology of the Egyptian free-tailed bat and Cape serotine, specifically the sizes of their foraging or community ranges, are not available. Data from European free-tailed bat, *Tadarida teniotis*, in Portugal (Marques et al. 2004) and Serotine bat, *Eptesicus serotinus*, in England (Robinson and Stebbings 1997) were used as surrogates. Feeding areas for some *T. teniotis* individuals were over 30 km from their roost while the maximum distance between *E. serotinus* feeding areas was over 41 km.

CIA in South African typically consider developments within a radius of 35 km which therefore is potentially in line with the movement ecology of the Egyptian free-tailed bat and Cape serotine, and potentially the regional movements of Natal long-fingered bat. Hence the EAAA was defined as a 35 km radius around the PAOI.

7.4.2 Step 2: Other Activities and External Drivers

The second step in the CIA was to identify other past, existing, or planned activities within the EAAA and to assess the external influences and stressors on the three VECs. With reference to the Renewable Energy Application database (Q4, 2022), currently five onshore wind energy projects (including the Pofadder WEF 1 and Pofadder WEF 2 being concurrently developed with Pofadder WEF 3) are located within the EAAA (Figure 6). This is likely to be higher since the database only considers logged applications and those in the early development stages are not included. In addition, the EAAA is located on the border of the Springbok Renewable Energy Development Zone (REDZ) which adds additional external influences beyond the EAAA which also needs consideration. As such, at least a moderate level of wind energy development can be expected over the following 25 years in the EAAA.

There are no documented major past threats to Egyptian free-tailed bat and Cape serotine or current threats to them other than renewable energy (Child et al. 2016). Hence this CIA considers renewable energy the primary impact to these VECs. In addition to wind energy impacts, Natal long-fingered bat is locally threatened in parts of its range by habitat loss resulting from conversion of land to agricultural use, incidental poisoning with insecticides, loss of prey base, and the disturbance of roosting and maternity caves (Child et al. 2016).

7.4.3 Step 3: Baseline Status of VECs

Egyptian free-tailed bat is very widely distributed, locally common and recorded from many protected areas in South Africa however, although the population is stable, the population size is unknown (Child et al. 2016). It is classified as Least Concern nationally and globally. This species is present in the AoI and based on its activity levels, it is at high risk of collision during autumn and summer. It is flexible in its habitat requirements and one reason for its wide distribution is its affinity to roost in buildings or other man-made structures (Monadjem et al. 2020).

Cape serotine is also widely distributed in South Africa with a large population and hence is classified as Least Concern nationally and globally. However, it is possible that this species comprises a complex of closely related species (Monadjem et al. 2020). The population trend is stable, but the population size is unknown. This species is present in the AoI but its activity levels suggest low risk of collision. However, this species as been killed at most South African wind farms (Aronson 2022). Cape serotine is flexible in its habitat requirements and its use of buildings and other anthropogenic structures as roosts has possibly led to its numbers increasing.

Natal long-fingered bat is a common and widespread species, classified as Least Concern nationally and globally with a stable national population, but it may be experiencing local declines (Child et al. 2016). The size of the national population is unknown but this species roosts in large colonies; De Hoop Guano cave in the Western Cape hosts approximately 200,000 individuals, and in the Highveld, some caves may contain up to 4000 individuals (Child et al. 2016). Activity levels of this species in the AoI were relatively low and this species was seldomly recorded at height.

7.4.4 Step 4: Assess Cumulative Impacts on VECs

The key potential impacts and risks that could affect the long-term sustainability and/or viability of the VECs in EAAA are collisions with wind turbines. This may lead to local extinctions and fragmentation of the national population since bats have low reproductive rates (Barclay and Harder 2003). For Natal long-fingered bat, impacts could also include displacement along migratory routes due to wind turbines (Millon et al. 2018).

7.4.5 Step 5: Assess Significance of Predicted Cumulative Impacts

Rodhouse et al. (2019), Davy et al.(2020) and Frick et al. (2017) have all shown that in North America, Least Concern bats may be experiencing impacts due to wind farms that could result in changes to their conservation status. This may be a future scenario for widespread, common Least Concern bats species in South Africa. As such, the significance of cumulative impacts is assessed as High.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Bat Species and their populations	Cumulative impacts to bats across multiple wind energy projects	3	4	2	3	3	3	45	-	High	Buffering key habitats used by bats, use of appropriate lighting technology, and using curtailment and/or acoustic deterrents.	3	4	2	3	3	2	30	-	Medium

7.4.6 Step 6: Management of Cumulative Impacts

Management interventions for bats at operating wind farms in South Africa are benchmarked against fatality thresholds. These thresholds attempt to manage impacts to bats by considering potential population level effects, with the threshold values set below the rate at which populations may decline due to anthropogenic pressures (MacEwan et al. 2018). Thresholds have been set for this project and these should be determined for all other future wind energy developments. In theory, should each individual development apply thresholds and appropriate mitigation measures if these are exceeded, the EAAA VEC populations may not decline.

The mitigation measures proposed in this report include buffering key habitats used by bats, use of appropriate lighting technology, and using curtailment and/or acoustic deterrents should be applied to all future projects so that there is a collective management responsibility (IFC 2013).

7.5 Comparative Assessment of Alternatives

7.5.1 No-Go Alternative

Since the principal risk to bats from wind farms is collision (Arnett and Baerwald 2013), not developing the Pofadder WEF 3 would mean the identified impacts to bats would not occur and the current social-ecological dynamics of the PAOI would be maintained. The same would apply with respect to cumulative impacts to bats of the five WEFs within the cumulative impact region should these not be developed either.

8. ENVIRONMENTAL MANAGEMENT PROGRAMME

Impact/ Aspect	**Mitigation/ Management Actions**	***Responsibility***	***Methodology***	**Mitigation/ Management Objectives and Outcomes**	***Frequency***
Modification of Bat Habitat and Roost Disturbance/ Destruction	- Minimise clearing of vegetation - Rehabilitate all areas disturbed during construction (including aquatic habitat) - Avoid construction activities at night. - Minimise disturbance and destruction of farm buildings on site - Minimise removal of trees - Minimise blasting and removal of rocky habitat on site - Limit potential for bats to roost in project infrastructure (e.g., buildings, turbines, road culverts).	Pofadder Wind Energy Facility 3 (Pty) Ltd	- Apply good construction abatement control practices to reduce emissions and pollutants (e.g., noise, erosion, waste) - Apply appropriate vegetation rehabilitation practices. - Ensure buildings, turbines and road culverts are correctly insulated and sealed to prevent bats from roosting. - Where trees and rocky crevices will be impacted, these features should be examined for roosting bats.	- No bat roosts are destroyed - No bats colonise new project infrastructure for roosting - No infrastructure in No-Go areas (except roads) - All areas disturbed during construction are rehabilitated	During design and planning phase and throughout construction phase and until rehabilitation is complete.
Light Pollution	Use as little lighting as possible to avoid sky-glo	Pofadder Wind Energy Facility 3 (Pty) Ltd	- Using hoods, low pressure sodium and warm white lights - Maximise use of motion-sensor lighting.	- No infrastructure in No-Go areas (except roads) - Use of appropriate lighting technology - Minimised light pollution	Completed during design and construction phase.

Bat Mortality	- No placement of turbines within No-Go areas - Minimum blade sweep of 35 m - Blade feathering must be used to prevent free-wheeling of turbine blades below the turbine cut-in speed - Implement post-construction fatality monitoring - Apply curtailment or deterrents if fatality thresholds are exceeded.	Pofadder Wind Energy Facility 3 (Pty) Ltd	- Adhere to the bat constraints map for No-Go areas (Figure 5). - Select turbine with 35 m minimum blades sweep - Implement blade feathering below turbine cut-in speed - Implement best practise bat fatality monitoring according to Aronson et al. (2020). - Estimate bat fatality using GenEst (Simonis et al. 2018). - Develop bat adaptive management plan if fatality thresholds are exceeded which will include a curtailment plan and/or plan for use of acoustic deterrents.	- Bat fatalities do not exceed fatality thresholds for any species.	Turbine layout and turbine model finalised during design phase. Operational Phase fatality monitoring according to Aronson et al. (2020).

9. CONCLUSION

Findings of the bat baseline monitoring show that bats are active both at ground level and up to 100 m, and that activity at ground level is lower relative to at height. Activity on site was dominated by open-air foraging species meaning they typically forage in open spaces high in the air and away from vegetation. This increases the risk to these species. Based on the impact assessment methodology applied, collision risk to bats is assessed as medium overall however this will vary with high risk predicted during certain periods and for certain species. Specifically, risk during summer and autumn is predicted to be high across the site, and across most of the bat active hours during each night but principally for Egyptian free-tailed bat and possibly Roberts's flat-headed bat as well.

Mitigation measures used to reduce risk to bats include the application of buffers around areas and/or specific habitat features important for bats (e.g., building, farm dams, rocky crevices), restrictions on turbine size (i.e., a minimum blade sweep of 35 m), the use of blade feathering and use of appropriate lighting at project infrastructure. Further, bat fatality must be monitored for a minimum of two years from commencement of operation and estimated fatality levels compared to the thresholds set for the project. If these thresholds are exceeded, an adaptative management plan for bats must be developed which will outline the use of curtailment and/or acoustic deterrents to reduce fatality to below threshold levels.

Based on the impacts assessed, and the implementation of mitigation measures proposed to reduce these impacts, the Pofadder WEF 3 can be authorized without unacceptable impacts to bats.

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	Significance	
		Without Mitigation	With Mitigation
Construction Phase			
Bat habitat features (foraging/commuting habitat)	Vegetation clearing for access roads, turbines and their service areas and other infrastructure, as well as noise and dust generated during the construction phase, will indirectly impact bats by removing habitat used for foraging/commuting and through disturbance.	Low	Low
Bat habitat features (roost habitats)	Construction of WEF infrastructure could result in destruction (direct impact) of bat roosts (trees, rock crevices) and disturbance (indirect impact) of bat roosts (trees, building, rock crevices) potentially resulting in roost abandonment. Bats may also roost in project infrastructure (e.g., buildings, turbines, road culverts) potentially attracting them to risky locations.	Low	Low
Operational Phase			

Bat species	Bat mortality (direct impact) through collisions and/or barotrauma with wind turbine blades.	Medium	Low
Bat and insect species	The installation of lighting in the landscape at project infrastructure can attract insects and in turn foraging bats, bringing them into the vicinity of wind turbines. Insects can also die at lighting infrastructure, removing bat prey resources.	Low	Low
Decommissioning Phase			
Bat species	Disturbance to bats due to decommissioning activities through noise and dust, and damage to vegetation.	Low	Low
Cumulative			
Bat Species and their populations	Cumulative impacts to bats across multiple wind energy projects	High	Medium

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Appendix 1: Figures

CAMISSA
SUSTAINABILITY CONSULTING

- PAOI
- Area of Interest
- Pofadder WEF 1
- Pofadder WEF 2
- Pofadder WEF 3
- Roost Survey Location

Bat Detector Locations

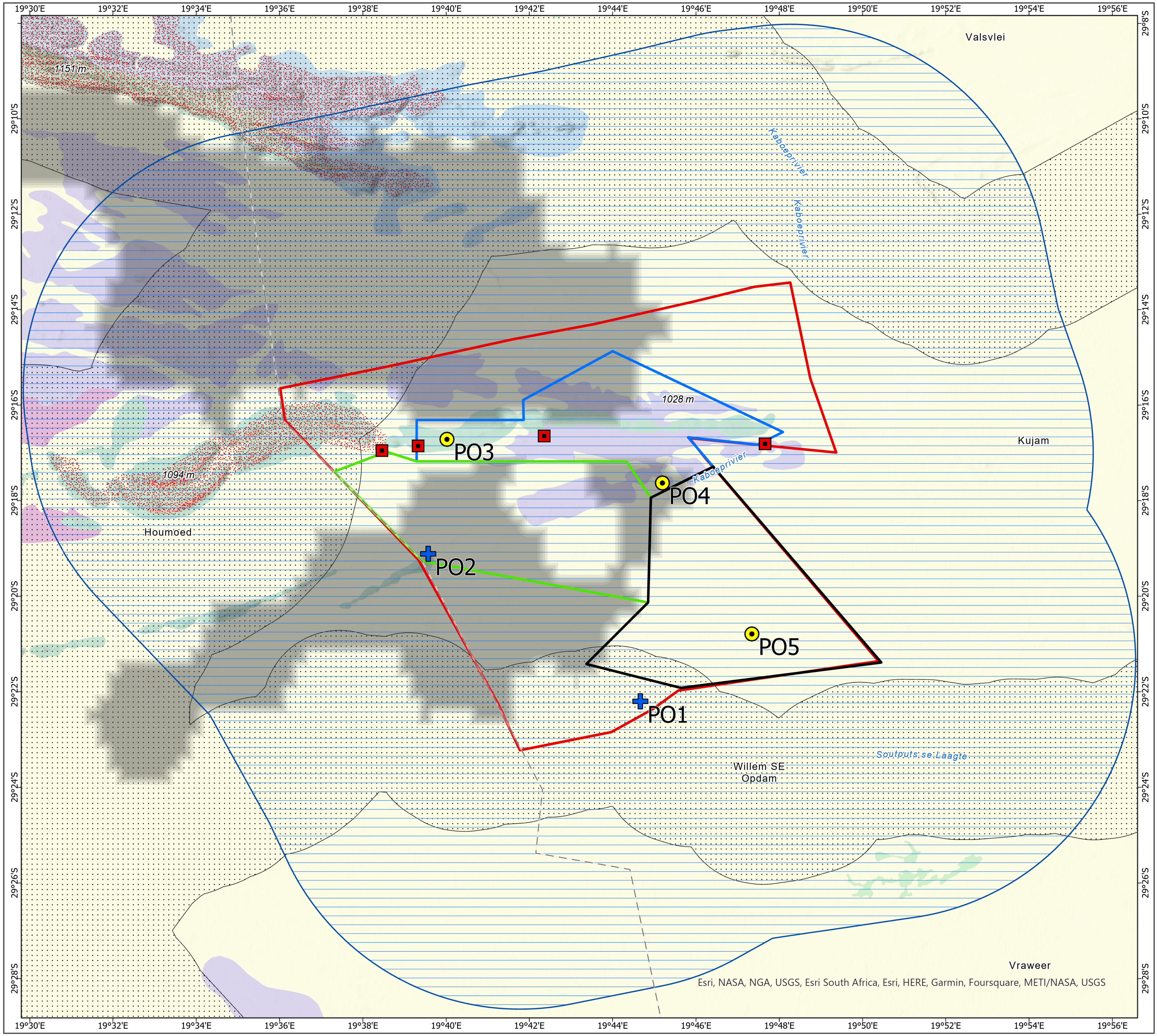
- Met Mast
- Short Mast
- National Protected Areas Expansion Target
- ESA
- CBA2

Vegetation Types

- Aggeneys Gravel Vygieveld
- Bushmanland Arid Grassland
- Bushmanland Basin Shrubland
- Bushmanland Inselberg Shrubland
- Bushmanland Vloere
- Eastern Gariep Plains Desert
- Eastern Gariep Rocky Desert
- Namaqualand Klipkoppe Shrubland

0 5 10 Km
N

09/Jul/2022



Pofadder WEFs
Bat Monitoring Locations
Figure 1

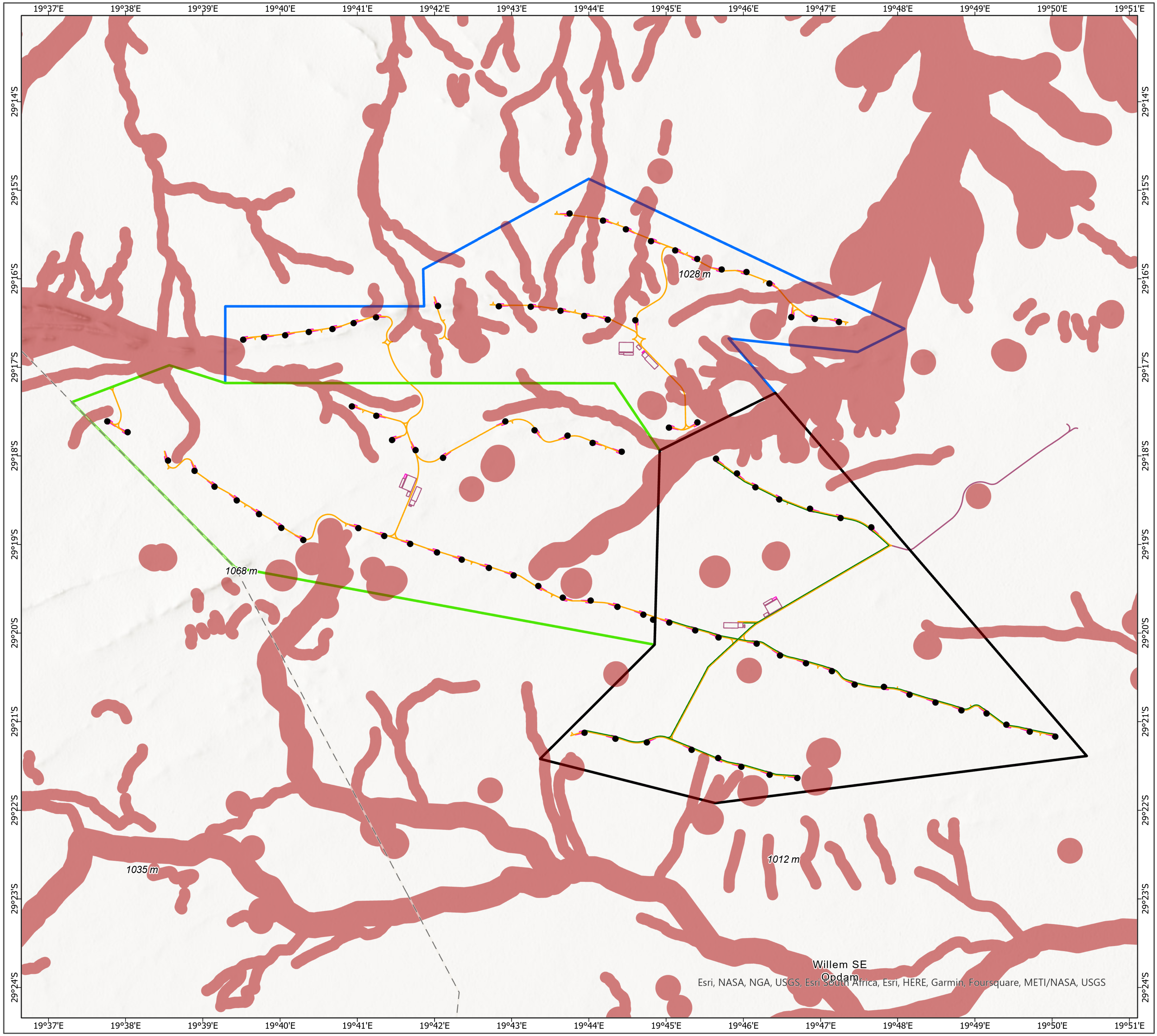
CAMISSA
SUSTAINABILITY CONSULTING

- Pofadder WEF 1
- Pofadder WEF 2
- Pofadder WEF 3
- No Go Areas
- Turbine Layout
- Turbine Hardstands
- Access Roads
- MV Cabling
- Supporting Infrastructure

0 2,5 5 Km

N

09/Jul/2022



Pofadder WEFs
Bat Constraints Map
Figure 5

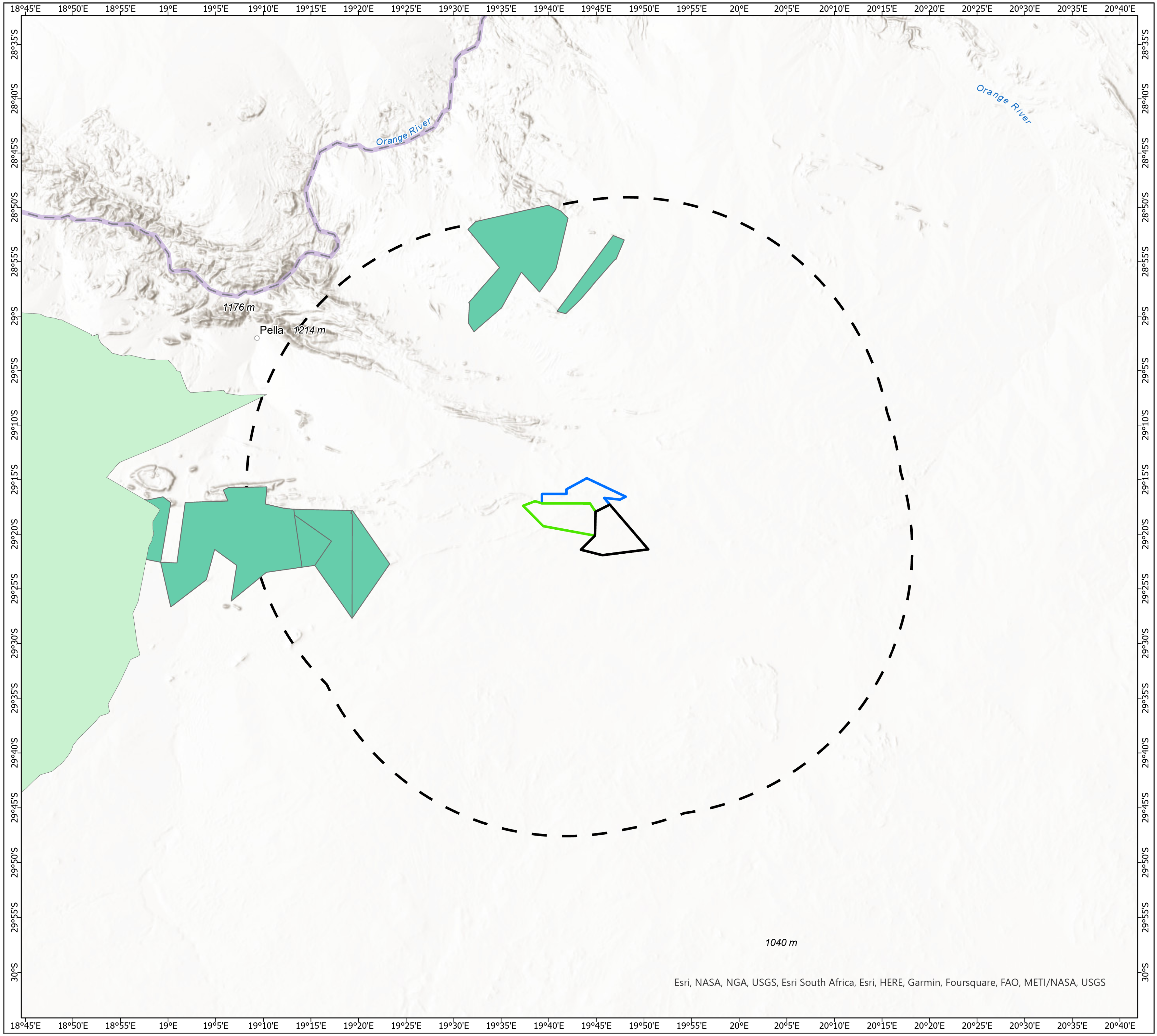
CAMISSA
SUSTAINABILITY CONSULTING

- CumulativeArea
- Pofadder WEF 1
- Pofadder WEF 2
- Pofadder WEF 3
- Onshore Wind Project
- Springbok REDZ

0 20 40 Km

N

09/Jul/2022



Pofadder WEFs
Cumulative Impact Area
Figure 6

Appendix 2: Specialist CV

CURRICULUM VITAE JONATHAN ARONSON

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1 BACKGROUND

Jonathan is a research ecologist with 13 years of experience working on bat and wind energy interactions. He has been at the forefront of bats and wind energy research in South Africa and has worked on more than 100 WEF projects in South Africa, Kenya, Ethiopia, Mozambique, Zambia, Uzbekistan, Azerbaijan, Pakistan, Vietnam, and the UK. He has presented his research at the International Bat Research Conference, the Conference on Wind Energy and Wildlife Impacts, and at numerous local and international bat workshops and symposia.

He is experienced in undertaking pre-construction and operational monitoring projects for bats, impact assessments, mitigation strategy design (including the design of curtailment programs), due diligence exercises, ecological surveys, GIS screening studies and providing strategic advice. He has delivered training to local search teams at operational wind farms in South Africa, Pakistan and Vietnam on bat and bird carcass search methodologies, including providing on-going support and mentoring.

Jonathan has also helped shaped wind-wildlife best practise and policy, co-authoring the Good Practise Guidelines for Surveying Bats at Wind Energy Facilities in South Africa, and developing monitoring guidelines for bat fatality at operational wind power projects. He is a founding member of the South African Bat Assessment Advisory Panel (SABAAP) and a registered as a Professional Natural Scientist (Ecological Science) with SACNASP.

2 PROFESSIONAL HISTORY

Director/Founder, Camissa Sustainability Consulting (2020 – current)
International Finance Corporation (IFC) ESG Sustainability Advice & Solutions Department (2020 – current)
Senior Ecologist, Arcus Consultancy Services South Africa (Pty) Ltd (2019 - 2020)
Ecology Specialist, Arcus Consultancy Services South Africa (Pty) Ltd (2013 – 2019)
Director/Founder, Gaia Environmental Services Pty (Ltd) (2011 - 2013)

3 QUALIFICATIONS

MSc (Environment and Resource Management; Energy and Climate Specialization)
Vrije Universiteit Amsterdam (2020 – 2021)

MSc (Zoology)
University of Cape Town (2009 – 2011)

BSc - Honours (Freshwater Biology)
University of Cape Town (2007)

BSc (Zoology)
University of Cape Town (2003 – 2006)

4 AFFILIATIONS

South African Bat Assessment Advisory Panel (2013 to 2020)
Professional Natural Scientist (Ecological Science) – SACNASP Registration #400238/14

5 PROJECT EXPERIENCE

Research Projects

- Current State of Knowledge of Wind Energy Impacts on Bats in South Africa
- Darling National Demonstration Wind Farm Project. Designed and implemented a research project investigating bat fatality in the Western Cape

Strategic Advice

- Risk screening for five wind farms in Uzbekistan and Azerbaijan (International Finance Corporation)
- Review of Terms of Reference for Bat Pre-construction Monitoring projects in India (International Finance Corporation)
- Stakeholder Advisory Committee for Good Practices Handbook Post-Construction Monitoring of Bird and Bat Fatalities at Onshore Wind Energy Facilities (International Finance Corporation)
- Review of Bird Fatality data from De Aar 1 and De Aar 2 Wind Farms (Mulilo)
- Management and mitigation recommendations for bats at three proposed wind farms (Rainmaker Energy)
- Peer Review for Three Bat Monitoring Reports for the Bokpoort II Solar Developments (Golder Associates)
- Peer Review of Operational Monitoring at the Jeffreys Bay Wind Farm, including updating the operational mitigation strategy for bats (Globeleq South Africa Management Services)
- Oyster Bay Wind Energy Facility. Reviewing a pre-construction bat monitoring study and providing input into a stand-alone study (RES Southern Africa)
- Review and design mitigation strategies for bats at the Kinangop Wind Park, Kenya (African Infrastructure Investment Managers)

Operational Monitoring Projects for Bats and Birds

- Pakistan Super Six Wind Farms (Consortium of six Companies)
- Loi Hai 2 and Phu Lac 2 Wind Farms (International Finance Corporation)
- Waainek, Chaba and Grassridge Wind Farms (EDF Energy)
- Golden Valley 1 Wind Farm (Biotherm Energy)
- Darling Wind Farm (ENERTRAG)
- Eskom Sere Wind Farm (Endangered Wildlife Trust)
- West Coast One Wind Energy Facility (Aurora Wind Power)
- Fazakerly Waste Water Treatment Works (United Utilities)
- Beck Burn Wind Farm (EDF Energy)
- Gouda Wind Energy Facility (Blue Falcon 140)
- Hopefield Wind Farm (Umoya Energy)

Pre-Construction Monitoring and Environmental Impact Assessments for Bats

- Taaibos and Soutrivier Wind Energy Facilities (WKN Windcurrent SA)
- Pofadder Wind Energy Facility (Atlantic Renewable Energy Partners (Pty) Ltd)
- Ummbila Emoyeni Wind Energy Facility (Windlab Developments South Africa (Pty) Ltd)
- Kleinberg Wind Energy Facility (Mulilo)
- Klipfontein & Zoute Kloof Solar PV Projects (Resource Management Services)
- Swellendam Wind Energy Facility (The Energy Team/Calidris)
- Swellendam Wind Energy Facility (Veld Renewables)
- Ingwe Wind Energy Facility (ABO Wind renewable energies)
- Duiker Wind Energy Facility (ABO Wind renewable energies)
- Pienaarspoort Wind Energy Facility (ABO Wind renewable energies)
- Choje Wind and Solar Energy Facility (Wind Relic)
- Wobben WEC Wind Project (Integrated Wind Power)
- Nuweveld Wind Energy Facility (Red Cap Energy)
- Banna Ba Phifu Wind Energy Facility (WKN Windcurrent SA)
- Kwagga Wind Energy Facility (ABO Wind renewable energies)
- Unika 1 Wind Farm in Zambia (SLR Consulting)
- Namaacha Wind Farm (Consultec)
- Paulputs Wind Energy Facility (WKN Windcurrent SA)
- Putsonderwater Wind Energy Facility (WKN Windcurrent SA)
- Zingesele Wind Energy Facility (juwi Renewable Energies)

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- Highlands Wind Energy Facility (WKN Windcurrent SA)
- Kap Vley Wind Energy Facility (juwi Renewable Energies)
- Universal and Sonop Wind Energy Faculties (JG Afrika)
- Kolkies and Karee Wind Energy Facility (Mainstream Renewable Power South Africa)
- Komsberg East and West Wind Energy Facility (African Clean Energy Developments)
- Spitskop West Wind Energy Facility (RES Southern Africa/Gestamp)
- Spitskop East Wind Energy Facility (RES Southern Africa)
- Patryshoogte Wind Energy Facility (RES Southern Africa)
- Elliot Wind Energy Facility (Rainmaker Energy)
- Pofadder Wind Energy Facility (Mainstream Renewable Power South Africa)
- Swartberg Wind Energy Facility (CSIR)
- Clover Valley and Groene Kloof Wing Energy Facility (Western Wind Energy)

Ecological Surveys

- Mokolo Bat Cave Assessment for water pipeline development (GIBB)
- Killean Wind Farm Bat acoustic surveys for this proposed site in Scotland, UK. (Renewable Energy Systems)
- Maple Road, Tankersely. Bat acoustic surveys including a walked transect for this proposed site near Barnsley, UK (Rula Developments).
- Wild Bird Global Avian Influenza Network for Surveillance (Percy Fitzpatrick Institute of African Ornithology)
- Tree-Grass Dynamics Research Project (University of Cape Town)
- Zululand Tree Project (University of Cape Town)

Environmental Due Diligence Projects

- Klawer Wind Farm (SLR Consulting)
- Excelsior Wind Farm (IBIS Consulting)
- Golden Valley Wind Farm (IBIS Consulting)
- Perdekraal Wind Farm (IBIS Consulting)
- Copperton Wind Energy Facility (SLR Consulting)
- Roggeveld Wind Farm (IBIS Consulting)
- Kangas Wind Farms (ERM)
- Excelsior Wind Farms (ERM)
- Golden Valley Wind Farms (ERM)

Amendment Applications for Wind and Solar Farms

- Bokpoort Solar Amendment (Royal HaskoningDHV)
- Haga Haga (CES - Environmental and social advisory services)
- Paulputs (Arcus Consultancy Services South Africa)
- Suurplaat (Savannah Environmental)
- Kap Vley (juwi)
- San Kraal (Arcus Consultancy Services South Africa)
- Phezukomoya (Arcus Consultancy Services South Africa)
- Gemini (Savannah Environmental)
- Castle Wind Farm (juwi)
- Namas (Savannah Environmental)
- Zonnequa (Savannah Environmental)
- Ukomeleza (CES - Environmental and social advisory services)
- Great Kei (CES - Environmental and social advisory services)
- Motherwell (CES - Environmental and social advisory services)
- Dassiesridge (CES - Environmental and social advisory services)
- Great Karoo (Savannah Environmental)
- Gunstfontein (Savannah Environmental)

- Komserberg East and West (Aurecon South Africa)
- Soetwater (Savannah Environmental)
- Karusa (Savannah Environmental)
- Zen (Savannah Environmental)

Screening Studies

- Feasibility assessment for four potential wind farms in the Northern Cape (ABO Wind renewable energies)
- Feasibility assessment for four potential wind farms in Mozambique (Ibis Consulting)
- Assessment of the Feasibility of a Wind Farm in the Northern Cape (juwi Renewable Energies)
- Assessment of the Feasibility of two Wind Farms in the Eastern Cape (WKN Windcurrent SA)

6 PUBLICATIONS

Aronson, J.B., Shackleton, S., and Sikutshwa, L. (2019). Joining the puzzle pieces: reconceptualising ecosystem-based adaptation in South Africa within the current natural resource management and adaptation context. Policy Brief, African Climate and Development Initiative.

MacEwan, K., Aronson, J.B, Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – South African Bat Assessment Association (1st Edition).

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Aronson, J.B., Richardson, E.K., MacEwan, K., Jacobs, D., Marais, W., Aiken, S., Taylor, P., Sowler,S. and Hein, C (2014). South African Good Practise Guidelines for Operational Monitoring for Bats atWind Energy Facilities (1st Edition).

Sowler, S. and S. Stoffberg (2014). South African Good Practise Guidelines for Surveying Bats in WindEnergy Facility Developments - Pre-Construction (3rd Edition). Kath Potgieter, K., MacEwan, K., Lötter,C., Marais, M., Aronson, J.B., Jordaan, S., Jacobs, D.S, Richardson, K., Taylor, P., Avni, J., Diamond,M., Cohen, L., Dippenaar, S., Pierce, M., Power, J. and Ramalho, R (eds).

Aronson, J.B., Thomas, A. and Jordaan, S. 2013. Bat fatality at a Wind Energy Facility in the Western Cape, South Africa. African Bat Conservation News 31: 9-12.

7 TRAINING

- National Wind Coordinating Collaborative (NWCC) Wind Wildlife Research Meeting, December 2020.
- Conference on Wildlife and Wind Energy Impacts, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Stirling, August 2019.
- GenEst Carcass Fatality Estimator Workshop, Kirstenbosch Research Centre (KRC), October 2018.
- Windaba Conference and Exhibition - Africa’s Premier Wind Energy Conference; Cape Town, 2013 – 2019
- Bats & Wind Energy Workshop, The Waterfront Hotel & Spa, Durban, July 2016.
- Endangered Wildlife Trust (EWT) Bats & Wind Energy Training Course, Oct 2013.
- Endangered Wildlife Trust (EWT) Bats & Wind Energy Training Course, Jan 2012.

Appendix 3: Site Verification Report

SITE SENSITIVITY VERIFICATION
(IN TERMS OF PART A OF THE ASSESSMENT PROTOCOLS PUBLISHED IN GN 320 ON 20 MARCH 2020

1 INTRODUCTION

Pofadder Wind Energy Facility 1 (Pty) Ltd is proposing the development of a commercial Wind Energy Facility (WEF) and associated infrastructure, Pofadder WEF 1, on a site located approximately 20 km Southeast of Pofadder within the Kai !Garib Local Municipality and the Z F Mgcawu District Municipality in the Northern Cape Province, South Africa.

In accordance with Regulation 16(1)(b)(v) of the EIA Regulations, a Screening Report is required to accompany any application for Environmental Authorisation. The National Web based Environmental Screening Tool[1] was used to generate this Screening Report for the Pofadder WEF 1. Subsequently, this document presents a site sensitivity verification (SSV) to confirm the current land use and environmental sensitivity of the proposed project area as identified by Screening Tool.

2 SITE SENSITIVITY VERIFICATION

The SSV was undertaken at the desktop level as well as using on-site information collected as part of the 12-month pre-construction bat acoustic monitoring being undertaken for the project in accordance with best practise standards for wind energy projects (MacEwan et al. 2020). The Project Area of Influence (PAOI) was defined as the project boundary plus a 10 km buffer[2] given that bats are volant mammals.

Desktop resources included published scientific articles, texts (Monadjem et al. 2010, Child et al. 2016, Monadjem et al. 2020), and databases (ACR 2020, IUCN 2021) on South African bats. These were used to determine which bat species (i.e., impact receptors) are likely to occur at the project as well as to provide information on their natural history and conservation status.

The acoustic monitoring data were used to confirm species occurrence at the project as well as the magnitude of bat activity. It commenced on 29 June 2021 and bat activity is being sampled at five locations, nightly from sunset to sunrise. Locations were chosen based on a provisional turbine layout to sample bats in areas representative of where turbines might be installed. Two locations are sampling bats at approximately ground level (10 m) while at three locations, sampling is being undertaken simultaneously at 50 m and 100 m. In addition, eight buildings at a farmstead within the project boundary were systematically surveyed on 26 August 2021. The surveys aimed to directly observe roosting bats, locate evidence of roosting bats (e.g., culled insect remains, fur-oil-stained exit and entry points, guano/droppings), and assess the potential for each building to support bats.

As per the Species Environmental Assessment Guideline (SANBI 2020), the best practise bat guidance was used to assign sensitivity to the impact receptors (specifically bat species) in the PAOI. Sensitivity was obtained by calculating the median number of bat passes/hour per night (n = 157 sample nights) pooled across all monitoring locations and bat species but separated by height. These were then compared to the reference values in the bat guidelines to assign a sensitivity rating to the PAOI (Table 1).

Table 1: Height-specific bat activity (passes/hour) and fatality risk for the Nama Karoo Biome

Height Category	Fatality Risk (Sensitivity)		
	Low	Medium	High
Ground level	< 0.18	0.18 – 1.01	> 1.01
Rotor sweep	< 0.03	0.03 – 0.42	> 0.42

[1] https://screening.environment.gov.za.
[2] In line with guidance for wind farms in the United Kingdom (Scottish Natural Heritage (SNH) 2019)

3 ASSUMPTIONS AND LIMITATIONS

Acoustic monitoring for bats allows for rapid, passive collection of a large volume of bat activity data which can help identify the bat species present within a particular location and their associated relative spatio-temporal activity patterns. In the context of wildlife and wind farm interactions, acoustic monitoring is therefore a useful technique however, there are several constraints (Brigham et al. 2004, Kunz et al. 2007, Adams et al. 2012, Voigt et al. 2021). Acoustic monitoring cannot provide an indication of bat abundance or population size at a site. In addition, population demographics such as age and sex of bats cannot generally be determined from echolocation calls. Species identification is challenging given the variation individual species display in their echolocation call structure and overlap in these structures between species. Echolocation data are thus not as reliable as an identifier of bat species compared to live trapping. To identify species, this study used the Wildlife Acoustics Inc. library “Bats of South Africa Version 5.4.0”, but this excludes reference calls for most South African species thus echolocation recordings were also reviewed manually. Lastly, bat activity is notably variable in response to several factors such as land use change, climactic variability, variations in prey abundance and meteorological conditions which can vary over different time scales. Since this SSV is based on six of months (winter and spring) the bat species inventory of the site may not be complete.

4 OUTCOME OF SITE SENSITIVITY VERIFICATION

The PAOI is situated in the Nama Karoo Biome and the landscape is characterised by open, relatively flat, and sparsely vegetated plains with mountainous terrain in the north and northwest. The vegetation is dominated by Bushmanland Arid comprising low growing shrubs and bunch grasses at low density. Bushmanland Basin Shrubland and Bushmanland Inselberg Shrubland bisects the middle of the PAOI, and Eastern Gariep Rocky Desert vegetation occurs in the north. Sheep farming is the primary land use.

Roost sites in the project are relatively limited and unlikely to support large congregations of bats. The closest known major bat roosts are approximately 120 km northeast of the PAOI. Rocky outcrops are present primarily in the north and northwest and these geological features may provide roosting species for species such as Roberts’s Flat-headed Bat that roost in rocky crevices. Bats are also likely to roost in buildings associated with farmsteads within and bordering the project especially Cape Serotine and Egyptian Free-tailed Bat. Trees growing at these farmsteads, and in limited places elsewhere on site usually at livestock kraals, could also provide roosting spaces for bats although the extent of this is likely limited since these trees are typically not large. The building inspections on site did not reveal any evidence of roosting bats. Sensitive features in the PAOI at which bat activity may be concentrated include farmsteads, farm dams, and the livestock kraals. The presence of water, vegetation and lighting at these features could promote insect activity and hence attract foraging bats. Activity could also be concentrated along the non-perennial Karoep and Soutputs se Laagte rivers which flow through the northeast and south of the project respectively.

Based on current taxonomic information and bat occurrence data, 8 bat species could occur at the project, four of which have been confirmed based on the acoustic data recorded thus far (Table 2). No Threatened species were recorded or expected to occur on site but based on habitat suitability modelling (Monadjem et al. 2010), it is possible that the distribution of the nationally Near Threatened Angolan Wing-gland Bat (*Cistugo seabrae*) may overlap with the project but there is little information on the natural history of this species (Jacobs et al. 2016). It is endemic to the west coast of southern Africa from northern South Africa to southern Angola, and the PAOI is located at the extreme southern edge of its distribution (Figure 1). The closest known localities of this species to the PAOI are between 85 km and 100 km north of the project near the Orange River (ACR 2020). This species is currently considered to be at low risk of wind energy impacts (MacEwan et al. 2020).

The preliminary acoustic monitoring results show that the median number of bat passes/hour per night at height (50 m and 100 m) was 0.1 which would classify the PAOI as medium sensitivity (Table 1). Based on ground level data median pass/hour was 0.0 resulting in low sensitivity. Since the impact (i.e., direct fatality) of the project infrastructure would primarily occur at height, the medium sensitivity rating would be applicable to the PAOI.

Table 2: Bat Species Potentially Occurring at Pofadder 1 WEF

Family	Common Name	*Species Name*	Conservation Status		WEF Risk[δ]	Habitat Requirements*	Prob. of Occurrence	Rationale
			IUCN†	RSA*				
Miniopteridae	Natal Long-fingered Bat	*Miniopterus natalensis*	LC/ Unknown	LC	High	Temperate or subtropical species. Primarily in savannas and grasslands. Roosts in caves, mines, and road culverts. Clutter-edge forager.	Low	Lack of suitable roosts (cave-dependent).
Vespertilionidae	Cape Serotine	*Laephotis capensis*	LC/ Stable	LC	High	Arid semi-desert, montane grassland, forests, savanna and shrubland. Roosts in vegetation and human-made structures. Clutter-edge forager.	**Confirmed**	Echolocation calls recorded.
Molossidae	Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	LC/ Unknown	LC	High	Desert, semi-arid scrub, savanna, grassland, and agricultural land. Roosts in rocky crevices, caves, vegetation, and human-made structures. Open-air forager.	**Confirmed**	Echolocation calls recorded Suitable habitat and roosts.
Molossidae	Roberts's Flat-headed Bat	*Sauromys petrophilus*	LC/ Stable	LC	High	Wet and dry woodlands, shrublands and Acacia-wooded grasslands always in areas with rocky outcrops and hills. Roosts in narrow rock crevices and fissures. Open-air forager.	**Confirmed**	Echolocation calls recorded Suitable habitat.
Vespertilionidae	Long-tailed Serotine	*Eptesicus hottentotus*	LC/ Unknown	LC	Medium	Montane grasslands, marshland and well-wooded riverbanks, mountainous terrain near water. Roosts in caves, mines, and rocky crevices. Clutter-edge forager.	**Confirmed**	Echolocation calls recorded. Suitable roosts.
Cistugidae	Angolan Wing-gland Bat	*Cistugo seabrae*	LC/ Unknown	NT	Low	Limited knowledge of habitat and ecology. All records are in arid areas with mean annual rainfall < 100 mm. Previously captured in riverine vegetation along dry riverbeds and close to open water. Clutter-edge forager.	Low	Edge of range (Figure 1)
Nycteridae	Egyptian Slit-faced Bat	*Nycteris thebaica*	LC/ Unknown	LC	Low	Savannah, desert, arid rocky areas, and riparian strips. Gregarious and roosts in caves but also in mine adits, Aardvark holes, rock crevices, road culverts, roofs, and hollow trees. Clutter forager.	High	Common throughout range. Closest record 38 km north of PAOI (ACR 2020).
Rhinolophidae	Damara Horseshoe Bat	*Rhinolophus damarensis*	LC/ Unknown	LC	Low	Arid savannah and shrubland habitats within the Nama-Karoo Biome. Roosts in caves and mine adits. Clutter forager. Little is known about abundance or population trends of this species.	Medium	Suitable habitat but no suitable roosts. Closest record 64 km west of PAOI (ACR 2020).

LC = Least Concern; NT = Near Threatened
*Based on Child et al. (2016)
†Based on IUCN (2021)
[δ]Based on MacEwan et al. (2020)

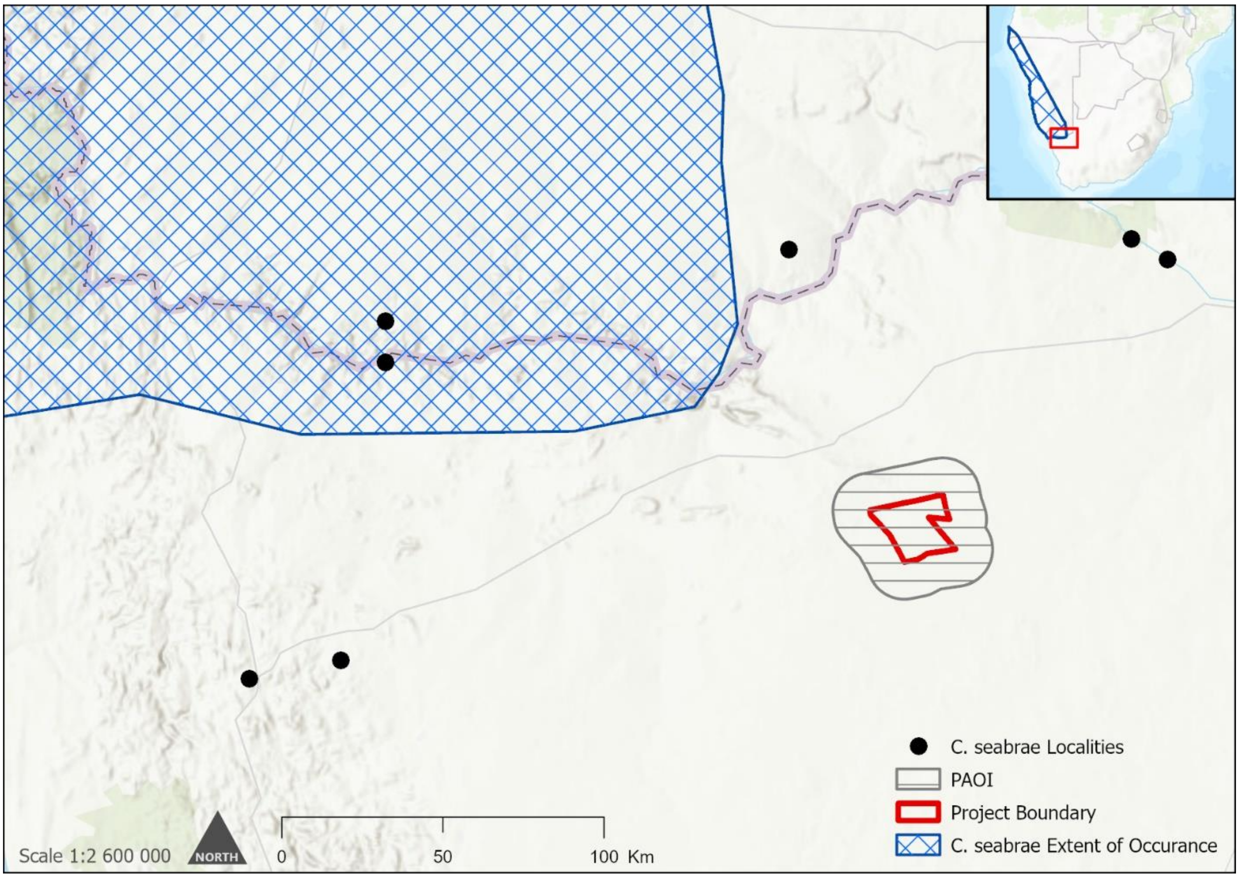

Figure 1: Extent of Occurrence and Locality Records of Angolan Wing-gland bat (*Cistugo seabrae*) relative to the Project Area of Influence (PAOI).

5 NATIONAL ENVIRONMENTAL SCREENING TOOL

The Screening Tool classified areas within the site boundary as medium and high sensitivity according to the Bats theme (Figure 2). High sensitivity features were wetlands and rivers buffered by 500 m, with the remaining areas classified as medium. As a result, the PAOI is classified as high sensitivity overall[3]. The tool did not reveal the presence of any species of conservation concern (SSC).

The outcome of the SSV is that the overall sensitivity of the site is classified as medium, lower than the high sensitivity rating given by the Screening Tool. However, the two sensitivities are based on different data types. The Screening Tool is based on broad scale habitat data whereas the SSV is based on bat collision risk with wind turbines derived from activity data collected within the project boundary and is therefore a better approximation of the project sensitivity because collision is the primary impact. As such the SSV disputes the current environmental sensitivity of the proposed project area, arguing that the sensitivity should be reduced to medium.

[3] In accordance with Government Notice No. 1150 (30 October 2020) Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (Table 1, 1.6): "If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint."

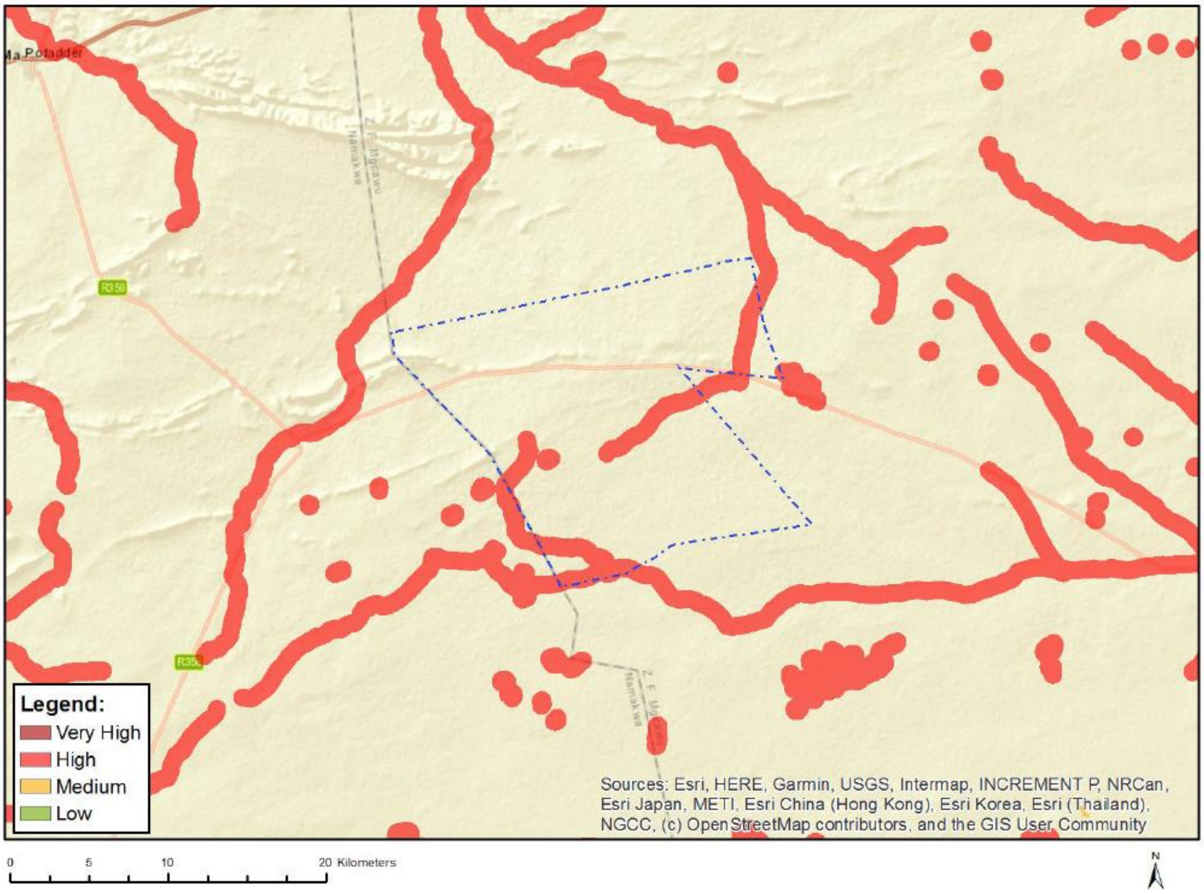

Figure 2: Map of Bats (Wind) Theme Sensitivity

6 CONCLUSION

This document presents a site sensitivity verification (SSV) to confirm the current land use and environmental sensitivity of the proposed Pofadder 1 WEF as identified by National Web based Environmental Screening Tool. Based on the Screening Tool the PAOI is classified as high sensitivity overall. The SSV argued that based on bat collision risk with wind turbines the environmental sensitivity of the PAOI should be classified as medium. As per best practise (MacEwan et al. 2020) a Bat Specialist Assessment is being undertaken for the project.

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