EA Amendment Assessment Report for the preconstruction bat sensitivity study

- For the Suurplaat and Gemini Wind Energy Facilities

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Appointment of Specialist (Animalia Zoological & Ecological Consultation)

Specialist Company:	Animalia Zoological & Ecological Consultation
Project overseen and reviewed by:	Werner Marias & Monika Moir
Appointed by:	Savannah Environmental (Pty) Ltd
For:	EA Amendment Assessment Report for the Suurplaat and Gemini WEFs, taking cognizance of the findings of the preconstruction bat monitoring study

Independence:

Animalia Zoological & Ecological Consultation CC has no connection with the developer. Animalia Zoological & Ecological Consultation CC is not a subsidiary, legally or financially of the developer; remuneration for services by the developer in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal and the consultancy has no interest in secondary or downstream developments as a result of the authorization of this project.

Applicable Legislation:

Legislation dealing with biodiversity applies to bats and includes the following:

NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 OF 2004; especially sections 2, 56 & 97)

The act calls for the management and conservation of all biological diversity within South Africa. Bats constitute an important component of South African biodiversity and therefore all species receive attention additional to those listed as Threatened or Protected**.**

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1. TERMS OF REFERENCE

- To assess all impacts related to the proposed amendments
- Consider the advantages and disadvantages associated with the proposed amendments
- Describe any additional measures required to ensure management and mitigation of impacts associated with such proposed amendments

2. ASSUMPTIONS AND LIMITATIONS

The satellite imagery partly used to develop the sensitivity map, that was used in the amendment assessment, may be slightly imprecise due to land changes occurring since the imagery was taken.

The 12-month pre-construction bat monitoring study, used to inform this report, has not yet been fully completed.

There is no scientifically accredited study that can lend insight into the exact impacts the proposed amendments will have on the site specific species and specific turbine dimensions and layout. Thus the impact assessment is based on best judgement and experience of the Specialist.

3. PROJECT OVERVIEW

The Suurplaat and Gemini Wind Farms are located approximately 38km to 50km south east from the town of Sutherland in the Northern Cape Province of South Africa. The turbine layouts straddle the border between the Western Cape and Northern Cape Provinces. The wind farms have Environmental Authorization for steel tower turbines with a rotor diameter up to 90m and a hub height of 80m. This report will assess the impacts on bat sensitivity for the proposed amendments of a steel or concrete tower maximum hub height of 120m and an increased rotor diameter of up to a maximum 132m.

The proposed amendments to the Environmental Authorization are outlined in the table below (information provided by Savannah Environmental (Pty) Ltd).

Table 1: Proposed amendments to the Suurplaat and Gemini Wind Farms

Authorized Specifications	Proposed Amended Specifications
1.8 – 3MW turbines	1.8 – 4 MW turbines
Steel tower	Steel or concrete tower
Rotor diameter of up to 90m	Rotor diameter of up to 132m
80m hub height	120m hub height

The 12-month preconstruction bat monitoring study, being conducted by Animalia Zoological and Ecological Consultation, is currently in progress and will be finalised by October 2016. The bat sensitivity map provided on completion of the study is to be used to inform the final turbine layout. The recommendations and mitigations outlined in the final report of the pre-construction bat monitoring study supersede this report; and must be used to inform the construction and operation of the wind farms above this report.

Figure 1 below displays the general Suurplaat and Gemini WEF site location. **Figures 2 and 3** below display the current Suurplaat and Gemini WEF turbine layouts respectively.

4. BAT SENSITIVITY MAP

Figures 4 and 5 display the current bat sensitivity map with the current turbine layouts. The sensitivity map displays the bat sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are confirmed and most probable to occur on site. The sensitivity map was generated during the course of the preconstruction bat monitoring study and may be subjected to further review. The map is to be used by the developer as a pre-construction mitigation in terms of improving turbine placement with regards to bat preferred habitats on site. There is infringement of the current turbine layouts on bat sensitive habitat, this can be solved by micro siting the specific turbines.

Table 2: Description of sensitivity categories utilized in the sensitivity map

Sensitivity	Description
Moderate Sensitivity	Areas of foraging habitat or roosting sites considered to have significant roles for bat ecology, with an expected relative higher risk of impacting on local bats. Turbines within or close to these areas must acquire priority (not excluding all other turbines) during pre/post-construction studies and for the application of mitigation measures.
High Sensitivity and their buffers	Areas that are deemed critical for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity than the rest of the site. These areas are 'no-go' areas and turbines must not be placed in these areas.

Figure 1: General location of the Suurplaat and Gemini WEFs within South Africa

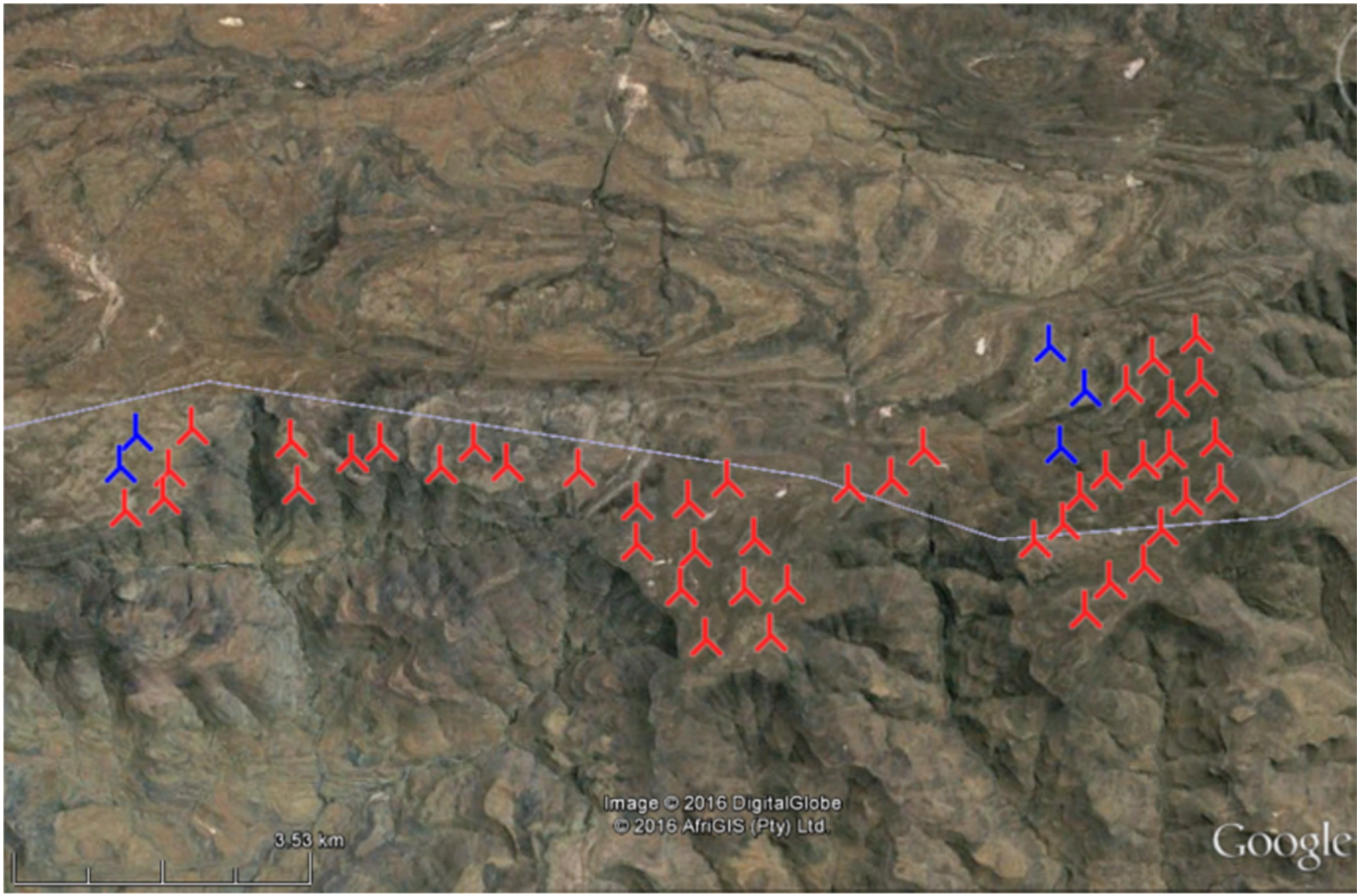

Figure 2: Turbine layout of the Suurplaat WEF

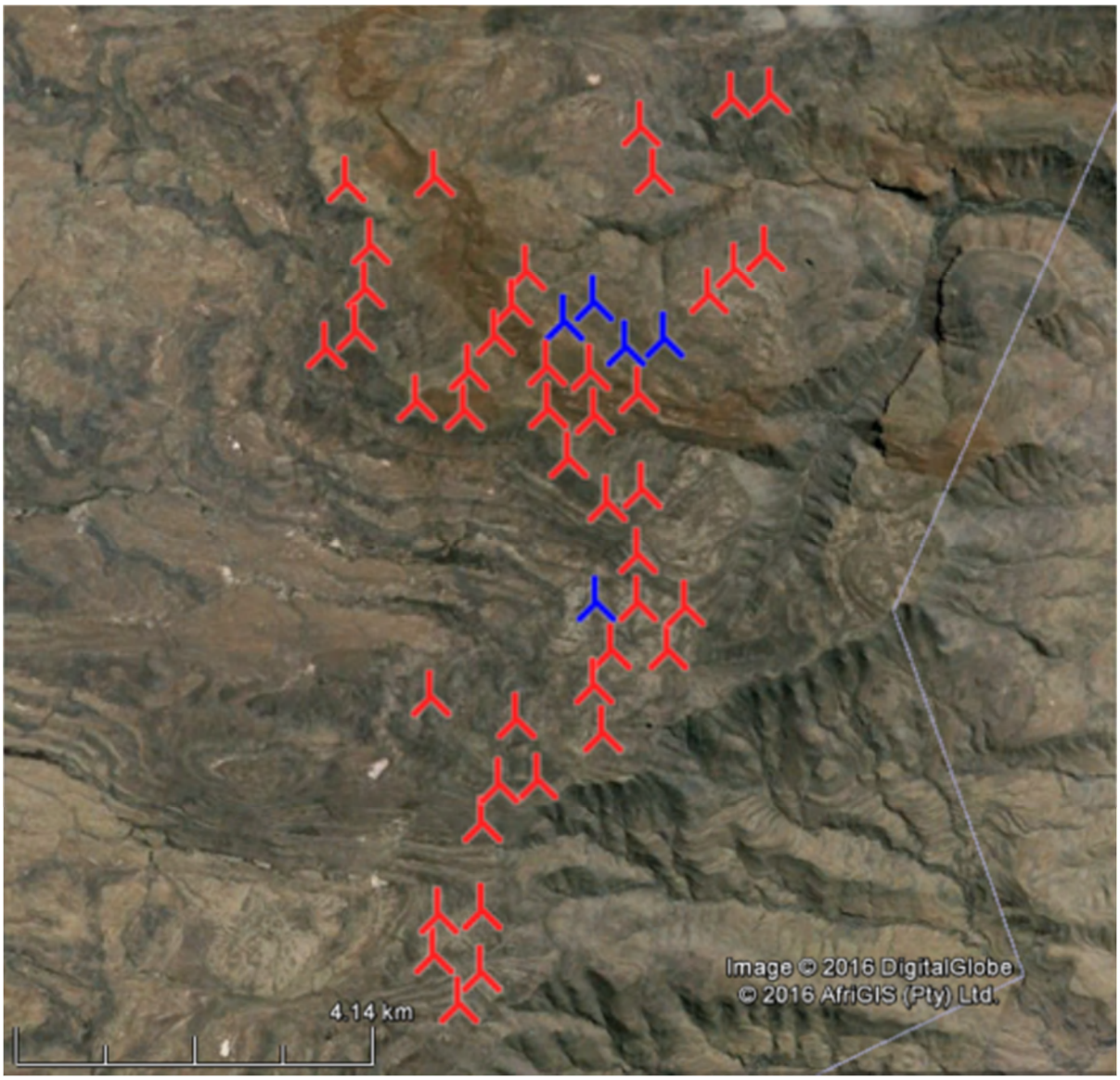

Figure 3: Turbine layout of the Gemini WEF

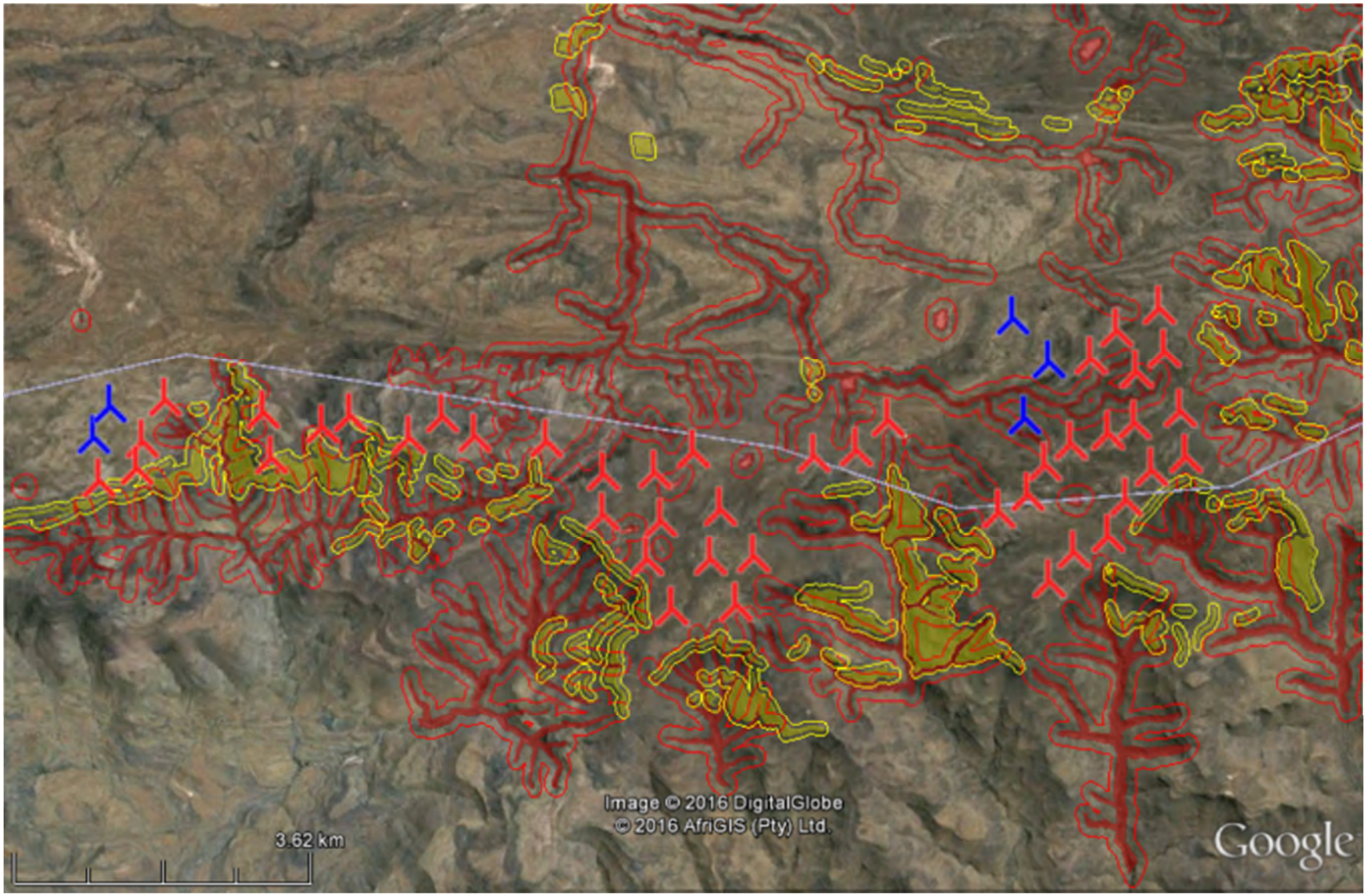

Figure 4: Bat sensitivity map with the Suurplaat WEF turbine layout overlaid (high sensitivity – red; moderate sensitivity – yellow)

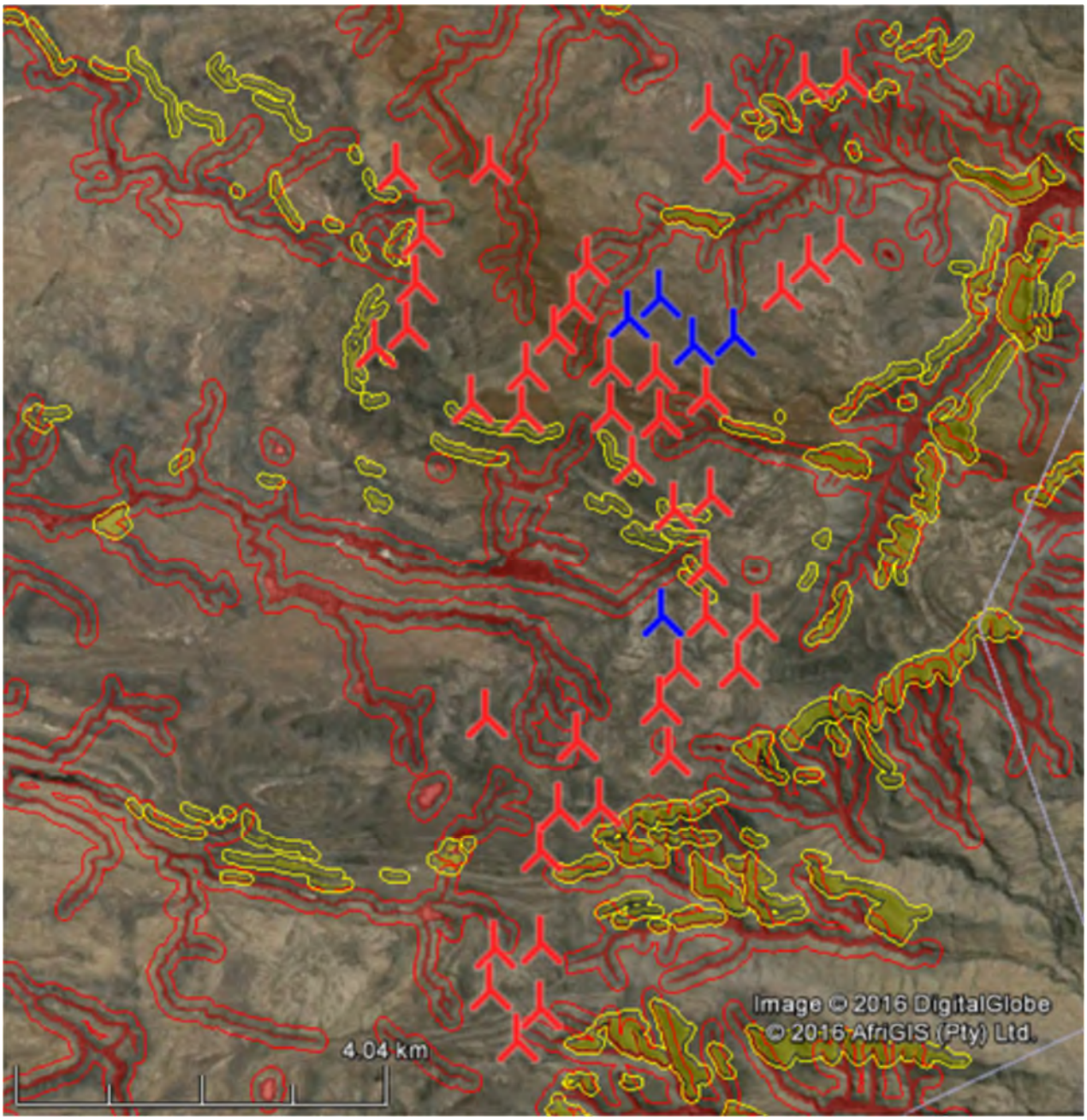

Figure 5: Bat sensitivity map with the Gemini WEF turbine layout overlaid (high sensitivity – red; moderate sensitivity – yellow)

5. IMPACT ASSESSMENT

The impact assessment tables below display the assessments for both the authorised specifications and proposed amendments.

Nature of impact: Bat mortalities due to direct blade impact or barotrauma during foraging (not migration).				
	Authorized		**Proposed amendment**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Medium (2)	Low-medium (2)	Medium - high (4)	Low-medium (2)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)	Moderate (7)	Low (5)
Probability	Probable (3)	Improbable (2)	Probable (3)	Probable (3)
Significance	36 (Medium)	20 (Low)	45 (Medium)	33 (Medium)
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes		Yes	
Mitigation: Adhere to the sensitivity map by micro siting all turbines out of sensitive areas. Adhere to specific mitigation measures outlined in the final report of the full 12-month pre-construction bat monitoring study (when completed).				

Nature: Bat mortalities due to direct blade impact or barotrauma during migration Migratory routes in the region are completely unknown. Migratory bats are known to travel at higher altitudes than during normal foraging behaviours. Thus the greater height of the increased proposed turbine size has a larger negative impact.				
	Authorized		**Proposed amendment**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Medium (3)	Medium (3)	High (5)	Medium - high (4)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)	High (8)	Low (5)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	39 (Medium)	33 (Medium)	51 (Medium)	42 (Medium)
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Low	Low	Low
Irreplaceable loss of resources?	Yes	No	Yes	No
Can impacts be mitigated?	Yes		Yes	
Mitigation: Adhere to specific mitigation measures outlined in the final report of the full 12-month pre-construction bat monitoring study (when completed). Apply a thorough and well-designed operational phase bat monitoring study. Monitor passive data and mortalities over the operational phase to determine if new migrations occur on site or not. If migrations occur affected turbines must be curtailed accordingly to avoid impact to migrating bats.				

6. PROPOSED MITIGATION MEASURES AND DETAILS

The correct placement of wind farms and of individual turbines can significantly lessen the impacts on bat fauna in an area, and has been considered as the preferred option for mitigation. The layout must be respective of the bat sensitive habitat and thus the mitigation of turbine placement must be adhered to.

Nevertheless, certain turbines may experience high bat activity only during certain times of the year and when a combination of certain climatic conditions occur simultaneously - in these cases, if such turbines are found during the post construction (operational) monitoring study, it will be recommended that mitigation be applied during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing.

If found to be necessary during operational monitoring, mitigation options that may be utilized include curtailment, blade feathering, blade lock, acoustic deterrents or light lures. The following terminology applies:

Curtailment:

Curtailment is defined as the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades.

Cut-in speed:

The cut-in speed is the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial RPMs below cut-in speed when no electricity is being produced.

Feathering or Feathered:

Adjusting the angle of the rotor blade parallel to the wind, or turning the whole unit out of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times.

Free-wheeling:

Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be “locked” and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel.

Increasing cut-in speed:

The turbine’s computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer’s set speed,

and turbines are programmed to stay locked or feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back “into the wind” and begin to spin normally and producing power.

Blade locking or feathering that render blades motionless below the manufacturers cut in speed, and not allow free rotation without the gearbox engaged, is more desirable for the conservation of bats than allowing free rotation below the manufacturers cut in speed.

Acoustic deterrent:

Acoustic deterrents are a developing technology that has not yet proved successful on a large scale application, and will therefore need investigation closer to time of wind farm operation.

Light lures:

Light lures refer to the concept where strong lights are placed on the periphery (or only a few sides) of the wind farm or problem areas to lure insects and therefore bats away from the turbines. The long term effects on bat populations and local ecology of this method is unknown.

Habitat modification, with the aim of augmenting bat habitat around the wind farm in an effort to lure bats away from turbines, is not recommended. Such a method can be adversely intrusive on other fauna and flora and the ecology of the areas being modified. Additionally, it is unknown whether such a method may actually increase the bat numbers of the broader area, causing them to move into the wind farm site due to resource pressure.

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favorable to bats.

A basic "4 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation:

1. No curtailment (free-wheeling is unhindered below manufacturers cut in speed so all momentum is retained, thus normal operation).
2. 90 Degree feathering of blades below manufacturers cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.
3. 90 Degree feathering of blades below mitigation cut in conditions.
4. 90 Degree feathering of blades at mitigation cut in conditions as determined by the results of the operational phase bat monitoring study.
5. 90 Degree feathering throughout the entire night.

The final report of the 12-month preconstruction bat monitoring study will inform whether mitigation is necessary and the schedule thereof.

7. CONCLUSION

The current proposed turbine layout and bat sensitivity map are displayed in **Section 4** of this report. There is infringement of the current turbine layouts on bat sensitive habitat, this can be solved by micro siting the specific turbines.

A change to turbine specifications can increase the risk of impact on bats due to the fact that an increased turbine size increases the airspace in which bat mortality may occur. The proposed increased hub height from 80m to 120m, and the proposed increased rotor diameter from 90m to 132m; increases the highest tip of the blade height above the ground from 125m to 186m and the original lowest tip height above the ground from 35m to 54m. This results in a much larger airspace that the blades occupy at a higher altitude.

Thus the amended turbine size will have an increased impact on high flying bat species, such as *Tadarida aegyptiaca*, but a slightly decreased impact on low flying species that are active near vegetation clutter, such as *Neoromicia capensis*. The increased risk of mortality due to larger turbine specifications are reflected in the impact assessment ratings of **Section 5**. The impacts are more significant during the operational phase of the facilities; only the applicable impacts that are altered by the amendment have been presented in this report. On completion of the study, see the final report of the 12-month preconstruction bat monitoring study for the full impact assessment.

Signed off by:

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