Umsinde Wind Energy Facility: Bat Impact Assessment Report Amendment

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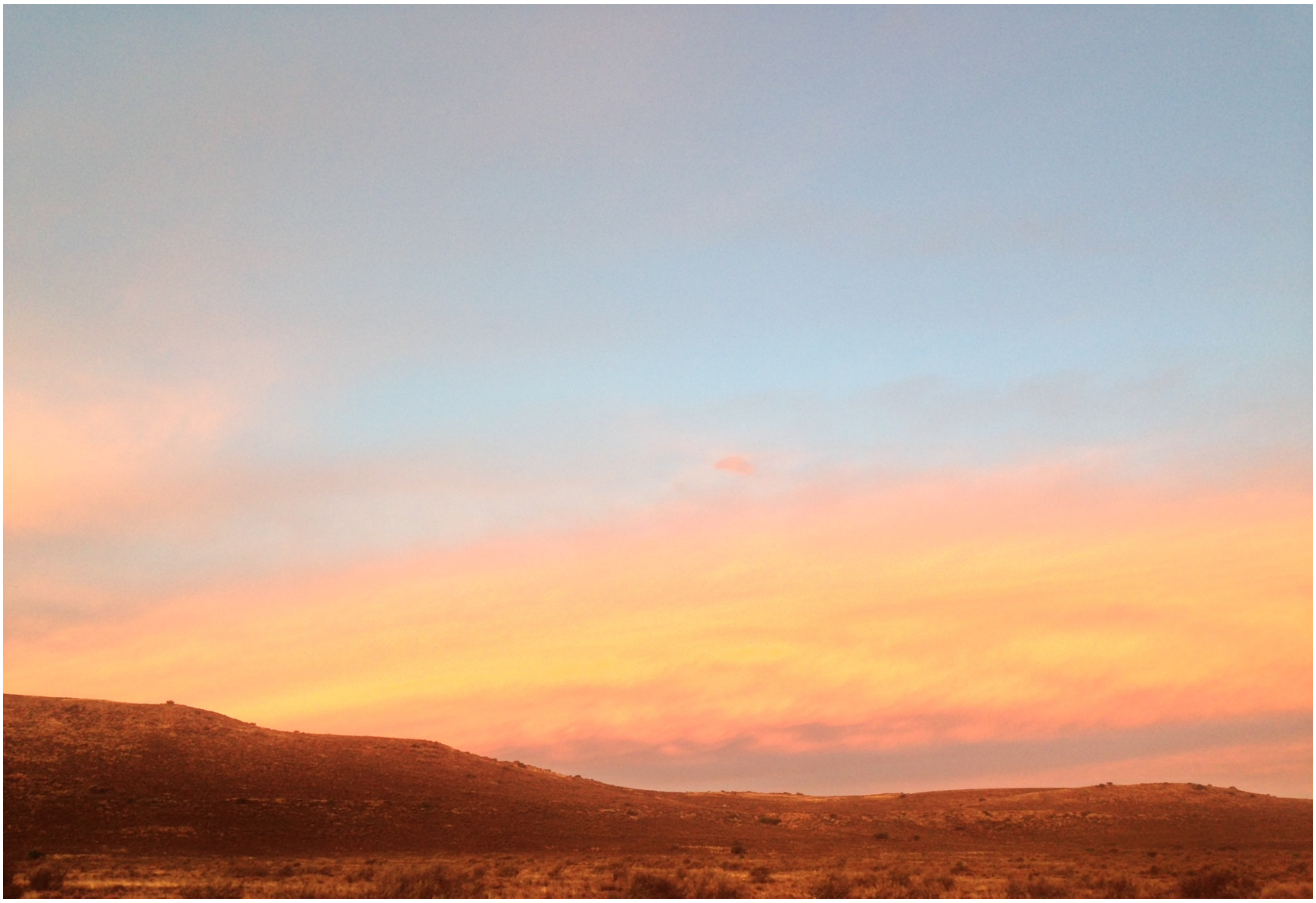

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1. Introduction and Scope of Work

1.1 Introduction and Brief Project Description

Windlab Developments South Africa Pty Ltd (Windlab) intend on developing a wind energy facility (WEF), consisting of two phases near the town of Murraysburg, known as the Umsinde Emonyeni WEF (Umsinde). Twelve months of Preconstruction Bat Monitoring according to the 2nd and 3rd edition of the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg 2012/2014) was conducted in 2013/2014 by the bat division Natural Scientific Services CC, now Inkululeko Wildlife Services (Pty) Ltd. This monitoring study involved ultrasonic acoustic monitoring at 17 static monitoring sites between mid-July 2013 to mid-July 2014.

Arcus Consultancy Services (Arcus) are the environmental assessment practitioners for the Umsinde project. In November 2015, IWS compiled a Bat Impact Assessment Report for the Umsinde project (IWS, 2015). However, since then, the turbine layout and dimensions have changed within the same site boundary area.

The new turbine layout will have a total of 70 turbines - 35 turbines per phase, each with a hub height of up to 135 m and a rotor diameter of up to 150 m (approx. 75 m blade length). The grid connection route does not change.

Arcus have appointed IWS to submit an amendment to the Bat Impact Assessment Report. The scope of work is outlined below and this current amendment report must be read in conjunction with NSS (2014) and IWS (2015).

1.2 Scope of Work/ Terms of Reference

The scope of work for **bats** includes the following:

- Assess the new layout / project description against baseline environment and the assessment that was conducted previously.
- Update the impact assessment as applicable, should there be no change in the assessment, this should be stated clearly.

IWS was not required to rewrite our report, but to provide an addendum to the report, including the following:

- New project description
- Confirmation that the study and the assessment complies with relevant legislation and guidelines;
- Findings of the site visit
- Updated impact assessment, should any of the assessment rating change and an explanation of the change in rating, this must include the cumulative assessment of the proposed development as well
- Additional buffers and no-go areas, if applicable

- Confirmation of no- areas, and buffers
- Clear indication of what infrastructure is permitted / not permitted in buffer areas (for example, a road may be acceptable to pass through a bat buffer area)
- In indication of which turbines must be moved or which if they are acceptable to keep, and must be micro-sited
- A reasoned opinion as to whether the proposed project should be authorized
- Any conditions, that should be included in the environmental authorization

2. Amendment Assessment Approach

Seeing that the original pre-construction monitoring was conducted between mid-July 2013 to mid-July 2014, it is more than three years since the monitoring was completed. Therefore, according to Sowler *et al*. (2017), should an environmental application or an amendment application only be submitted more than three years or less than six years after the completion of the 12-month fieldwork period, a bat specialist, preferably the one who did the original study, must provide an official statement in a letter on whether the original preconstruction bat monitoring study is still valid or not. The specialist must determine whether there is a need to conduct a desktop survey and/or a short field assessment in order to provide such a statement.

From 5 to 7 December 2017, IWS conducted a field trip to assess the new turbine layout (of both Phase 1 and 2) for Umsinde. To do this, IWS:

- Set up three Wildlife Acoustic SongMeter3 (SM3) bat detectors across the phases to record bat activity over two nights (5 and 6 December 2017). The detectors and microphones were set up on three existing meteorological masts (details in **Table 1** below) at a height of 10 m (**Figure 1**).
- Assessed the general habitat and determined whether any significant environmental or climatic changes have occurred since the previous monitoring period and/or if any alterations to significant bat habitats had occurred in particular.
- Assessed the vegetation, topography and potential bat sensitivity of the area near and around the site of each proposed turbine. Many of the proposed turbine locations were difficult to access via existing road networks and given the limited time, IWS made the best attempt to get as close to each proposed location as possible and note the habitat, photograph it and assess the potential impacts for bats at each location. The tracks driven during the ground-truthing exercise are displayed in **Appendix 1** and the findings for some bat important features are presented in **Appendix 2**.

Table 1. Umsinde bat detector details

Mast No.	Mast Coordinates	Data recorded	Photo
UMS17	S 31.847313° E 24.068925°	231 MB	
UMS10	S 31.869315° E 24.009989°	237 MB	

UMS18	S 31.788868° E 23.925542°	254 MB	

Figure 1. SM3 bat detector unit and microphone installed on a met mast at a height of 10 m above the ground.

3. Bat Activity and Sensitivity

3.1 Bat Activity

By averaging the bat passes per date in the month of December 2013 and for the two nights in December 2017, we roughly compared bat activity levels at monitoring stations relatively close to each other. The results are displayed in **Figure 2**. The results are not very definitive –three different stations with three different results. At TB10, the results were similar in 2013 and 2017; at TB17 activity levels were higher in 2013 and at TB18 activity levels were higher in 2017. This could be because only two nights of December 2017 are being compared to a full month in December 2013. It could be because of the severe drought in 2017 and changes in the distribution of bats throughout the site.

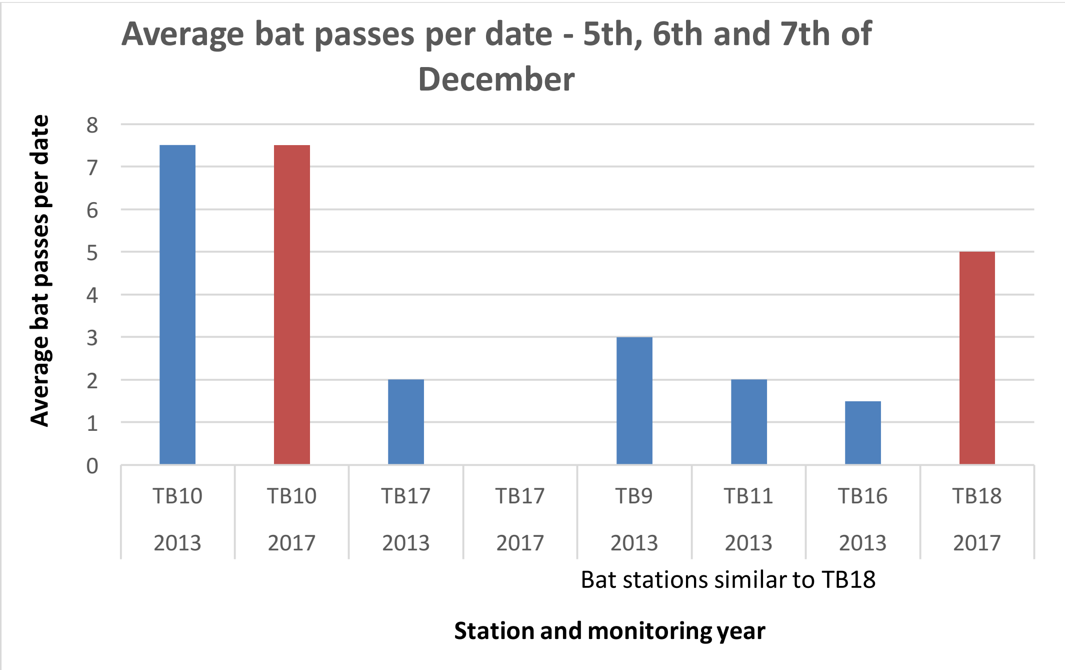

Figure 2 **Average Bat Activity Level Comparisons between 2013 and 2017**

During the December 2017 site visit, IWS conducted a ground-truthing exercise across most of the newly proposed turbine positions. Based on IWS's extensive experience since 2013 at 9 operational WEFs in SA and based on the ground-truthing exercise, IWS revised the bat sensitivity map for Umsinde (**Figure 3**, **Figure 4**, **Figure 5**).

Table 2 Bat Sensitivity Map Classifications

Sensitivity Class	Description
Low to Medium	The Low-Medium Sensitivity Areas were: • The remaining areas above the 1440m, after the identified higher sensitivity classes were delineated. • All areas otherwise not designated with a higher sensitivity Most of these areas are higher lying plateau areas. The reason this is area is classified as Low to Medium, as opposed to just Low is that no one can be certain that the risk of bat fatality is low. Experience from the USA shows that whilst high activity does normally equate to high fatality, low activity does not necessarily equate to low fatality (*pers comm*. Cris Hein, 28 August 2014). Additionally, IWS is monitoring at 9 operational WEFs and all have had bat fatalities to a greater or lesser extent. IWS believes that the bats occurring in the lower valley areas for most of the year and in the harsher weather conditions will move and forage along the higher lying plateaus in optimal low wind speed and warm conditions.
Medium	The Medium Sensitivity Areas were: • All potential bat roosts with a 500 m buffer, • Ephemeral streams and dams ground-truthed in December 2017 as Medium, • Rocky gullies ground-truthed in December 2017 as Medium, plus a 50 m buffer, and • All areas otherwise not designated with a higher sensitivity below the 1440m contour.
Medium to High	The Medium - High Sensitivity Areas were made up as follows: • The Upper Karoo Hardeveld vegetation type.
High	The High Sensitivity Areas were made up as follows: • All FEPA wetlands & rivers with a 500 m buffer. • Confirmed bat roosts with a 1 km buffer, and • Ephemeral streams and dams ground-truthed in December 2017 as High,

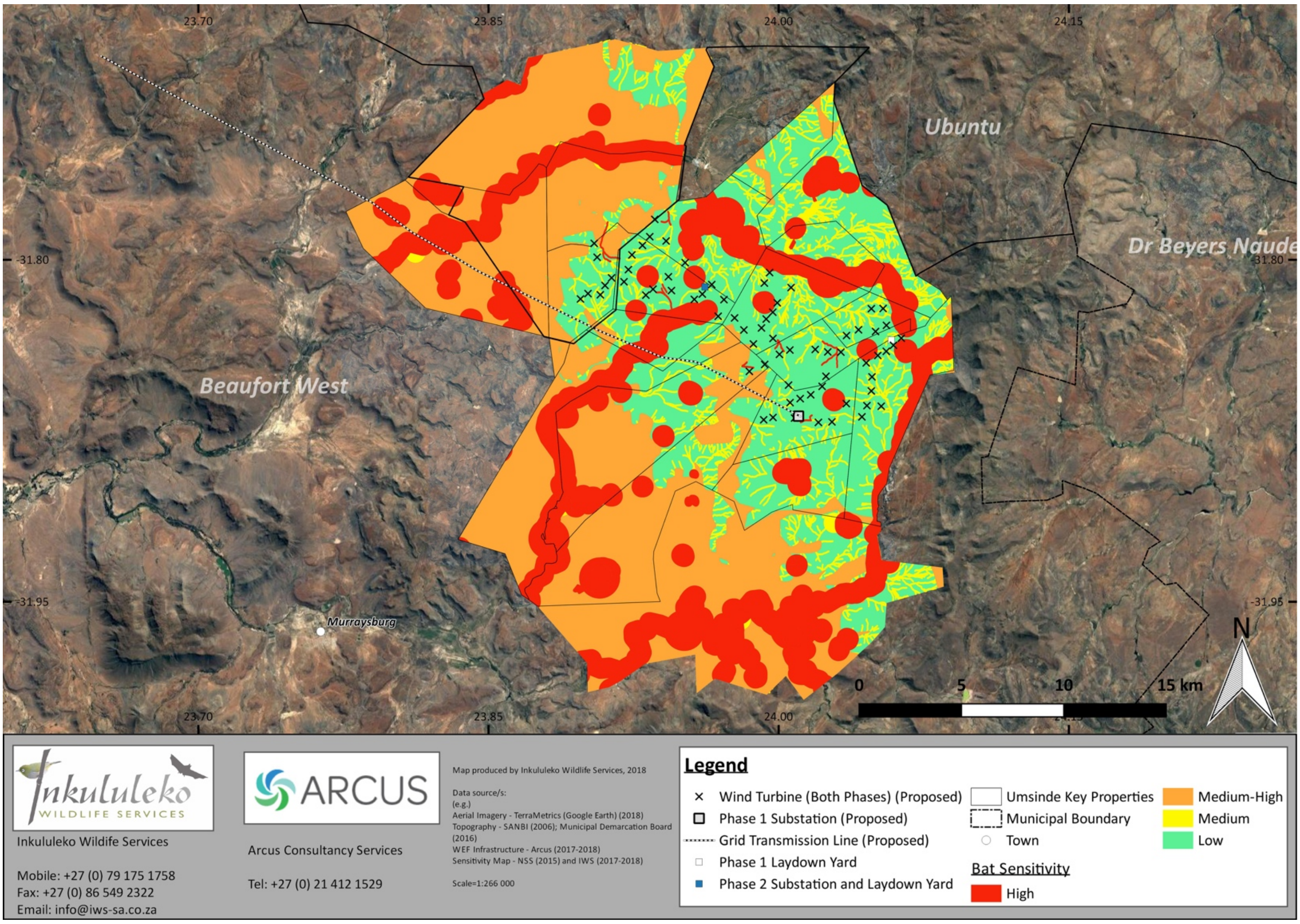

Figure 3 **Umsinde 2017 Bat Sensitivity Map – Whole Site**

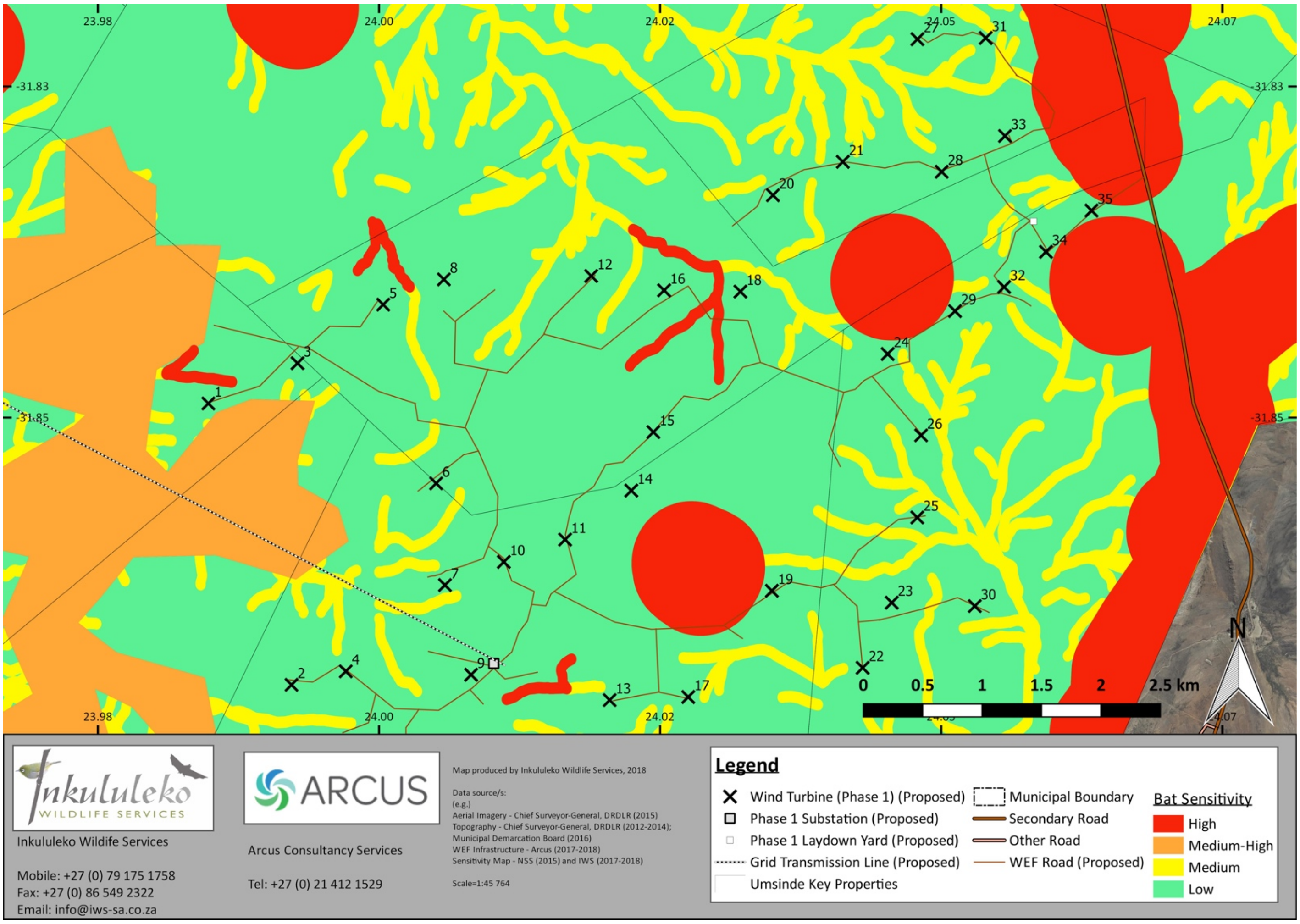

Figure 4 **Umsinde 2017 Bat Sensitivity Map – Phase 1 Zoomed In**

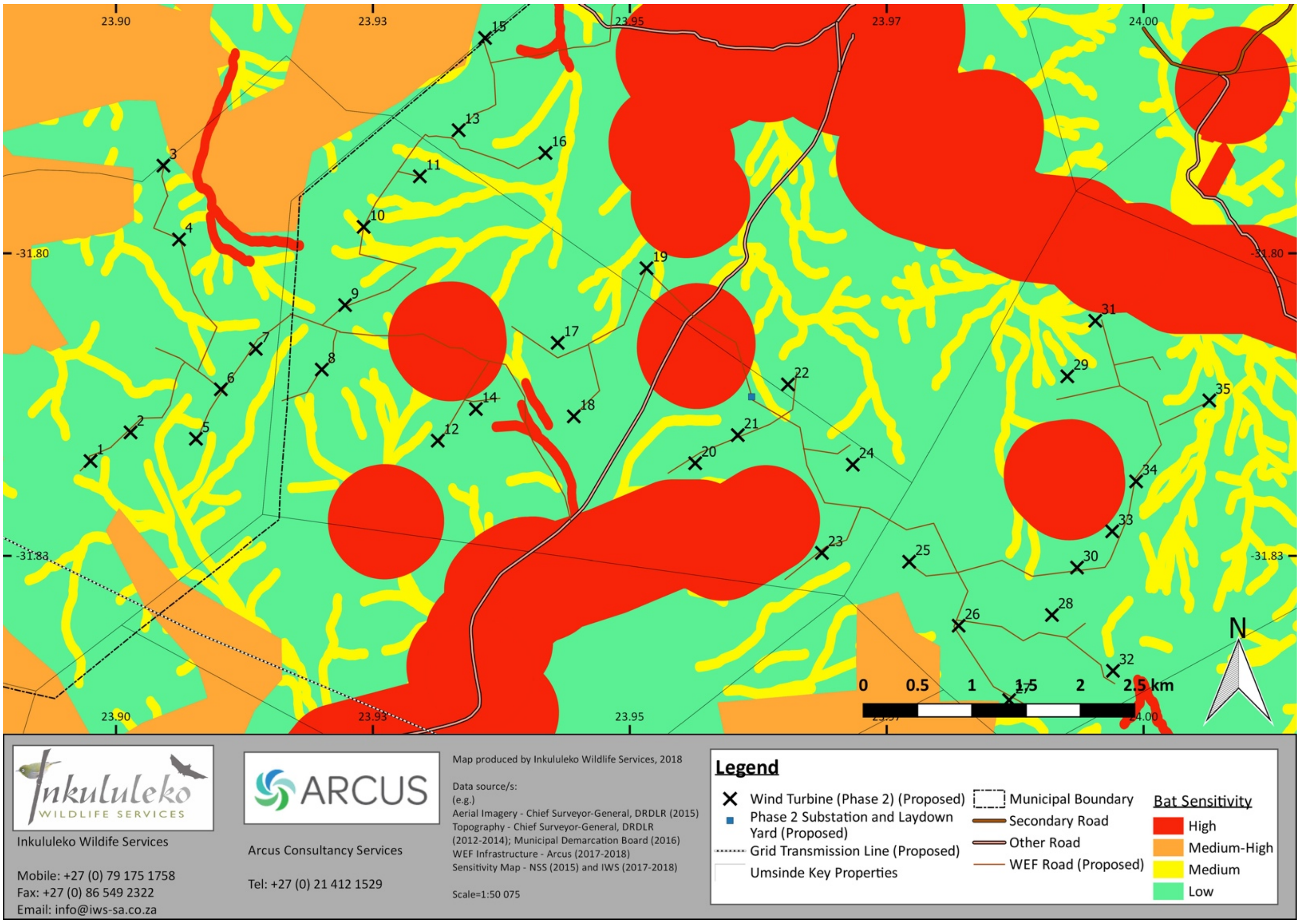

Figure 5 **Umsinde 2017 Bat Sensitivity Map – Phase 2 Zoomed In**

It must be noted that the site is currently in an area experiencing a drought and there was substantially less surface water than when IWS was last at the site. Additionally, one farmer mentioned that this was the driest he had seen the area since 1991/1992. From a bat perspective, this means that many areas in the drought may appear less sensitive considering the lack of water and the fact that surface water provides important foraging and drinking points for bats. IWS took this into account and assessed possible sensitivity based on presence of water during normal climatic conditions.

Based on the revised sensitivity map, no turbines are within or are <75 m from a High or Medium-High bat sensitive area. This should remain that no part of the turbine, including the full rotor sweep should encroach into the High or Medium-High bat sensitive areas.

Furthermore, whilst certain turbines have their base in a specific bat sensitive area, the blades encroach (based on a 75 m blade length) on a higher level of sensitivity. The turbines shown in **Table 3** are such turbines, however, the turbines are not required to be moved but rather the mitigation measures applicable to Medium sensitive areas should be applied.

Table 3. Turbines in each phase which are within 75 m (rotor blade length) of a Medium bat sensitive areas according to the 2017 sensitivity map

Phase 1	• T31 is 49 m from a Medium bat sensitive area
Phase 2	• T10 is in a Medium bat sensitive area • T31 is 64 m from a Medium bat sensitive area

4. Amended Bat Impact Assessment and Mitigation Measures

This section of the report relates to Section 4 of IWS (2015). Only impacts and mitigation measures that have been amended since IWS (2015) are raised here, otherwise all other impacts and mitigation measures from IWS (2015) remain as IWS's assessment and recommendations now.

4.1.1 Roost disturbance and/or destruction due to wind turbine, O&M building, sub-station and road construction

Six confirmed and 14 potential bat roosts were located at Umsinde Emoyeni WEF by NSS (2014). The roost types that were identified included house roofs and tree roosts, rock overhangs in the gorges and small caves/ overhangs in the rocky outcrops. There seemed also to be a *Miniopterus natalensis* roost very close to mast TB 13, under a large inaccessible overhang in a deep gorge in the north west of the site. Other species of bat could also be roosting in the gorge.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidenc*
Without mitigation	Regional 2	High 3	Short-term 1	**Medium** 6	Probable	**MEDIUM**	**– ve**	High
Essential mitigation measures: · Turbine placement, sub-station and O&M buildings should only be built in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. · Roads to only be built 500m from any confirmed roosts. · Clearing of natural and agricultural areas be kept to a minimum. · Blasting activities not to occur within 2km of any known bat roosts. · Dust suppression measures to be used during the full construction phase. · Any new roosts discovered, should be reported and incorporated into the adaptive management plan. **Best practise mitigation measures:** · Roost searches to continue during construction and operational phases.								
With mitigation	Local 1	Medium 2	Short-term 1	**Very Low** **4**	Possible	**INSIGNIFICANT**	**– ve**	High

4.1.3 Disturbance to and displacement from foraging habitat due to wind turbine, O&M building sub-station and road construction

Construction will involve vegetation clearance at the footprint of each turbine, hard stand area, along the road network, at the office and sub-station buildings. This causes disturbance to bat foraging habitat.

General dust and noise will increase in the area which may cause more sensitive species to disperse either temporarily or permanently.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Medium 2	Medium-term 2	**Medium 6**	Definite	**MEDIUM**	**– ve**	High
Essential mitigation measures: · Turbine bases, hard stand, office, sub-station and lay-down areas should only be in areas of Low-Medium and Medium bat sensitivity. · With the exception of compulsory civil aviation lighting, minimise artificial lighting at night, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. · Roads may cross areas of bat foraging habitat, but: o Clearing of natural and agricultural areas be kept to a minimum. o Dust control measures should in commissioned.								
With mitigation	Local 1	Medium 2	Medium-term 2	**Low 5**	Definite	**LOW**	**– ve**	High

4.2.2. Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.

Bat deaths by collision with or due to barotrauma caused by wind turbines have been reported worldwide (Kunz *et al*., 2007; Arnett *et al*., 2008; Baerwald *et al*., 2008; Rydell *et al*., 2010; Baerwald and Barclay, 2011; Hull and Cawthen, 2013; Voigt *et al*., 2012; Lehnert *et al*., 2014), including for South Africa (SA) (Doty and Martin, 2012; MacEwan, 2016). There is not a single WEF in SA, where operational monitoring is being conducted, that has not had any bat fatalities (Perrold and MacEwan, 2017).

There are various hypotheses as to why certain species of bats are killed by wind turbines, but one common hypothesis that is emerging worldwide, is that bats that move and feed in less cluttered and more open-air space environments, are more vulnerable to collisions with wind turbines than those moving and feeding in more cluttered environments (Arnett, 2017).

Arnett and Baerwald (2013) did a comparison of bat fatality data from 123 studies at 72 operational WEFs from all over the United States of America (USA) and Canada for the period 2000 to 2011. The results varied substantially based on geographic locality and habitat type with the lowest mean fatalities being 1.39 bats/MW/year in Great Basin/Southwest Open Range-Desert to 8.03 bats/MW/year in Northeastern Deciduous Forest (with one study site yielding an outlying result of 41.17 bats/MW/year in the Southeastern Mixed Forest).

Perrold and MacEwan (2017) did a comparison of bat fatality data from across 10 Year 1 studies at 10 operational WEFs from the Eastern, Northern and Western Cape Provinces of South Africa (SA). The results varied based on geographic locality and habitat type with the lowest mean fatalities at a site in the Drakensberg Montane Grasslands, Woodlands and Forests ecoregion being 0.91 bats/MW/year to 7.38 bats/MW/year at a site in the Nama Karoo ecoregion (with one study site yielding an outlying results of 16.8 bats/MW/year in the Lowland Fynbos ecoregion).

The majority of the Umsinde Phase 1 and 2 turbine layout occur within the Nama Karoo ecoregion, hence, based on Perrold and MacEwan (2017) the risk of fatality is potentially high. However, if purely based on the average hourly bat activity levels in 2013 at Umsinde (NSS, 2014), the risk of fatality is low-medium according to Table 5 of Sowler *et al.* (2017).

Additionally, migrating bats in the USA and Europe have been shown to be at risk of fatality due to wind turbines. Whilst the migrating bats in South Africa are different species and are not tree-roosting species, the long distances that they travel and the height at which they fly also puts them at risk of fatality. SA migrating bats are cave-dwellers and also fly very long-distances (>100km). *Miniopterus natalensis* that has been confirmed at Umsinde and most likely roosts within the study boundary area is one of these migrating species. These impacts could have far reaching consequences, not only locally, but regionally too. Isotope studies in Europe have revealed that wind farms may kill bats from populations more than 1,000km away (Voigt et al. 2012). Fatality of bats from potentially large geographic areas could have a devastating, long-term impact on species.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	National 3	High 3	Long-term 3	**Very High** 9	Probable	**VERY HIGH**	**– ve**	High

Essential mitigation measures:

- Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the full rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.
- With the exception of compulsory civil aviation lighting, minimise artificial lighting at night, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination.
- No turbines to be placed within 200 m of the O&M buildings or sub-stations.
- Turbine engineers work with bat specialists to build in the necessary turbine adaptions needed for erecting bat detectors or deterrent devices on the turbines in the design phase, so there are no unexpected surprises or concerns after the turbines are built.
- For areas of Low-Medium and Medium Sensitivity
  - With the exception of when temperatures are below 12°C:
  - An initial cut-in speed of 5.25 m/s (approximately 50% of bat activity occurs below this wind speed) is recommended as follows:
    - Not in winter, i.e. the months of June, July and August.
    - 20h00 to 04h00 in Summer
    - 18h30 to 04h30 in Autumn
    - 19h00 to 04h00 in Spring
- Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible.
- The SABAA Threshold document (MacEwan *et al.* 2017 or later versions) should be used in the adaptive management decision making process.
- Construction phase monitoring on at least one met mast in each phase commences as soon as Phase 1 construction of any sort starts. Any additional mitigation measures that arise from the monitoring and from lessons learned from Phase 1 operational monitoring, get implemented in Phase 2.

Best practise mitigation measures: • All live and fatality monitoring data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations. • During operational monitoring, quarterly progress reports and annual monitoring reports to be submitted to SABAAP, EWT and the DEA. • Monthly carcass searching reports to be submitted to the SABAAP. • As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.								
With mitigation	Regional 2	Low 1	Long-term 3	Medium 6	**Possible**	**LOW**	**– ve**	**High**

4.1 Cumulative Impacts

Whilst it is very important to consider the local impacts that may be caused by individual developments; it is equally important to consider the cumulative impacts of the facility considering other similar developments nearby. **Figure 6** shows all EIA applications for renewable energy projects approved or under review by the DEA as at the third quarter of 2017 within 30km and 100km of the proposed Umsinde WEF (DEA, 2017b). Within 30km (the approximate nightly foraging distances of many bat species), there is another large WEF that has been approved immediately to the north-west. Within 100km (comfortably the distances some bat species move seasonally), there are at least another four WEFs that have been approved or are pending approval and several other renewable energy projects that are unspecified for now.

Whilst the DEA may request that a 30km radius is used for the assessment of cumulative impacts, this is not based on ecological processes and certainly does not take into account the larger seasonal distances that bats move. Hence, IWS uses 100km as a minimum distance for assessing the cumulative impact on bats.

Based on IWS's experience at nine operational WEFs in the Eastern Cape already, several bat species (of the same kind as found at Umsinde) are being killed by wind turbines. For example, *Tadarida aegyptiaca*, and *Neoromicia capensis* in the thousands each already and *Miniopterus natalensis* in the tens to hundreds already. SABAAP have developed a "living" and revisable (as new information comes available) Fatality Threshold Guideline (MacEwan *et al* 2017) that will guide specialists and developers on dangerous levels of fatality that would likely lead to population declines. IWS and SABAAP do not condone the killing of any bats, however, multiple fatalities of any species needs to be taken seriously and should warrant mitigation.

The greater the area of wind turbine development, the greater the impact will be on the high-risk species. IWS predicts some additive cumulative impact effect with each separate WEF being added to the region. Bat fatalities are concentrated to relatively fewer species than birds (in SA, only seven of the over 60 bat species to date have been found as fatalities at WEFs). Therefore, cumulated fatalities can potentially have significant impacts on their populations. (Barclay *et al*. 2017).

Population data are not likely to be available for most bat species in the near future and thus wind operators should practise the precautionary principle and avoid high-risk areas and implement operational minimisation measures at sites where bat fatalities are known or are predicted (Arnett & Baerwald 2013; Arnett, 2017). SABAAP has developed initial Threshold Guidelines to reduce the potential effects of cumulative impacts on bat populations and to avoid SA reaching the millions of bat fatalities that have been observed in the USA, Canada and Europe. These Threshold Guidelines should be used to inform adaptive management at Umsinde, based on operational monitoring results.

Arnett and Baerwald (2013) conducted a synthesis of bat fatality data from 122 post-construction fatality studies between the years 2000 to 2011 from 73 regional wind energy facilities in the USA and Canada. The findings estimated that cumulative bat fatalities for these 12 years amounted to between 650 104 to 1 308 378 and they predicted an additional 200 000 to 400 000 for the year 2012 alone. With growing numbers of operational wind turbines in North America, these fatality numbers are expected to grow annually. In Germany, between 2004 and 2015 (11 years), it is estimated that over two million bats have been killed by wind turbines (Voigt *et al*., 2015).

Whilst clustering WEFs may have grid infrastructure benefits, these benefits must not come at cost of irreversible negative cumulative environmental impacts. As several WEFs have already been approved for the area surrounding Murraysberg and Victoria West and several more are in the process of submitting applications, monitoring of the construction and operational phase impacts at already approved WEFs must be conducted to prove that the environmental impacts are not significant, before further facilities in the same area are approved. There should be a staggered approach to the approvals, so learning can adequately inform future approvals.

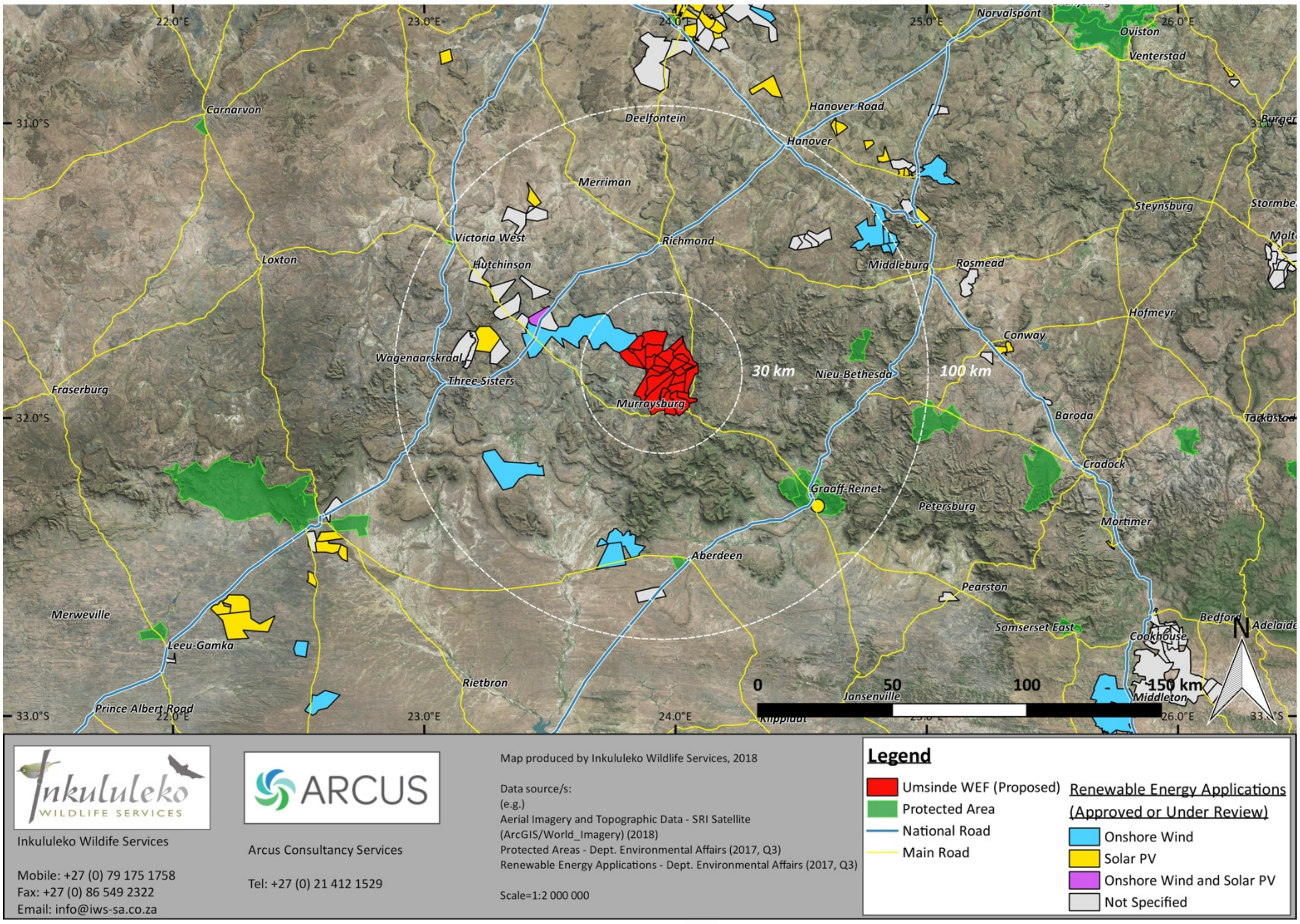

Figure 6 Renewable Energy Cumulative Impact Map

5. Conclusions

The major changes between IWS (2015) and the current amendment are:

- Several turbines that were originally situated in high bat sensitive areas have been moved to Low-Medium and Medium areas. No turbines, nor their full rotor swept zone are in or within 75 m of a High or Medium-High bat sensitive area.
- The extreme drought at Umsinde has possibly caused changes in bat activity distribution around the site compared with 2013.
- The bat sensitivity map was amended to include some ground-truthed ephemeral drainage areas, rocky gullies and farm dams.
- The only changes to the bat impact assessment were in Sections 4.1.1, 4.1.3 and 4.2.2 and the Cumulative Impact section.
- All mitigation measures in IWS (2015) and those specific measures superseded by IWS (2018) should be adhered to. The environmental authorisation (EA) to please also include all essential and best practise mitigation measures listed in this current report (IWS 2018) and those not amended from IWS (2015).
- Whilst it is very important to consider the local impacts that may be caused by individual developments; it is equally important to consider the cumulative impacts of the facility in light of phased or other similar developments nearby. There should be a staggered approach to the environmental authorisations in a region, so learning can adequately inform future approvals.
- Perrold and MacEwan (2017) collated bat fatality data from across Year 1 studies at 10 operational WEFs from the Eastern, Northern and Western Cape Provinces of South Africa. For just that one year and only for a sub-set of the facilities, well over 1000 bats had been killed and this number continues to increase. This number is much higher now. The greater the number of turbines, the greater the potential for cumulative impact. Hence, keeping the number of turbines or the airspace occupied by rotor sweep as low as possible in order to meet the power requirements would be beneficial to bat populations.
- If the commitment is made in the EA that all mitigation recommendations described above are adhered to and adaptive management at potential "problem" turbines is committed to based on the guidance of SABAA's Threshold and Mitigation documents to avoid cumulative impacts, then IWS does not object to the 70 turbine Umsinde project proceeding. However, should any of the recommendations not be met, IWS does not support this development.

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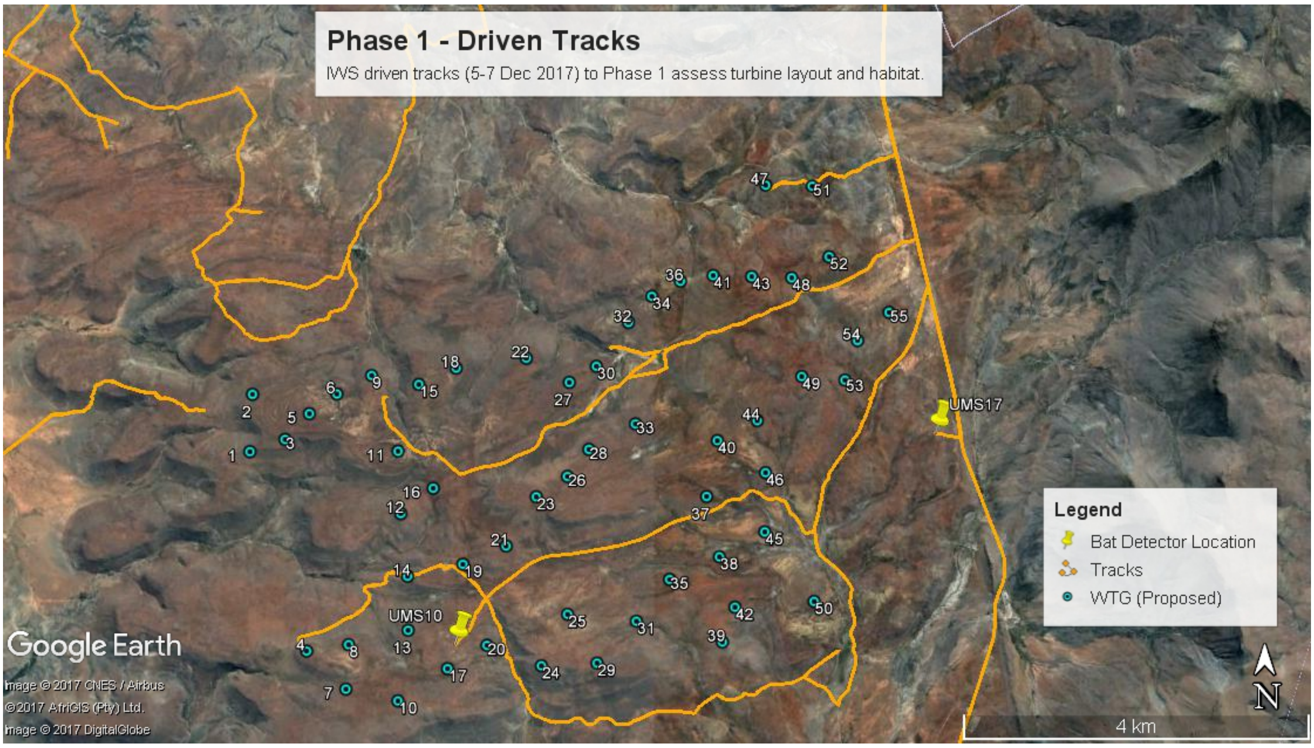
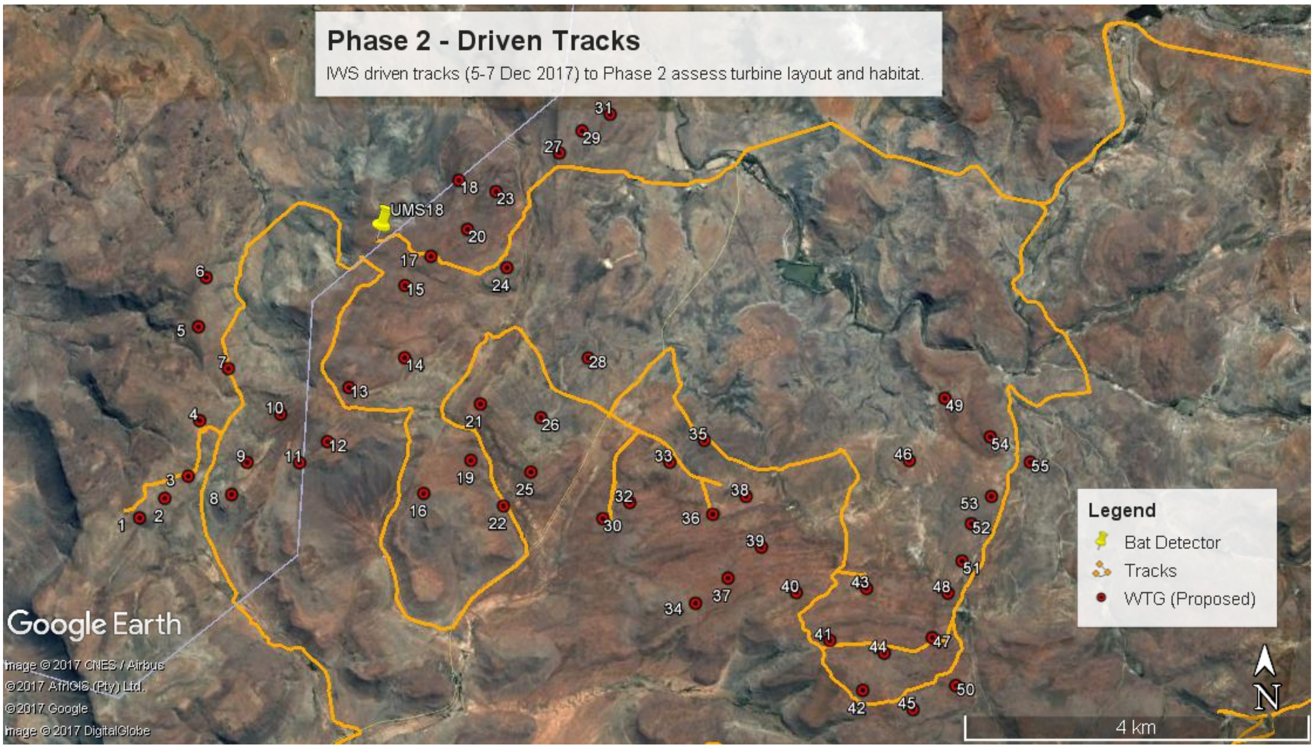
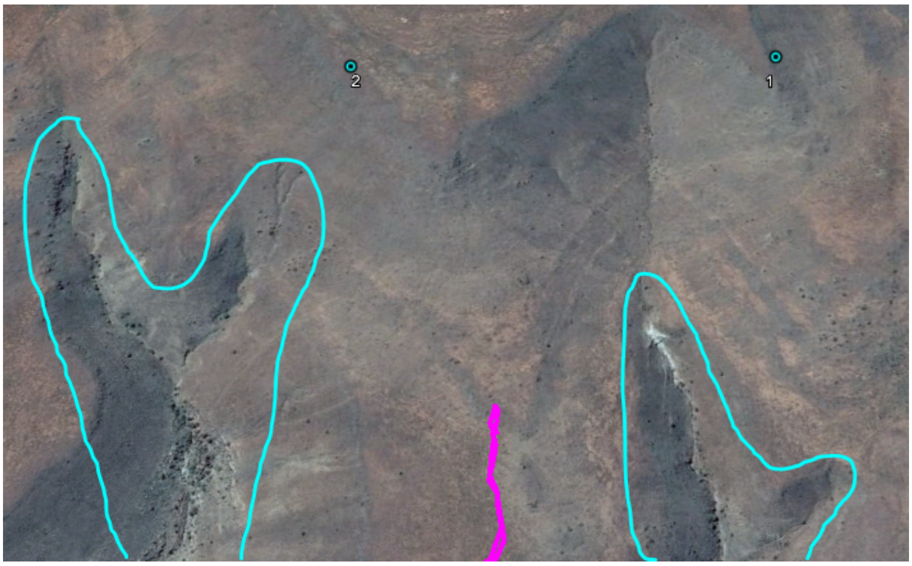
7. Appendix 1 – Ground-truthing Tracks from 5-7 December 2017





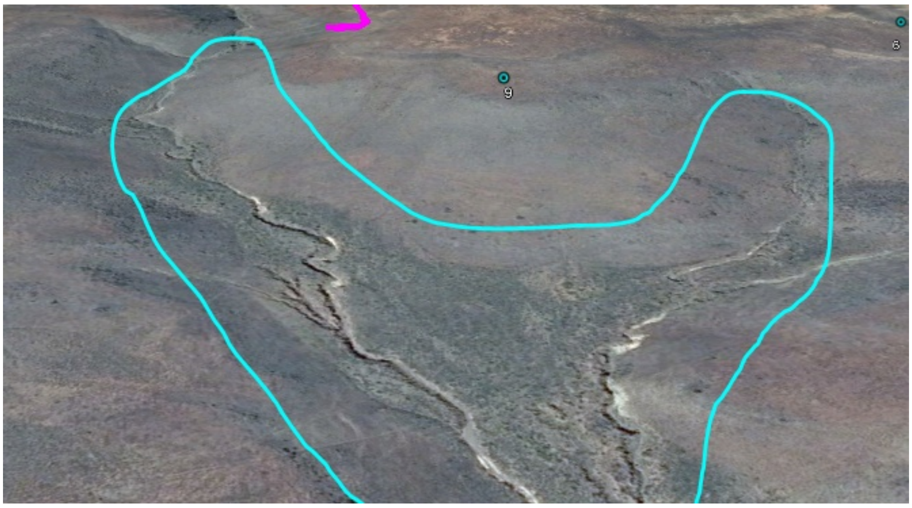
8. Appendix 2 – Bat Important Features

Phase 1

Turbine N°.	Issue	Approx. distance from feature/s	Photo/s
1	Close to gully	130 m	
2	Close to gully and intermittent stream	400 m	

28	Close to possible surface water (seep)	440 m	
33	Close to possible surface water (seep)	190 m	

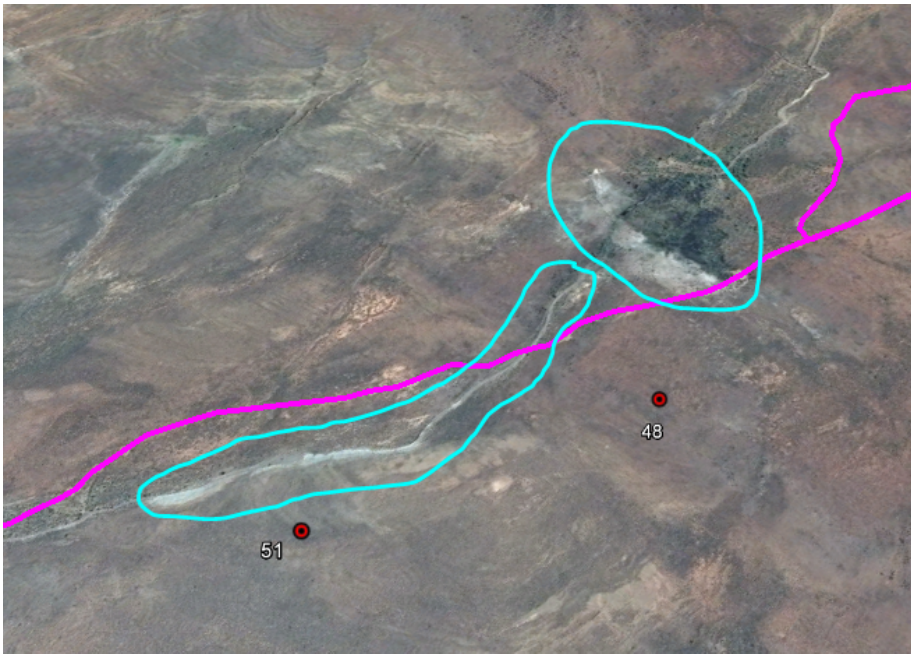
30	Close to possible roost site and intermittent stream	220m	
20	Close to gully and intermittent stream	190m	

9	Close to valley and intermittent streams	300 m	

Phase 2

Turbine N°.	Issue	Approx. distance from feature/s	Photo/s
5	Close to intermittent stream	290 m	
6	Close to gully and intermittent stream	330 m	
7	Close to intermittent stream	270 m	

			 
19	Close to gully (possible bat flight path)	270 m	
22	Close to gully (possible bat flight path)	170m	

23	Close to gully and intermittent stream	270 m	
25	Close to gully (possible bat flight path)	260 m	
48	Close to intermittent stream and possible wetland	170 m	
51	Close to intermittent stream	110 m	

50	Close to gully and intermittent stream	220 m