

# Great Karoo Wind Energy Facility and associated infrastructure, Northern Cape Province

Motivation for amendment of Environmental Authorisation

DEA Ref.: 12/12/20/2370/3

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## PROJECT DETAILS

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<b>Client</b>	:	Great Karoo Wind Farm (Pty) Ltd
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## TABLE OF CONTENTS

	<b>PAGE</b>
<b>PROJECT DETAILS</b> .....	<b>i</b>
<b>TABLE OF CONTENTS</b> .....	<b>ii</b>
<b>APPENDICES</b> .....	<b>iii</b>
<b>PURPOSE OF THE REPORT</b> .....	<b>iv</b>
<b>1. OVERVIEW OF THE PROJECT</b> .....	<b>1</b>
1.1. Location .....	1
1.2. Potential Environmental Impacts as determined through the EIA Process.....	1
1.3. Amendments of the Environmental Authorisation .....	4
<b>2. DETAILS OF THE AMENDMENTS APPLIED FOR</b> .....	<b>6</b>
2.1. Decrease in number of Wind Turbines .....	6
2.2. Amendment to Wind Turbine specifications .....	6
2.3. Extension of validity period of the EA.....	6
2.4. Amendment to Condition 13.2 of the EA: .....	7
2.5. Amendment to Condition 49 of the EA: .....	7
<b>3. MOTIVATION FOR THE PROPOSED AMENDMENTS</b> .....	<b>10</b>
3.1. Decrease in number of Wind Turbines and Amendment to Wind Turbine Specifications .....	10
3.2. Validity extension of the EA.....	10
3.3. Amendment to Condition 13.2 and 49 of the Environmental Authorisation .....	10
<b>4. Considerations in terms of the requirements of the EIA Regulations</b> .....	<b>12</b>
<b>5. POTENTIAL FOR CHANGE IN THE SIGNIFICANCE OF IMPACTS AS ASSESSED IN THE EIA AS A RESULT OF THE PROPOSED AMENDMENTS</b> .....	<b>13</b>
<b>5.1. Impacts on avifauna</b> .....	<b>13</b>
5.1.1. Comparative Assessment.....	14
5.1.2. Conclusion.....	17
<b>5.2. Impacts on bats</b> .....	<b>20</b>
5.2.1. Comparative Assessment.....	21
5.2.2. Conclusion.....	23
<b>5.3. Ecological Impact</b> .....	<b>24</b>
5.3.1. Comparative assessment .....	25
5.3.2. Advantages and disadvantages .....	28
5.3.3. Conclusion.....	28
<b>5.4. Impacts on heritage</b> .....	<b>29</b>
5.4.1. Comparative Assessment.....	31
5.4.2. Conclusion.....	34
<b>5.5. Visual Impact</b> .....	<b>35</b>
5.5.1. Comparative Assessment.....	38
5.5.2. Conclusion.....	38
<b>5.6. Noise impact</b> .....	<b>39</b>
5.6.1. Comparative Assessment.....	39
5.6.2. Conclusion.....	39
<b>6. ADVANTAGES AND DISADVANTAGES OF THE PROPOSED AMENDMENTS</b> .....	<b>40</b>
<b>7. REQUIREMENTS FOR ADDITIONAL MITIGATION AS A RESULT OF THE PROPOSED AMENDMENTS</b> .....	<b>42</b>
<b>8. PUBLIC PARTICIPATION</b> .....	<b>44</b>
<b>9. CONCLUSION</b> .....	<b>45</b>

## APPENDICES

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- Appendix A:** Avifauna Specialist Addendum Report
- Appendix B:** Bat Specialist Addendum Report
- Appendix C:** Ecology Specialist Comment Letter
- Appendix D:** Heritage Specialist Comment Letter
- Appendix E:** Visual Specialist Addendum Report
- Appendix F:** Noise specialist Comment Letter
- Appendix G:** Public Participation Documentation
  - Appendix G1: I&AP Database
  - Appendix G2: Consultation with I&APs
  - Appendix G3: Consultation with Organs of State
  - Appendix G4: Advertisements and Site Notices
  - Appendix G5: Comments and Responses Report
  - Appendix G6: Comments Received
- Appendix H:** A3 Maps
- Appendix I:** EMPr
  - Appendix I(A): Erosion Management Plan
  - Appendix I(B): Alien Invasive Management Plan
  - Appendix I(C): Plant Rescue and Protection Plan
  - Appendix I(D): Draft Bird Monitoring Programme for the Operational Phase
  - Appendix I(E): Draft Bat Monitoring Programme for the Operational Phase
- Appendix J:** CVs and Declarations

## PURPOSE OF THE REPORT

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An Environmental Authorisation (EA) for the Great Karoo Wind Energy Facility and associated infrastructure, in the Northern Cape Province (DEA ref: 12/12/20/2370/3) was obtained by Great Karoo Wind Farm (Pty) Ltd on 12 August 2014. The project is intended to be bid into future rounds of the Department of Energy's (DoE) Renewable Energy Independent Power Producers Procurement (REIPPP) Programme. There have been advancements to wind turbine technology since the issuing of the EA, and the turbines authorised in the EA are therefore no longer considered to be the most suitable in terms of production and economic considerations.

In this regard, Great Karoo Wind Farm (Pty) Ltd is considering an updated turbine model for the project and is proposing the following:

1. A reduction in the number of wind turbines from the authorised 52, to **up to 42**;
2. An increase to the rotor diameter for each wind turbine from the authorised diameter of up to 140m, to **up to 180m**;
3. An increase in hub height from up to 120m, to a range of **up to 150m**;
4. Turbine capacity from 3,6 MW, to **up to 6,5 MW** per turbine;
5. Update the layout as required based on the revised turbine numbers and turbine specifications;
6. Extend the validity period by an additional 5 years.
7. Amendment of Condition 13.2 of the EA:

**from:**

*"A 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities"*

**To:**

*"Turbine and infrastructure positions as approved by an avifaunal specialist"*

8. Amendment of Condition 49 of the EA

**from:**

Condition 49, from:

*"A 150m between watercourses and 100m buffer between the ridge edge and the turbine/construction activities must be implemented."*

**To:**

*"The layout must be approved by the avifaunal specialist."*

The increase in the rotor diameter, hub height, wind turbine generation capacity and reduction in the number of turbines will result in the optimisation of the facility layout which was submitted to the Department of Environmental Affairs (DEA) in the EIA process, and subsequent amendments thereto. These amendments to the project are proposed in order to increase the efficiency of the facility and consequently the economic competitiveness thereof, as well as to avoid environmental sensitivities on the site.

The proposed amendments in themselves are not listed activities, and do not trigger any new listed activity as the proposed amendments are within the original authorised development footprint, and do not change the scope of the EA.

In terms of Condition 5 of the Environmental Authorisation and Chapter 5 of the EIA Regulations of December 2014 (as amended on 07 April 2017 and 13 July 2018), it is possible for an applicant to apply, in writing, to the competent authority for a change or deviation from the project description to be approved.

Savannah Environmental has prepared this Final Motivation Report in support of this amendment application on behalf of Great Karoo Wind Farm (Pty) Ltd. This report aims to provide detail pertaining to the significance and impacts of the proposed change to the project description and layout in order for interested and affected parties to be informed of the proposed amendments and provide comment, and for the competent authority to be able to reach a decision in this regard. This report is supported by specialist studies in order to inform the final conclusion regarding the proposed amendments (refer to **Appendix A to F** of this report). This main report must be read together with these specialist studies in order to obtain a complete understanding of the proposed amendments and the implications thereof.

The Draft amendment motivation report was made available to registered interested and affected parties for a 30-day period from **26 April 2019 to 29 May 2019**. A subset of registered I&APs who were inadvertently excluded from the aforementioned notification were subsequently notified on Friday 31 May 2019 and provided with a full 30-day review and comment period from **Friday 31 May 2019 to Tuesday 2 July 2019**. The availability of the report was advertised in the Noordwester newspaper on 26 April (refer to **Appendix G4**).

The draft amendment motivation report was made available for download at [www.savannah.com](http://www.savannah.com) during the above-mentioned commenting periods. CD copies were also available on request. To obtain CD copies, further information, register on the project database, or submit written comment, Interested and Affected Parties were invited to contact:

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All comments received during the review periods were included within a Comments and Responses report (refer to **Appendix G5**) as submitted to the DEA with this Final Motivation Report and updated application for decision making purposes.

# 1. OVERVIEW OF THE PROJECT

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## 1.1. Location

The authorised Great Karoo Wind Farm is located approximately 40km south of Sutherland and falls within the Karoo Hoogland Local Municipality, which falls within the jurisdiction of the Namakwa District Municipality in the Northern Cape Province. The project site is located within the Komsberg Renewable Energy Development Zone (REDZ 2) as determined by the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa (2015 – CSIR/DEA), and formally gazetted on 16 February 2018 (GN 114). The Great Karoo Wind Farm is to be constructed within the project site which comprises the following farm portions:

- » The Farm Kentucky 206; and
- » Portion 1 of Farm Wolvenkop 207.

## 1.2. Potential Environmental Impacts as determined through the EIA Process

From the specialist investigations undertaken within the EIA process for the wind energy facility, the following environmental impacts were identified:

- » Potential impacts on birds;
- » Potential impacts on bats;
- » Potential ecological impact;
- » Potential impacts on heritage;
- » Areas of visual impact; and
- » Potential noise impact.

### Key conclusions and recommendations of the EIA pertinent to this application:

From the specialist investigations undertaken as part of the EIA for the wind energy facility, it was concluded that the majority of impacts are of low to medium significance with the implementation of appropriate mitigation measures. No environmental fatal flaws were identified on the site. However, areas of very high sensitivity were identified and avoided through micro siting of the wind turbines. Areas of sensitivity identified during the EIA process<sup>1</sup> include:

#### » **Avifauna:**

The avifaunal impact assessment recorded 148 bird species. This included 16 priority species and 9 Regional Red Data species. These are mostly nationally and/or globally threatened species which are known to occur, or could occur in relatively high numbers in the development area and which are likely to be, or could be, negatively affected by the WEF project.

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<sup>1</sup> The original EIA (which received environmental authorisation on 12 August 2014) and associated specialist studies considered three wind energy facilities collectively referred to as the Hidden Valley Wind Energy Facility. The Hidden Valley Wind Energy Facility consisted of three phases: The Great Karoo WEF, the Soetwater WEF and the Karusa WEF. The key findings and sensitivities described in this section relate to the broader Hidden Valley study areas, which includes the Great Karoo WEF.



The key findings of the original avifaunal impact assessment can be summarised as follows:

- \* Identified avifaunal micro-habitats are cultivated lands, shrublands, dams, rivers, streams, drainage lines, hills, ridges and thickets.
- \* SABAP1 Data considered recorded Martial Eagle, Ludwig's Bustard, Black Stork, Greater Flamingo and Black Harrier. The former two species were relatively regularly recorded and abundant in this data set.
- \* 39 species were recorded during the site visit including the following priority species and/or raptors: Black Stork, Black-shouldered Kite, Jackal Buzzard, Pale Chanting Goshawk, Rock Kestrel, and Southern Black Korhaan.
- \* A list of 'target species' was identified as being "the most important species to be considered (for assessment)" and these were: Ludwig's Bustard, Black Stork, Southern Black Korhaan, Martial Eagle, Jackal Buzzard, Greater Flamingo, Lesser Kestrel, and assorted waterfowl and waders.
- \* In general, the site was found to be moderately sensitive in terms of avifauna.
- \* The most important potential impacts of the proposed development will be collision of certain bird species with the turbine blades, and collision of birds with the associated power lines.
- \* It was concluded by EWT (2014) that "...the proposed site was found to be moderately sensitive in terms of avifauna, with areas of high, medium and unknown sensitivity being present on site...There are no foreseeable fatal flaws associated with the site, however the project should proceed in line with the recommendations and mitigations provided" .

Pre-construction bird monitoring report was conducted by Endangered Wildlife Trust in 2014 and was conducted in line with the applicable monitoring guidelines at the time. It is however important to note that this study was conducted over a larger area and included all three phases of the Hidden Valley WEF (Karusu, Soetwater and Great Karoo). The data was not broken down in to the different phases, and therefore it can't be determined which data (if any) is only applicable and/or not applicable to the Great Karoo WEF. However, the avifaunal specialist has considered all previous monitoring results from the broader Hidden Valley Assessment in the current assessment, which is considered to be a robust approach.

» **Bats:**

- \* During the EIA survey Pre-construction bat monitoring confirmed three bat species occurring on the project site (one specie considered as "near threatened" (the Natal longfingered bat) and two considered as species of "least concern" (the Cape Serotine bat and the Egyptian Free-tailed bat).
- \* Overall the proposed turbine positions for the Great Karoo wind farm had relatively low bat activity. The impact on bats is expected to be low.

» **Ecology:**

The Great Karoo site is located in the rugged terrain just to the south of the Great Escarpment. The Klein Roggeveldberge run approximately north-south direction through the site. The low mountains are dissected by small river valleys in which perennial or non-perennial streams are found. The site is in the catchment of the Meintjiesplaasrivier River, which flows into the Buffelsrivier before passing through Laingsburg.

The following areas occur on the site:

- \* Vegetation of conservation importance: this is based primarily on the location of the site within the

Hantam-Roggeveld Centre of Endemism and the Fynbos Biome and which falls within the Namakwa District Biodiversity Sector Plan (NDBSP), Critical Biodiversity Area (CBA) T2 (for this site - important terrestrial habitats that are south-facing slopes larger than 25 ha in size, kloofs and habitat for riverine rabbit, therefore with high biodiversity) (medium sensitivity).

- \* Potential areas for the occurrence of populations of Red List fauna and flora that have been evaluated as having a probability of occurring in natural habitats within the study area.
- \* Perennial and non-perennial rivers, streams and watercourses (high sensitivity).
- \* Areas classified as mountains, ridges or steep slopes: some of the steeper scarp slopes of the study area are steep enough to be sensitive to erosion and downslope impacts from disturbance and have been identified as important biodiversity habitats (essential T2 areas from the NDBSP) (high sensitivity).
- \* The remaining natural vegetation on site is classified as Least Threatened. However, the site falls within the Cape Floristic Region and the Hantam-Roggeveld Centre of Endemism. It is not expected that turbines structures will have a major effect on natural vegetation, due to the small footprint of each structure, but it is still likely that associated infrastructure such as the access roads will cause negative impacts (disturbance and loss) on natural vegetation.

» **Heritage:**

**Graves and built environment heritage**

A relatively large, approximately 20mx 20m in extent, dry packed stone walling kraal in situated about 200m away from the main farmhouse within the vicinity of the current farmstead complex. The kraal has been built on the slight gradient slope of a low hill above one of the farm gravel roads that lead around the farmstead complex. Several of the kraal walls have collapsed and the kraal is no longer in use. Two graveyards are situated within the vicinity of the current farmstead complex. The family graveyard is situated 300m west of the main house and comprises mainly formal graves with headstones and two stone packed graves with make-shift flat stone slab headstones. The dates of the headstones range from the early 1900's to the mid 1900's. The graves are cordoned off by a boundary fence and gate. An informal labourers' graveyard is situated near the current farmstead complex, the remnants of a stone-walled kraal to the north of the current farmstead complex and the ruins of a stone walled, large farmstead complex were documented within one of the valleys. The graves comprise mainly of stone packed graves with make-shift headstones including flat stone slabs, as well as stone and wooden crosses.

**Archaeology** –The wider Karoo landscape has been occupied by humans since the Early Stone Age (ESA), and archaeological evidence is usually observed as surface scatters and is widely dispersed across the landscape. However no pre-colonial archaeological heritage remains, features or sites were documented within the area proposed for development.

**Palaeontology** – The proposed Great Karoo WEF is entirely underlain by sediments and rocks of the Karoo Supergroup, which are assigned to the Beaufort Group. The site is associated with continuous Permian-age sedimentary strata that cover large geographical areas, as well as more recent Quaternary-age alluvial and superficial valley fill deposits that occur as localized events. The area within which the wind energy facility is primarily underlain by in situ strata of the fossil-bearing Abrahamskraal Formation. Quaternary alluvial deposits, especially near water courses and drainage lines have the potential to yield microfossil mammal remains. The proposed development is located within igneous bedrock (dolerite), and therefore represents no paleontological impact.

» **Visual:**

- \* The large size of the Great Karoo WEF and high number of wind turbines proposed to form part of this wind farm would create a distinct feature in the open and sparsely vegetated Karoo landscape, and would be visible for a considerable distance.
- \* There exists a core area of potentially moderate visual impact on the site itself and within a 5km radius of the proposed wind energy facility. There are several visually screened patches towards the eastern periphery of this zone. Potential areas of high visual impact within this 5km radius include a stretch of the secondary road between the Komsberg substation and the Roggeveld substation and the secondary road following the Droerivier/Komsberg Powerline. Several settlements and homesteads also fall within this 5km radius. These receptors are those deemed to be sensitive, and which are likely to be exposed to high frequencies of visual exposure. The extent of potential visual impact is Low between the 5km and 10km radius, while the hilly topography results in large visually screened patches. Areas of potentially moderate visual impact are restricted to roads and only a few settlements. Beyond the 10km radius (but within the 20km radius), the extent of potential visual impact decreases quite markedly, with visually exposed areas located mainly in the south and east. The magnitude of visual impact in the visually exposed areas is reduced to very low. Sensitive visual receptors likely to be exposed to high frequencies of visual exposure include a small section of the R354 and secondary road near Kruispad, and limited discontinuous stretches of secondary roads to the east. These receptors are likely to experience low visual impact. A number of settlements and homesteads are likely to experience a similar impact. These are located primarily in the east of the zone.

» **Noise:**

The operation of the Great Karoo Wind Farm would increase the existing ambient sound levels to a point where the increase would be detectable by one of the Noise Sensitive Developments (NSD07). The projected noise level at NSD07 was 44 dBA, with the closest wind turbine generator (WTG) around 800 m, with the noise level the cumulative effect of nine WTG located within 1,500m from this NSD. The model used the Vestas V90 3.0MW wind turbine with a maximum sound power emission level of 106 dBA. The noise levels at the other NSDs would be below the SANS recommended fixed noise level of 35 dBA at all wind speeds. The operation of the Great Karoo Wind Farm will have a noise impact of a low significance on all potential noise-sensitive developments.

### **Summary of EIA Findings**

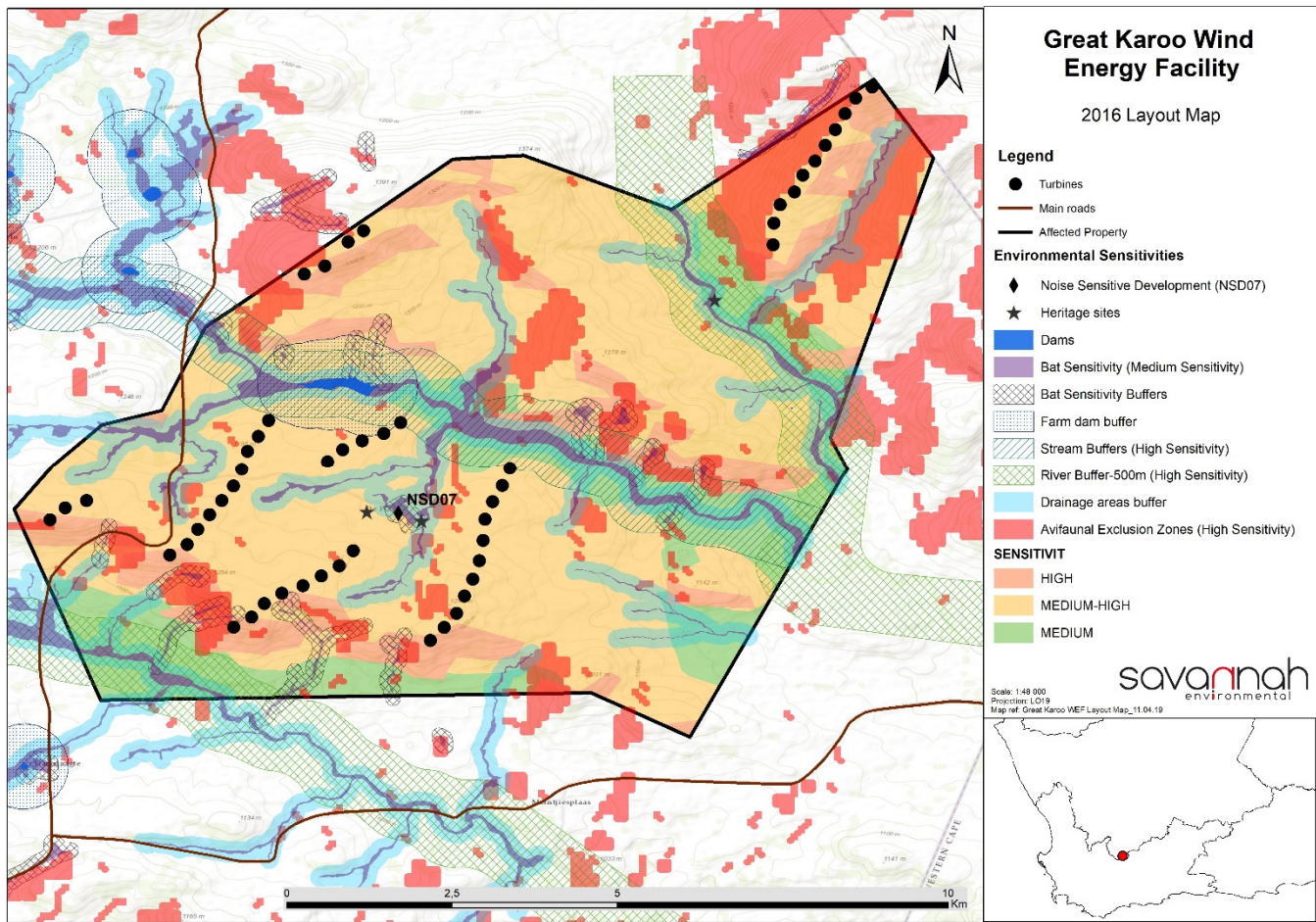
As part of the planning mitigation strategy, the applicant considered all the above-mentioned findings and sensitivities, and duly made the necessary amendments to the layout considered in the EIA in order to reduce impacts to an acceptable level. No environmental fatal flaws were identified to be associated with the proposed Great Karoo Wind Energy. A number of issues requiring mitigation were however highlighted. Environmental specifications for the management of potential impacts are detailed within the final Environmental Management Programme (EMPr).

### **1.3. Amendments of the Environmental Authorisation**

Following the issuing of the EA in August 2014, a number of amendments were made to the Environmental Authorisation, including the following:

- » Amendment 1 issued on 25 July 2016: Amendment of the number of turbines (from 57 down to 52); turbine specifications (increase in rotor diameter to up to 140m and change in hub height to up to 120m); change in turbine capacity to 3.6MW
- » Amendment 2 issued on 05 May 2017: Extension of the validity of the EA for an additional 2 years (i.e. up to August 2019).

The layout presented for the amendment issued in July 2016 is presented below. It must be noted that this layout was not approved and therefore a final layout is still required to be submitted in accordance with Condition 13 of the EA dated August 2014.



**Figure 1:** Layout Map for Great Karoo WEF presented for the amendment dated 25 July 2016 (A3 Map included in **Appendix H**).



## 2. DETAILS OF THE AMENDMENTS APPLIED FOR

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The amendments being applied relate to the authorised wind turbine specifications as detailed in the EA dated 12 August 2014, as amended. This requested amendment will result in an optimisation of the layout assessed within the EIA. This proposed amended updated layout is presented in **Figure 2**. It must be noted that this layout will be finalised and submitted to the DEA for review and approval (in accordance with Condition 13 of the EA) once a turbine supplier has been selected for the project.

This section of the report details the amendments considered within this report and by the specialist investigations (refer to **Appendix A – F**). Each amendment request is detailed below.

### 2.1. Decrease in number of Wind Turbines

The number of wind turbines is proposed to be decreased from the authorised 52 turbines, to 42 turbines. It is therefore requested that the project description in the amended EA dated July 2016 be amended to include the correct maximum number of turbines to be installed at the site as follows (amendments shown in **Bold** text):

**From:**

52 turbines

**To:**

**Up to 42 turbines.**

### 2.2. Amendment to Wind Turbine specifications

The wind turbine rotor diameter, hub height and turbine capacity as specified in the EA amendment dated July 2016 are requested to be amended as follows:

**From:**

"...up to 3.6MW in capacity and with up to 140m rotor diameter and a hub height of up to 120m

**To:**

"...up to **6.5MW** in capacity and with up to **180m** rotor diameter and a hub height of up to **150m**

### 2.3. Extension of validity period of the EA

It is requested that the validity period of the EA be extended by an additional 5 years in the EA amendment dated May 2017 (with DEA reference number 12/12/20/2370/3/AM2) is requested to be amended as follows:

**From:**

"The activity must commence within a period of two (02) years from the date of expiry of the EA issued on 12 August 2014 (i.e. the EA lapses on 12 August 2019)."

**To:**

"The activity must commence within a period of five (05) years from the date of expiry of the EA issued on 12 August 2014 (i.e. the EA lapses on 12 August 2024)."

**2.4. Amendment to Condition 13.2 of the EA:**

Condition 13.2 of the EA states that the layout must adhere to a 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities. Condition 13.2 of the EA is requested to be amended:

**From:**

"A copy of the final development layout map must be made available for comments by registered Interested and Affected Parties and the applicant must consider such comments. Once amended, the final development layout map must be submitted to the department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must include the following:

13.2. A 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities."

» **To:**

"A copy of the final development layout map must be made available for comments by registered Interested and Affected Parties and the applicant must consider such comments. Once amended, the final development layout map must be submitted to the department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must include the following:

**13.2. "Turbine and infrastructure positions as approved by an avifaunal specialist."**

**2.5. Amendment to Condition 49 of the EA:**

Condition 49 of the EA states that a 150m between watercourses and 100m buffer between the ridge edge and the turbine/construction activities must be implemented. Condition 49 of the EA is requested to be amended

**From:**

"A 150m between watercourses and 100m buffer between the ridge edge and the turbine/construction activities must be implemented."

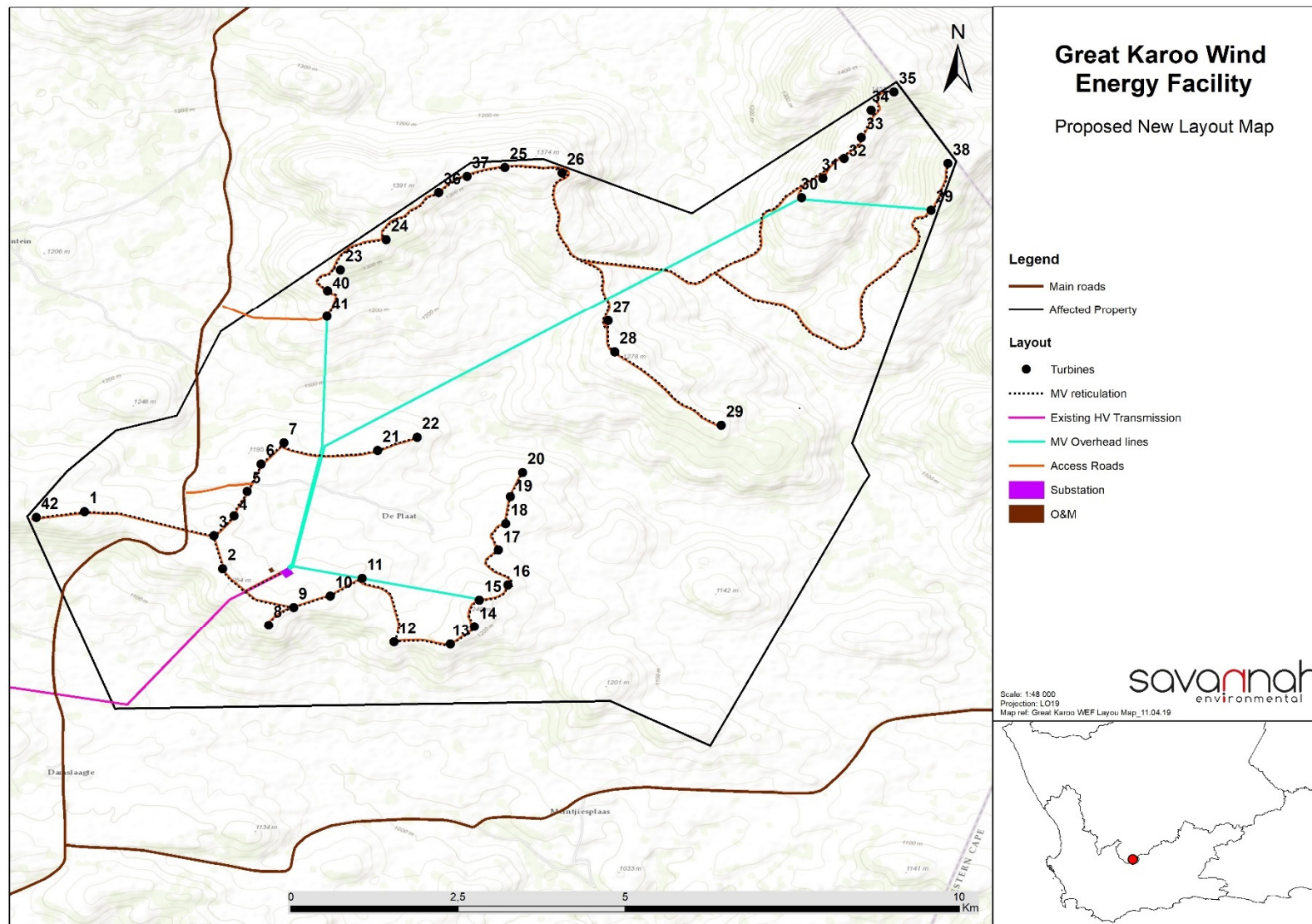
**To:**

**"The layout must be approved by the avifaunal specialist."**

The table below provides a detailed comparison of the project description included in the amended EA as authorised on 25 July 2016 with the proposed project components which are requested to be amended (shown in **bold** text).

<b>Component</b>	<b>Authorised specification</b>	<b>Amended specifications</b>
Number of turbines	52	<b>Up to 42</b>
Rotor diameter	Range up to up to 140m	<b>Range up to 180m</b>
Hub height	Range up to 120m	<b>Range up to 150m</b>
Wind Turbine Generation Capacity	3.6MW	<b>Range up to 6.5MW</b>
Condition 13.2 of the EA is requested to be amended from:	A 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities	<b>Turbine and infrastructure positions as approved by an avifaunal specialist.</b>
Condition 49 of the EA is requested to be amended from:	A 150m between watercourses and 100m buffer between the ridge edge and the turbine/construction activities must be implemented.	<b>The layout must be approved by the avifaunal specialist.</b>

This proposed amended layout is presented in Figure 2 below. It must be noted that this layout will be finalised and submitted to the DEA for review and approval (in accordance with Condition 13 of the EA) once a turbine supplier has been selected for the project.



**Figure 2:** Updated wind farm layout - A3 Map included in **Appendix H.**



### **3. MOTIVATION FOR THE PROPOSED AMENDMENTS**

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#### **3.1. Decrease in number of Wind Turbines and Amendment to Wind Turbine Specifications**

Wind turbine generators are constantly under development to increase the potential energy output capacity per wind turbine. The more energy one turbine can produce, the fewer turbines are required to generate the authorised contracted capacity of the project.

Following the issuing of the EA for the project, there have been advancements to wind turbine technology with newer turbines becoming larger and more powerful. The turbines authorised in the EA are therefore not considered to be the most suitable in terms of production and economic considerations. In this regard, Great Karoo Wind Farm (Pty) Ltd is considering an updated turbine model for the project and wishes to amend the EA to cater for larger turbine specifications, to enable the use of the latest, most efficient turbines available on the market. The increase in the rotor diameter, wind turbine generation capacity and reduction in the number of turbines will result in the optimisation of the facility layout which was assessed within the EIA for the project. These amendments to the project are proposed in order to increase the efficiency of the facility and consequently the economic competitiveness thereof, as well as to avoid environmental sensitivities on the site. It is also noted that the proposed amendments will improve the efficiency of the wind farm which may reduce the electricity tariff charged by the project, which would be to the benefit of all electricity consumers in South Africa.

The proposed amendments are not in themselves a listed activity and will not trigger any new listed activities as the proposed amendment will fall within the originally authorised footprint of the facility and will not change the scope of the EA.

#### **3.2. Validity extension of the EA**

It is requested that the validity period of the EA be extended by an additional 5 years. The Applicant intends to bid the Great Karoo Wind Farm ("the Project") in the next bidding window of the South African Government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). To-date there have been four bidding windows in the REIPPPP, with the last of these bid windows taking place in 2014. Due to various socio-economic, political and legal reasons the fifth bid window – which was initially expected in 2015/2016 – has been delayed by some years. The next REIPPPP bid window is now anticipated in the second half of 2019 or early 2020. Should the wind farm be successfully selected as a Preferred Bidder in the next round of REIPPPP, construction would be expected to commence in late 2020 or 2021 at the absolute earliest. The extension of the EA validity is requested in order to enable the holder of the EA to (a) bid the project into upcoming round/s of the REIPPPP and (b) commence construction in 2020/2021 (or later) should the project be selected as a Preferred Bidder in REIPPPP.

#### **3.3. Amendment to Condition 13.2 and 49 of the Environmental Authorisation**

Condition 13.2 and 49 of the Environmental Authorisation require that a buffer of 150m must be implemented around watercourses and a 100m buffer must be applied to "the ridge edge". Although condition 49 is listed under the heading of "Vegetation, wetlands and water resources" in the EA, the recommendation to buffer certain watercourses and ridges by 150m and 100m respectively arose from the avifaunal impact assessment conducted as part of the original EIA (EWT 2012 and EWT 2014).

Section 5.6 of the *Pre-construction Bird Monitoring Report and Updated Avifaunal Assessment Report* (EWT, 2014) states:

*"The high sensitivity zones include the Rivers and Streams in the study area buffered by 150m on either side, ridge buffers were not included on the map as flight data was used instead. These zones represent potential high sensitivity areas."*

The avifaunal specialist did not apply a generic 100m buffer to ridge lines – instead the specialist utilised avifaunal flight data (gathered over a 12-month period) to inform a more accurate delineation of the avifaunal "high sensitivity areas".

It is requested that Condition 13.2 and 49 be amended to remove the reference to a 100m ridge edge buffer, and instead it is requested that Condition 13.2 and 49 stipulate that the final layout be approved by a suitably qualified avifaunal specialist prior to construction. The avifaunal specialist would consider the site-specific high-sensitivity zones delineated by EWT after 12 months of monitoring, as well as any additional site data gathered prior to construction in accordance with the recommendations made by the specialist as part of this amendment application (refer to Section 7 of this report). This would arguably be more appropriate to manage and mitigate potential avifaunal impacts as opposed to implementing a generic 100m ridge edge buffer.

More over the reference to "ridge edge" in the EA is somewhat confusing, as it is not clear what defines a "ridge edge", nor how this would be identified in practical terms.

All specialists have considered and accepted this proposed amendment<sup>2</sup>. No specialists require or recommend a 100m "ridge edge" buffer. Refer to specialist reports in Appendix A-F.

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<sup>2</sup> All specialists were requested to consider this amendment as part of their Terms of Reference, and no concerns were raised by the specialists in relation to this amendment.

## **4. CONSIDERATIONS IN TERMS OF THE REQUIREMENTS OF THE EIA REGULATIONS**

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In terms of Regulation 31 of the EIA Regulations 2014, as amended, an environmental authorisation may be amended by following the process in this Part (i.e. a Part 2 amendment) if it is expected that the amendment may result in an increased level or change in the nature of impact where such level or change in nature of impact was not:

- a) Assessed and included in the initial application for environmental authorisation; or
- b) Taken into consideration in the initial authorisation.

In this instance, the amended turbine specifications were not considered in the initial authorisation. The change does not however, on its own, constitute a listed or specified activity. Therefore, the application is made in terms of Regulation 31 (a).

## 5. POTENTIAL FOR CHANGE IN THE SIGNIFICANCE OF IMPACTS AS ASSESSED IN THE EIA AS A RESULT OF THE PROPOSED AMENDMENTS

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In terms of Regulation 32(1)(a)(i), the following section provides an assessment of the impacts related to the proposed amendments. Understanding the nature of the proposed amendments and the impacts associated with the project (as assessed within the EIA), the following has been considered:

- » Impacts on birds;
- » Impacts on bats;
- » Ecological Impacts;
- » Heritage Impacts;
- » Visual impacts; and
- » Noise impacts.

The change in rotor diameter and turbine hub height, the reduction in the number of turbines (and subsequent change to the layout assessed in the EIA process) are expected to have **no effect** on the findings of the Socio-economic Assessment undertaken as part of the EIA process. Therefore, no Socio-economic Specialist Report has been included as part of the current amendment application.

The potential for change in the significance and/or nature of impacts based on the proposed amendments as described within this motivation report is discussed below, and detailed in the specialists' assessment addendum letters and reports (as applicable) contained in **Appendix A-F**<sup>3</sup>. Additional mitigation measures recommended as a result of the proposed amendments have been underlined for ease of reference, where applicable. This section of the main report must be read together with the specialist reports contained in **Appendix A-F** in order for the reader to obtain a complete understanding of the proposed amendments and the implications thereof.

### 5.1. Impacts on avifauna

The avifaunal amendment study (**Appendix A**) undertaken to assess the proposed amendments included a site visit in 05-08 February 2019. A total of 64 species were recorded during the site visit and incidental and ad-hoc observations of priority species or raptors on the WEF site included: Ludwig's Bustard (one sighting of one adult); Verreaux's Eagle (one sighting of one adult); Jackal Buzzard (three sightings of at least two different adults); Steppe Buzzard (one sighting of one adult); Booted Eagle (two sightings of two different adults); Rufous-breasted Sparrowhawk (two sightings of two different adults); Martial Eagle (one sighting of one juvenile); Grey-winged Francolin (numerous sightings of a number of flocks); Greater Kestrel (one sighting of one adult) and Rock Kestrel (numerous sightings of at least five different adults). Three nests (N1-N3) were identified within or in the near vicinity of the Great Karoo Wind Farm, two on cliffs and one in a stand of trees.

The nests observed during the site visit are described in more detail below and their locations are shown in Figure 5.1:

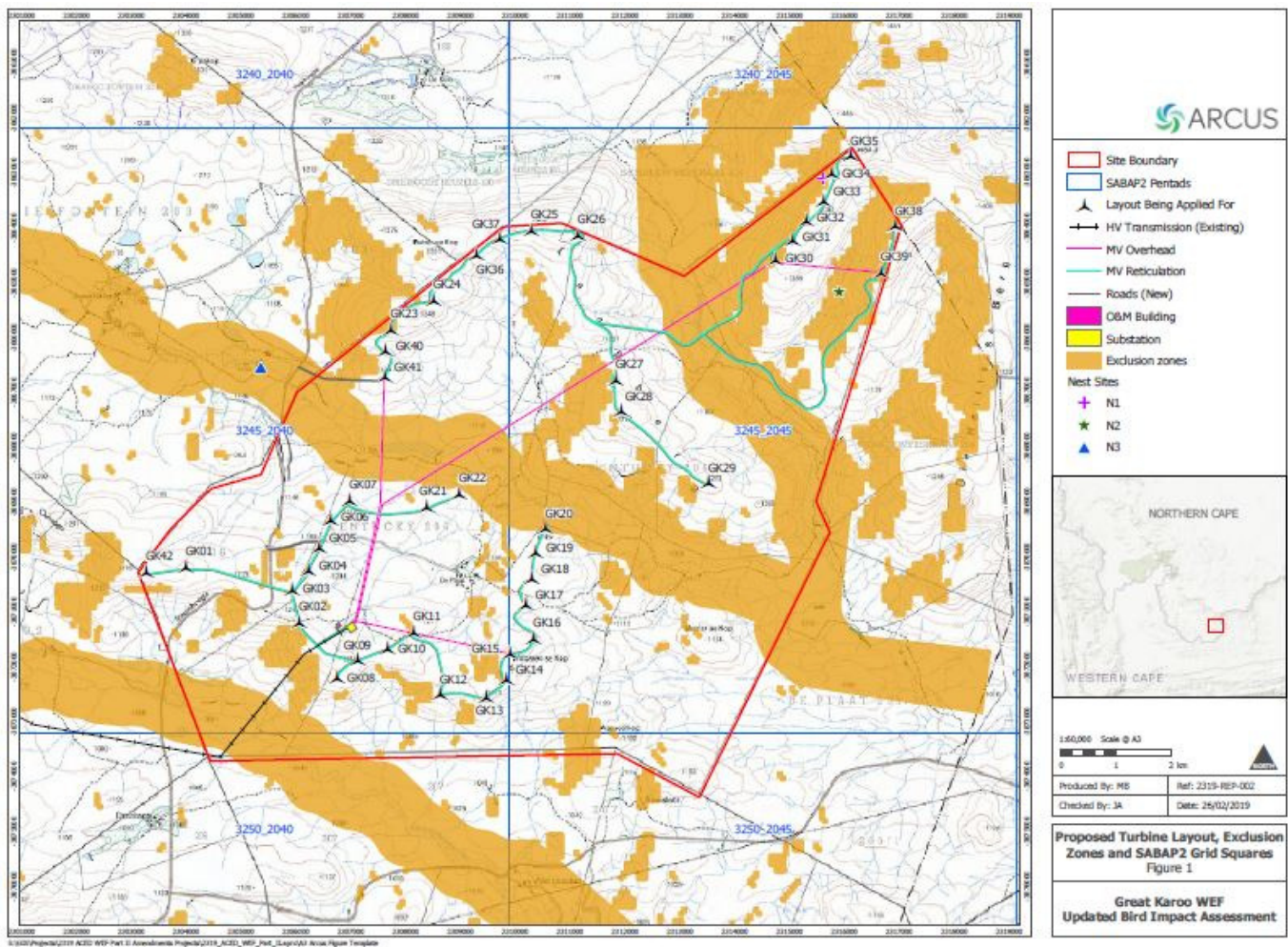
- » **N1:** A medium sized stick nest in a sheltered corner/crevice of a cliff. Access was difficult and this nest

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<sup>3</sup> It must be noted that the original specialists who undertook the EIA studies have been used for these assessments as far as possible. However, where the original specialists were not available for whatever reason, suitably qualified and experienced specialists have been used to provide an assessment of the proposed amendments.

site was viewed from distance (i.e. approximately 750 m away in the valley below). It is highly likely a raptor nest, and there is a possibility that it is a Verreaux's Eagle nest site. A single adult Verreaux's Eagle was seen flying within 1 km of this site, but no birds were seen on or near the nest. It is noted though that it could also possibly be used by White-necked Ravens and a pair of this species was observed in the vicinity.

- » **N2:** A small/medium stick nest. Viewed at a distance of approximately 300 m in poor light conditions. It is likely a raptor nest (possibly Booted Eagle or Jackal Buzzard). It was grey and dry, with no evidence of recent use.
- » **N3:** A medium stick nest in a large stand of Poplar trees. No birds seen on or near nest. Nest had some evidence (e.g. feathers on nests and white-wash below) of recent use although species could not be confirmed with certainty. It possibly could be nest of a Martial Eagle, although Jackal Buzzard or Black Sparrowhawk could not be discounted.



**Figure 5.1:** Three nest sites in relation to the proposed wind turbines (A3 Map included in **Appendix H**).

### 5.1.1. Comparative Assessment

The avifaunal amendment report (**Appendix A**) compiled to assess the proposed amendments includes a list of the most significant impacts on birds of the proposed wind energy facility (WEF) development (adapted from EWT 2014 and Arcus 2016). This is as follows:

- » Construction Phase: Disturbance of birds and Habitat destruction.



- » Operational Phase: Collision with turbines; Collision with associated overhead power lines; Electrocutation on associated overhead power lines; Disturbance during operation and maintenance; and Disruption in local bird movement patterns.

Table 5.1 provides a summary of the bird impacts as rated by Arcus (2016) for the currently authorised project description (i.e. the 52 turbine layout). Arcus determined whether the significance of each impact (as authorised) would change due to the proposed amendments, and this is shown in the last column in Table 5.2 below. This determination of a change in significance was made by considering all applicable information which included: i) a literature review; ii) review of applicable documents; iii) the latest available information on WEF impacts on birds in South Africa; iv) the specialists experience of monitoring at various operational WEFs and v) the proposed changes to the Great Karoo WEF layout and turbine specifications.

**Table 5.1: Summary of Avifaunal Impacts**

Phase	Impact	Significance Without-Mitigation	Significance With-Mitigation	Significance <sup>4</sup> will change due to Proposed Amendment (Y/N)
Construction	Disturbance	Medium	Low	N
	Habitat Destruction	Medium	Medium	Y
Operational	Collision with turbines	Medium	Medium	N
	Collision with associated overhead power lines	Medium	Medium	N
	Electrocution with associated overhead power lines	Medium	Low	N
	Disturbance during operation and maintenance	Medium	Low	N
	Disruption of local bird movement patterns	Medium	Low	N
N/A	Cumulative Impacts on Birds	High	High	N

It was determined that the significance scores of all impacts except one, are likely to remain unchanged with the implementation of the proposed amendments. The significance score for the impact of habitat destruction during construction is reduced (Table 2 below). This is primarily because the amended layout will have 10 less turbines and associated platforms, roads, foundations etc.

**Table 5.2: Updated Impact Table for Habitat Destruction – Construction Phase**

<i>Nature: Destruction of habitat used by birds</i>				
	Authorised		Proposed Amendment	
	Without mitigation	With mitigation	Without mitigation	With mitigation
<b>Extent</b>	2 (local)	1 (local)	2 (local)	1 (local)
<b>Duration</b>	4 (long term)	4 (long term)	4 (long term)	4 (long term)
<b>Magnitude</b>	4 (low)	3 (minor-low)	3 (minor-low)	1 (minor)
<b>Probability</b>	5 (definite)	5 (definite)	5 (definite)	5 (definite)
<b>Significance</b>	<b>50 (Medium)</b>	<b>40 (Medium)</b>	<b>45 (Medium)</b>	<b>30 (Medium)</b>

<sup>4</sup> Refers to the actual numerical significance score, and not necessarily the significance category of Low/Medium/High

<b>Status (positive or negative)</b>	Negative	Negative	Negative	Negative
<b>Reversibility</b>	Medium	Medium	Medium	Medium
<b>Irreplaceable loss of resources?</b>	No	No	No	No
<b>Can impacts be mitigated?</b>	Partially	Partially	Partially	Partially
<b>Mitigation:</b> <ul style="list-style-type: none"> <li>» Strict control over contractors, to ensure only the minimum required areas is cleared.</li> <li>» No off-road driving.</li> <li>» Minimize footprint areas, road lengths, road widths, wherever possible during the final layout design.</li> <li>» Where possible existing roads must be used and batching plants, labour camps, equipment storage, etc. should be situated in areas that are already disturbed.</li> <li>» A full site specific EMP must also be compiled to specify all of the impacts and mitigation measures and provide a step by step programme to follow for the ECO on site.</li> <li>» Construction of infrastructure must consider avifaunal sensitivity zones and avoid areas of higher sensitivities where possible.</li> <li>» Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats within which construction activities may need to be excluded.</li> <li>» Any clearing of stands of alien trees on site should be approved first by an avifaunal specialist.</li> <li>» Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within EMP.</li> </ul>				
<b>Cumulative impacts:</b> Multiple WEFs may result in a larger habitat destruction impact on birds, which could potentially be Medium significance after mitigation is applied at all facilities.				
<b>Residual Risks:</b> Residual impacts will be medium in the long term -Habitat destruction will be long-term for the operational life of the facility, with little options to mitigate. Over the very long term, the residual impacts could be low if the facility is decommissioned, infrastructure removed and habitat is re-habilitated				

It was found that the new layout associated with the amendment currently being applied for predominantly adheres to the recommendations and exclusion areas given by EWT (2014). Therefore, as was done by EWT (2014) this 'embedded design mitigation' was already considered in the 'Without Mitigation' rating. Figure 5.1 shows that four turbines in the new proposed layout (i.e. GK23, GK32, GK34 and GK39) are situated within exclusion zones. Three of these (i.e. GK23, GK32 and GK34) are very close to the edges of the zones, and have been moved outside of these zones. Considering the resolution and coarseness of the spatial slope and aspect data used by EWT in their modelling, the fact that the number of turbines is now reduced to 42, and the fact that the site in the most part has low levels of priority species flight activity and no eagle nest have been confirmed on or near the site, it is acceptable to the specialist that one turbine (GK39) remains within the current exclusion zone. This is unlikely to result in a significant increase in the overall collision impact rating of the site.

The proposed increase in rotor diameter and blade tip height means that the aggregate rotor swept area of the amended layout will be larger. The Great Karoo WEF as originally authorised included 57 turbines with a rotor diameter of 120 m would have a combined RSA of approximately 633,343.2 m<sup>2</sup> (or ~63.33 ha), subsequently amended to 52 turbines with a rotor diameter of 140 m which would have a combined RSA of ~80.05 ha, while the new proposed amendment of 42 turbines with a rotor diameter of 180 m have a combined RSA of approximately 1,068,768.9 m<sup>2</sup> (or ~106.8 ha). Although there are ten less turbines in the proposed amendment compared to the current approved layout, there is an increase in total RSA of approximately 26.7 ha. One would initially assume that a larger RSA would mean an increase in the risk of

collision. However, most published findings indicate that rotor swept area is not a key factor in the collision risk. Turbine dimensions seem to play an insignificant role in the magnitude of the collision risk in general, relative to other factors such as topography, turbine location, turbine numbers, species abundance, morphology and a species' inherent ability to avoid the turbines, and may only be relevant in combination with other factors, particularly wind strength and topography. The reduction in turbine numbers is likely to be a more critical factor in the overall significance of the collision risk of a project.

Overall, the specialist found that these differences are probably not sufficient to require any material change to the overall findings of the existing impact assessment, although this review presents the opportunity to introduce new mitigation measures in accordance with current guidelines and knowledge. These new mitigation measures are outlined as follows:

- » The current best practise guidelines for pre-construction monitoring (Jenkins et al., 2015) indicate that additional monitoring may be advisable if there is a significant gap between the original assessment and the commencement of construction, to assess whether there have been any changes in species abundance, movements and/or habitat use in the interim. As the pre-construction monitoring data (EWT, 2014) is now over four years old, it is recommended that additional pre-construction monitoring be conducted. This monitoring can be refined, and focussed on the Great Karoo WEF, and it is not necessary to repeat the full protocol conducted by EWT (2014). The monitoring data collected will update the avifaunal baseline for the site, to allow for meaningful comparison with operational monitoring data, and it must also be used to inform the final micro-siting of the WEF where applicable. The additional pre-construction monitoring can take place after the current amendment decision, but must be done prior to construction, in sufficient time so as to allow the results to inform the micro-siting of the WEF site prior to any construction taking place.
- » The nests sites, N1-N3, must be revisited by an avifaunal specialist during the eagle breeding season (e.g. approximately June-September) to confirm the activity of these sites and the species utilising these sites (if active). Once the above has been completed, the specialist must advise any additional recommendations and/or mitigations, which may result in a need to update the EMPr for the project and/or refine the final layout of the turbines. If any active nest sites of eagles are confirmed, these nests sites must be re-visited and regularly surveyed to determine the breeding success of eagles. Monitoring of any such active eagle nest sites should continue in to the construction phase of the project, and throughout the operational lifespan of the project, in accordance with the applicable guidelines in effect at the time.

### **5.1.2. Conclusion**

Based on the specialist assessment, the proposed amendment will not result in a 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.

The impact of bird mortalities from turbine collisions is unlikely to change because any increased risk due to an increased RSA per turbine may be offset by a reduction in the number of turbines built. The only impact rating that changes, because of a reduced number of turbines, is that of habitat destruction, which now has a **lower significance score** (30) with mitigation, but remains within the **Medium category**.

The additional fieldwork conducted for this assessment revealed the location of three nest sites, potentially used by raptors and possibly eagles – however nest activity and the species utilising the nests could not be



determined with certainty. The nests sites must be revisited in the eagle breeding season to determine the activity status and species utilising these sites, the results of which must inform possible additional mitigation measures and the final layout. Furthermore, all mitigation measures given previously (i.e. in Arcus, 2016) must be incorporated into the updated EMPr and implemented. This includes a thorough operational phase bird monitoring programme (in line with the guidelines applicable at the start of the operational phase) that must be implemented, and should start no later than the commercial operation date of the facility. This programme should feed back into an adaptive management strategy, which could include the need to shut down or curtail certain turbines should unacceptably high impacts be found.

Cumulative impacts remain a concern for the broader Sutherland area, with several proposed WEF projects in the region. If a number of these projects are built, it is likely that the cumulative impact of turbine collision will be high without mitigation, particularly on red data eagle species such as Verreaux's Eagle and Martial Eagle, and possibly also on Ludwig's Bustard. However, the extent of actual cumulative impacts on the region's avifauna will only become known once a few wind farms are developed in the Sutherland area and operational data becomes available, and regional population viability analysis have been conducted for key species.

In the light of the additional avifaunal work that has now been completed by Arcus, it is requested that instead of adhering to a generic 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities as originally recommended in the EIA and stipulated in the EA, the updated exclusion zones (see Figure 5.2 below) and avifaunal assessments be adhered to. The current exclusion zones have been delineated based on 12 months of avifauna monitoring by EWT (2014), together with additional field assessment by Arcus in 2019. The current revised layout adheres to the avifaunal exclusion zones and was assessed and approved by the avifaunal specialist for this amendment motivation report and is thus the most recent avifaunal opinion on the proposed amendment.

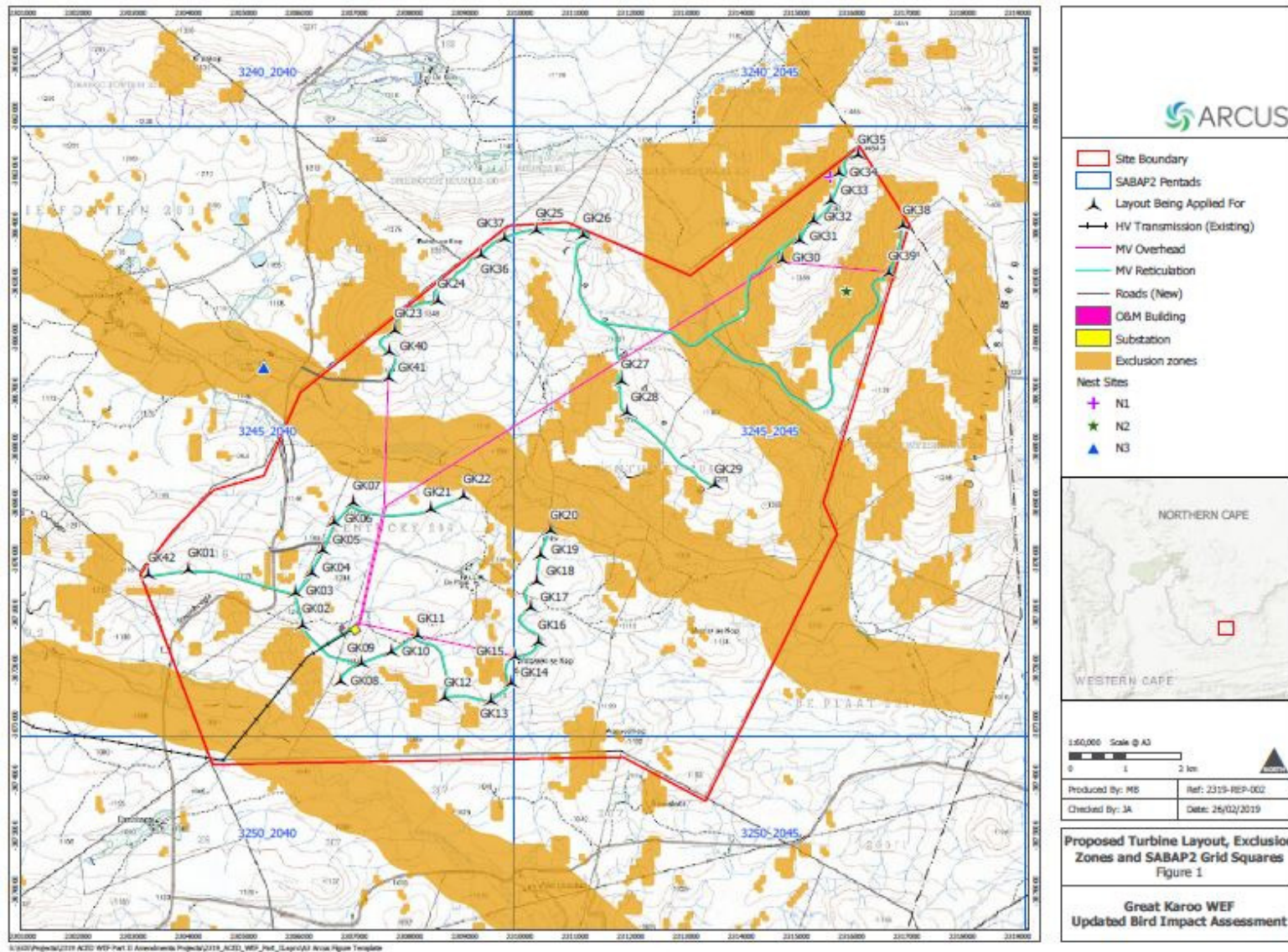


Figure 5.2. The updated exclusion zones based on avifaunal assessments (A3 Map included in **Appendix H**)

## 5.2. Impacts on bats

The proposed amendment to the turbines for the Great Karoo Wind Farm would result in a greater per turbine rotor swept area and hence a potentially greater likelihood bats would collide with turbine blades or experience barotrauma. Currently, the rotor swept area for each turbine is 15,394 m<sup>2</sup> (or 1.5394ha) but based on the amendment being applied for, this would increase to up to 25,447 m<sup>2</sup> (or 2.5447ha) per turbine. The 42 turbines applied for in this amendment process would result in a total rotor swept area of approximately 106ha. This represents an increase in total rotor swept area of approximately 26.7 ha.

During the pre-construction bat monitoring, microphones were placed at 10 m and 50 m on two met masts respectively. The activity data showed that in October and between January and April, Egyptian free-tailed bat activity at 50 m was up to twice that at 10 m but that the average number of bats passes per night was less than six. The Cape serotine was recorded more often at 50 m at one met mast but not the other, and generally less than one bat pass on average was recorded per night at 50 m for this species. Therefore, bat activity at 50 m at the Great Karoo wind farm is low. At a nearby site where Arcus undertook pre-construction bat monitoring, activity at 80 m was also lower compared to near ground level.

The exact turbine dimensions being applied for are up to 150 m for the hub height, and up to 180 m for the rotor diameter. Within this range, the impacts to bats and associated buffer zones needed to limit impacts (as an initial mitigation) will vary depending on the size of the turbines used. Turbines with a lower ground clearance will need to be placed further away from buffers than turbines with a higher ground clearance to ensure that blades do not intrude into the buffer area. To determine the turbine setback distances required to ensure that no turbine blades enter the bat buffer, the following formula should be used (Mitchell-Jones and Carlin 2014):

$$b = \sqrt{(bd + bl)^2 - (hh - fh)^2}$$

Where: b=distance between base of turbine and bat sensitive feature, bd = desired buffer distance, bl = blade length, hh = hub height and fh = feature height (zero in this instance)

Thus, based on the above, assuming a desired buffer distance of 200 m for example, a turbine with a rotor diameter of 180m and hub height of 120 m (i.e. 30 m ground clearance) will need to be 264 m away from the buffered feature (that is, the distance between the base of the turbine and the bat sensitive feature must be 264m ("b"), to ensure that the turbine blades will not encroach within the desired 200m buffer).

The specialist has recommended that a buffer of 100m be implemented around all features of medium bat sensitivity and 500m for features of high sensitivity. For the purpose of the current assessment it has been assumed that a turbine with the maximum specifications (180m rotor diameter and 150m hub height) will be used, and the current amended layout adheres to these buffers, with all turbines appropriately setback from the edge of the buffer areas. However, the required distance between the bat sensitive features and the turbine base ("b") will need to be calculated and confirmed using the above equation once the final turbine model is selected. Any turbines within bat sensitivity buffers will need to be repositioned during the micro-siting process, under the guidance of a bat specialist. Given that the current layout considers the maximum turbine specifications, any such micro-siting is expected to be minimal if required at all.

Despite the available pre-construction monitoring data showing that bat activity at 50m and 80 m is low, it would be preferential to maximize the distance between the ground and blade tips by using turbines with the shortest possible blades and the highest possible hub height. This would reduce the number of species potentially impacted upon by turbine blades during the operational phase. It would also be preferential to use as short a blade as possible so that they don't intrude into higher airspaces and in so doing reduce the potential impact to high flying species such as free-tailed bats. Despite the low activity at height, increasing evidence suggests that bats actively forage around wind turbines, so the installation of turbines in the landscape may alter bat activity patterns, either by increasing activity at height and/or increasing the diversity of species making use of higher airspaces.

Of the impacts identified in the EIA, only mortality of species due to collision with turbine blades or due to barotrauma, and cumulative impacts, are relevant to this amendment. The potential increase in the per turbine footprint should have a negligible effect on bats, and may be offset by the overall conversion of less habitat by using fewer turbines (52 turbines are currently approved with the amendment applying for 42 turbines).

#### **Amendments to Condition 13.2 and Condition 49 of the EA:**

Condition 13.2 and 49 of the EA states that the layout must adhere to a 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities. It is requested that these conditions be amended to state that the layout must be approved by an avifaunal specialist.

The updated layout adheres to the current delineated site-specific bat sensitivity areas. Conditions 13.2 and 49 of the EA require a generic 150 m and 100 m buffer respectively between watercourses, ridge edges and the turbine/construction activities. The delineated site-specific bat sensitivity areas are more accurate and more appropriate for the site compared to generic 150 m/100 m buffers. In light of this Arcus is of the opinion that potential impacts to bats would be best managed and mitigated by adhering to the site-specific bat sensitivity areas, and therefore Condition 13.2 and 49 are not applicable to bats. As per the mitigation measures stipulated in this report and which have been included in the updated EMPr, the final layout must be reviewed and approved by a suitably qualified bat specialist. This requires a recalculation of the bat buffers based on the final turbine dimensions using the Mitchell-Jones and Carlin (2014) formula.

#### **5.2.1. Comparative Assessment**

The potential collision impact to bats is currently rated as medium before, and low after mitigation with adherence to the sensitivity buffers being the major mitigation measure proposed. No turbines from the layout using the current turbine specifications are located in these sensitivity buffers. The significance of the impact after the proposed change would be dependent on the size of the turbines chosen. The assessments here (Table 5.3 and Table 5.4) is based on the scenario where turbines of the maximum dimensions being applied for are used. This would increase risk to high flying species such as free-tailed bats because the turbines blades would extend higher into the air.



**Table 5.3: Impact Assessment Table for Increasing Turbine Size at the Great Karoo Wind Farm**

<b>Nature:</b> Mortality of bats due to collision with turbine blades or barotrauma caused by turbine operation.				
	<b>Authorised (Animalia 2016)</b>		<b>Proposed amendment</b>	
	<b>Without mitigation</b>	<b>With mitigation</b>	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Low-medium (2)	Low-medium (2)	Low-medium (2)	Low-medium (2)
<b>Duration</b>	Long term (4)	Long term (4)	Long term (4)	Long term (4)
<b>Magnitude</b>	Moderate (6)	Low (4)	Moderate (7)	Low (4)
<b>Probability</b>	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)
<b>Significance</b>	<b>36 (Medium)</b>	<b>20 (Low)</b>	<b>39 (Medium)</b>	<b>20 (Low)</b>
<b>Status (positive or negative)</b>	Negative	Negative	Negative	Negative
<b>Reversibility</b>	Low	Low	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	No	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes		Yes	
<p><b>Mitigation:</b></p> <p>Mitigation measures</p> <ul style="list-style-type: none"> <li>» All currently proposed mitigation measures proposed by Animalia (2014) and Animalia (2016) should be adhered to. This includes adhering to the sensitivity map and buffer zones which may require repositioning turbines depending on the size of the turbines used.</li> <li>» All mitigation measures to protect bats proposed in the EMPr (2014) must be adhered to which includes adaptive management and the use of curtailment if and when required.</li> </ul> <p>Additional mitigation measures</p> <ul style="list-style-type: none"> <li>» <u>The impacts presented can be mitigated by using turbines which maximise the ground clearance as much as possible, and by minimising the tip height (i.e. the distance between the ground and the blade tip at its highest point) as far as possible in the final turbine selection.</u></li> </ul> <p><u>To be included in the EA: a minimum buffer to <b>blade tip</b> of 100 m for moderate, and 500 m for high sensitivity bat features must be applied.</u></p>				
Cumulative Impact: see Table 5.4				
<p><b>Residual Risks:</b></p> <p>Residual Impacts: Residual impacts may still remain even if the moderate and high sensitivity buffers are adhered too and by using turbines of an appropriate size to limit bat fatalities. Bat fatalities are a widely occurring phenomenon having been reported across Europe, North America, Central America, Brazil, India, Australia and South Africa (Baerwald and Barclay 2011; Barros et al. 2015; Hein and Schirmacher 2016; Kumar et al. 2013; Rodríguez-Durán and Feliciano-Robles 2015; Rydell et al. 2010). Further, evidence has shown that pre-construction monitoring data may not be able to adequately predict post-construction fatality risk (Hein et al. 2013), and that bats actively investigate and forge around turbines (Cryan et al. 2014; Foo et al. 2017). This suggests that there may still be fatality impacts. Residual impacts can likely be reduced to very low if curtailment is used when appropriate and this has been shown to be one of the most effective mitigation measures (Arnett and May 2016).</p>				

**Table 5.4: Cumulative Impact Assessment**

<p><b>Nature:</b> Cumulative mortality of bats due to collision with turbine blades or barotrauma caused by turbine operation across multiple wind energy facilities.</p> <p>The cumulative impacts will depend on the number of wind energy facilities in the region, the species involved, the levels of bat mortality and mitigation measures implemented at each wind energy facility. Bats reproduce slowly (Barclay and Harder 2003) and their populations can take long periods of time to recover from disturbances so the cumulative impacts can be high if appropriate management and mitigation is not implemented.</p>
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There are approximately 17 wind energy facilities planned within a 50 km radius of the Great Karoo wind farm (higher than the number of wind energy facilities during the original EIA process). The assessment below assumes all 17 facilities implement appropriate mitigation measures.

	Authorised		Proposed amendment	
	Without mitigation	With mitigation	Without mitigation	With mitigation
<b>Extent</b>	Medium (3)	Medium (3)	Medium (3)	Medium (3)
<b>Duration</b>	Long-term (4)	Long-term (4)	Long-term (4)	Long-term (4)
<b>Magnitude</b>	High (8)	High (8)	High (8)	Moderate (6)
<b>Probability</b>	Definite (5)	Improbable (2)	Definite (5)	Probable (3)
<b>Significance</b>	<b>75 (High)</b>	<b>30 (Medium)</b>	<b>75 (High)</b>	<b>39 (Medium)</b>
<b>Status (positive or negative)</b>	Negative	Negative	Negative	Negative
<b>Reversibility</b>	Low	Low	Low	Low
<b>Irreplaceable loss of resources?</b>	Yes	No	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes		Yes	

#### Mitigation measures

- » All currently proposed mitigation measures proposed by Animalia (2014) and Animalia (2016) should be adhered to. This includes adhering to the sensitivity map and buffer zones which may require repositioning turbines depending on the size of the turbines used.
- » All mitigation measures to protect bats proposed in the EMPr (2014) must be adhered to which includes adaptive management and the use of curtailment if and when required.

#### Additional mitigation measures

- » The impacts presented can be mitigated by using turbines which maximise the ground clearance as much as possible, and by minimising the tip height (i.e. the distance between the ground and the blade tip at its highest point) as far as possible in the final turbine selection.

**Residual Impacts:** Residual impacts may still remain even if the moderate and high sensitivity buffers are adhered to and by using turbines of an appropriate size to limit bat fatalities. Bat fatalities are a widely occurring phenomenon having been reported across Europe, North America, Central America, Brazil, India, Australia and South Africa (Baerwald and Barclay 2011; Barros et al. 2015; Hein and Schirmacher 2016; Hull and Cawthen 2012; Kumar et al. 2013; Rodríguez-Durán and Feliciano-Robles 2015; Rydell et al. 2010). Further, evidence has shown that pre-construction monitoring data may not be able to adequately predict post-construction fatality risk (Hein et al. 2013), and that bats actively investigate and forge around turbines (Cryan et al. 2014; Foo et al. 2017). This suggests that there may still be fatality impacts. Residual impacts can likely be reduced to very low if curtailment is used when appropriate as this has been shown to be one of the most effective mitigation measures (Arnett and May 2016).

### 5.2.2. Conclusion

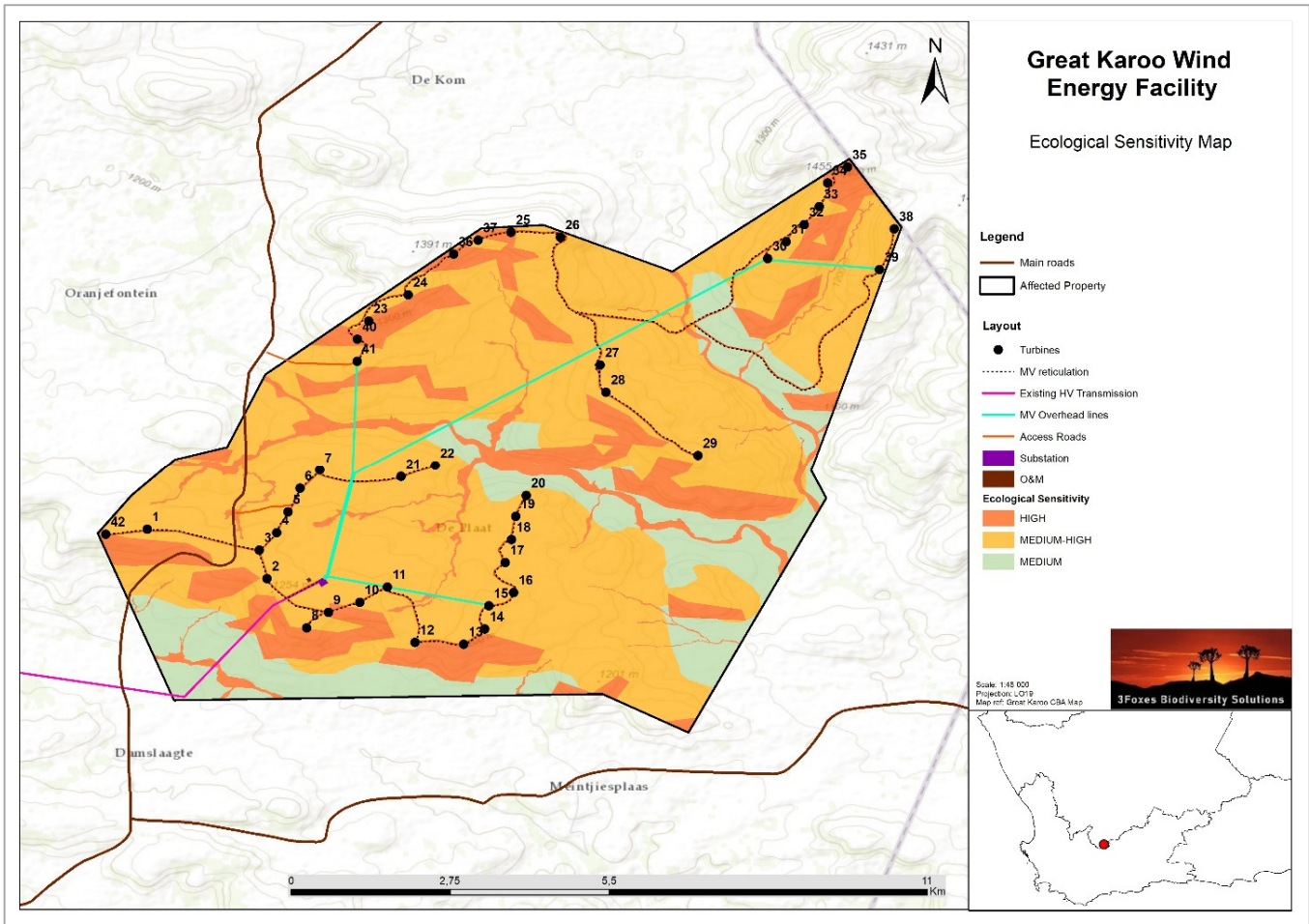
Compared to the previous impact assessments undertaken by Animalia in 2014 and 2016, it is likely that the amendments to the turbine dimensions proposed at the Great Karoo Wind Farm would slightly increase mortality impacts to bats. This is primarily because the blades will extend higher into the air and place bats using open spaces for commuting and foraging at greater risk. Based on bat activity levels as assessed from pre-construction monitoring data, impacts to bats are likely to be of a medium significance before mitigation and low after mitigation. In terms of cumulative impacts, there are approximately 17 wind energy facilities planned within a 50 km radius of the Great Karoo wind farm (higher than the number of wind energy facilities during the original EIA process). Cumulative impacts after mitigation would also increase (the increase is not due to the amendments themselves, but rather the fact that more wind farms are now proposed within 50km of the site). Cumulative impacts are likely to be of a high significance before mitigation and medium after

mitigation. The magnitude of bat impacts may differ based on the exact dimensions of the turbines chosen. Turbines with longer blades that reach lower to the ground would likely have a greater impact by putting a greater diversity of species at risk. Longer blades will also extend higher into the air and place open air species such as free-tailed bats at greater risk. Therefore, it is recommended that turbines must be selected in order to maximise the ground clearance and minimise the tip height (i.e. the distance between the ground and the blade tip at its height point) as much as possible.

The key initial mitigation measure that should be implemented at the Great Karoo wind farm would be adherence to the sensitivity map created by Animalia. The proposed amended layout adheres to the proposed buffer areas. However, the exact combination of final turbine dimensions that will be selected is unknown but depending on the size of the turbines selected, turbines may need to be relocated (micro-sited) if they are within any buffers. The final layout will therefore need to be assessed by a bat specialist to ensure this is adhered to once the turbines are chosen. Any turbine micro-siting will need to be done before construction. Residual impacts that occur will need to be evaluated during the operational phase using carcass searches to monitor actual impacts. Depending on the outcome of this operational monitoring, curtailment may be needed and this has been included in the EMPr. An initial curtailment design has been provided by Animalia (2014) which can be used to guide adaptive mitigation at the wind farm if required.

### 5.3. Ecological Impact

The amended layout was reviewed in reference to both the original 77 turbine layout assessed (Hoare 2014) (which EA approved 57 turbines) as well as the amended 52 turbine layout that was subsequently assessed and approved (2016) and the sensitivity of the site as originally assessed and mapped. The ecological sensitivity map of the site, depicting the amended layout is presented below in Figure 5.3.1. **Please note:** high sensitivity areas depicted in Figure 5.3.1 below are not to be regarded as 'no-go' areas. Rather they are areas in which disturbance must be minimised as far as possible, and where search-and-rescue operations should be focussed. This is consistent with the original EIA ecological findings (Hoare, 2014). Refer to Appendix C for the ecological assessment.



**Figure 5.3.1.** Sensitivity map of the Great Karoo WEF site, depicting the amended layout of the facility as considered within this amendment, overlaid onto the original sensitivity map of the site as produced by Hoare (2014). The A3 map is included in Appendix H.

### 5.3.1. Comparative assessment

In terms of the original sensitivity map produced for the site, the ecological impact of the current proposed turbine layout would be similar or slightly lower than the most recent approved 52 turbine layout (Figure 5.3.1). The distribution of turbines, access roads and other infrastructure in relation to the assessed sensitivities of the site (Hoare, 2014) are similar and an increased impact on the high sensitivity parts of the site **is not likely**.

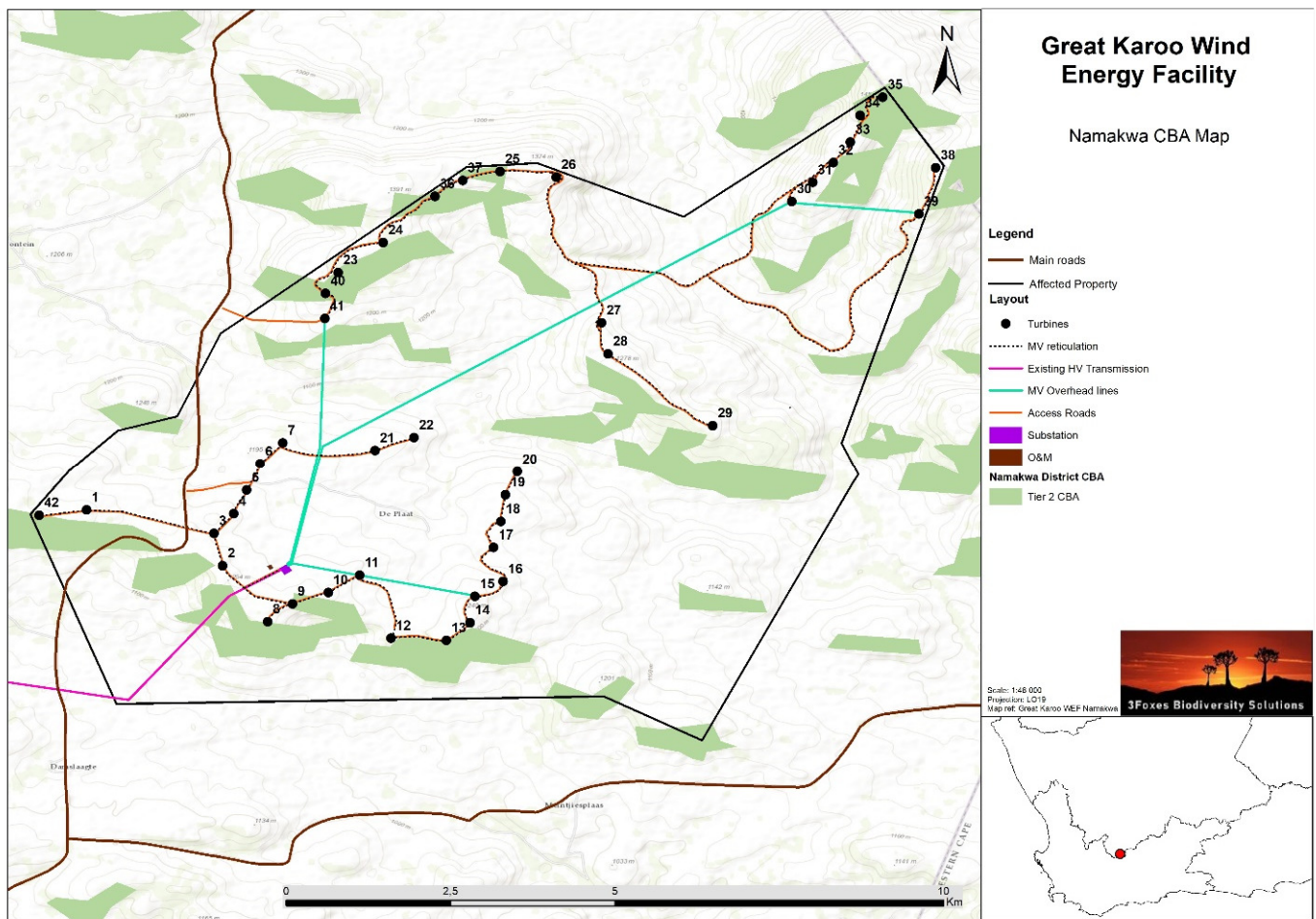
However, the impact of the development on CBAs was not directly assessed in the original ecological specialist study, as this information was not available at the time of the original ecological assessment. As such, it is not possible to compare the impact of the current amended layout on CBAs directly with the previously assessed impacts on CBAs. However, the Namakwa District CBA map available in 2014, was integrated into the original ecological sensitivity map and impacts on the CBAs were assessed as part of more general habitat loss. In terms of habitat loss, the current development would not have a greater footprint than the original layout and as the habitats impacted would essentially be the same, an increased impact on habitat loss as a result of the amended layout **is not likely**.

Since the original 2014 assessment, the Northern Cape CBAs map has been released in August 2018 and under this map, the site lies within areas classified as CBA 1 and CBA 2. The original Namakwa District CBA

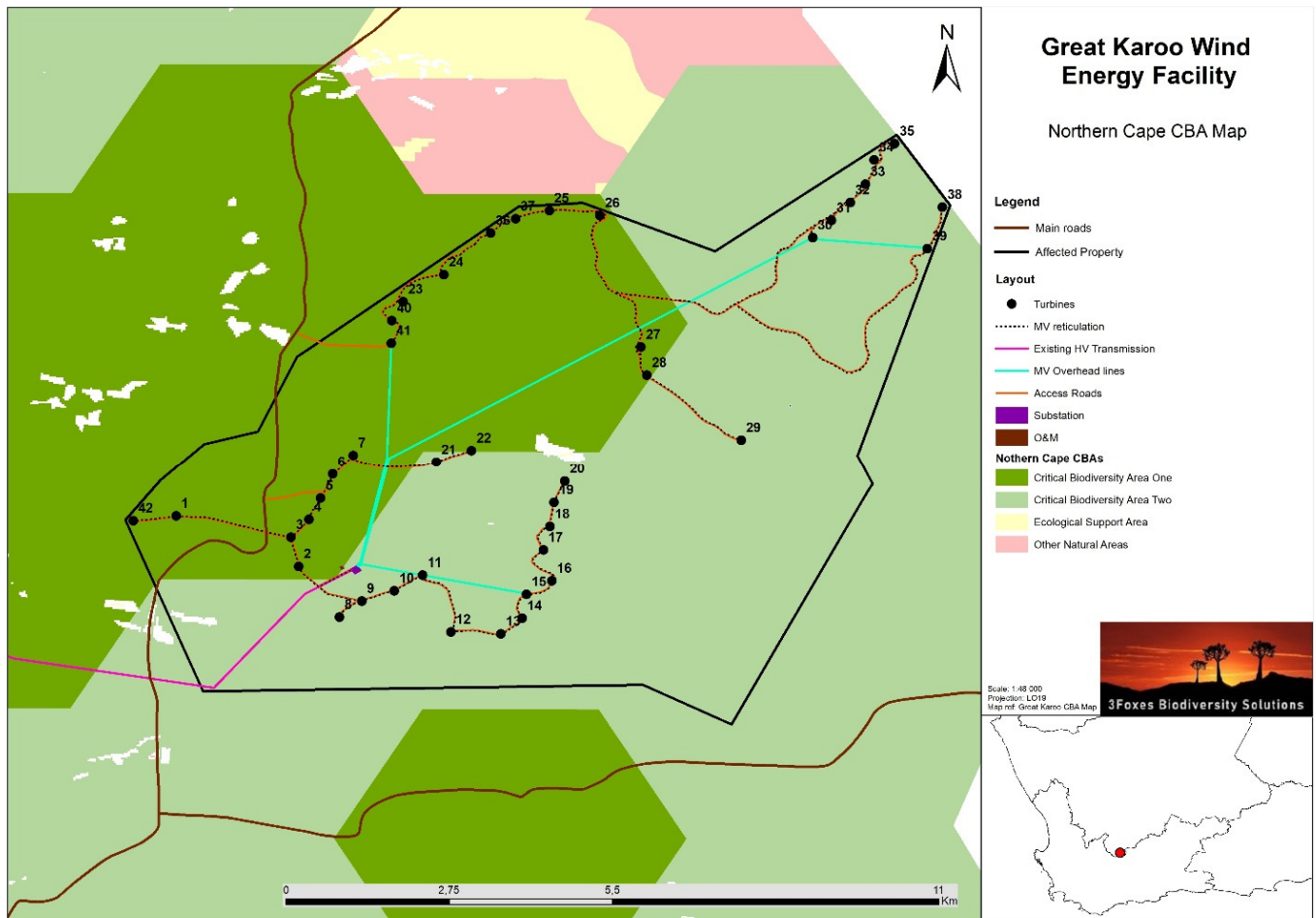


database mapped south-facing slopes and kloofs as CBA 2 areas (Figure 5.3.2), but these are generic features that are not necessarily the high biodiversity or ecologically important parts of the site, especially in the Roggeveld, where lowlands and drainage features are often of higher sensitivity due to the higher abundance of species of concern in these areas.

As the 2018 Northern Cape CBA map (Figure 5.3.3) does not indicate why an area has been selected as a CBA, it is not possible to tell why the areas within the site have been selected as CBAs, however, this appears to be related to the topographic diversity of the area as well as the fact that the area falls within the Roggeveld Centre of endemism, with a high abundance of plant species of concern. As the 2018 CBA map was not available at the time of the original assessment, it cannot be used to provide a comparison with the original assessment as it represents new information that has since become available.



**Figure 5.3.2.** The current turbine layout in relation to the Namakwa District CBA which was used to inform the original ecological study



**Figure 5.3.3.** The current turbine layout in relation to the more recent 2018 Northern Cape CBA map which has superseded the Namakwa District map.

An aspect that requires some attention is the distribution of underground vs. overhead cabling at the site (see Figure 5.3.1). The current amendment allows for the extent of internal overhead lines to be increased significantly compared to the assessed layout which included a larger amount of buried cabling. While this is seen as having a positive impact on terrestrial ecology within the high sensitivity parts of the site, this is not the only consideration in this regard. An increase in overhead lines is likely to have some implications for avifauna and as such, the recommendations of the avifaunal specialist in this regard should take precedence within all areas except High ecological sensitivity areas, where specific input from an ecologist should be sought regarding the acceptability and routing of underground vs overhead MV lines. As such, the total extent of overhead lines on the site should be guided largely by avifaunal considerations, with ecological considerations only being of high importance in high and very high sensitivity parts of the site.

**Amendments to Condition 13.2 and Condition 49 of the EA:**

Condition 13.2 and 49 of the EA states that the layout must adhere to a 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities. It is requested that these conditions be amended to state that the layout must be approved by an avifaunal specialist.

The turbines of the current amended layout are not located within ecological no-go areas and adheres to 500m buffers from major watercourses. The high sensitivity areas and features at the site are currently outside

of the development footprint or have acceptable levels of impact. The reference to “ridge edge” in the Environmental Authorisation (EA) is ambiguous as it is not clear how a “ridge edge” would be defined, as the site is not along the escarpment itself which has a clearly defined edge and in terms of the affected ridges, these are generally fairly flat on top but most grade gradually from ridge top to slope. This would make it challenging to implement the condition as stated in the EA. The increase in overhead lines would not increase terrestrial impacts and as such is considered acceptable from a terrestrial ecology standpoint, but as it is likely to have some implications for avifauna, the recommendations of the avifaunal specialist should take precedence in this regard. It is therefore requested that the final layout be approved by a suitably qualified avifaunal specialist.

**In light of this it is suggested that instead of adhering to a 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities, that the layout be approved by a suitable experienced avifaunal specialist.**

### 5.3.2. Advantages and disadvantages

The major change to the development in terms of the current amendment and which could have potentially significant ecological impacts, is the increase in turbine size as this could result in an increase in the footprint of each turbine. However, this would occur simultaneously with a decrease in the number of turbines required and the change in the distribution of access roads and medium voltage cabling. The change in turbine size is **not likely to** result in significant additional impact as any increase from the original assessed turbine size would be simultaneously associated with a decrease in turbine number, thereby largely ameliorating the increased individual footprint. In terms of the roads, the total extent of the road footprint is assumed to be similar to the original assessed layout and as such there is not likely to be any change in impact associated with the roads as the amount of footprint within the high sensitivity parts of the site has not increased. **Overall, no upward or downward adjustment of impacts is justified based on the changes to the layout. As such, the amendment is supported from an ecological perspective as it would not increase or change any impacts associated with the development.**

### 5.3.3. Conclusion

- The findings of this statement are contingent of the layout as provided for the assessment. There are a variety of high sensitivity areas and features at the site, which are currently outside of the development footprint or which have acceptable levels of impact, but which could be affected by any changes to the road or turbine layout. As such any further changes to the road or turbine positions should be checked by an ecological specialist.
- The amendment allows for the extent of internal overhead lines to be increased. From an ecological standpoint, this has some potential positive impacts especially on flora. However, as this may have implications for avifauna, the recommendations in that regard must also be considered. Where there is doubt, specific input from a plant ecologist familiar with the area should be sought.
- Should the development proceed to construction, the final development footprint should be subject to a preconstruction walk-through to locate and identify species of conservation concern that are within the development footprint. Some search and rescue of plant species of conservation concern may be required.
- The Great Karoo Wind Farm Amended layout is well supported in terms of terrestrial ecology impacts. **Overall the impact of the amended layout on fauna and flora would be the same as the authorized layout and there are no fatal flaws or critical issues associated with the proposed changes.** As a result,



the amendment is supported from an ecological perspective as it will not result in an increase in the significance in any of the assessed ecological impacts.

#### 5.4. Impacts on heritage

##### Archaeology

In the original heritage assessment undertaken by Booth (SAHRIS NID 44935) in 2012 it was noted that “No archaeological heritage remains were documented within the areas proposed for the development of the wind turbines.” However, Booth (2012) also identified a family graveyard (Site ID 35235) and an informal labourers’ graveyard (Site ID 35281) situated near to the current farmstead complex, the remnants of a stone-walled kraal to the north of the current farmstead complex (not mapped) and the ruins of a stone walled, large farmstead complex were documented within one of the valleys (Site ID 35236). These identified sites have been mapped in relation to the proposed development amendments (Figures 5.4.1a – 5.4.1c), and will not be impacted. Based on this information, no new impacts are anticipated. There are no advantages or disadvantages associated with the proposed change and no additional measures are required to ensure avoidance, management and mitigation of impacts associated with such proposed change.

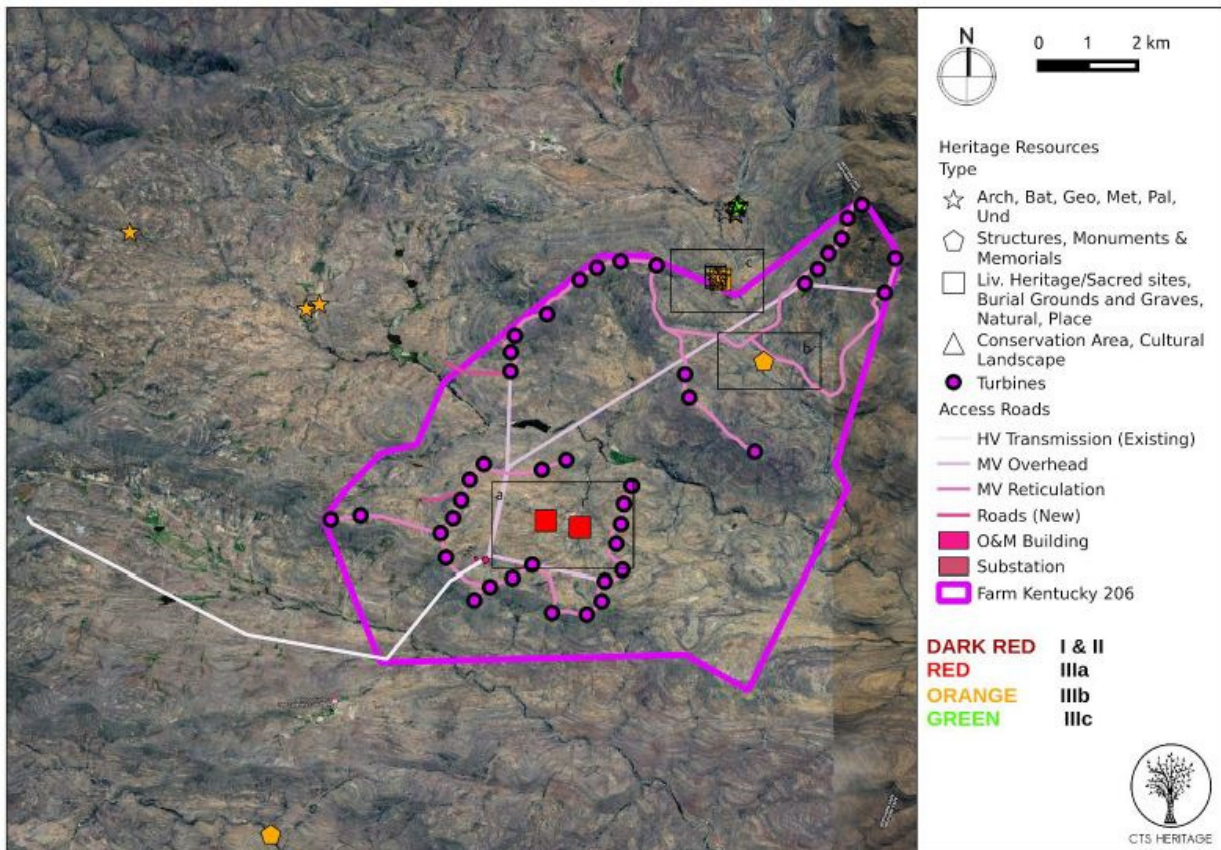


Figure 5.4.1: Google Earth map of the study area showing the turbines (purple dots).



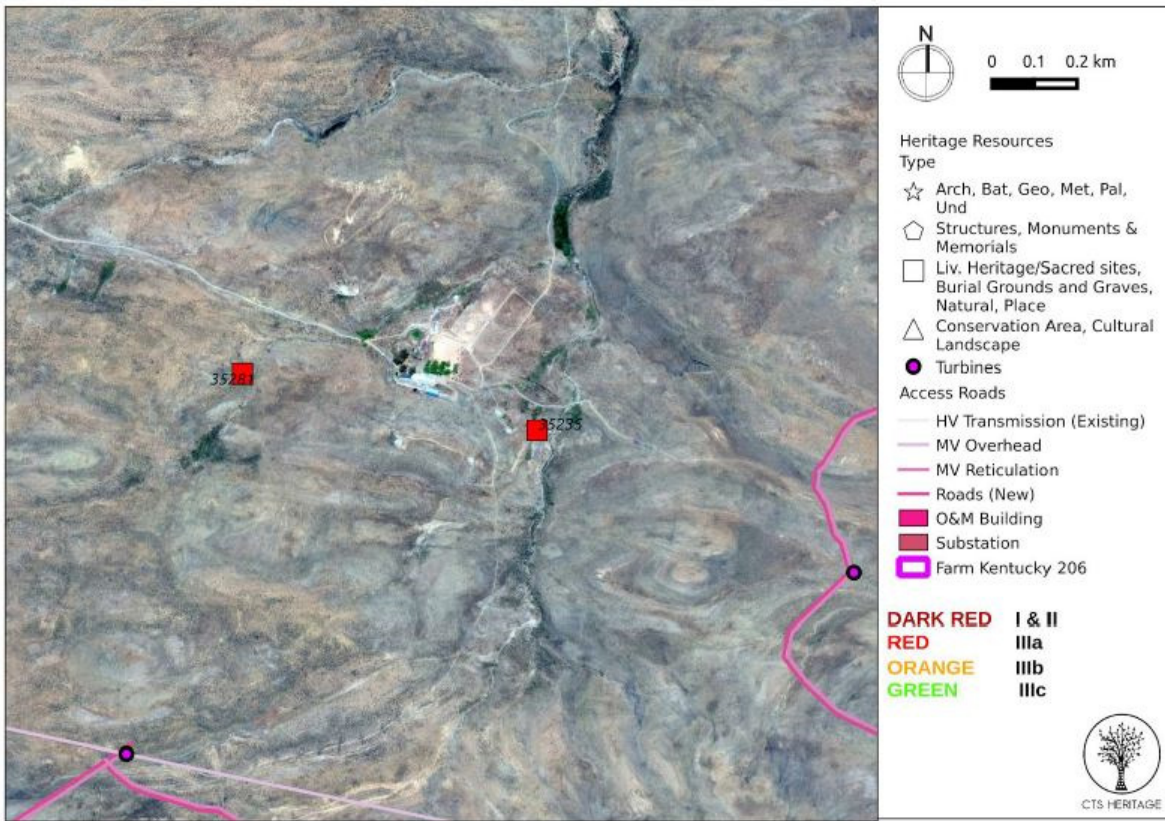


Figure 5.4.1a. Heritage Resources Map

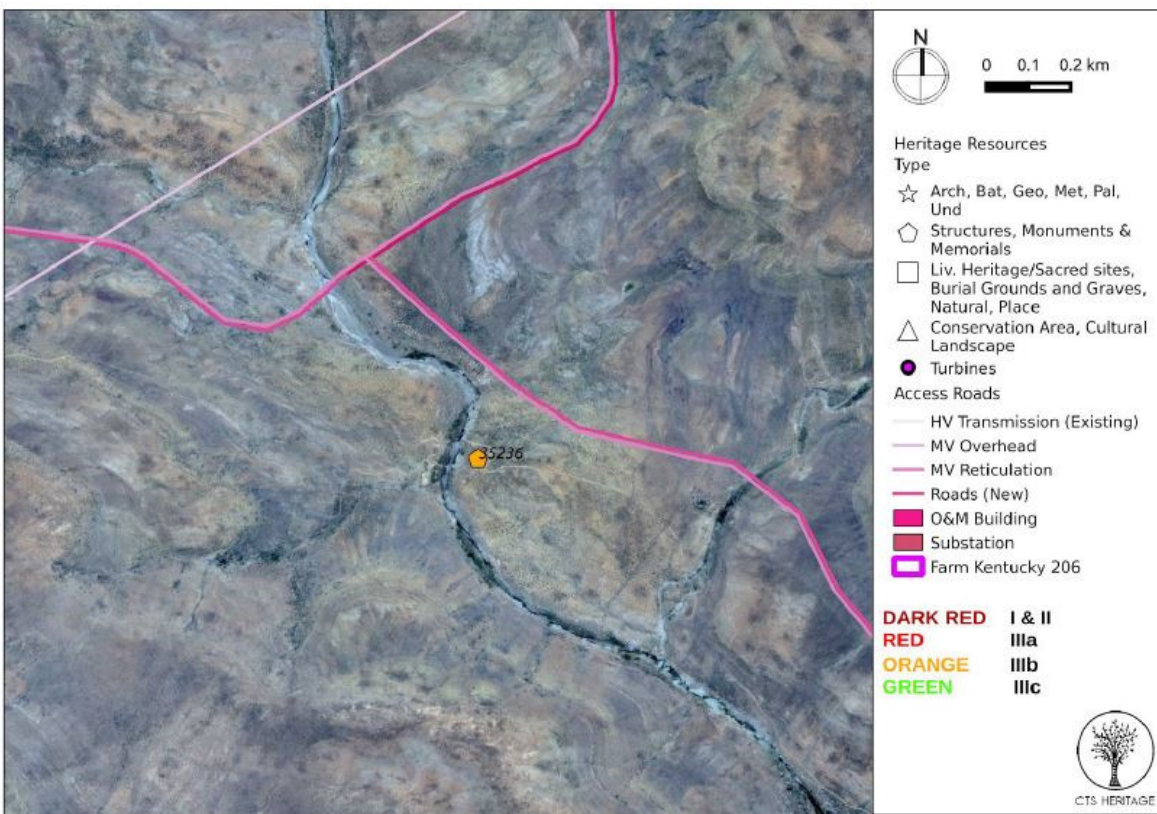


Figure 5.4.1.b. Heritage Resources Map.





**Figure 5.4.1c. Heritage Resources Map.** Inset map - no impact to resources located outside of the Farm Kentucky 206 anticipated.

**5.4.1. Comparative Assessment**

Booth (2012) Recommendation	Comment
<b>35281 and 35235:</b> An alternative access route must be proposed for the construction and development activities for the wind energy facility so as to avoid the destruction and/or negative impact on the graveyards.	No impact will occur based on the proposed amended alignment of the access road.
<b>Kraal:</b> An alternative access route must be proposed for the construction and development activities for the wind energy facility so as to avoid the destruction and/or negative impact on the dry stone walling kraal.	No impact will occur based on the proposed amended alignment of the access road.
<b>35236:</b> An alternative access route must be proposed for the construction and development activities for the wind energy facility as the widening of the roads may impact on the sensitive heritage structures (stonewall ruins).	No impact will occur based on the proposed amended alignment of the access road.
A 10m perimeter boundary fence must be established of the sensitive heritage structures adjacent to the farm gravel road before and during all construction and development activities. If there is no alternative route available for accessibility during the construction and development of the wind energy facility, and access can only occur on the road through the farmstead complex,	A 10m perimeter boundary fence must be established around the sensitive heritage structures adjacent to the farm gravel road before and during all construction and development activities. Please note: this is not a new condition requested by the specialist, but a repetition of the original EA Heritage condition.



Booth (2012) Recommendation	Comment
<p>passing the farmstead complex should be shifted to the east taking heed of the 10m protection perimeter boundary area to avoid the destruction and/or negative impact on the sensitive heritage structures adjacent to the farm gravel road.</p>	

In addition, the below recommendations from Booth (2012) have been endorsed by SAHRA in their Final Comment for this project dated 25 August 2016 and remain applicable for the proposed amendment:

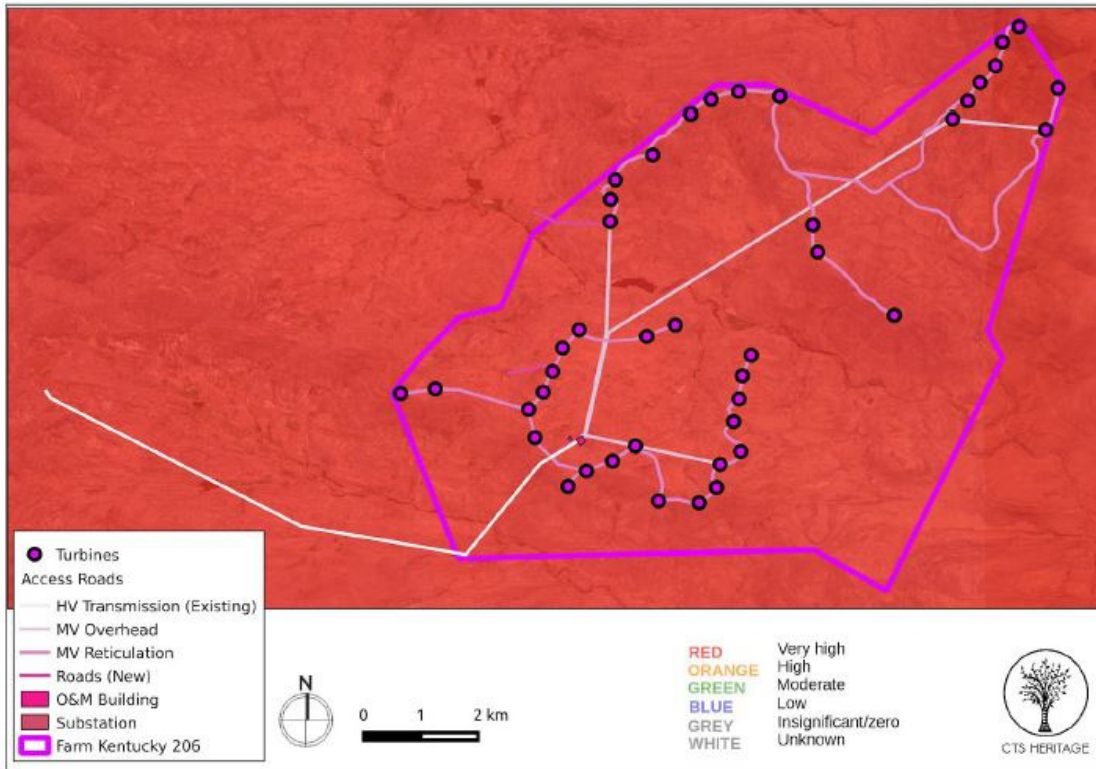
- » A walk-down of the amended layout is required prior to construction. This must be conducted by a qualified archaeologist to ensure that no heritage resources are to be impacted by the new locations of the turbines. If heritage resources are identified at or near any proposed infrastructure, an assessment of the significance of the heritage resources and the impact to the identified heritage resource must be completed. A report detailing the results of the survey must be submitted to SAHRA before construction commences.
- » If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.
- » Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

### Palaeontology

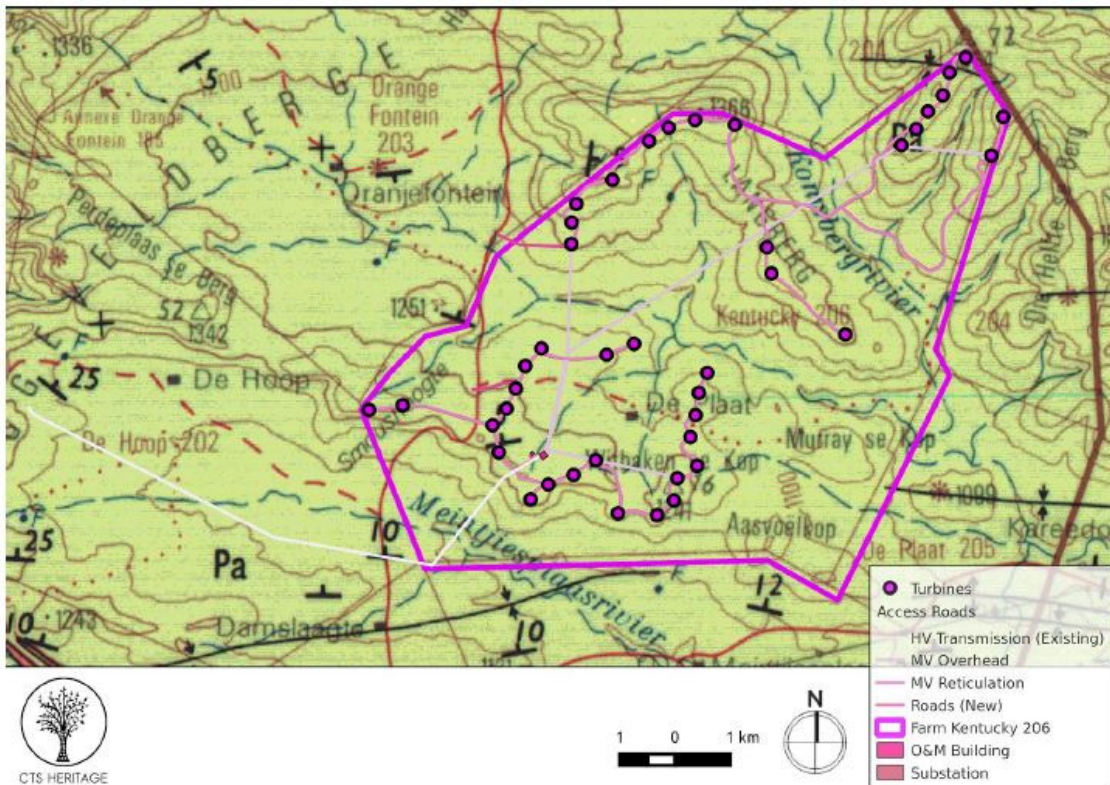
Rossouw (2012) conducted a Desktop Palaeontology Assessment for the area proposed for development (SAHRIS ID 44936). Rossouw (2012) noted that the development area is underlain by sediments of the Karoo Supergroup assigned to the Beaufort group, within the Abrahamskraal Formation of the Adelaide Subgroup (Figure 5.4.2.b), which area of very high palaeontological significance (Figure 5.4.2.a). These identified significances have been mapped in relation to the proposed development amendments (Figures 5.4.2 a and 5.4.2. b). Based on this information, no new impacts are anticipated. The proposed development is located within igneous bedrock (dolerite), and therefore represents no paleontological impact. There are no advantages or disadvantages associated with the proposed change and no additional measures are required to ensure avoidance, management and mitigation of impacts associated with such proposed change.

Rossouw (2012) recommended that a palaeontological field assessment be conducted of the turbine footings, access roads, offices and substation and underground cable routes prior to the commencement of development activities. In addition, Rossouw (2012) recommended that palaeontological monitoring take place during the construction phase of the development. In their Final Comment for this project dated 25 August 2016, SAHRA recommended that a walk-down of the amended layout is required prior to construction. This must be conducted by a qualified palaeontologist to ensure that no heritage resources are to be impacted by the new locations of the turbines. If heritage resources are identified at or near any proposed infrastructure, an assessment of the significance of the heritage resources and the impact to the identified heritage resource must be completed. A report detailing the results of the survey must be submitted to SAHRA before construction commences.

In a subsequent letter from SAHRA dated 21 October 2016, SAHRA confirmed that “There will be no need for further palaeontological field assessment, as the Desktop Study is sufficient. A map of the identified palaeontological resources relative to the layout of the proposed development must be emailed to the case officer and the ECO must monitor all excavations in the Great Karoo WEF.” No such map is yet available and as such, this requirement remains applicable.



**Figure 5.4.2.a. Palaeo-sensitivity Map:** Indicating fossil sensitivity underlying the study area.



**Figure 5.4.2.b. Geology Map.** Extract from the CGS 3220 Sutherland Map indicating that the development area is underlain by sediments of the Karoo Supergroup assigned to the Beaufort group, within the Abrahamskraal Formation of the Adelaide Subgroup.

#### 5.4.2. Conclusion

The proposed changes to the EA and site layout plan will not increase the significance of impacts originally identified in the EIA report or lead to any additional impacts. The proposed amendments will have zero or negligible effect on the significance of impacts identified in the EIA report as long as the recommendations contained in Booth (2012) and Rossouw (2012), and **repeated below** are implemented.

#### Recommendations:

- » A walk-down of the amended layout is required prior to construction. This must be conducted by a qualified archaeologist to ensure that no heritage resources are to be impacted by the new locations of the turbines. If heritage resources are identified at or near any proposed infrastructure, an assessment of the significance of the heritage resources and the impact to the identified heritage resource must be completed. A report detailing the results of the survey must be submitted to SAHRA before construction commences.
- » If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.
- » Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

- » A map of the identified palaeontological resources relative to the layout of the proposed development must be emailed to the case officer and the ECO must monitor all excavations in the Great Karoo WEF.

## 5.5. Visual Impact

A visibility analysis was undertaken from each of the wind turbine positions (52 in total) at an offset of 190m (maximum blade tip height) above ground level as part of the July 2016 EA amendment. The result of this analysis represents the potential total visual exposure of the turbine dimensions (indicated in green) approved within the EA amendment in July 2016. The viewshed analysis was repeated at an offset of 240m to indicate the visual exposure (shown in red) of the increased turbine dimensions, updated positions and reduced number of turbines (42 in total). The results of the visibility analyses are displayed on **Figure 5.5.1**.

It is clear that the approximately 21% increase in turbine dimensions, would have a relatively small influence on the overall visual exposure, due to the already tall turbine structures previously approved and the elevated positions of the turbines on ridges. The surface area (within the study area) of the original turbine exposure is 345km<sup>2</sup>, compared to the 354km<sup>2</sup> of the increased dimensions of the wind turbine exposure. This is an increase of 9km<sup>2</sup>, or alternatively, an increase of less than 3% in potential visual exposure.



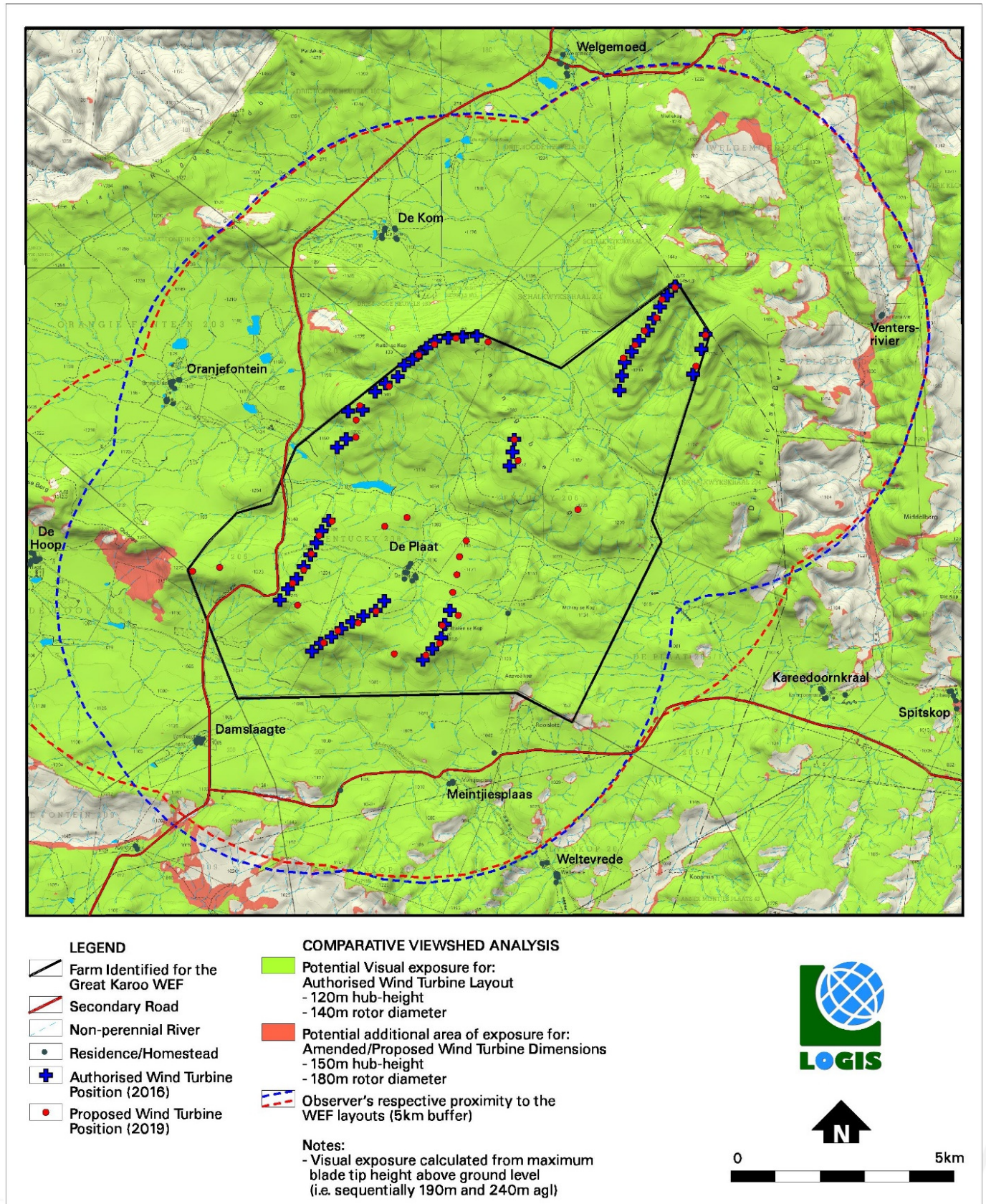


Figure 5.5.1: Comparative Viewshed Analysis – Great Karoo Wind Energy Facility.

There are no additional sensitive visual receptors located within the area of increased visual exposure.

Potential sensitive visual receptors within an approximately 5km radius (identified during the EIA phase) include:

- » De Plaat\*
- » Oranjefontein\*
- » De Hoop\*
- » De Kom\*
- » Welgemoed\*
- » Damslaagte\*
- » Meintjiesplaas\*
- » Weltevrede\*
- » Kareedoomkraal and Spitskop (located at distances exceeding 6.7km)
- » Observers travelling along the secondary roads traversing near or over the proposed development site

Note:

- » The homesteads marked \* are located on the farms earmarked for WEF developments (i.e. Karusa, Soetwater (phases of the Hidden Valley WEF), Rietrug, Maralla and Komsberg West WEFs), assuming their approval of WEF developments.
- » The potential impacts to the above-listed receptors will not change (as a result of the proposed amendments) from that previously assessed and authorised.
- » Where homesteads are derelict or deserted, the visual impact will be non-existent, until such time as it is inhabited again.

The increased area of visual exposure does not include a significant portion of additional exposure to the secondary roads within the study area.

It is expected that the wind turbine structures, both the authorised dimensions and the proposed increased dimensions would be equally visible and noticeable from both the roads and homesteads identified above, therefore signifying a negligible change to the potential visual impact.

It is worth noting that the Great Karoo WEF is located within the Komsberg Wind Renewable Energy Development Zone (REDZ) as determined by the *Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa (2015 – CSIR/DEA)*. The consolidation and concentration of the wind energy facilities within this zone is therefore preferred and the cumulative visual impact is deemed to be of an acceptable level (see to Figure 5.5.2).



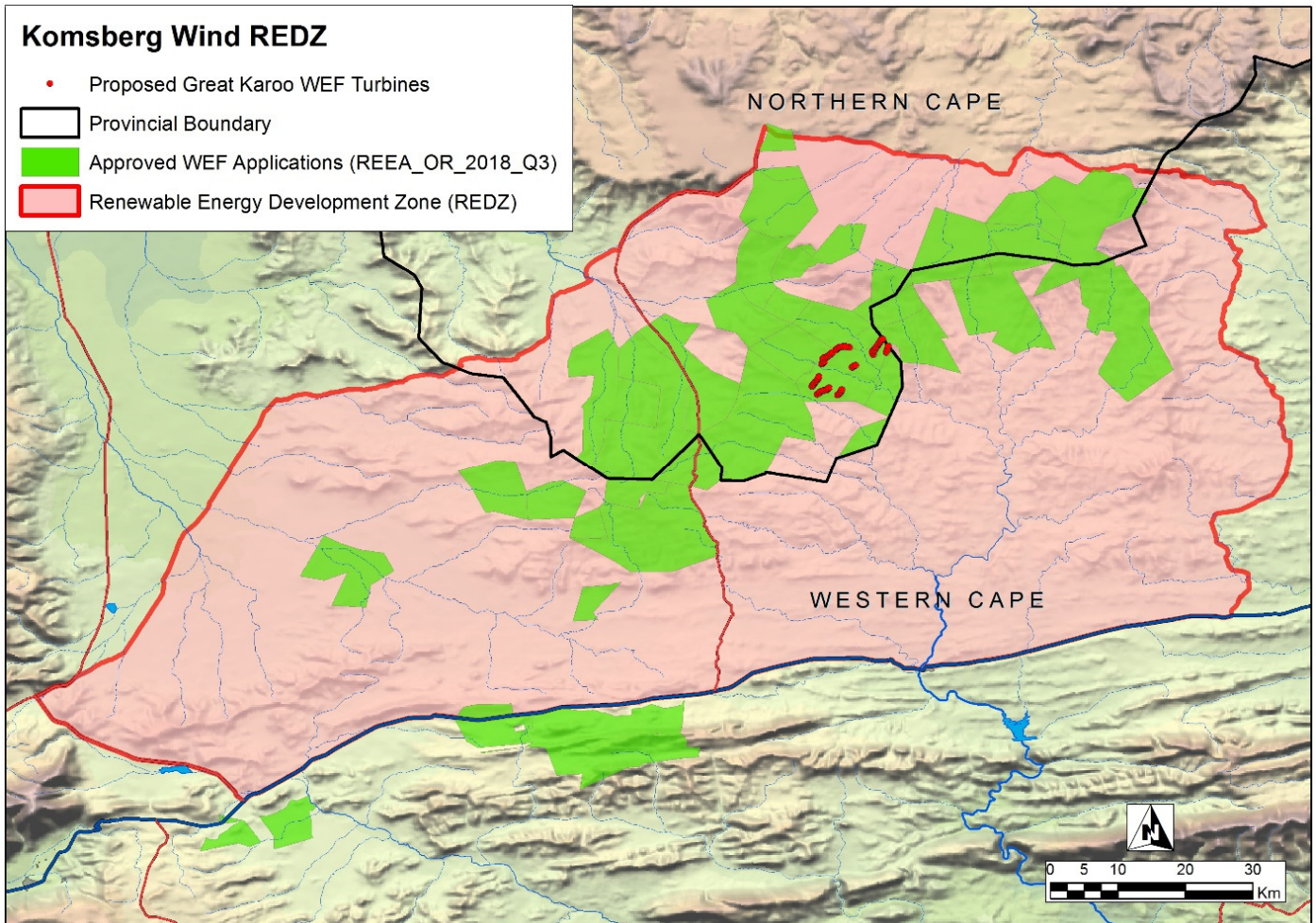


Figure 5.5.2: The location of the Great Karoo WEF in the Komsberg Wind REDZ.

### 5.5.1. Comparative Assessment

In consideration of the proposed amendments, there is no (zero) change to the significance rating compared with the original EIA visual impact assessment report. This is due to the negligible change in visual exposure of the turbines as shown in Figure 5.5.1.

### 5.5.2. Conclusion

The proposed increase in the dimensions of the wind turbine structures is **not expected to significantly alter** the influence of the WEF on areas of higher viewer incidence (observers travelling along secondary roads within the region) or potential sensitive visual receptors (residents of homesteads in close proximity to the WEF).

The proposed increase in dimensions are consequently **not expected to significantly influence** the anticipated visual impact, as stated in the original VIA report (i.e. the visual impact is expected to occur regardless of the amendment). This statement relates specifically to the assessment of the visual impact within a 5km radius of the wind turbine structures (potentially **high** significance), but also generally apply to potentially **moderate to low** visual impacts at distances of up to 20km from the structures.

From a visual perspective, the proposed changes will therefore require no (zero) changes to the significance rating within the original visual impact assessment report that was used to inform the approved EIA. In addition to this, no new mitigation measures are required.

It is suggested that the proposed amendment to the turbine dimensions and layout be supported, subject to the conditions and recommendations as stipulated in the original Environmental Authorisation, and according to the Environmental Management Programme and suggested mitigation measures, as provided in the original Visual Impact Assessment report.

## **5.6. Noise impact**

The noise amendment comment letter (Appendix F) addresses the potential changes in noise impact significance in terms of the proposed amendments by comparison with the original assessment undertaken in 2012. The 2012 assessment indicated that the proposed wind farm will have a noise impact of a low significance on all potential noise-sensitive developments. Ambient sound levels were measured at a number of locations and it was concluded that the operation of the Great Karoo Wind Farm would increase the existing ambient sound levels to a point where the increase would be detectable by NSD07. The projected noise level at NSD07 was 44 dBA, with the closest wind turbine generator (WTG) around 800 m, with the noise level the cumulative effect of nine WTG located within 1 500m from this NSD. The model used the Vestas V90 3.0MW wind turbine with a maximum sound power emission level of 106 dBA.

### **5.6.1. Comparative Assessment**

The updated layout locates the closest WTG 1 090m from NSD07, with eight WTGs located within 1 500m from this NSD. The wind turbines (of the new layout) are on average slightly further from this potential noise sensitive receptor. Considering the location of the wind turbines and the potential noise impact, the change will not increase the significance of the noise impact, subject that a wind turbine with a maximum sound power emission level of 107 dBA is used for the Great Karoo WEF.

### **5.6.2. Conclusion**

Considering the modelled construction and operational noise levels in the EIA phase, it is concluded that the proposed changes to the wind turbines specifications (and minor layout changes) will not lead to any noise impacts other than those originally predicted, neither will it change the significance of the noise impact as defined in the original impact assessment report, and no further mitigation measures be required. The findings and recommendations highlighted in the 2012 report would remain applicable.

Considering the possible **low** significance of the potential noise impact, the proposed amendment of the Great Karoo WEF can be authorised from a noise perspective.



## 6. ADVANTAGES AND DISADVANTAGES OF THE PROPOSED AMENDMENTS

In terms of Regulation 32(1)(a)(ii), this section provides details of the advantages and disadvantages of the proposed amendment.

Advantages of the amendment	Disadvantages of the amendment
<b>General</b>	
<p>The increase in rotor diameter will increase the efficiency of the facility and consequently the economic viability thereof. Increased efficiency of a facility is considered to be beneficial to the environment as this will reduce the need for additional facilities to generate additional electricity.</p> <p>It is also beneficial from a macro-economic perspective as it results in the lower cost per unit of energy (i.e. lower tariff), ultimately benefiting the South African public.</p>	None
<p>The number of wind turbines is proposed to be reduced from the 52 wind turbines originally approved, to the proposed 42 wind turbines. This would result in a reduced footprint and lower impacts on the environment (in terms of impacts on ecology and avifauna) if the amendment is granted. The significance of all identified impacts barring bat impacts (and pending the exact rotor diameter used) would be reduced.</p>	None
<b>Avifauna</b>	
<p>Overall reduction in number of turbines from 52 to 42, which according to Arcus (2019) is 'likely to be a more critical factor in the overall significance of the collision risk of a project'</p>	None
<p>Overall reduction in construction footprint – reducing extent of peripheral degradation of habitat and possibly reducing disturbance caused by construction</p>	None
<p>The impact of bird mortalities from turbine collisions is unlikely to change because any increased risk due to an increased RSA per turbine may be offset by a reduction in the number of turbines built.</p>	Although there are ten less turbines in the proposed amendment compared to the current approved layout, there is an increase in total RSA of approximately 26.7 ha – possibly increasing collision mortality risk
<b>Bats</b>	
<p>No turbines from the amended layout are located in the sensitivity buffers.</p>	The proposed amendment to the turbines at the wind farm would result in a greater per turbine rotor swept area and hence a potentially greater likelihood bats would collide with turbine blades or experience barotrauma. The RSA could increase by 26.7 ha with the proposed amendment. The increased rotor swept area is however offset in part by a reduced number of turbines. The significance of the overall collision impact will not change as a result of the amendments.
<p>The potential increase in the per turbine footprint should have a negligible effect on bats, and may be offset by</p>	None

Advantages of the amendment	Disadvantages of the amendment
the overall conversion of less habitat by using fewer turbines.	
Ecology	
The increase in the footprint of each turbine which would increase the ecological impact, can be offset by the decrease in the number of turbines required.	The increase in turbine size could result in an increase in the footprint of each turbine which would increase the ecological impacts. The change in turbine size is however not likely to result in significant additional impact as any increase from the turbine size would be simultaneously associated with a decrease in turbine number.
Heritage (including Palaeontology)	
The access road has been rerouted so as to avoid the heritage features identified on site (graveyards and stone wall ruins) as per the recommendations made in the original HIA.	None
Visual	
Fewer wind turbines in the landscape.	None
Noise	
Fewer wind turbines (noise sources) in the landscape. Turbines are located further away from NSD07, and fewer turbines are proposed in proximity to NSD07.	None - the change will not increase the significance of the noise impact, subject that a wind turbine with a maximum sound power emission level of 107 dBA is used for the Great Karoo WEF.

Based on the above, it can be concluded that the advantages of the proposed change outweigh the disadvantages from an environmental and technical perspective.

## 7. REQUIREMENTS FOR ADDITIONAL MITIGATION AS A RESULT OF THE PROPOSED AMENDMENTS

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As required in terms of Regulation 32(1)(a)(iii), consideration was given to the requirement for additional measures to ensure avoidance, management and mitigation of impacts associated with the proposed change. From the specialist inputs provided into this amendment motivation, it is concluded that the mitigation measures proposed within the EIA would be sufficient to manage potential impacts within acceptable levels. Updated mitigation measures are however provided by the Avifaunal, Bat and ecological and heritage specialists as follows:

- » The current best practise guidelines for pre-construction monitoring (Jenkins et al., 2015) indicate that additional monitoring may be advisable if there is a significant gap between the original assessment and the commencement of construction, to assess whether there have been any changes in species abundance, movements and/or habitat use in the interim. As the pre-construction monitoring data (EWT, 2014) is now over four years old, we recommend that additional pre-construction monitoring must be conducted. This monitoring can be refined, and focussed on the Great Karoo WEF, and it is not necessary to repeat the full protocol conducted by EWT (2014). The monitoring data collected will update the avifaunal baseline for the site, to allow for meaningful comparison with operational monitoring data, and it must also be used to inform the final micro-siting of the WEF where applicable. The additional pre-construction monitoring can take place after the current amendment decision, but must be done prior to construction, in sufficient time so as to allow the results to inform the micro-siting of the WEF site prior to any construction taking place.
- » The nests sites, N1-N3, must be revisited by an avifaunal specialist during the eagle breeding season (e.g. approximately June-September) to confirm the activity of these sites and the species utilising these sites (if active). Once the above has been completed, the specialist must advise any additional recommendations and/or mitigations, which may result in a need to update the EMPr for the project and/or refine the final layout of the turbines. If any active nest sites of eagles are confirmed, these nests sites must be re-visited and regularly surveyed to determine the breeding success of eagles. Monitoring of any such active eagle nest sites should continue in to the construction phase of the project, and throughout the operational lifespan of the project, in accordance with the applicable guidelines in effect at the time.
- » The impacts on bats can be mitigated by using turbines which maximise the ground clearance as much as possible, and by minimising the tip height (i.e. the distance between the ground and the blade tip at its highest point).
- » There are a variety of high ecological sensitivity areas and features at the site, which are currently outside of the development footprint or which have acceptable levels of impact, but which could be affected by any changes to the road or turbine layout. As such any further changes to the road or turbine positions should be checked by an ecological specialist.
- » Prior to construction, the final development footprint should be subject to an ecological preconstruction walk-through to locate and identify species of conservation concern that are within the development footprint. Some search and rescue of plant species of conservation concern may be required.
- » Prior to construction, a walk-down of the amended layout must be conducted by a qualified archaeologist to ensure that no heritage resources are to be impacted by the new locations of the turbines. If heritage resources are identified at or near any proposed infrastructure, an assessment of the significance of the heritage resources and the impact to the identified heritage resource must be

completed. A report detailing the results of the survey must be submitted to SAHRA before construction commences.

- » If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum (046 622 2312) and/or the South African Heritage Resources Agency (SAHRA) (021 642 4502) so that systematic and professional investigation/ excavation can be undertaken.
- » Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

No other novel mitigation measures are introduced from the other specialists. These additional mitigation measures are recommended based on additional information available regarding interactions of sensitive species with wind farms and additional specialist work having been conducted since the initial EA issuance. **These updated mitigation measures have been updated in the Draft EMPr (Appendix I) and should be included within the approved project EMPr when the updated layout and EMPr are finalised and submitted for final approval to the DEA** (in accordance with Conditions 13, 15 and 20 of the EA).

**To be included in the EA:**

A minimum buffer to blade tip of 100 m for moderate, and 500 m for high sensitivity bat features must be applied.



## 8. PUBLIC PARTICIPATION

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A public participation process is being conducted in support of a Part 2 application for amendment of the Environmental Authorisation for the Great Karoo Wind Energy Facility and associated infrastructure, Northern Cape Province. This public participation includes:

- » Site notices were placed at the site on **17 January 2019** (refer to **Appendix G4**).
- » The draft motivation report being made available for a public review period on [www.savannahsa.com](http://www.savannahsa.com) from **26 April 2019 until 29 May 2019**. A subset of registered I&APs who were inadvertently excluded from the aforementioned notification were subsequently notified on Friday 31 May 2019 and provided with a full 30-day review and comment period from Friday 31 May 2019 to Tuesday 2 July 2019.
- » Written notification to registered I&APs regarding the availability of the amendment motivation report was distributed on **26 April 2019** (refer to **Appendix G2**).
- » Advertisements were placed in the Noordwester newspaper on **26 April 2019** (refer to **Appendix G4**).

Comments received (refer to **Appendix G6**) during the public review period have been included in this final submission to the DEA for consideration in the decision-making process. Comments have been included and responded to in the Comments and Responses Report (**Appendix G5**). Proof of attempts made to obtain comments are included in **Appendix G2** and **Appendix G3**, accordingly.

## 9. CONCLUSION

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Based on the specialist findings, it is concluded that the proposed amendments to the turbine specifications, wind farm layout and Conditions of the EA are not expected to result in an increase to the significance ratings for the identified potential impacts. In some cases (avifauna and bats), the quantitative value has changed in terms of the magnitude of impacts, but this has not resulted in a change to the qualitative category (i.e. Low, Medium, High) of the significance rating after mitigation measures. There is a reduction in significance in some impacts as a result of the reduced number of turbines and the location of these outside of identified high sensitivity areas.

In addition, the amended wind turbine positions considered avoids all identified avifaunal exclusion zones and areas of high sensitivity (refer to Figure 9.1). One turbine, turbine 39, remains in the avifaunal exclusion zone. The avifaunal specialist concluded that this is unlikely to result in a significant increase in the overall collision impact rating of the site and that the location of this turbine is acceptable. It was recommended that fieldwork be done in the eagle breeding season to determine the activity status and species utilising the three nests recorded on site. These results must inform possible additional mitigation measures and the final micro-siting of the layout, which will be submitted to the DEA for approval in terms of the requirements of Condition 13 of the EA dated August 2014. Operational phase bird monitoring programme was also recommended by the avifaunal specialist (in line with the guidelines applicable at the start of the operational phase).

The bats specialist report concluded that the amendments to the turbine dimensions proposed at the Great Karoo Wind Farm would slightly increase mortality impacts to bats, but that the overall impact significance would remain unchanged. Based on bat activity levels as assessed from pre-construction monitoring data, impacts to bats are likely to be of a medium significance before mitigation and low after mitigation. It was recommended that ground clearance be maximised and the tip height (i.e. the distance between the ground and the blade tip at its height point) be minimised as far as possible in the final turbine selection. Cumulative impacts on bats after mitigation would also increase due to the increased number of third-party projects now proposed within 50km of the site. Cumulative impacts are likely to be of a high significance before mitigation and medium after mitigation.

In terms of aspects relating to heritage, visual and noise, the proposed changes to the EA and site layout plan will not increase the significance of impacts originally identified in the EIA report or lead to any additional impacts.

The amendment in itself does not constitute a listed activity. The mitigation measures described in the original EIA document are adequate to manage the expected impacts for the project. **Additional mitigation measures have been recommended by the avifauna and bat specialists and, as a result of this proposed amendment, must be included within the project EMP when the updated layout is finalised and submitted to DEA for final approval.**

Given the above, Great Karoo WEF (Pty) Ltd requests the following amendments to its EA:

1. a reduction in the number of wind turbines from the authorised 52, to **up to 42**;

2. an increase to the rotor diameter for each wind turbine from the authorised distance of up to 140m, to **up to 180m**;
3. an increase in hub height from up to 120m, to a range of **up to 150m**;
4. amendment of turbine capacity from 3,6 MW, to **up to 6,5 MW** per turbine;
5. Update the layout as required; and
6. Extend the validity period by an additional 5 years
7. Amendment of **condition 13.2** of the EA

**from:**

*"A 150m and 100m buffer respectively between watercourses; ridge edge and the turbine/construction activities"*

**To:**

*"Turbine and infrastructure positions as approved by an avifaunal specialist."*

- » Amendment of **condition 49** of the EA

**from:**

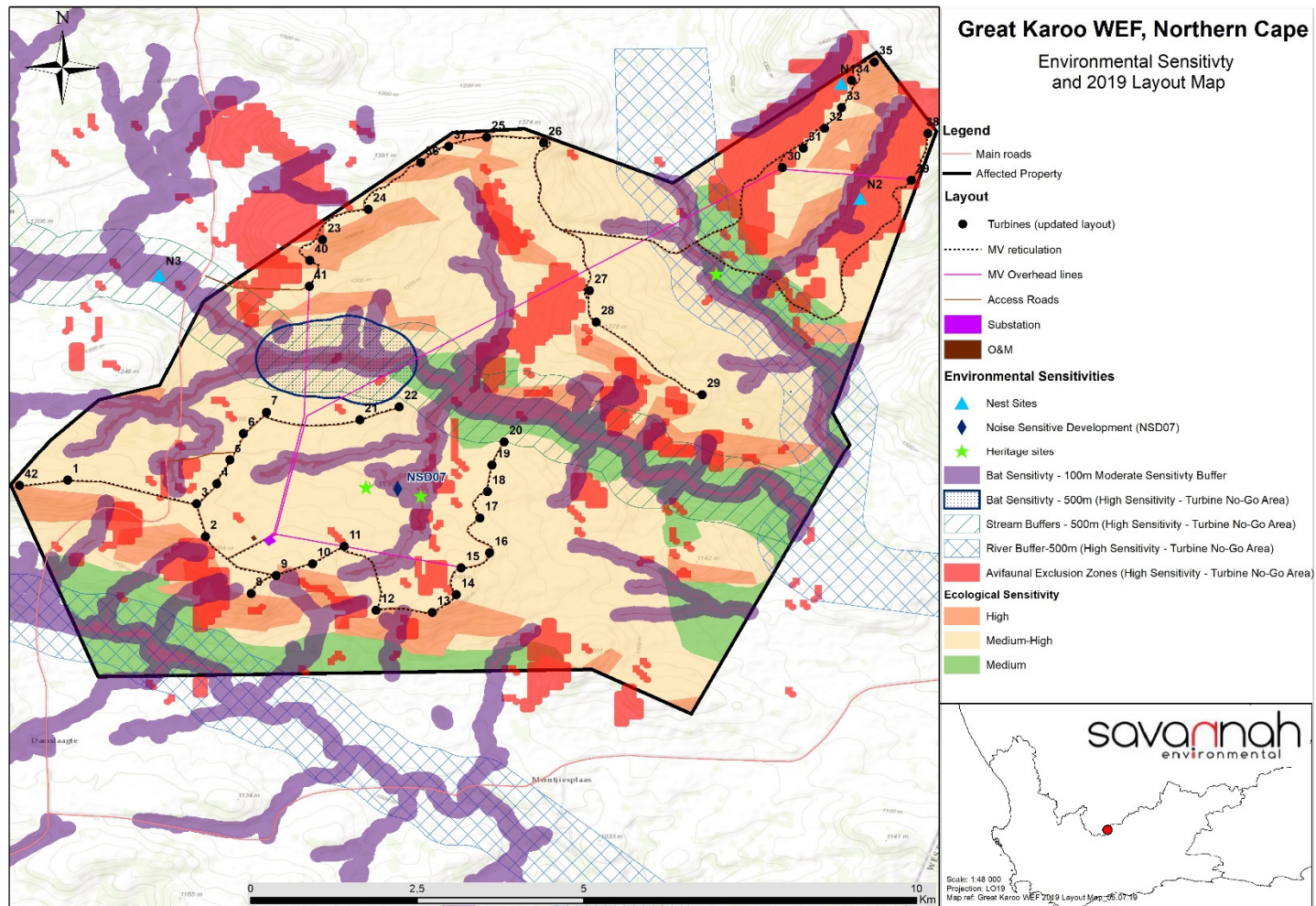
*"A 150m between watercourses and 100m buffer between the ridge edge and the turbine/construction activities must be implemented."*

**To:**

*"The layout must be approved by an avifaunal specialist."*

This requested amendment of the turbine specifications and number will result in an optimisation of the layout assessed within the EIA and the avoidance of sensitive areas. As required in terms of Condition 13 of the EA, the final layout will be submitted to the DEA for review and approval once a turbine supplier has been selected for the project.

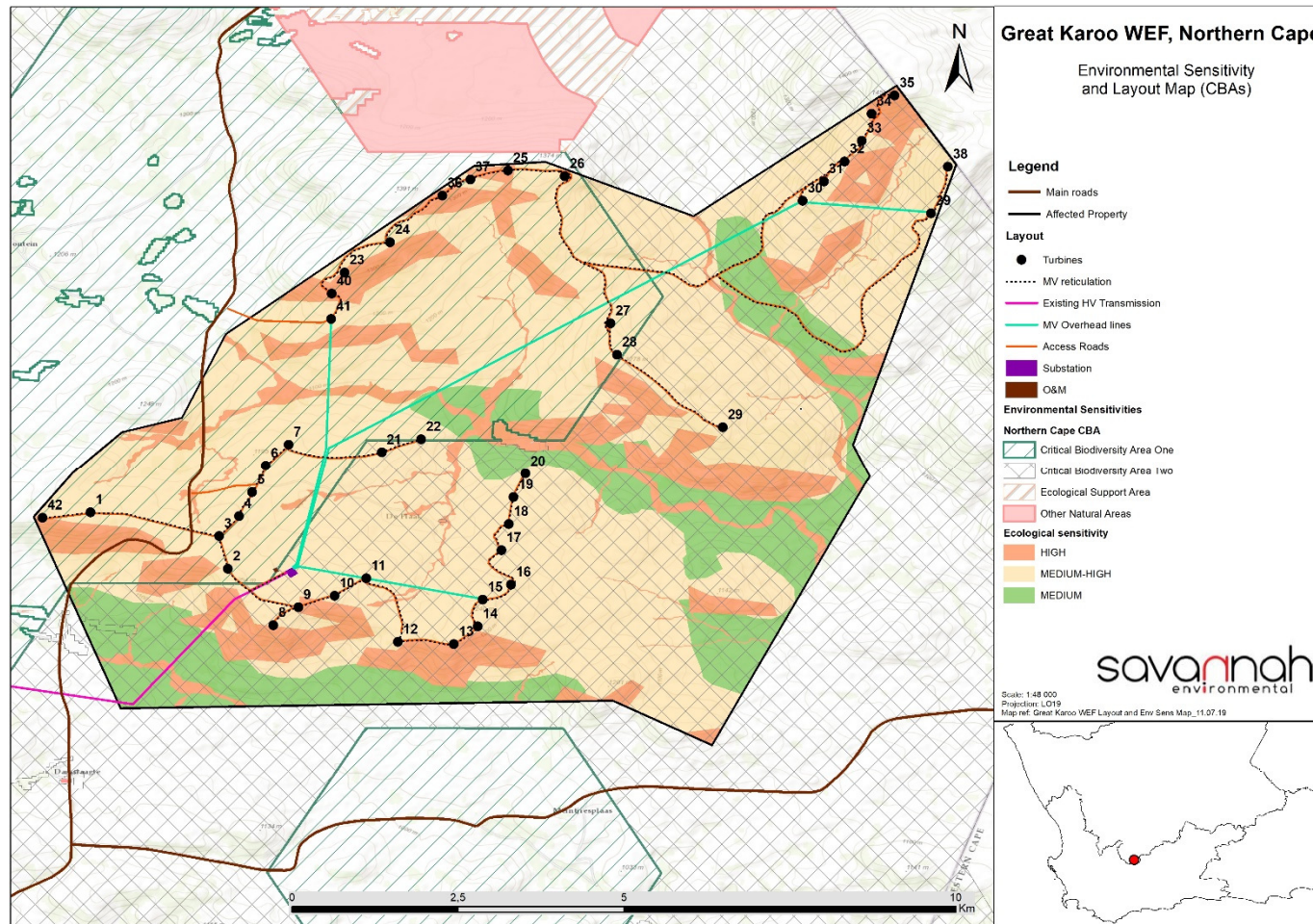
Taking into consideration the conclusions of the studies undertaken for the proposed amendments associated, with the revised turbine specifications and updated layout (as detailed in **Appendix A – F**), **it is concluded that these amendments are considered acceptable from an environmental perspective, provided that the original and additional mitigation measures stipulated herein are implemented.**



**Figure 9.1:** Updated wind farm layout with specialist environmental sensitivities (A3 Map included in **Appendix H**).<sup>5</sup>

<sup>5</sup> The sensitivities presented in Figure 9.1 were identified during the EIA phase of the project. No new sensitivities, apart from the three nests, have been identified as a result of the amendment process.





**Figure 9.2:** Updated wind farm layout<sup>6</sup> with Northern Cape Critical Biodiversity Areas (A3 Map included in **Appendix H**).<sup>7</sup>

<sup>7</sup> During the EIA phase of this project, no CBA information was available for this area. Since then CBA data has become available for this region and the layout presented in Figure 9.2 is shown in relation to the CBAs of the Northern Cape.

