

AMENDMENT TO THE WIND TURBINE LAYOUT FOR THE ZEN WIND FARM AND BERGRIVER WIND FARM, NEAR GOUDA IN THE WESTERN CAPE PROVINCE

Avifauna and Bats Amendment Report

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By

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1 INTRODUCTION

1.1 PROJECT & SCOPE

Savannah Environmental contracted Enviro-Insight to perform an investigation to assess the impacts on avifauna and bats from proposed layout changes to the authorised Zen Wind Farm (DFFE reference: 14/12/16/3/3/2/322) and the authorised Bergriver Wind Farm (DFFE reference: 14/12/16/3/3/2/2105), located near Gouda in the Western Cape Province. The project description for each is provided below:

1.1.1 Zen Wind Farm

The authorised Zen Wind Farm is located approximately 10 km northwest of the town Gouda and falls within the Drakenstein Local Municipality in the Cape Winelands District Municipality, Western Cape. An Environmental Authorisation (EA) for the Zen Wind Farm and associated infrastructure was received on 03 November 2016.

The Zen Wind Farm is to be constructed within the project site which comprises the following farm portions:

- » Portion 1 of the Farm Bonne Esperance 83,
- » Portion 2 of the Farm Bonne Esperance 83,
- » Portion 9 of the Farm No. 88
- » Portion 0 of the Nayoth 458

Due to the proximity to the Bergriver Wind farm and the operational Gouda Wind Farm. Acciona Energy South Africa Global (Pty) Ltd (AESAG) acquired the project from the original developers and is developing a wind farm cluster. AESAG will adopt the latest wind turbine technology available to Acciona Energy for the project. The facility layout has been designed to optimise the energy yield and considers the latest technology. The project will also utilise combined construction infrastructure (temporary facilities, laydown areas, batch plants to further reduce the overall impacts of the project and the adjacent Bergriver Wind Farm. Both the Zen and the Bergriver Wind Farm projects are designed to share infrastructure to optimise construction expenses and timeline.

In this regard, the following is proposed:

1. Retain the overall capacity of the wind farm at 147 MW;
2. Reduction in the number of turbines from 27 to 17;
3. Increase turbine capacity from 6 MW to up to 7.5 MW per turbine;
4. Retain tip height of up to 230 m;
5. Increase the internal roads width from 6 m to ~8 m;

6. Optimise turbine/facility layout based on the energy yield, and revise the layout as required based on the revised turbine numbers and turbine specification; and
7. Optimise internal underground cabling (33kV) to enable a consolidated point of grid connection for the Zen/Bergriver cluster, and remove substation and overhead power line connection from the project description.

The proposed amendments are not listed activities and do not trigger any new listed activity. No additional properties will be affected by the amendments as the proposed amendments are within the originally authorised development footprint.

In addition to the above, the final facility layout and the EMPr for the facility must be submitted and approved prior to commencement of construction, as per the requirements of the EA.

The Zen Wind Farm project site is proposed to accommodate the following infrastructure:

- » Up to 17 wind turbines at 7.5 MW each with a tip height of up to 230 m.
- » Concrete turbine foundations and turbine hardstands;
- » Internal access roads (up to 8m in width) linking wind turbines and other infrastructure on the Bergriver Wind Farm site.

The Zen Wind Farm and Bergriver Wind Farm will share the following infrastructure.

- » Temporary facilities, laydown areas and batch plants
- » Onsite Substation and Switching Substation
- » Operation and Maintenance buildings including a gate house, security building, control centre, offices, warehouses, a workshop and visitors centre.

Below are the details or dimensions of the up to 147 MW Zen Wind Farm and associated infrastructure:

Infrastructure	Footprint and dimensions
Facility capacity	Contracted capacity of 147 MW
Number of turbines	Up to 17 turbines
Turbine tip height	Up to 230 m
Turbine foundations	Approximately 20 m x 20 m to a depth of 6 m per turbine
Access and internal roads	Existing roads on farm will be used where feasible and practical. The width of the access road will be approximately 8m (this is also relevant for existing roads) however during

	construction access roads may be up to 10m in width. The total length of access roads is approximately. The access roads will be gravel.
Underground cabling	Underground cabling between the turbine will be installed at a depth of 1.5 m to 3 m. Cabling to follow internal access roads.

1.1.2 Bergriver Wind Farm

The authorised 120 MW Bergriver Wind Farm is located adjacent to the town of Gouda and approximately 6km south of Saron and falls within the Drakenstein Local Municipality in the Cape Winelands District Municipality, Western Cape. An Environmental Authorisation (EA) for the Bergriver Wind Farm and associated infrastructure was received on 29 July 2022.

The Bergriver Wind Farm is to be constructed within the project site which comprises the following farm portions:

- » Portion 3 of the Farm Hartebeeste Kraal 88
- » Portion 4 of the Farm Bonne Esperance 83
- » Portion 1 of the Farm Hartebeeste Kraal 88
- » Portion 1 of Farm 397
- » Portion 2 of Farm 397

Due to the proximity to the Zen Wind farm and the operational Gouda Wind Farm. Acciona Energy South Africa Global (Pty) Ltd (AESAG) acquired the project from the original developers and is developing a wind farm cluster. AESAG will adopt the latest wind turbine technology available to Acciona Energy for the project. The facility layout has been designed to optimise the energy yield and considers the latest technology. The new layout also takes into consideration the ideal point of connection to the grid, and ideal location of the 132kV on-site substation. The project will also utilise combined construction infrastructure (temporary facilities, laydown areas, batch plants to further reduce the overall impacts of the project and the adjacent Zen Wind Farm. Both the Bergriver and the Zen Wind Farm projects are designed to share infrastructure to optimise construction expenses and timeline.

In this regard, the following is proposed:

1. Retain the 16 wind turbines;
2. Retain the tip height of up to 230 m;
3. Retain turbine capacity at 7.5 MW per turbine;
4. Optimse turbine/facility layout based on the energy yield;

5. Optimise position of on-site facility substation to enable a consolidated point of grid connection for the Zen/Bergriver wind farm cluster.

The proposed amendments are not listed activities and do not trigger any new listed activity. No additional properties will be affected by the amendments as the proposed amendments are within the originally authorised development footprint.

In addition to the above, the final facility layout and the EMPr for the facility must be submitted and approved prior to commencement of construction, as per the requirements of the EA.

The Bergriver Wind Farm project site is proposed to accommodate the following infrastructure:

- » Up to 16 wind turbines at 7.5 MW each a tip height of up to 230 m.
- » Concrete turbine foundations and turbine hardstands;
- » Access and internal roads with a width of up to 10 m;
- » Temporary laydown areas which will accommodate storage and assembly areas;
- » Cabling between the turbines, to be laid underground where practical;
- » Onsite Substation, BESS and operational and maintenance (O&M Hub);
 - An on-site facility substation
 - A battery Energy Storage System (BESS)
 - Temporary concrete batching plant; and
 - Operation and maintenance buildings including a gate house, security building, control centre offices, warehouses, a workshop and visitors centre.

Below are the details or dimensions of the 120 MW Bergriver Wind Farm and associated infrastructure:

Infrastructure	Footprint and dimensions
Facility capacity	Contracted capacity of 120 MW
Number of turbines	Up to 16 turbines
Turbine tip height	Up to 230 m
Turbine foundations	Approximately 20 m x 20 m to a depth of 3 m per turbine
On-site Facility Substation	Capacity of 132 kV The on-site substation, BESS and O&M buildings, temporary facilities and laydown will be placed within area within the development footprint.

Access and internal roads	Existing roads on farm will be used where feasible and practical. The width of the access road will be approximately 8 m (this is also relevant for existing roads) however during construction access roads may be up to 10 m in width. The total length of access roads is approximately. The access roads will be gravel.
Underground cabling	Underground cabling between the turbine is preferred and will be installed at a depth of 1.5 m to 3 m. Cabling to follow internal access roads.

1.1.3 Motivation for combined amendment report – birds and bats

As both the Zen and Bergriver Wind farm projects are directly located adjacent to one another, proposed to be developed as a cluster, and are designed to share infrastructure to optimise construction expenses and timeline, the Specialist has considered the changes and the associated impacts together in one report. This is considered a preferred approach as it allowed for:

- Updating and standardisation of mitigation measures applied across both projects due to the shared landscape features between both projects (e.g. the Bergriver River) and therefore near-identical ecology. This ensures a comprehensive and integrated approach to managing the potential effects on birds and bats from both wind farms, providing a holistic understanding of the overall impact and facilitating coordinated mitigation efforts;
- More appropriate consideration of cumulative impacts, which can inform better decision-making and adaptive management;
- Removal of unnecessary duplication of information leading to potential confusion;
- A single consolidated set of recommendations and instructions for the Applicant aiming to develop the two authorised facilities as one entity.

1.2 TERMS OF REFERENCE

Enviro-insight was responsible for the review of all the applicable avifauna and bats information relating to the assessment of impacts for the Zen Wind Farm and Bergriver Wind Farm, and to provide a report which considers the impacts of the proposed change of the position of the facility layout (including turbine positions, roads, internal cabling and/or substation). The terms of reference include:

- A field survey to confirm the status of the environment compared to that at the time of the original assessment. This enables the specialist to make a statement as to whether the environment has changed since the original assessment, supported by a site verification survey – **Successfully completed (2.1.2 Turbine Habitats Survey)**
- An indication as to whether the impact rating as provided in the initial assessment remains valid; if the mitigation measures provided in the initial assessment are still applicable; or if there are any new mitigation measures which need to be included into the EA – **Successfully completed (2.2.3 Impacts and Recommended Mitigation)**

- An indication as to whether there are any new assessments/guidelines which are now relevant to the authorised development which were not undertaken as part of the initial assessment, must be taken into consideration and addressed in the report. – **Successfully completed (2.2.4 Construction and Post-construction Monitoring)**
- A description and an assessment of any changes to the environment (social and biophysical) that has occurred since the initial EA was issued. – **Successfully completed (2.1.2 Turbine Habitats Survey)**
- A description and an assessment of the surrounding environment, in relation to new developments or changes in land use which might impact on the authorised project, the assessment must consider the following:
 - similar developments within a 30 km radius; – **Successfully completed (2.2.5 Cumulative Impacts)**
 - Identified cumulative impacts, and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. – **Successfully completed (2.2.5 Cumulative Impacts)**
 - Measures to ensure avoidance, management and mitigation of impacts associated with such proposed changes, and any changes to the Environmental Management Programme (EMPr). – **Successfully completed (2.2.6 Environmental Management Programme Update)**

The assessment clarifies whether the proposed changes will:

- Increase the significance of impacts originally identified in the EIA report or lead to any additional impacts; or – **Successfully completed (2.2.3 Impacts and Recommended Mitigation)**
- Have a zero or negligible effect on the significance of impacts identified in the EIA report; or – **Successfully completed (2.2.3 Impacts and Recommended Mitigation)**
- Lead to a reduction in significance of any of impacts identified in the EIA report. – **Successfully completed (2.2.3 Impacts and Recommended Mitigation)**

The amendments to the Environmental Authorisation will include the following:

- Amend the project description, as required;
- Amend the facility layout;

In parallel, the specialist is required to:

- Confirm the acceptability of the amended facility layout (for submission to and approval by DFFE) – **Successfully completed (3 Conclusion and Recommendation)**
- Confirm the amendments to those measures to ensure avoidance, management and mitigation of impacts associated with such proposed changes (if required), and confirm any changes to the Environmental Management Programme

(EMPr). – **Successfully completed (2.2.3 Impacts and Recommended Mitigation, 2.2.6 Environmental Management Programme Update)**

1.3 DUE DILIGENCE

In addition, as part of a due diligence process by the specialists authoring this report, the following additional tasks were performed to confirm the findings of the original studies informing the EA's and to address any gaps identified:

- In accordance with the terrestrial animal species protocol published in Government Notice No. 1150 of 30 October 2020, the National Environmental Screening Tool was consulted (5 May 2023) to provide an updated list of avifauna species of conservation concern (SCC) and sensitive bat habitats potentially affected by the proposed development.
- A survey of the proposed turbine positions and surrounding areas was conducted (17-18 April 2023) to confirm habitat conditions described as well as previously mapped avifauna and bat sensitivities. No nocturnal bat surveys were performed;
- Updated best practice recommendations (Jenkins et al. 2015, Aaronson et al. 2020; MacEwan et al. 2020), if not included in the original avifauna & bat specialist reports and subsequently not included in the EMPr, were consulted to make relevant recommendations.

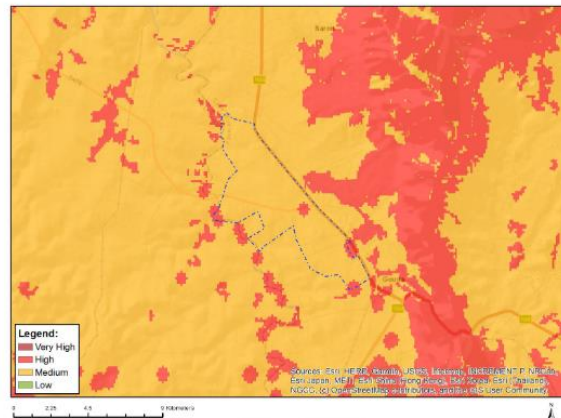
2 RESULTS

2.1 DUE DILIGENCE

2.1.1 Environmental Screening Tool

The screening tool report drawn on 5 May 2023 shows the main avifauna sensitivities (Figure 1) and bat sensitivities (Figure 2) in the study area. The report shows that four avifauna SCC are potentially expected in the study area (Figure 1) and that several highly sensitive habitat features for bats (in relation to wind energy developments) are present within the study area. High sensitivity indicates known occurrences while medium sensitivity indicates modelled likelihood, not actual known occupancy.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Pelecanus onocrotalus
High	Aves-Afrotis afra
Medium	Aves-Circus maurus
Medium	Aves-Hydroprogne caspia
Medium	Sensitive species 19
Medium	Invertebrate-Conocephalus peringueyi
Medium	Invertebrate-Brinckiella aptera
Medium	Invertebrate-Aneuryphymus montanus

Figure 1: Fauna species sensitivities from the screening tool report for the Zen & Bergriver Wind Farms.

update (refer to 2.2.2 Sensitivity mapping below). The final layout is presented later in the report for amendment of the environmental authorisation.

The general habitat and land use within the survey area surrounding the turbine layout has not changed markedly from the descriptions provided in the Zen Wind farm and Bergriver Wind farm EIA reports. Confirmation of the habitat for each turbine position or several adjacent turbines in homogenous agricultural fields, and also for the infrastructure and laydown areas is provided in the Appendix under 5.1 Habitat Descriptions. **All turbines are positioned with transformed agricultural fields which are considered to be of low sensitivity for avifauna and bats.**

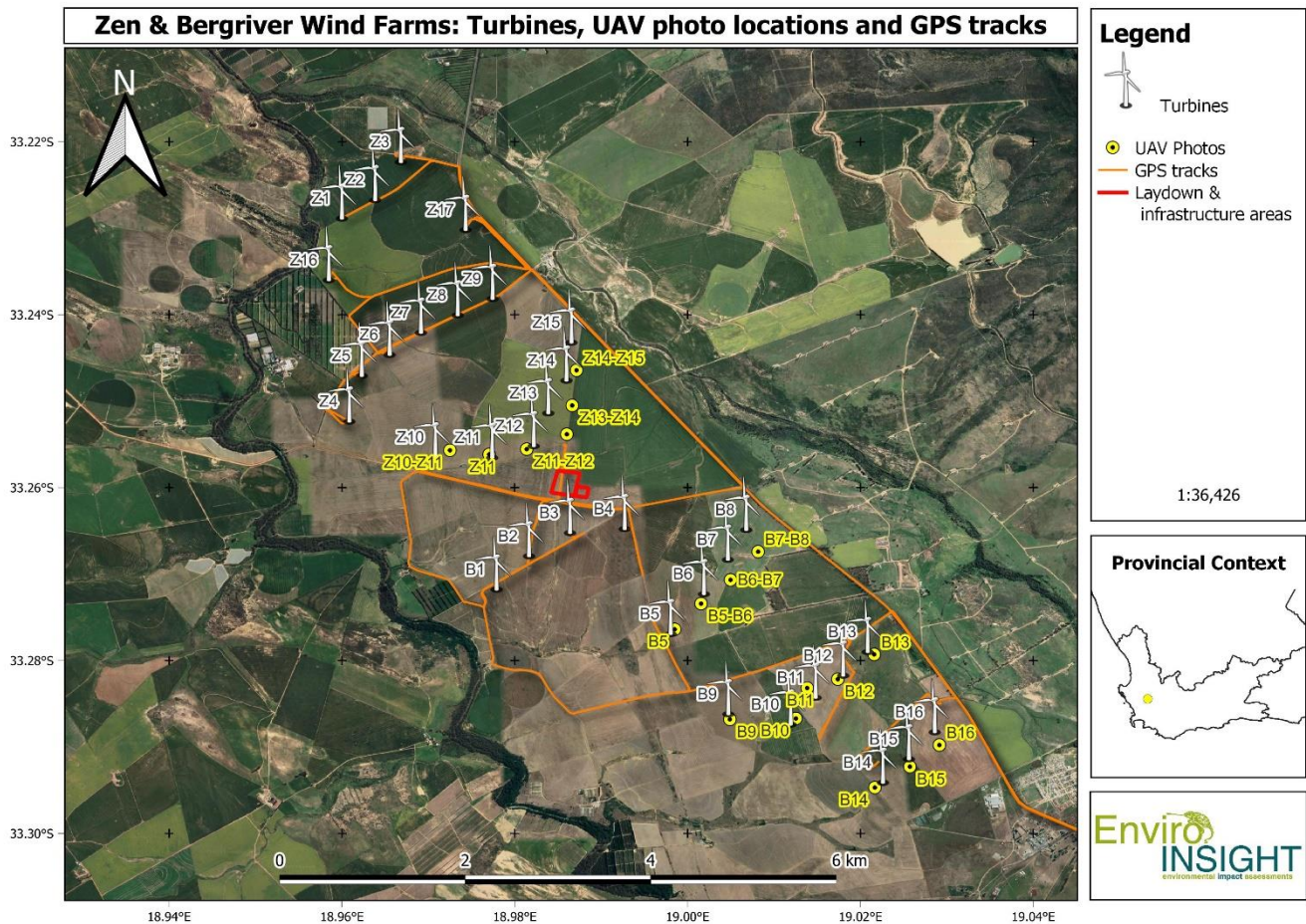


Figure 3: Specialist coverage and locations of turbine positions¹ and UAV photograph sites for the Zen & Bergriver Wind Farms.

¹ Note that as described in the preceding text above, these are not the final turbine positions for amendment of the environmental authorisation.

2.1.3 Priority Avifauna Species

Four priority avifauna species for wind farms were observed during the rapid survey performed during April 2023 to verify the habitat conditions, general ecology and potential impacts to birds and bats from the revised turbine positions. These species are: Secretarybird, Jackal Buzzard, Ludwigs's Bustard and Blue Crane (Figure 4). These species are considered as a priority in relation to wind energy developments as they are at risk from collision with the spinning turbine blades. Three of these species are also considered to be species of conservation concern as they are Threatened with extinction as evaluated by the IUCN, either globally (<http://www.iucnredlist.org/>) or locally (Taylor et al. 2015). As it is a requirement of the animal species protocol that observations of a species of conservation concern must be disseminated to a public database prior to the submission of the report to the client (clause 2.2.2), these observation records were submitted to iNaturalist². Secretarybird (Endangered) and Ludwig's Bustard (Endangered) were not observed during comprehensive surveys performed by Williams (2015) or Laurence (2022) but were predicted to occur sporadically within this region. Furthermore, Calidris (2019) also reported observations of these species.

² <https://www.inaturalist.org/observations/>: 156866681, 156866684, 156866682

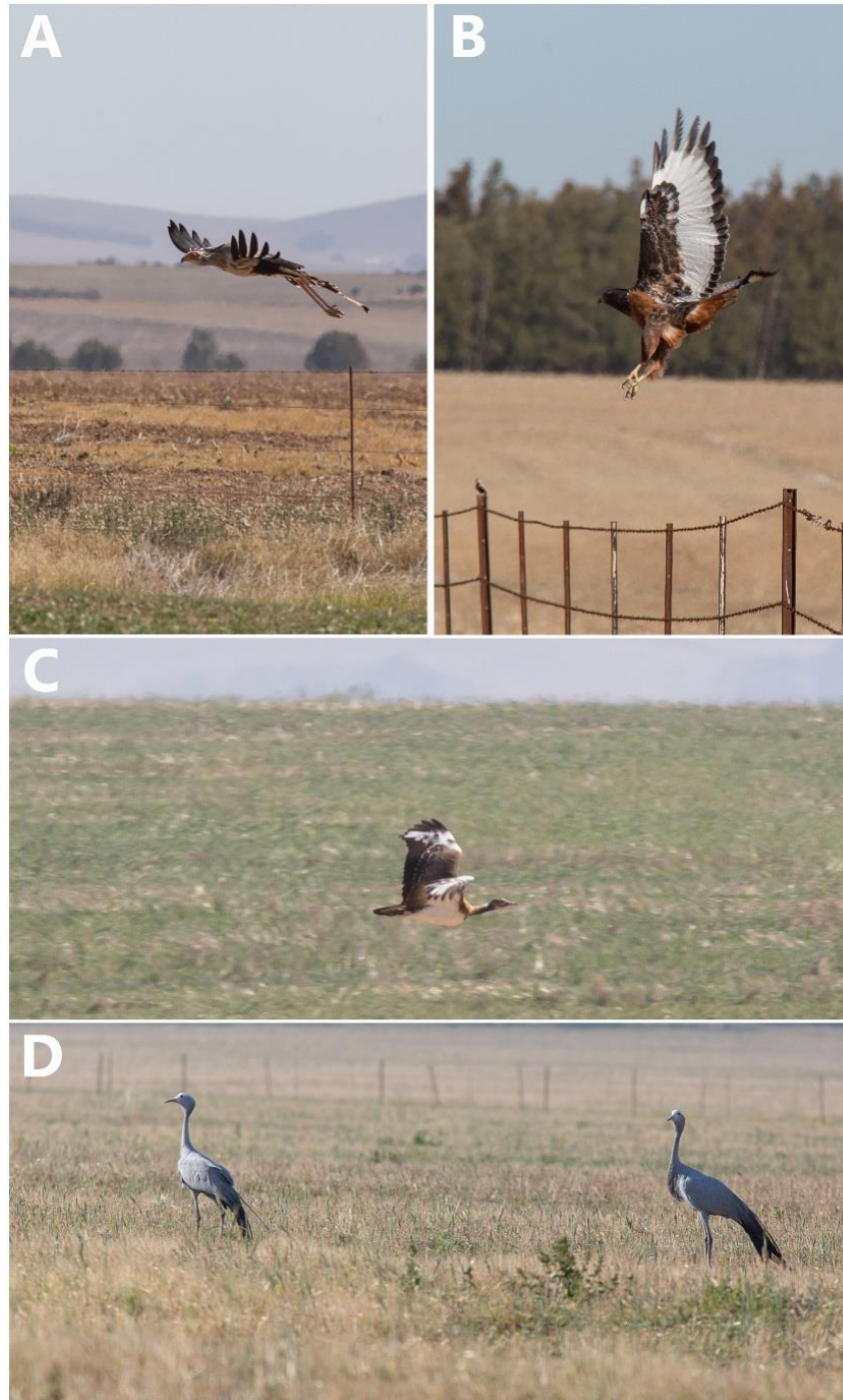


Figure 4: Priority (for WEFs) avifauna species observed during the April 2023 surveys of the revised turbine positions for the Zen & Bergriver Wind Farms³.

³ A] Secretarybird B] Jackal Buzzard C] Ludwigs's Bustard D] Blue Crane

2.2 STUDY REVIEW AND SENSITIVITY MAP TO INFORM SITE LAYOUT

2.2.1 Relevant studies

The following specialist studies associated with the Environmental Impact Assessments were reviewed to inform the re-assessment of the amended site layout:

Zen Wind Farm:

- Avifauna – Williams (2015) – Primarily 200 m buffers surrounding river vegetation, streams, water bodies and tree stands;
- Bats – Bio3 (2013) – Primarily 200 m buffers surrounding river vegetation and 500 m buffers surrounding bat roosts;

Bergriver Wind Farm:

- Avifauna – Laurence (2022) – Primarily 200 m buffers surrounding drainage lines, wetlands and natural vegetation used by raptors and other sensitive species and 500 m buffer around Blue Crane nesting sites;
- Bats – de Vries et al. (2022) – Primarily 500 m buffers surrounding movement corridors (river vegetation), 500 m buffers surrounding bat roosts and a 200 m buffer was implemented around drainage lines, dams and trees.

2.2.2 Sensitivity mapping

As indicated above, there is disparity between the EIA specialist studies concerning what was recommended with regards to the buffering of sensitive habitats. Specifically, the more recent studies (de Vries et al. 2022; Laurence 2022) recommended larger buffers for the Bergriver River for bats. The Zen Wind Farm study, which was conducted in 2013 with an update in 2015 only recommended a 200m buffer (Bio3 2013). This buffer is considered insufficient given the advanced understanding of the impacts to birds and bats from wind turbines, and therefore a consistent buffer across both wind farm sites is recommended. That is, each habitat is required to be buffered according to the largest recommended buffer by the specialist studies.

A consolidated sensitivity map for both wind farm sites, and also both birds and bats was developed with the consistent and largest buffering recommendations per habitat type, showing that the first layout provided by the Applicant contained three turbines that were not compliant with the updated recommendations (Figure 5):

- Zen Wind Farm Turbines Z1 & Z16 → In 500 m buffer of river;
- Bergriver Wind Farm Turbine B7 → In a 500 m buffer around a waterbody.

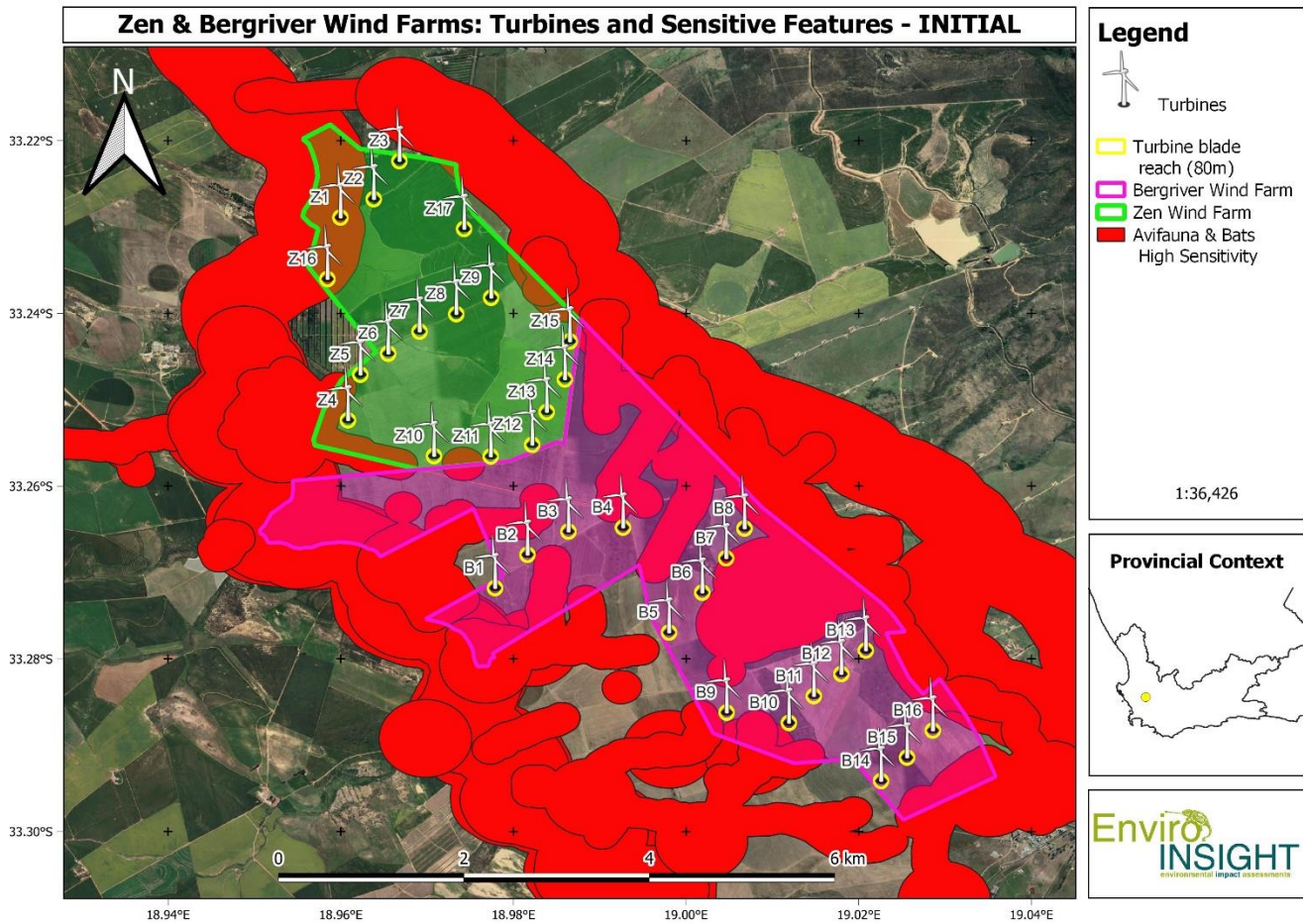


Figure 5: Consolidated bat and bird sensitivity mapping for the Zen & Bergriver Wind Farms, showing the initial revised turbine positions.

Based on the above-described non-compliance of the initial revised turbine layout with the updated buffer recommendations, the turbine layout was revised once more by the Applicant to locate both turbine bases as well as the turbine blade reaches outside of the updated consolidated bat and bird sensitivity areas (all buffers are no-go for turbines to blade tip) (Figure 6).

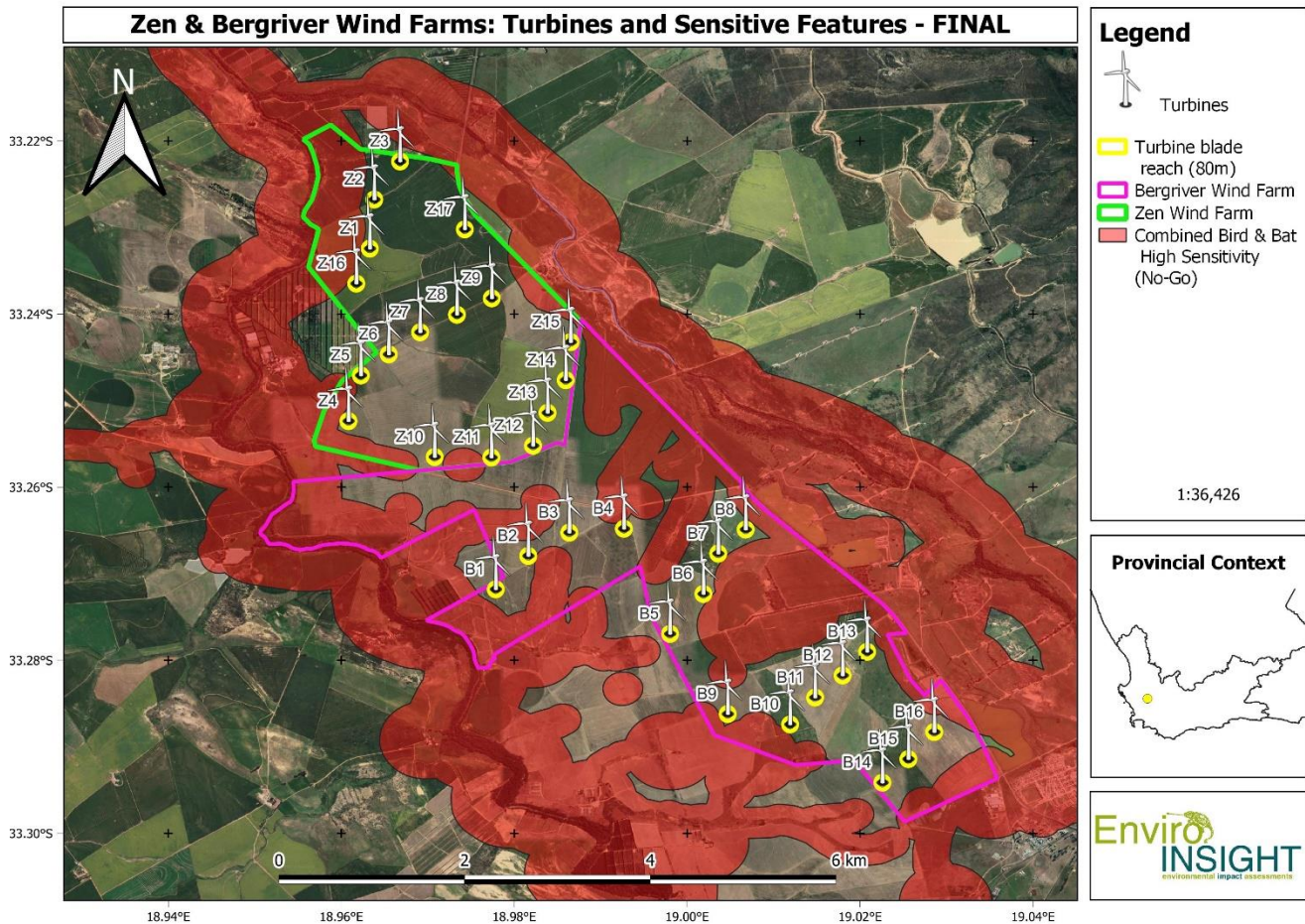


Figure 6: Consolidated bat and bird sensitivity mapping for the Zen & Bergriver Wind Farms, showing the final revised turbine positions.

The final site layout shapefiles of the proposed facility were obtained from the Applicant and added to the project GIS to inspect and describe intersections and overlaps between sensitive features for avifauna and bats. As shown in Figure 6 there are no overlaps between the turbine base positions, their blade reaches and consolidated bat and bird high sensitivity areas. Therefore, the proposed site layout with the finalised turbine base positions is considered to be compliant with the requirement for infrastructure siting related to avifauna and bats.

2.2.3 Impacts and Recommended Mitigation

The following potential impacts to avifauna and bats described were reviewed:

- Zen Wind Farm: Impacts to avifauna

- Zen Wind Farm: Impacts to bats
- Bergriver Wind Farm: Impacts to avifauna
- Bergriver Wind Farm: Impacts to bats

The potential impacts to avifauna and bats were reviewed and found to be relevant in terms of their description and evaluation of significance to the revised turbine layout. Therefore, no changes in significance of evaluated impacts and no additional impacts from the revised turbine layout are expected for either the Zen Wind farm, or the Bergriver Wind Farm. Changes from the initial turbine layout are expected to reduce the likelihood of collision mortalities for both birds and bats as all turbines associated with the Zen Wind farm and the Bergriver Wind Farm are now placed at least 500 m away from rivers and their riparian vegetation, leading to a reduction in both the likelihood and severity of this anticipated impact.

The following summarizes the mitigation recommendations from the aforementioned specialist studies for the final turbine layout.

2.2.3.1 Avifauna – Zen Wind farm and the Bergriver Wind Farm

- Avoidance of sensitive areas - this is by far the most important mitigation measure and this has been achieved by placing turbines and their spinning blades outside of the high sensitivity buffered habitats (Figure 6).
- Painting turbine towers dark and one blade a different colour from the other two – this must be applied prior to construction pending permission from the South African Civil Aviation Authority (SACAA);
- Nocturnal illumination of rotor blades using green or blue light (pending permission from SACAA) – this is to prevent collisions from nocturnally migrating species which were shown to utilize the airspace at rotor sweep heights;
- Closure of turbines during periods of agricultural activities likely to attract raptors and other species of conservation concern such as large flocks of cranes or storks;
- Deployment of radar devices that detect approaching birds and temporarily suspend turbine operation. While this recommendation is still valid, newer camera-based technology from Bioseco is cheaper, will achieve the same goal and is already commercially available (<https://bioseco.com>). The latter is preferentially recommended;
- If the above approaches fail to mitigate nocturnal mortalities, closure of turbines at night during the months of waterbird migration is recommended;
- Shutdown-on-Demand (SOD) – either human or automated - to be informed by post-construction fatality monitoring;
- Bird-flight diverters to be installed on any overhead power lines.

2.2.3.2 Bats - Zen Wind farm and the Bergriver Wind Farm

- Avoidance of sensitive areas (flyways and roosts) - this is by far the most important mitigation measure and this has been achieved by placing turbines and their spinning blades outside of the high sensitivity buffered habitats (Figure 6).
- Nocturnal illumination of turbines must not use white light and should be intermittent (not steady) (pending permission from SACAA) – this is to prevent attraction of insects which in turn will attract bats;

- Other nocturnal illumination must be kept to a minimum, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines.
- Cut in speeds needs to be increased and possible curtailment during times when bats migrate or during other times of intensive activity. Bat passes at height were very limited reducing the likelihood of collisions and barotrauma (de Vries et al. 2022). However, should post-construction fatality monitoring reveal high levels of fatality, automated real-time bat monitoring and analysis systems are recommended as these have been shown to be successful in the USA, reducing bat fatalities by over 80% (Hayes et al., 2019). This option has recently become available as the “Smart System” from Wildlife Acoustics (<https://www.wildlifeacoustics.com/products/smart-system>), and it is strongly recommended as the primary method for automated and near-real-time bat fatality mitigation.

2.2.4 Construction and Post-construction Monitoring

The pre-construction monitoring studies performed by Bio3 (2013) and Williams (2015) were not conducted in compliance with the current best-practice guidelines for bats (MacEwan et al. 2020) and avifauna (Jenkins et al. 2015) as they preceded the publication of these guidelines. Nevertheless, the surveys and results are considered sufficient to inform on the impacts to bats and avifauna, as long as the updated buffers to sensitive habitats are applied, as discussed in 2.2.2 Sensitivity mapping. There is no need to repeat any of these studies. However, appropriate sample locations for vantage point surveys (avifauna) and bat detectors (bats) should be defined prior to inception of the construction and post-construction monitoring surveys.

Although some operational and post-construction monitoring recommendation are made in the specialist reports and the EMPr, they are not comprehensive or specific enough to be fully compliant with the requirements of the current guidelines for bats (Aronson et al. 2020) and avifauna (Jenkins et al. 2015). It is therefore recommended that operational (avifauna) and post-construction monitoring (bats and avifauna) be conducted according to the current best-practice guidelines for bats (MacEwan et al. 2020) and avifauna (Jenkins et al. 2015) (with quarterly reporting) and implemented by an appropriate avifauna and bat specialist respectively. Monitoring is not mitigation, but rather a tool to assess impacts (both predicted and unforeseen) and rapidly apply corrective mitigation through adaptive management in order to limit any such impacts.

2.2.5 Cumulative Impacts

The revised turbine layout of 33 turbines including blade reaches (Figure 6), represents an area of ~2000 ha, hereafter referred to as the development footprint, which is 0.6 % of the 30 km radius area (Table 1). An additional 750 ha of non-approved wind energy development area will be added by the proposed facility, as the majority of the Zen Wind Farm and the Bergriver Wind Farm project areas are already approved for wind energy developments according to REEA 2022-Q4 (Figure 7). It's important to note that the development footprint area is not totally transformed during development. The total area of approved WEFs in this region (development unconfirmed, and only based on REEA 2022-Q4) represents 6.8% of the land area and with the

additional 750 ha of the Zen Wind Farm and the Bergriver Wind Farm project area boundary (Figure 7), will increase to 7.0 %. This is considered to be an acceptable level of cumulative impact, given that is a relatively small proportion of the region, utilising agriculturally transformed land only, with appropriate avoidance of sensitive habitats.

Table 1: Cumulative impact from renewable energy developments in the region (30 km buffer around the proposed Zen & Bergriver Wind Farms).

Elements	Area (ha)	Proportion (%)
Total area	348,921.9	100
All Renewables	27,460.4	7.9
Solar PV	3619.6	1.0
Wind	23,840.8	6.8
Zen & Bergriver Wind Farm footprint	2000	0.6

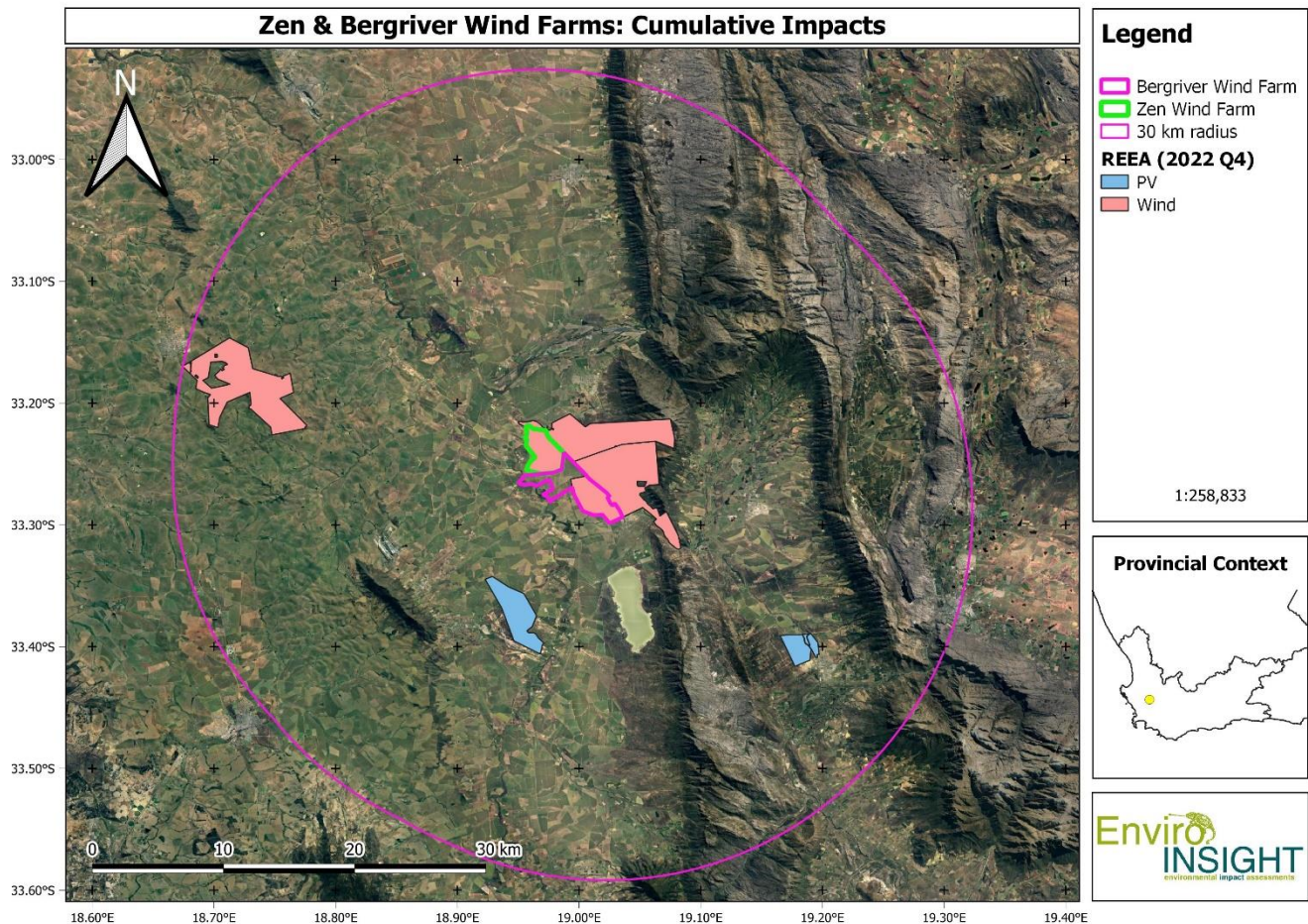


Figure 7: Location of known regional renewable energy projects in relation to the proposed Zen & Bergriver Wind Farms.

2.2.6 Environmental Management Programme Update

The EMPr for Bergriver Wind Farm, which is the more recently drafted, sufficiently captures the mitigation and post-construction monitoring requirements for both birds and bats. The EMPr for the Zen Wind Farm is required to be updated accordingly (as it is dated) to include the current post-construction monitoring requirements and specify the amended sensitive habitat buffers as per the consolidated sensitivity mapping (e.g. 500 m [not 200 m] buffer from the river; Figure 6) with updated sensitivity mapping provided. It is recommended that the avifauna and bat sections of the EMPr for Bergriver Wind Farm (Objectives 4 & 5 respectively of section 8) are applied to both the Zen Wind Farm and the Bergriver Wind Farm, which will result in appropriate management, should the below recommendations be included.

The following changes to the Zen Wind Farm EMPr are recommended to address avifauna and bat requirements:

- The EMPr must specifically include the necessity for post-construction avifauna and bat monitoring as stipulated in Jenkins et al. (2015) and Aronson et al. (2020) respectively. Currently, only Jenkins et al. (2015) is referred to.
- Update requirements for bat fatality monitoring and reporting to be in line with that required by Aronson et al (2020) or refer directly to this reference to be implemented. Currently the EMPr does not appropriately stipulate the requirements for operational bat fatality monitoring and must include at minimum the following statement: “post-construction bat monitoring must take place and must be fully compliant with Aronson et al. (2020)”.
- Finally, include the mitigation options of using technology-assisted management of SOD (“Smart System” from Wildlife Acoustics), to limit bat collision fatalities as described above (currently only available for birds).

The following changes to the Bergriver Wind Farm EMPr are recommended to address avifauna and bat requirements:

- Update reference for MacEwan et al. (2018) to the latest edition: MacEwan, K., Aronson, J., Richardson, K., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W. and Richards, L. 2020. South African Bat Fatality Threshold Guidelines- 3rd ed. South African Bat Assessment Association.
- Update “Objective 5: Protection of bat species” under “Mitigation: Action/control” to include the following statement: “Develop and implement a post-construction bat monitoring programme which includes carcass searches for bats during the first two years of operation, to be fully compliant with Aronson et al. (2020). Should post- construction fatality monitoring reveal high levels of fatality, automated real-time bat monitoring and analysis systems are recommended as the primary method for automated and near-real-time bat fatality mitigation”.

3 CONCLUSION AND RECOMMENDATION

The finalised infrastructure layout provided by the Applicant for both the Zen Wind Farm and the Bergriver Wind Farm is considered suitable for development from both an avifauna and bat perspective. The proposed amendment to the facility layout for both wind farms will result in no change to the significance rating of the impacts of disturbance, turbine collisions, bird mortality

through collision/electrocution with power lines, disruption of movement patterns, and cumulative impacts, as they have been rated previously in the Zen Wind farm EIA and Bergriver Wind Farm EIA respectively.

It is the opinion of the specialist that the facility layout amendments can be authorised for both Zen Wind Farm and the Bergriver Wind Farm, subject to:

- All mitigation measures captured above remain valid and must be adhered to;
- The final EMPr must appropriately capture the recommended changes suggested above.

In addition, the Specialist confirms:

- the acceptability of the amended facility layout (for submission to and approval by DFFE)
- the amendments to those measures to ensure avoidance, management and mitigation of impacts associated with such proposed changes, and additions/changes to the Environmental Management Programme (EMPr) are provided.


4 REFERENCES

- Aronson, J., Richardson, E., MacEwan, K., Jacobs, D., Marais, W., Taylor, P., Sowler, S., Hein, C. and Richards, L. 2020. South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities – 2nd ed. South African Bat Assessment Association
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- Laurence, S.D. 2022. Final Report: Pre-construction Avifauna Monitoring Assessment for the Proposed Bergriver Wind Energy Facility, located south of Saron in the Western Cape. Enviro-Insight.
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5 APPENDIX





5.1 HABITAT DESCRIPTIONS





The following habitat descriptions and photographs were recorded during the surveys conducted 17-18 April 2023 and therefore represents the most "current" state of conditions. The location of each sample site is mapped in Figure 3.


B1	
-33.2718747° S 18.9778893° E	Transformed - agricultural fields.
North	East
	
South	West
	





B2	
<p>-33.2681128° S 18.9817496° E</p>	<p>Transformed - agricultural fields.</p>
North	East
	
South	West
	





B3	
<p>-33.2652135° S 18.9863974° E</p>	<p>Transformed - agricultural fields.</p>
North	East
	
South	West
	





B4	
<p>-33.2648076° S 18.9926863° E</p>	<p>Transformed - agricultural fields.</p>
North	East
	
South	West
	





B5	
<p>-33.2764° S 18.9985° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B5-B6	
<p>-33.2734° S 19.0016° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B6-B7	
<p>-33.2707° S 19.005° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B7-B8	
<p>-33.2674° S 19.0082° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B9	
<p>-33.2868° S 19.0049° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B10	
<p>-33.2867° S 19.0125° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B11	
<p>-33.2832° S 19.0138° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B12	
<p>-33.2822° S 19.0174° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	

B13	
<p>-33.2793° S 19.0216° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B14	
<p>-33.2947° S 19.0217° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B15	
<p>-33.2923° S 19.0257° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





B16	
<p>-33.2898° S 19.0292° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





LAYDOWN AND INFRASTRUCTURE AREA	
-33.2601482° S 18.9857046° E	Transformed - agricultural fields.
North	East
	
South	West
	

Z1	
-33.2289864° S 18.9599269° E	Transformed - agricultural fields.
North	East
	
South	West
	

Z2	
-33.226805° S 18.9639329° E	Transformed - agricultural fields.
North	East
	
South	West
	





Z3	
-33.222415° S 18.9668439° E	Transformed - agricultural fields.
North	East
	
South	West
	





Z4	
-33.252384° S 18.9608793° E	Transformed - agricultural fields.
North	East
	
South	West
	





Z5	
-33.2470319° S 18.9624025° E	Transformed - agricultural fields.
North	East
	
South	West
	





Z6	
-33.2447475° S 18.9656037° E	Transformed - agricultural fields.
North	East
	
South	West
	





Z7	
<p>-33.2421307° S 18.9689648° E</p>	<p>Transformed - agricultural fields. With a row of exotic trees along the road.</p>
North	East
	
South	West
	





Z8	
<p>-33.2400484° S 18.9734593° E</p>	<p>Transformed - agricultural fields. With a row of exotic trees along the road.</p>
North	East
	
South	West
	





Z9	
<p>-33.2381705° S 18.9773828° E</p>	<p>Transformed - agricultural fields. With a row of exotic trees along the road.</p>
North	East
	
South	West
	





Z10-Z11	
<p>-33.2557° S 18.9725° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	



Z11	
<p>-33.2562° S 18.977° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	





Z11-Z12	
<p>-33.2556° S 18.9814° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	

Z12-Z13	
<p>-33.2538° S 18.986° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	

Z13-Z14	
<p>-33.2505° S 18.9867° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	

Z14-Z15	
<p>-33.2464° S 18.9872° E</p>	<p>Transformed - agricultural fields. Large expanse of agriculture, not necessary to verify each site individually. UAV images sufficient to confirm habitat status.</p>
North	East
	
South	West
	

Z16	
<p>-33.2360696° S 18.958458° E</p>	<p>Transformed - agricultural fields. However, note depression wetland nearby to the North</p>
North	East
	
South	West
	

Z17	
-33.2301936° S 18.9740784° E	Transformed - agricultural fields.
North	East
	
South	West
	

5.2 SACNASP REGISTRATION & CV OF SPECIALIST



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Luke Verburgt

Education

Completed	Degree and Institution
1994	Matric, Pietersburg Hoërskool, Polokwane, South Africa
1999	BSc in Zoology, University of Pretoria, Pretoria, South Africa
2002	BSc (Honours) in Zoology, University of Pretoria, Pretoria, South Africa
2006	MSc in Zoology (Evolutionary Biology, Behaviour, Bioacoustics), University of Pretoria, Pretoria, South Africa.

Bio-Sketch

Luke Verburgt is a consulting herpetologist living in South Africa with over 19 years of herpetofauna survey experience across 23 African countries (Angola, Botswana, Cameroon, DRC, Ghana, Ivory Coast, Kenya, Lesotho, Liberia, Namibia, Madagascar, Malawi, Mali, Morocco, Mozambique, Republic of Guinea, São Tomé and Príncipe, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda and Zimbabwe). He is co-owner of Enviro-Insight, holds an MSc in Zoology from the University of Pretoria and is a registered scientific professional with the South African Council for Natural Scientific Professions (SACNASP). He has published more than 30 scientific articles, which include several descriptions of new African herpetofauna species and is co-author of the book titled "Snakes and other reptiles of Zambia and Malawi" (Struik Random House Publishers). He is also an extraordinary lecturer in the Department of Zoology & Entomology at the University of Pretoria.

Recent Relevant Project Experience

[Year - Nature of project – Specialist Capacity - Industry / - Client / Developer – Country]

- 2022 - Biodiversity studies for proposed PV Solar Facility - Namane - Project Management, Ecologist - Energy generation / Solar - Digby Wells and Associates (South Africa) (Pty) Ltd. - South Africa
- 2022 - Desktop herpetofauna study for proposed Wind Energy Facility – Loxton WEF - Herpetologist - Energy generation / Wind - Atlantic Renewable Energy Partners (Pty) Ltd - South Africa
- 2022 - Biodiversity studies for proposed PV Solar Facility - Apollo - Project Management, Ecologist - Energy generation / Solar - Terramanzi Group (Pty) Ltd / Alt-E Developments - South Africa
- 2022 - Wolseley Part 2 Application Amendment: Specialist reporting on fauna - Specialist Ecologist - Energy generation / Solar - Terramanzi Group (Pty) Ltd - South Africa
- 2022 - Dominion PV Solar Cluster – scoping & EIA - Project Management, Ecologist - Energy generation / Solar - Terramanzi Group (Pty) Ltd / Red Rocket - South Africa
- 2022 - Biodiversity studies for proposed Wind Energy Facility - Hoeksplaas - Project Management, Ecologist - Energy generation / Wind - GAIA - South Africa
- 2022 - Bonnievale Part 2 Application Amendment: Specialist reporting on fauna - Specialist Ecologist - Energy generation / Solar - Terramanzi Group (Pty) Ltd / Terramanzi Group (Pty) Ltd - South Africa
- 2022 - Honingklip Part 2 Application Amendment: Specialist reporting on fauna - Specialist Ecologist - Energy generation / Solar - Terramanzi Group (Pty) Ltd - South Africa
- 2022 - Tsoelwana Avifauna Pre-Assessment for a proposed Wind Energy Facility - Project Management, Ecologist - Energy generation / Wind - African Clean Energy Developments - South Africa
- 2022 - RUIZIZI III Hydropower Plant, biodiversity risk assessment - GIS, Senior Herpetologist - Energy generation / Hydroelectricity - SLR Consulting (Africa) (Pty) Ltd - Democratic Republic of Congo (DRC)
- 2021 - Fraserburg Avifauna Pre-Assessment for a proposed Wind Energy Facility - Project Management, Ecologist - Energy generation / Wind - African Clean Energy Developments - South Africa
- 2021 - Biodiversity studies for proposed Wind Energy Facility - Pofadder - Project Management, Ecologist - Energy generation / Wind - Energy Team - South Africa
- 2021 - Copperton WEF Post-construction monitoring for bats and bird fatalities - Project Management, Ecologist - Energy generation / Wind - Terramanzi Group (Pty) Ltd - South Africa
- 2021 - Biodiversity studies for proposed Wind Energy Facility - Aggeneys - Project Management, Ecologist - Energy generation / Wind - Energy Team - South Africa
- 2021 - Biodiversity studies for proposed Wind Energy Facility - Gouda - Project Management, Ecologist - Energy generation / Wind - Calidris - South Africa
- 2021 - Biodiversity studies for proposed Wind Energy Facility - Loeriesfontein - Project Management, Ecologist - Energy generation / Wind - Calidris - South Africa
- 2021 - Development of the Mitigation Hierarchy Guidelines for South Africa - Project Management and Author - Law / Public communication - Endangered Wildlife Trust and BirdLife South Africa - South Africa
- 2020 - Development of the Species Environmental Assessment Guidelines for South Africa - Project Management, Lead Author and Herpetologist - Law / Public communication - South African National Biodiversity Institute and BirdLife South Africa - South Africa