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Khangela Emoyeni Wind Energy Facility (WEF)

Final Amendment Report

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1 Introduction

Emoyeni Wind (Pty) Ltd (EWFP¹) - the applicant - is proposing amendments to the authorised 140 MW Umsinde Emoyeni Wind Energy Facility (WEF): Phase 2, located near the town of Murraysburg in the Western Cape and Northern Cape Provinces. The proposed new name of Phase 2 is the Khangela Emoyeni Wind Energy Facility (WEF) (hereafter referred to as “the project”). The project is now referred to as **Khangela Emoyeni Wind Energy Facility**.

The project is one of four components that together form a consolidated development, which may be implemented independently of each other. The other three components include the Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2 (now known as Khangela Emoyeni WEF); the Umsinde Emoyeni WEF: Phase 1 (now known as Umsinde Emoyeni WEF); and the Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1.

The applicant has been authorised to construct the project which currently is comprised of up to 35 wind turbines with a hub height of 135 m, rotor diameter of 150 m and the blade tip height of 210 m (Arcus, 2018). Arcus Consultancy Services Ltd (Arcus) was the appointed Environmental Assessment Practitioner (EAP) that undertook an Environmental Impact Assessment (EIA) for the proposed development in terms of the EIA Regulations (GN R982 of December 2014, as amended) which concluded on 6 September 2018 upon issue of the Environmental Authorisation (EA) by the Department of Environment, Forestry and Fisheries (DEFF).

Subsequent advances in technology and refinement of the design has resulted in a change in scope. The applicant has therefore appointed Zutari (Pty) Ltd (Zutari) to manage the Amendment process in terms of the 2014 EIA Regulations (GN R 982 of December 2014, as amended).

The scope changes are namely based on the new, bigger turbines which are more efficient, resulting in a slight change to the environmental footprint. Windlab aims to complete the project in order to supply electricity to the National Government and in turn local and nation-wide communities at the least economical cost per kWh, whilst limiting the impact on the receiving environment as far as possible.

This report is therefore in fulfilment of the legal requirements for a Part 2 Amendment as defined in terms of Regulation 31(a) of GN R 982. It provides a description and motivation for the proposed changes, as well as an evaluation of the advantages and disadvantages of the changes, and mitigation measures in respect of any impacts resulting from the change to fulfil the requirements of Regulation 32. The nature of the changes and sensitivities on the site has required input from most of the specialists, namely terrestrial ecology, wetlands and freshwater ecology, avifauna, bats, heritage, palaeontology, visual and noise. Studies not deemed to require updates include the soils and agriculture study and the socio-economic study. Note that the Umsinde Emoyeni WEF: Phase 1 is also the subject of a Part 2 Amendment through a separate application, however the Public Participation Process (PPP) for Phase 1 (now simply Umsinde Emoyeni WEF) and Phase 2 (now Khangela Emoyeni WEF) is combined.

The Draft Amendment Report was subjected to a 30-day public participation process (as detailed in Appendix C) which ranged from **28 September to 29 October 2020** and all comments received were recorded, considered and responded to. The comments and responses thereto are included with the public participation information in Appendix C with a Comments and Responses Report included as Appendix X. This Final Amendment Report is now being submitted to DEFF for decision-making.

Material changes between the Draft and Final Amendment Reports are indicated with underline for insertions and ~~strikethrough~~ for deletions.

¹ EWFP is a Special Purpose Vehicle (SPV) established under Windlab Developments South Africa (Pty) Ltd (WDSA), a wholly-owned subsidiary of Windlab Systems (Pty) Ltd (Windlab).

2 Description of the development

2.1 Authorised activities

The project, as authorised by the DEFF allows for the construction of a 140 MW wind farm and its associated infrastructure. Figure 1 provides the project locality for both Umsinde Emoyeni and Khangela Emoyeni WEFs Phase 1 and Phase 2, Figure 2 shows the authorised layout for the project in relation to Umsinde Emoyeni WEF and the grid connections and Figure 3 shows the authorised detailed layout of the turbines, roads and substation.

The authorised facility and its associated infrastructure include the following major components as described in the EA (see Appendix A, page 9 and 10):

- Turbines: Up to 35 turbines (with a hub height up to 135 m, rotor diameter of up to 150 m, and blade length of 75 m);
- Hard standing area of up to 45 m by 25 m;
- Temporary laydown areas of up to 150 m by 60 m;
- Electrical cabling and onsite substation;
- Existing farm access tracks and watercourse crossings will be upgraded;
- On-site office compound, including site offices, parking and an operation and maintenance facility including a control room;
- In addition to the key components outlined above the WEF will also require:
 - Anemometer masts;
 - Security fencing; and
 - CCT monitoring towers.

2.2 Environmental process and impacts

Arcus undertook an EIA for the proposed development which concluded on 6 September 2018 upon issue of the EA by DEFF. The process involved the assessment of environmental impacts which was documented in the Final Environmental Impact Assessment Report (EIAR) dated February 2018 (Arcus, 2018). Appeals were lodged against DEFF's decision; however, these were dismissed on 27 June 2019 by the Minister of Environment, Forestry and Fisheries (DEFF). Copies of the EA authorisation and appeal decision are available in Appendix A.

2.3 Listed activities

Several listed activities in terms of GN R 983, GN R984 and GNR 985 (as amended) were authorised for the proposed development. These activities are listed in Table 1 below.

Table 1: Listed activities in terms of the NEMA 2014 EIA Regulations (as adapted from Arcus, 2018), with reference to the amendments of 7 April 2017 (indicated with "**")

2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
No	Description of Listed Activities	Triggered	No	Description of Listed Activities	Triggered
Listing Notice 1 (GN R 544)			Equivalent listing in 2014 Regulations		
GN R.544 11 (iii) (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m ² in size; or (xi) infrastructure or structures covering 50 m ² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The internal roads will include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. The footprint of the turbines and associated infrastructure will exceed 50 m ² , but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.	GN R.983 12 (iii) (x) and (xi)	The construction of- (iii) bridges exceeding 100 square meters in size; (x) buildings exceeding 100 square meters in size; (xii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs – (a) within a watercourse; or (c) if no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	The internal roads include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. Some of these may exceed 100 m ² . The footprint of the turbines and associated infrastructure will exceed 50 m ² , but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.
			*GNR 983 12 (i) (a) (c)	<i>The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</i>	
GN R.544 18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	GN R.983 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse
			*GN R.983 19	<i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i>	



2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
No	Description of Listed Activities	Triggered	No	Description of Listed Activities	Triggered
	N/A		GN R983 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	The majority of the proposed development site is currently used for agriculture, lies outside an urban area and the land to be developed will be bigger than 1 hectare.
			*GN R983 28 (ii)	<i>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</i>	
GN R.544 39 (iii)	The expansion of (iii) bridges; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	The internal roads will include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded.	GN R.983 48 (iii)	The expansion of (iii) bridges where the bridge is expanded by 100 square meters or more in size; where such development occurs – (a) within a watercourse; (b) in front of a development setback; or (c) if no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	The internal roads include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded. Some of these may exceed 100 m ² .
			*GN R.983 48 (i) (a)(c)	<i>The expansion of- (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or where such expansion occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;</i>	

2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
No	Description of Listed Activities	Triggered	No	Description of Listed Activities	Triggered
GN R.544 47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km – (i) where the existing reserve is wider than 13,5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	Where roads are present and may require widening for access reasons during construction this clause may be applicable. However, it is unlikely that any large roads will be affected.	GN R.983 56 (i) and (ii) [*No change in 2018]	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13,5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	Where roads are present and may require widening for access reasons during construction this clause may be applicable. However, it is unlikely that any large roads will be affected.
Listing Notice 2 (GN R 545)			Equivalent listing in 2014 Regulations		
GN R.545 1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 MW each.	GN R.984 1 [*No change in 2018]	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 MW each.
GN R.545. 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 Ha or more.	The project is located on currently undeveloped land the combined footprint of the turbines, laydown areas, internal roads and substation will exceed 20 hectares.	GN R.984 15 [*No change in 2018]	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance plan.	The project is located on currently undeveloped land the combined footprint of the turbines, laydown areas, internal roads and substation will exceed 20 hectares.
Listing Notice 3 (GN R 546)			Equivalent listing in 2014 Regulations		
GN R.546 4	The construction of a road wider than 4 m with a reserve less than 13.5 m (d) In Western Cape: (ii) All areas outside urban areas;	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be reduced to	GN R.985 4	The development of a road wider than 4 metres with a reserve less than 13.5 metres. (f) in Western Cape: (i) areas outside urban areas; (aa) areas containing indigenous vegetation	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during

2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
No	Description of Listed Activities	Triggered	No	Description of Listed Activities	Triggered
		max. 6 m width during operation. The proposed site falls outside of urban areas.	*GN R.985 4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. i. Western Cape: ii. Areas outside urban areas; (aa) Areas containing indigenous vegetation;	construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas and contains indigenous vegetation.
GN R.546 14 (a) (i)	The clearance of an area of 5 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In Western Cape: (i) All areas outside urban areas.	Clearance of vegetation will be required for construction of the turbine foundations, hardstands, substation and road network in areas with 75 % or more of indigenous vegetation and this will exceed 5 ha.		N/A	
	N/A		GN R.984 14 (iii) (x) and (xi) (a) and (c) (f) (i) (bb) and (ff)	The development of (iii) bridges exceeding 10 square meters in size; (x) buildings exceeding 10 square metres in size and (xi) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse and (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. (f) In Western Cape: (i) outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	Bridges may need to be constructed over watercourses exceeding 10 m ² in size. The development site area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, no development will occur in this area. No required water crossings fall within a Critical Biodiversity Area.
			*GN R.984 14 (ii) (a) and (c)(i) (i) (bb) and (ff)	<i>The development of-</i> <i>(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs-</i> <i>(a) within a watercourse;</i> <i>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</i>	



2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
No	Description of Listed Activities	Triggered	No	Description of Listed Activities	Triggered
				<i>i. Western Cape</i> <i>i. Outside urban areas:</i> <i>(bb) National Protected Area Expansion Strategy Focus areas;</i> <i>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</i>	
GN. R.546 19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (d) In the Western Cape: (ii) All areas outside urban areas	Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4- 9m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation.	GN R.984 18	The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre (f) In Western Cape: (i) All areas outside urban areas: (aa) Areas containing indigenous vegetation	Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4- 9m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation.
			*GN R.984 18	<i>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</i> <i>i. Western Cape</i> <i>ii. All areas outside urban areas:</i> <i>(aa) Areas containing indigenous vegetation</i>	

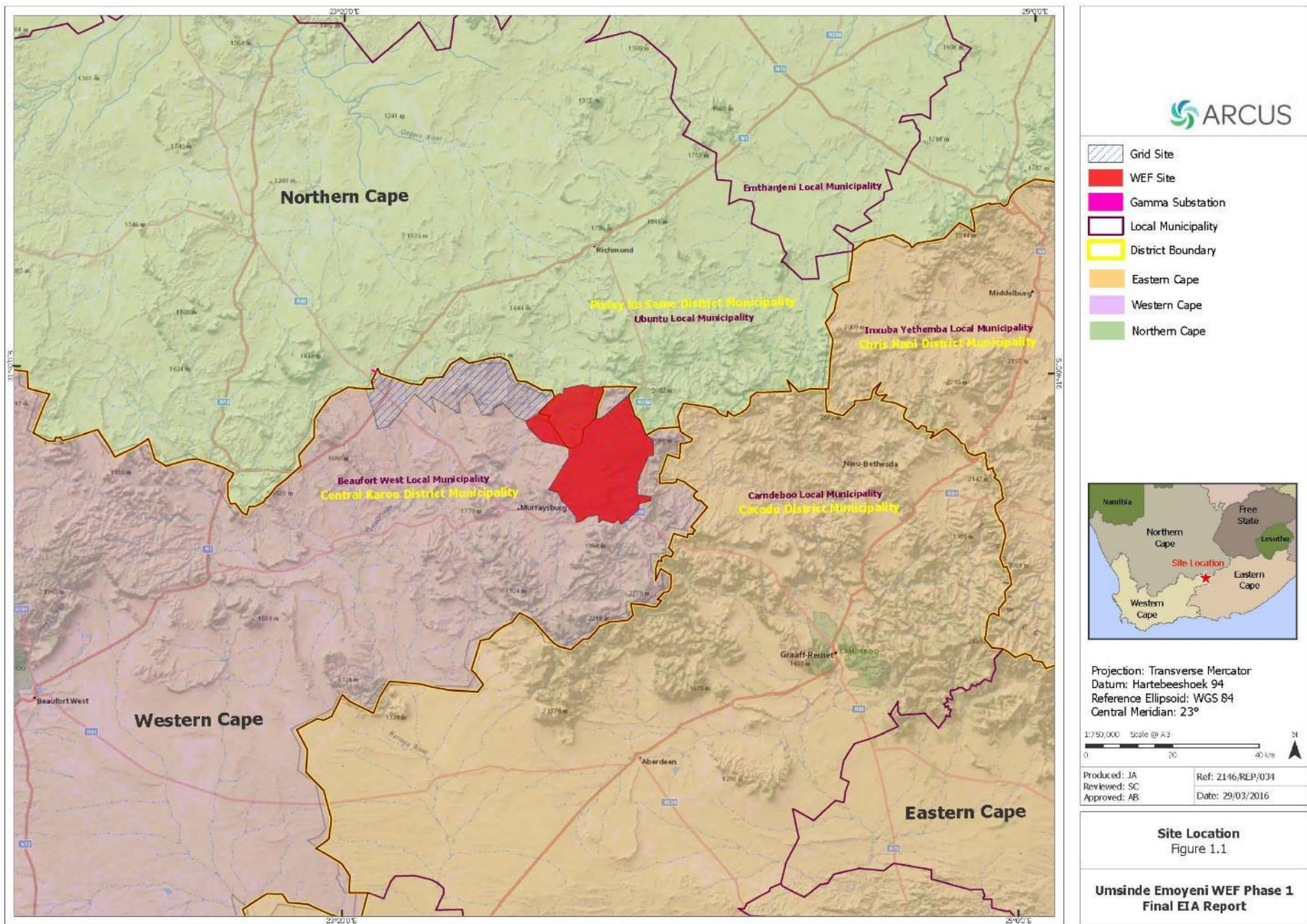


Figure 1: Project locality map showing consolidated site for Phase 1 (now Umsinde) and Phase 2 (now Khangela) in red (Arcus, 2018) which received Environmental Authorisation



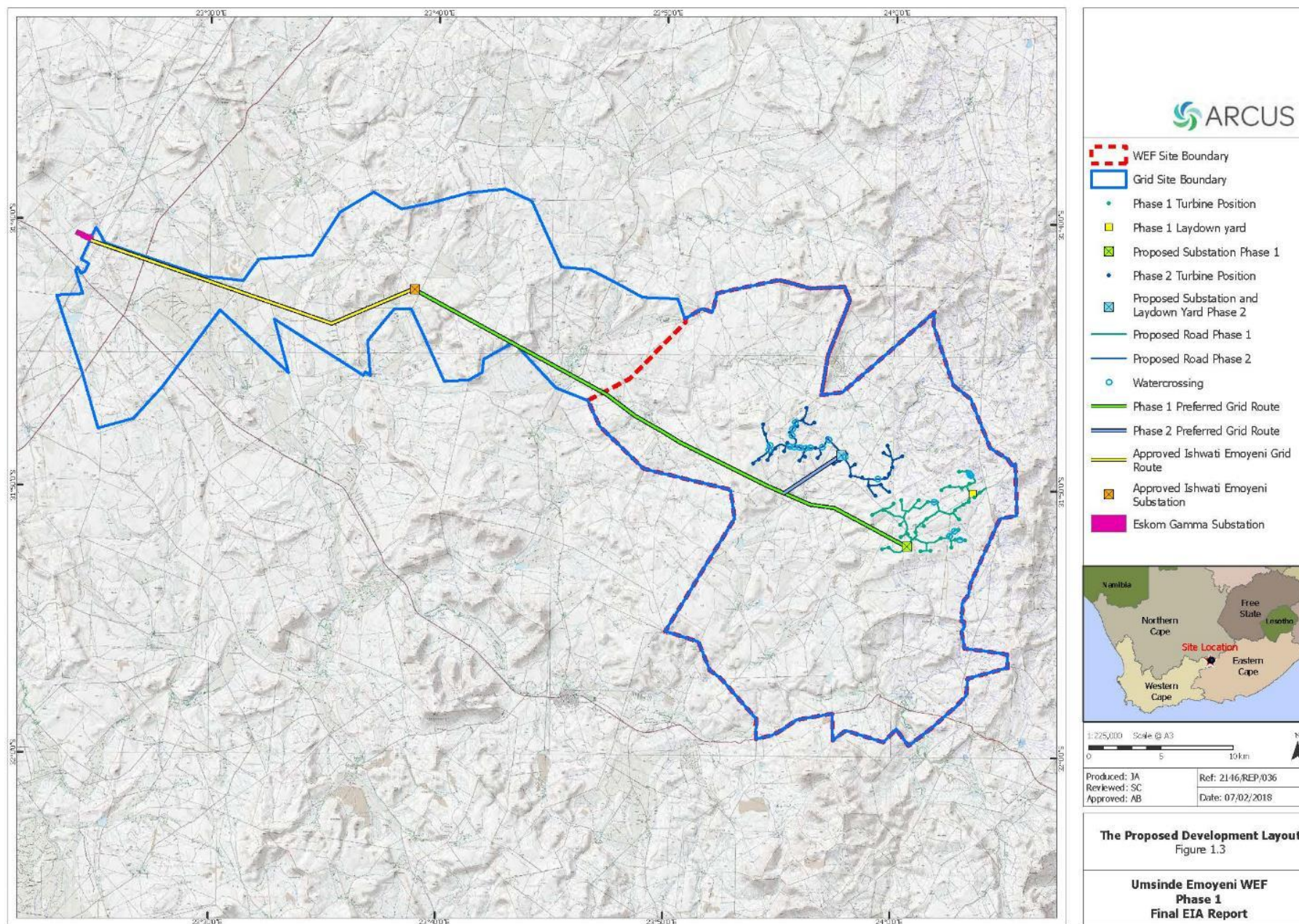


Figure 2: Authorised site layout of Phase 1 (green, now Umsinde Emoyeni) in relation to Phase 2 (blue, now Khangela Emoyeni) and the respective grid connections (Arcus, 2018)

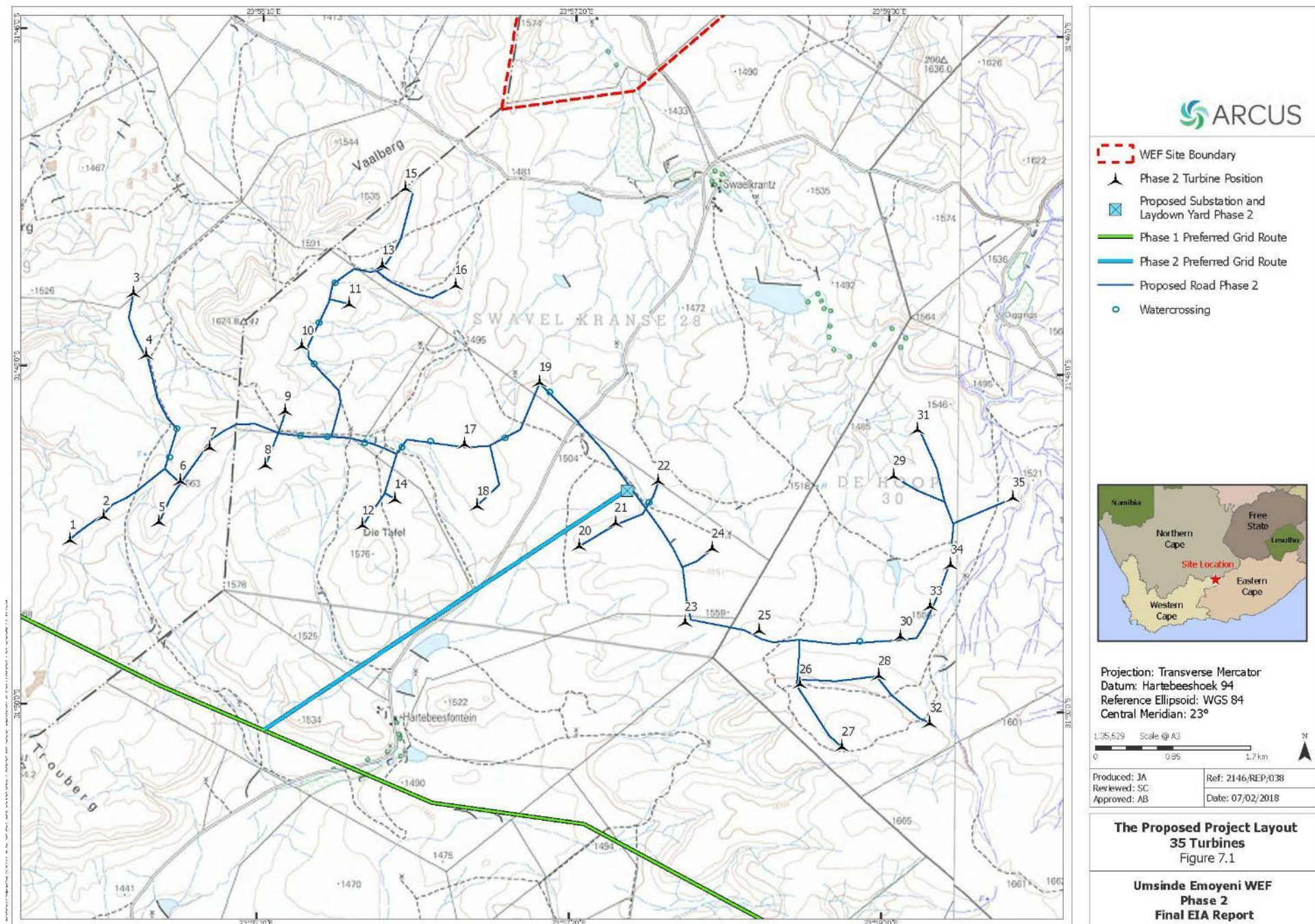


Figure 3: Authorised layout of Phase 2 (now Khangela Emoyeni)

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2.4 Project layout evolution

The project layout evolution is summarised by Arcus (2018: iii-iv) and repeated here for context. The original layout consisted of 98 turbines. The applicant, after taking into account the findings and recommendations of the additional avifauna information (through bird monitoring), agreed to revise the turbine layout and reduce the number of turbine placements to 55 turbines. This 55-turbine layout was provided to all specialists to review and provide updated impact assessments on. The specialists updated their assessments where necessary and provided revised buffer areas and no-go areas of high sensitivity. Through an iterative process that took into account all the recommendations and conclusions put forward by the specialists (including additional constraints, sensitive areas and no-go areas) a Revised Final layout was produced, which consists of 35 turbines for Khangela Emoyeni WEF of the development. See Appendix B for this authorised project layout showing the environmental sensitivities.

2.5 Approach to assessment of cumulative impacts

In the EIR, Arcus (2018), describes how new proposals for wind energy development have been stimulated by the policy support shown by the South African Government through the implementation of the Renewable Energy Independent Power Procurement programme (“REIPPPP”). The impact of all existing WEFs, approved developments and applications received, within a 100 km radius, was therefore considered in the EIA (see Figure 4 below). Furthermore, as the proposed development is one of four original components, as detailed in Section 1.1, there is potential for cumulative impacts between the four components. As such, the cumulative impact assessment of the proposed development considered the impacts of these other associated projects, along with the other existing and approved applications in the area. This amendment report therefore considers any changes to these initial ratings.

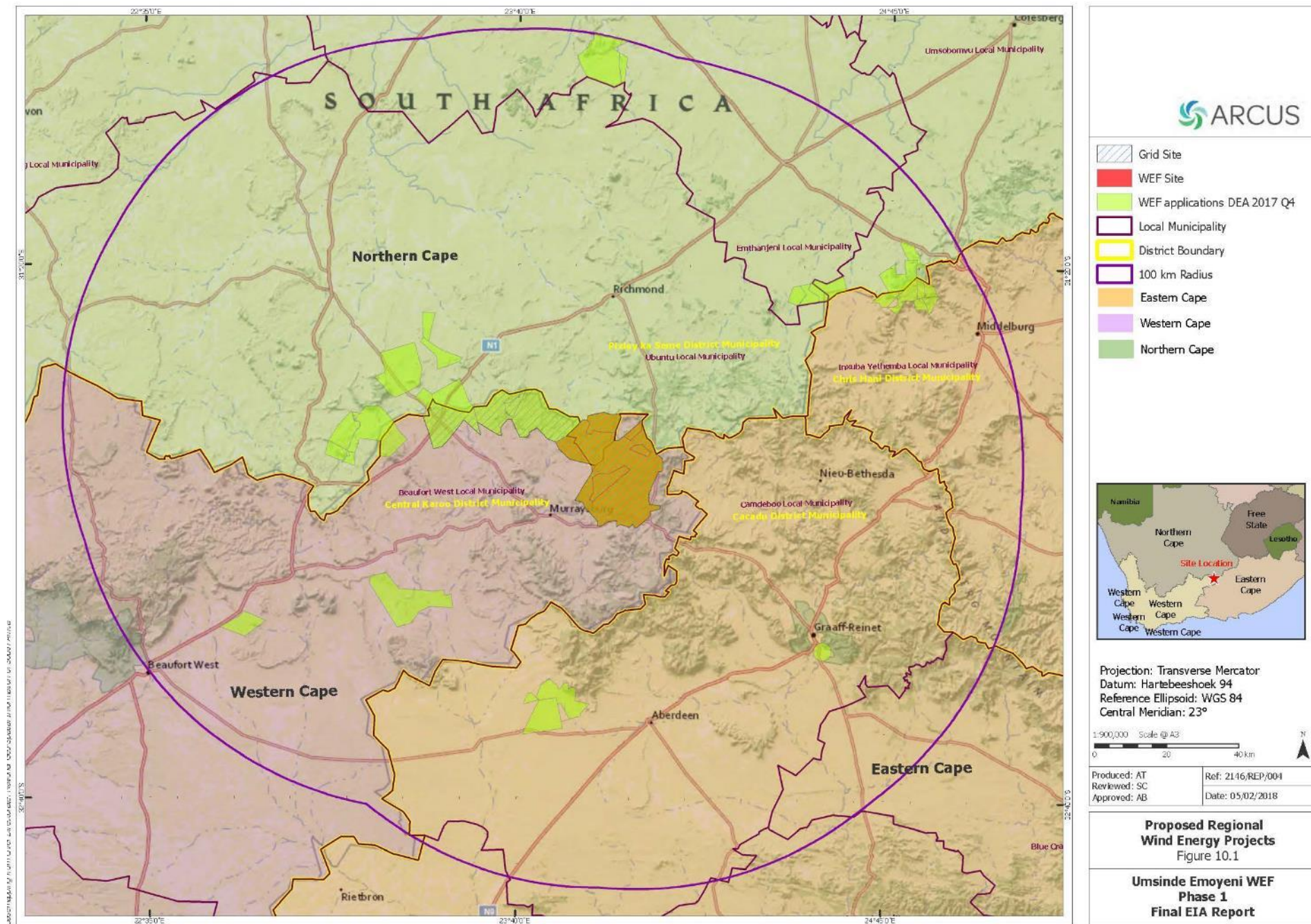


Figure 4: Other WEFs considered for cumulative impact assessment (Arcus, 2018)



3 Description and motivation for the proposed amendments

3.1 Details of proposed amendments

EWFP wishes to apply for an amendment to the project description and scope as authorised by DEFF (previously DEA). Table 2 below sets out a summary of the various components that are proposed to be amended and includes their original specifications as authorised and Figure 5 shows the revised rotor swept envelope against the approved envelope. In addition, the layout has been revised as shown in Figure 6 for the new layout, and Figure 7 which includes both authorised and amended layouts for comparison. The more detailed revised constraints maps are presented in Appendix B.

The amendments are in respect to:

1. Project name and affected properties.
2. The turbine specifications; the upper limit for hub height, blade length and rotor diameter have increased, and each turbine requires a larger permanent hardstand area.
3. Reduction in the total number of turbines due to the increased generation capacity per turbine; with associated changes to the layout.
4. The road alignments have changed in respect to turbine placement changes, along with the underground cables which follow these. Roads will also be temporarily widened further for construction access roads due to the larger turbine components and vehicles.
5. An extension of the validity of the EA.
6. Correcting the project location to reflect only the properties associated Umsinde Emoyeni Phase 2 (i.e. currently the authorisation also includes the Umsinde Emoyeni Phase 1 properties).

Table 2: Proposed changes in scope for the project

Component / Specification	Authorised	Proposed change
Project name	Phase 2 of the Umsinde Emoyeni Wind Energy Facility	Khangela Emoyeni Wind Energy Facility
Project location	Remainder of Farm 28; Portion 1 of Farm 29; Remainder, Portion 2, 3, 4 and remainder of Portion 1 of Farm De Hoop 30; Portion 1 of the Farm Matjeskloof 27; The Farm Voetpad 51; Portion 3, 4, 7, 10 and Remainder of Portion 2, of Farm Driefontein 26; Portion 1 of the Farm Middelvaly 52; Portion 1 and Remainder of the Farm Klein Driefontein 152; Portion 2 and 7 of Farm Witteklip 32; Portion 2 of Farm Swavel Kranse 28; Remainder, Portion 1, 3, 4, 6, 7 and Remainder of Portion 2 of Farm Klipplaat 109; Beaufort West and Ubuntu Local Municipalities Northern and Western Cape Provinces	Remainder and remainder of Portion 1 of Farm De Hoop 30; Portion 3, 7, 10 and Remainder of Portion 2, of Farm Driefontein 26; Portion 1 and Remainder of the Farm Klein Driefontein 152; Portion 2 of Farm Witteklip 32; Beaufort West and Ubuntu Local Municipalities Northern and Western Cape Provinces Portion 1 of Farm 29; Remainder and Portion 1, 2, 3 of Farm De Hoop 30; Portion 4 of Farm Driefontein 26; Portion 2 and Remainder of Farm Swavel Kranse 28; Portion 1, 2, 3, 4, 6 and 7 of Farm Klipplaat 109; Beaufort West and Ubuntu Local Municipalities Northern and Western Cape Provinces
Facility area	Hardstanding area: Up to 45 m x 25 m Turbine foundations: 30 m x 30 m and up to 3 m deep Onsite office compound, including site offices, parking, an operation and maintenance facility and a control room: Anemometer masts	Hardstanding area: Up to 55 m x 35 m Turbine foundations: 30 m x 30 m and up to 3 m deep Onsite office compound, including site offices, parking, an operation and maintenance facility and a control room: Anemometer masts

Component / Specification	Authorised	Proposed change
	CCTV monitoring towers	CCTV monitoring towers
Site access	Existing farm access tracks and watercourse crossing will be upgraded. Internal roads: 9 m width during construction. Reduced to 4 - 6 m during operations. Internal road length: 35.8 km	Existing farm access tracks and watercourse crossing will be upgraded. Internal roads: <u>up to</u> 12 m width during construction. Reduced to 4 - 6 m width during operations Internal road length: 29.3 km
Generation capacity	147 MW	147 MW
Number of turbines	Up to a maximum of 35	Up to a maximum of 33
Turbine generation capacity	1.5 – 4.5 MW	Up to 10 MW
Hub height from ground level	Up to 135 m	Up to 160 m
Rotor diameter	Up to 150 m	Up to 180 m
Blade length	75 m	Up to 90 m
Blade tip height	210 m	Up to 250 m
Area occupied by substations	200 x 250 m single storey substation compound	No amendment required.
Capacity of substation	33/132 kV	No amendment required.
Temporary construction hardstand area per turbine	60 x 30 m (1,800 m ²)	95 x 23 m (2,185 m ²)
Crane pad	14,000 m ²	(Not applicable ²)
Area occupied by construction laydown areas	Temporary laydown area: Up to three laydown areas of 9 000 m ² each (150 m x 60 m)	No amendment required.
Location of construction camps/ laydown areas	As per layout map included in the Final EIA Report.	No amendment required.
Area occupied by buildings	200 x 250 m	No amendment required.
Internal powerline/cables	All power lines linking wind turbines to each other and to the internal substation must be buried (Condition 35 of the EA).	Condition remains applicable. No amendment required.
Height of fencing	2 – 2.5 m	No amendment required.
Type of fencing	Steel palisade fencing around construction camp. Concrete palisade around substation.	No amendment required.
Validity extension	5 years from 6 September 2018	10 years from 6 September 2018.

² Note that the crane pad described in the original reports has been confirmed by the design engineers as not being required in addition to the temporary construction hardstand areas needed for the amended layout.

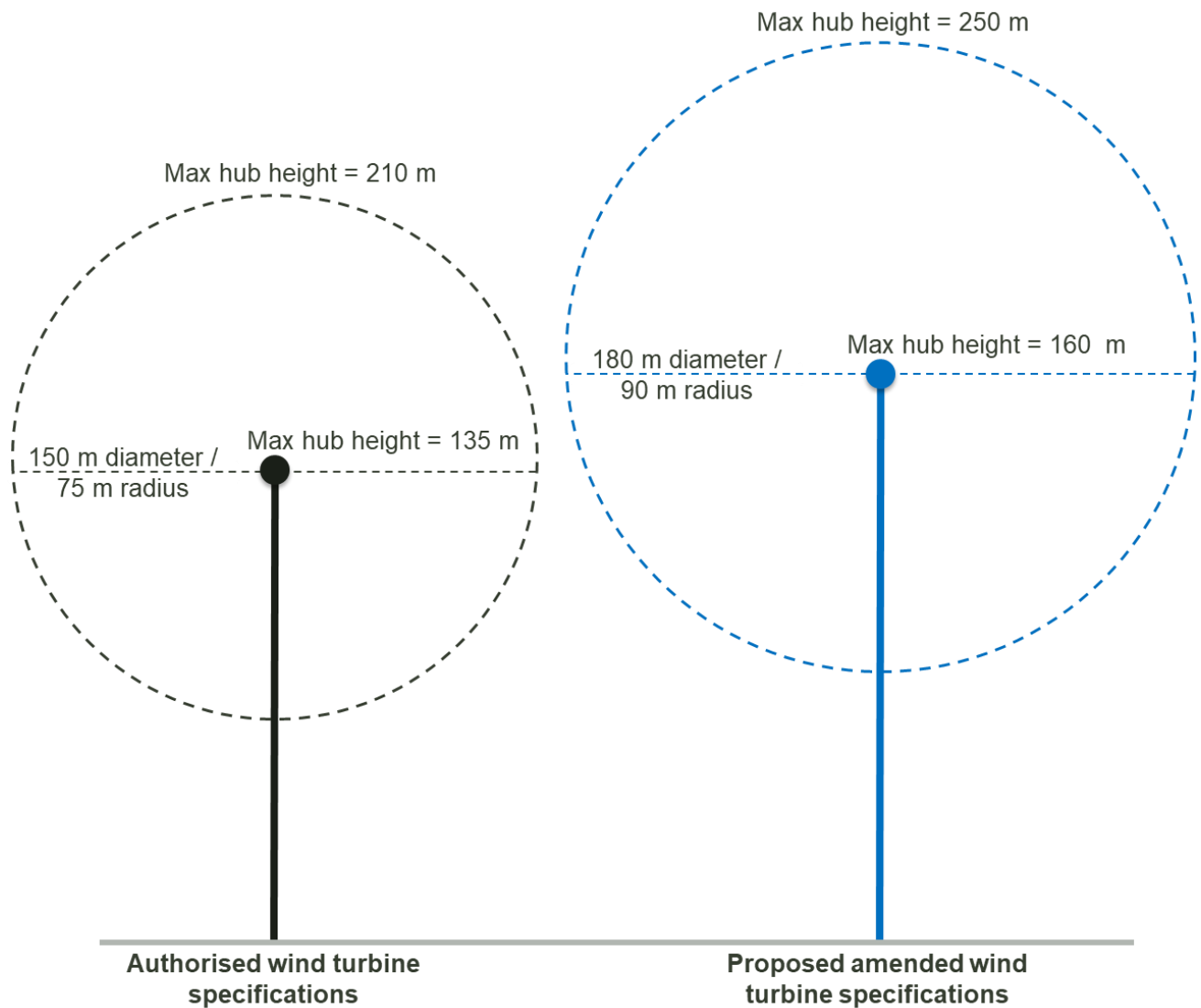


Figure 5: Proposed amended turbine specifications depicted against the authorised specifications

Table 3 sets out the authorised and amended dimensions as translated to total footprint. It is evident that there would be an increase in total footprint **if** the *maximum worst-case* scenario is undertaken. However, as is evident from Table 4, this is highly improbable due to the maximum project generation capacity constraint.

In terms of the project's access requirements, please take note of the following:

- The proposed permanent operational road width is 6 m where some sections of these roads would need to be temporarily widened up to 12 m during construction. Such sections would be dictated by the site and topography, for example at bends in the road and where cut and fill is required. A worst-case scenario is based on an assumption that all of the new roads would be 12 m in width during construction which is not going to be the case in reality.
- For the purposes of calculating the totals in Table 3 below, the operational road footprint has not been included in the totals as it falls within the construction road footprint as described.

Table 3: Authorised and amended dimensions demonstrating respective total footprints

Component	Authorised dimensions	Authorised footprint (m ²)	Amended dimensions	Amended footprint (m ²)
No of turbines		35		33
Swept area/ turbine	17,671	618,485	25,447	839,751
Hard standing areas	45 m x 25 m	39,375	55 m x 35 m	63,525
Crane boom areas	60 m x 30 m	63,000	95 m x 23 m	72,105
Crane pad		14,000	n/a	
Temporary laydown areas	150 m x 60 m x 3	27,000	150 m x 60 m x 3	27,000
Turbine foundations	30 m x 30 m	31,500	30 m x 30 m	29,700
Construction roads	9 m wide x 35.8 km	322,200	12 m wide x 29.3 km	351,600
Operational roads *	4-6 m wide x 35.8 km	214,800	4-6 m wide x 29.3 km	175,800
Substation, etc.	200 m x 250 m	50,000	200 m x 250 m	50,000
Total		547,075.00		593,930.00

* Included in the Construction roads total footprint

Developing all 33 turbines at the maximum turbine specification is not possible since the total capacity (in MW), as authorised, would be exceeded i.e. utilising 33 turbines at 10 MW capacity would result in a generation capacity of 330 MW where in fact only 147 MW total project capacity is authorised. With special reference to the listed activities whereby certain footprint thresholds would trigger a new environmental authorisation process, Table 4 has been prepared to **demonstrate likely scenarios by way of number of turbines, and specifications**. This provides justification that certain thresholds would not be exceeded in any of these scenarios and provides for a worst-case scenario. In summary, Table 4 shows that for the proposed amendment, for all turbine size scenarios, **the amended disturbance footprint would be smaller than the authorised footprint**. The larger turbines selected (e.g. 10 MW and 8 MW), the smaller the disturbance footprint.

Table 4: Turbine scenarios in relation to footprint as well as changes compared to authorised footprint

Turbine size (MW)	Number of turbines for a 140MW project	Hard stand dimensions	Total area per hard stand	Crane boom & blade laydown area	Temp laydown areas	Turbine foundations	Construction roads	Operational roads	Substation, etc.	Total construction footprint	Total operational footprint	Increase/reduction of disturbance footprint
		(m)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
10	15	55 x 35	2.83	3.21	2.70	1.32	35.16	17.58	5.00	50.22	26.73	-4.48
8	18	50 x 30	2.76	4.01	2.70	1.65	35.16	17.58	5.00	51.28	26.99	-3.42
6.5	23	50 x 30	3.39	4.94	2.70	2.04	35.16	17.58	5.00	53.23	28.01	-1.48
4.5	33	45 x 25	3.71	7.21	2.70	2.97	32.23	17.58	5.00	53.82	29.26	-0.88

* The footprint of the roads required for construction has been calculated at a width of 12 m for the 10 and 8 MW turbine scenarios and as 11 m for the 6.5 and 4.5 MW scenarios (based on the anticipated transportation requirements for the turbine components) as an average, although in both cases the width will reach up to 12 m in certain circumstances. Care will however be taken to ensure that the authorised disturbance footprint of 54.71 ha won't be exceeded as explained in Section 3.3.

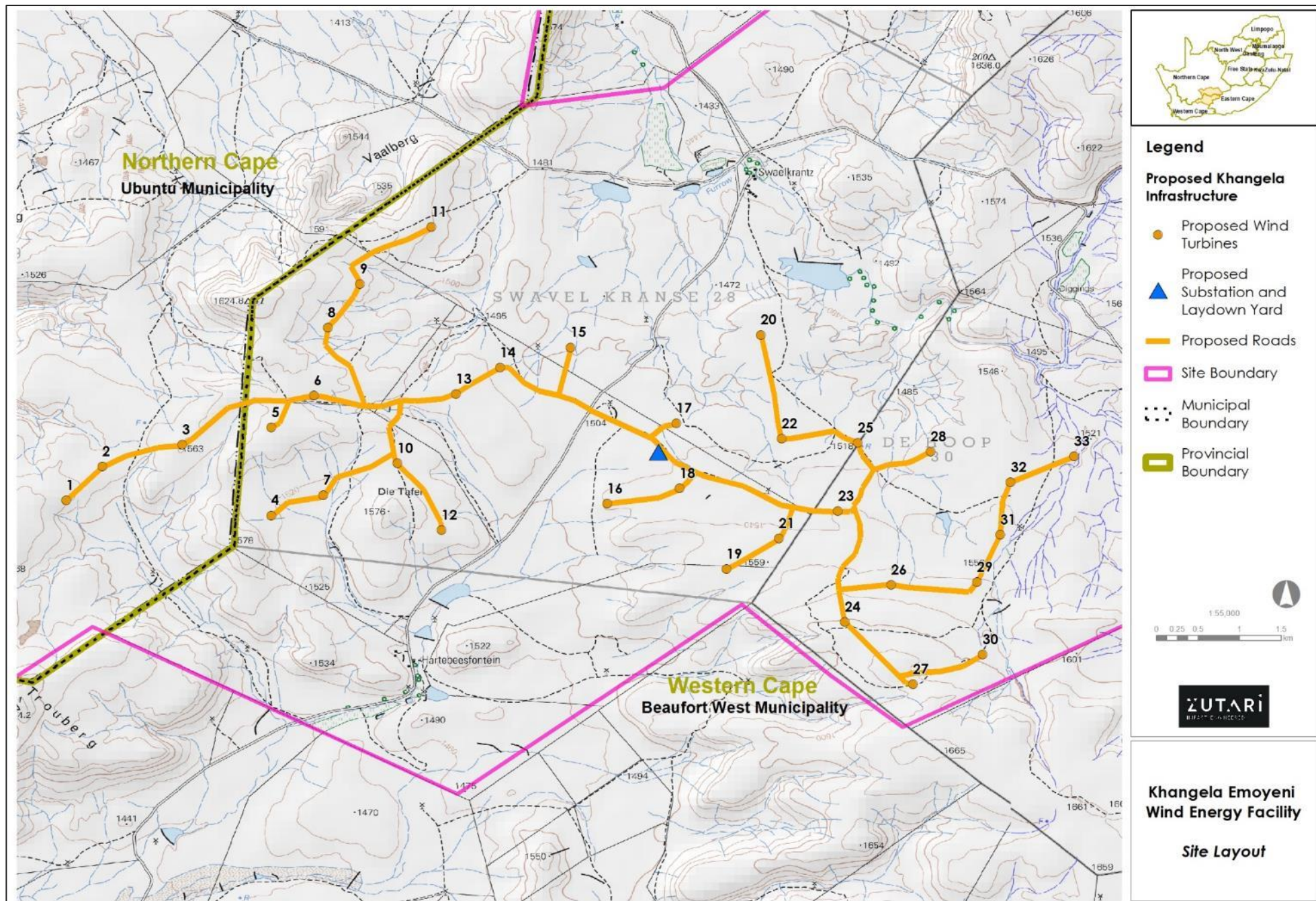


Figure 6: Proposed amended site layout for Khangela Emoyeni WEF



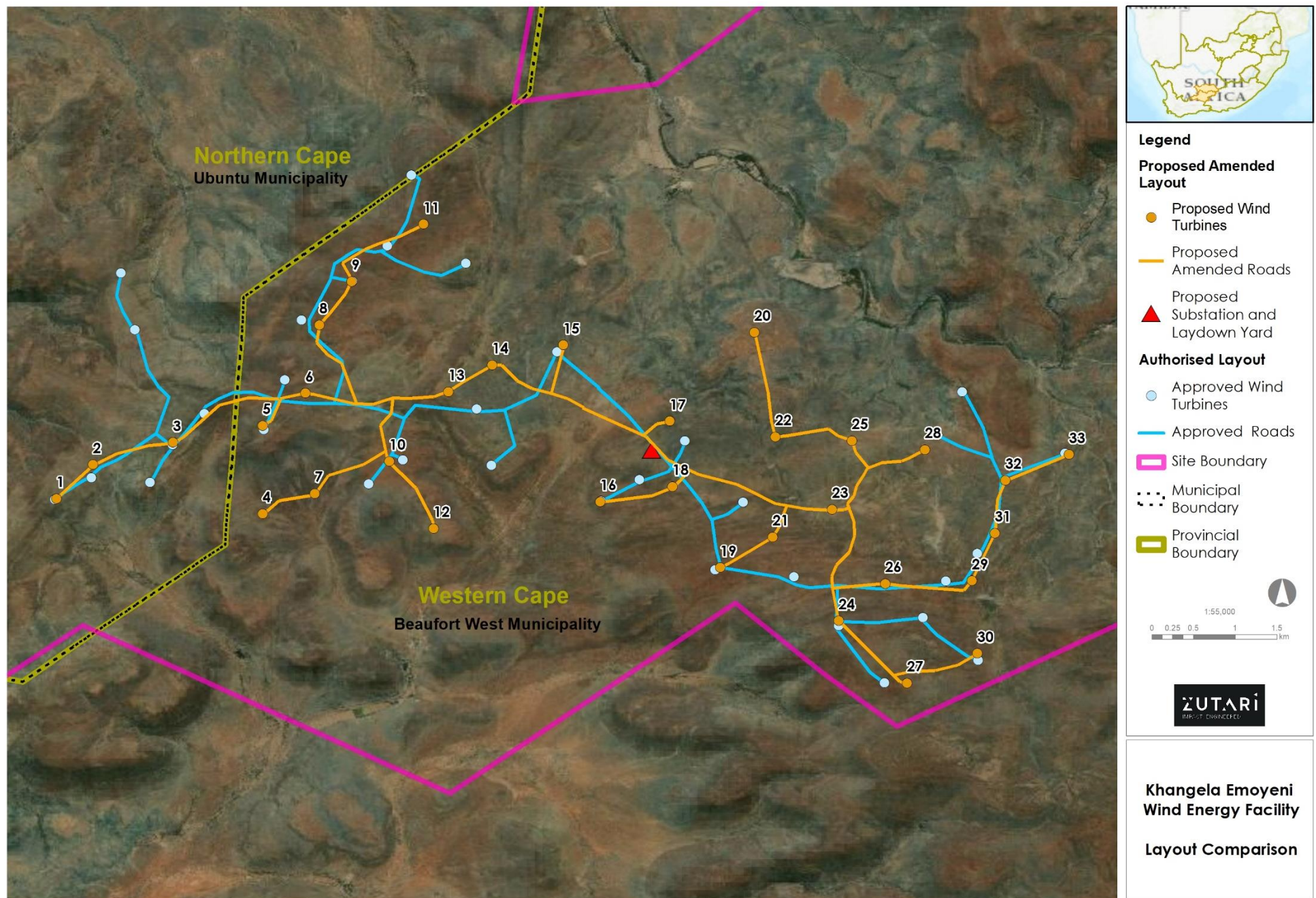


Figure 7: Layout comparison between the authorised (2018) and amended layouts (2020) for Khangela Emoyeni WEF

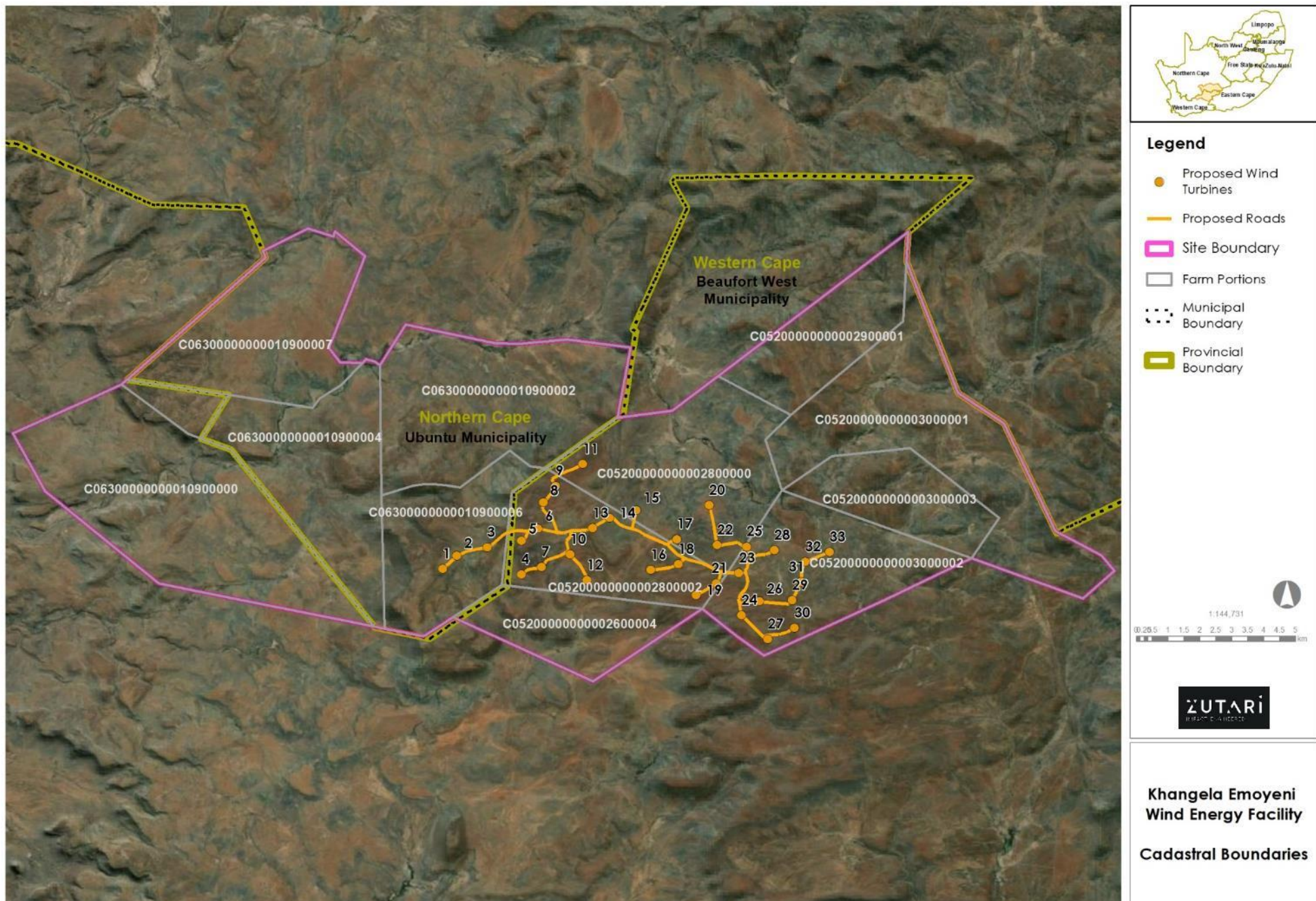


Figure 8: Cadastral map for the proposed amended Khangela Emoyeni WEF



3.2 Motivation for proposed amendments

The South African Government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is based on a competitive bidding process. To date there have been four bidding windows in the REIPPPP, with the last of these bid windows taking place in 2015. The fifth bid window - which was initially expected in 2015/2016 – has been delayed by some years and it is now anticipated that it will take place in early 2021.

The planning process for the Umsinde Emoyeni WEFs commenced back in 2014 where the wind turbines that were proposed for the development were based on forward looking estimates of what the most efficient turbine designs suitable for this site would be. Wind turbine technology has advanced rapidly since then with turbines becoming ever larger, more powerful and more efficient than predicted.

The applicant wishes to amend the EA in order to cater for these larger turbine specifications, to enable the applicant to utilise the latest, most efficient turbines available on the market, which will increase the energy output and overall efficiency of the Khangela Emoyeni WEF. This in turn will increase the overall competitiveness of these wind farms in the REIPPPP as it will allow the applicant to bid a lower tariff for the energy produced by the Project – which would not only ensure the project has more chance of being successful in the bid but lower tariffs are also beneficial to all electricity consumers in South Africa. Many wind farm developments in South Africa currently have approvals or are in the process of applying for approval/ amending their EA so as to be able to use these larger more efficient turbines. Larger turbines further result in less disturbance to the receiving environment, as typically less infrastructure i.e. turbines and roads are required to achieve the same project export capacity.

The final turbine type can only be selected closer to the time of construction, based on the most optimal turbine available on the market at the time. Thus, as per the original EIA, the application will be for a range/ envelope of specifications within which the final turbine that is chosen must fit. Furthermore, considering that the exact dates of future bidding rounds are unknown, and could possibly be delayed, the applicant is allowing for future technology advances and requesting an extension of the EA validity, thereby mitigating the need for a further amendment application in the near future with associated strain on both the applicants', stakeholders and the Department's resources.

This envelope is defined as having a maximum rotor diameter of 180 m, a maximum hub height of 160 m, a maximum tip height of 220 m and a capacity of up to 10 MW rated power per turbine. **The overall maximum project nameplate capacity as authorised (i.e. 147 MW) will not be exceeded.** The maximum number of turbines has reduced from 35 to 33 and the type of turbine will determine how many turbines will be installed. If turbines at the largest extent of the range are chosen, less than half of the 33 turbines will be required, whilst if smaller turbines within this range are chosen, the total number of turbines will be closer to 33.

In order to optimise the layout for the fewer, larger turbines, the location of some turbines has changed, along with the associated infrastructure, namely the alignment of the internal roads and cables. Hardstands at each turbine will permanently increase in size and roads will be slightly wider during construction to cater for the transport of the larger turbines. The revised turbine locations and associated infrastructure are all located within the site boundary as considered in the original EIA. The substations and grid connection locations will remain unchanged.

3.3 Amendments to the EA

Table 5 sets out the detail of the proposed amendments with reference to the EA, specifically the amendments that are related to the scope changes described in Section 3.1 and 3.2 above.

As explained in Section 3.1, it is confirmed that the proposed amendments have been cross-checked against all potential listed activities and it can be confirmed that none of the changes on their own, constitute a listed or specified activity (in other words, there are no new triggers in relation to already triggered activities, or new triggers in relation to new activities).

It should be noted however, the choice of final wind turbine specification will be selected based on what is most feasible at the time as described in Section 3.2. Therefore, the applicant is seeking authorisation for 33 turbine locations. In reality, not all of these will likely be utilised and whilst the specialists have assessed a

worst case scenario (i.e. largest turbine at all 33 locations), these impacts will never be realised to their full extent, as demonstrated in Table 4.

As further indication that the applicant is committed to not triggering any additional listed activities, proof of compliance with the authorised project description and scope, will be provided with the final layout and Environmental Management Programme (EMPr) for DEFF to approve in terms of Condition 14 of the EA, after it has been made available to registered Interested and Affected Parties (I&APs), which requires that:

"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. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:

- 14.1. Position of solar facilities [sic³] and its associated infrastructure;*
- 14.2. Internal roads indicating width and length;*
- 14.3. Wetlands, drainage lines, rivers, stream and water crossing of roads and cables;*
- 14.4. All sensitive features e.g. heritage sites, wetlands, pans and drainage channels that will be affected by the facility and associated infrastructure;*
- 14.5. Substation(s) inverters and/or transformer(s) sites including their entire footprint;*
- 14.6. Cable routes and trench dimensions (where they are not along internal roads);*
- 14.7. All existing infrastructure on the site, especially roads;*
- 14.8. Buildings, including accommodation; and,*
- 14.9. All "no-go" and buffer areas."*

³ Condition 14.2 in the EA erroneously refers to solar facilities and not wind turbines which has been corrected in Table 5 of this report.

Table 5: Proposed scope amendments with reference to the relevant section of the Environmental Authorisation (proposed changes underlined)

Pages 1 and 2 of the EA – Project details	
Authorised Description	Proposed Description
Phase 2 of the Umsinde Emoyeni wind energy facility near Murraysburg, Western Cape Province	<p>Khangela Emoyeni Wind Energy Facility near Murraysburg, Western Cape Province</p> <p><i>Motivation/Reason: The applicant requires the WEF's name to be changed as per the above proposed amendment, in order for the applicant to bid the project as part of the Government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and to avoid confusion between the two projects.</i></p>
<p>Holder of authorisation:</p> <p>Emoyeni Wind Farm Project (Pty) Ltd</p>	<p>Holder of authorisation:</p> <p>Emoyeni Wind (Pty) Ltd</p> <p><i>Motivation/Reason: The REIPPPP bidding process requires that all submissions have separate companies/ Special Purpose Vehicles (SPV) to qualify for consideration. For this reason, the applicant requests and amendment of the holder of the authorisation from Emoyeni Wind Farm Projects (Pty) Ltd to Emoyeni Wind (Pty) Ltd. The company/ SPV contact person will remain Mr Peter Venn.</i></p>
<p>Location of the activity:</p> <p>Remainder of Farm 28; Portion 1 of Farm 29; Remainder, Portion 2, 3, 4 and remainder of Portion 1 of Farm De Hoop 30; Portion 1 of the Farm Matjeskloof 27; The Farm Voetpad 51; Portion 3, 4, 7, 10 and Remainder of Portion 2, of Farm Driefontein 26; Portion 1 of the Farm Middelvaly 52; Portion 1 and Remainder of the Farm Klein Driefontein 152; Portion 2 and 7 of Farm Witteklip 32; Portion 2 of Farm Swavel Kranse 28; Remainder, Portion 1, 3, 4, 6, 7 and Remainder of Portion 2 of Farm Klipplaat 109; Beaufort West and Ubuntu Local Municipalities, Western Cape Provinces</p>	<p>Location of the activity:</p> <p><u>Portion 1 of Farm 29; Remainder and Portion 1, 2, 3 of Farm De Hoop 30; Portion 4 of Farm Driefontein 26; Portion 2 and Remainder of Farm Swavel Kranse 28; Portion 1, 2, 3, 4, 6 and 7 of Farm Klipplaat 109; Beaufort West and Ubuntu Local Municipalities; Northern and Western Cape Provinces</u></p> <p><i>[The following properties have been removed from the description:</i> <i>Remainder of Portion 1 and Portion, 4 of Farm De Hoop 30; Portion 1 of the Farm Matjeskloof 27; The Farm Voetpad 51; Portion 3, 7, 10 and Remainder of Portion 2, of Farm Driefontein 26; Portion 1 of the Farm Middelvaly 52; Portion 1 and Remainder of the Farm Klein Driefontein 152; Portion 2 and 7 of Farm Witteklip 32;; Remainder of Farm Klipplaat 109; Beaufort West and Ubuntu Local Municipalities Northern and Western Cape Provinces]</i></p> <p><i>Motivation/Reason: The property numbers listed in the EA also includes properties associated with the Phase 1 Umsinde Emoyeni WEF. The proposed amendment thus only lists properties associated with the Phase 2 Umsinde (now Khangela Emoyeni WEF) which are located in both provinces.</i></p>

Page 3 of the EA – Holder of the authorisation		
Authorised Description		Proposed Description
Emoyeni Wind Farm Project (Pty) Ltd		Emoyeni Wind (Pty) Ltd
		Motivation/Reason: The REIPPPP bidding process requires that all submissions have separate companies/ Special Purpose Vehicles (SPV) to qualify for consideration. For this reason, the applicant requests and amendment of the holder of the authorisation from Emoyeni Wind Farm Projects (Pty) Ltd to Emoyeni Wind (Pty) Ltd. The company/ SPV contact person will remain Mr Peter Venn.
Pages 5 to 9 of the EA – Table of listed activities		
Listed Activity	Authorised Description	Proposed Description
<u>GN R.545: Activity 1</u> The construction of facilities or infrastructure for the generation of electricity where the electricity (i) Output is 20 MW or more.	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 W each.	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of up to 10 MW each. Motivation/Reason: The proposed amendment allows for the use of more efficient turbine technology that is anticipated to be available in South Africa in the near future, resulting in a reduced number of turbines. The total generation capacity of the facility will however remain capped at 147 MW.
<u>GN R.546: Activity 4:</u> The construction of a road wider than 4 m with a reserve less than 13.5 m (a) In Western Cape: (ii) All areas outside urban areas	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas.	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 12 m wide during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas. Motivation/Reason: Due to the larger size of the turbine components, larger trucks will be required for delivery, which in turn require wider roads to access the site during the construction phase.
<u>GN R.546: Activity 18:</u> The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (d) in the Western Cape: (iii) All areas outside urban areas.	Where existing tracks/roads exist within the site these may be widened or lengthened to facilitate the access tracks of 4-9 m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4 – 6 m during operation.	Where existing tracks/roads exist within the site these may be widened or lengthened to facilitate the access tracks of up to 12 m which will be used to access the turbines. These access tracks will be up to 12 m wide during construction, but will be reduced to 4 – 6 m during operation. Motivation/Reason: Due to the larger size of the turbine components, larger trucks will be required for delivery, which in turn require wider roads to access the site during the construction phase.

Page 5 of the EA – Table of listed activities

Listed Activity	Authorised Description	Proposed Description
<u>GN R.984: Activity 1:</u> <i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.</i>	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 W each.	Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of up to 10 MW each. <i>Motivation/Reason: The proposed amendment allows for the use of more efficient turbine technology that is anticipated to be available in South Africa in the near future, resulting in a reduced number of turbines. The total generation capacity of the facility will however remain capped at 147 MW.</i>
<u>GN R.984: Activity 18:</u> <i>The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (f) in the Western Cape:</i> <i>(i) All areas outside urban areas:</i> <i>(aa) Areas containing indigenous vegetation.</i>	Where existing tracks/roads exist within the site these may be widened or lengthened to facilitate the access tracks of 4-9 m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4 – 6 m during operation.	Where existing tracks/roads exist within the site these may be widened or lengthened to facilitate the access tracks of up to 12 m which will be used to access the turbines. These access tracks will be up to 12 m wide during construction, but will be reduced to 4 – 6 m during operation. <i>Motivation/Reason: Due to the larger size of the turbine components, larger trucks will be required for delivery, which in turn require wider roads to access the site during the construction phase.</i>
<u>GN R.985: Activity 4:</u> <i>The development of a road wider than 4 metres with a reserve less than 13.5 metres. (f) in the Western Cape:</i> <i>(i) Areas outside urban areas:</i> <i>(aa) Areas containing indigenous vegetation.</i>	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas.	Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 12 m wide during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas. <i>Motivation/Reason: Due to the larger size of the turbine components, larger trucks will be required for delivery, which in turn require wider roads to access the site during the construction phase.</i>

Page 9 of the EA – Location of project and list of facility infrastructure

Authorised Description	Proposed Description
- for the Phase 2 Umsinde Emoyeni wind energy facility (WEF) near Murraysburg, Western Cape Province, hereafter referred to as “the property”.	- for the Khangela Emoyeni wind energy facility (WEF) near Murraysburg, Western Cape Province, hereafter referred to as “the property”. <i>Motivation/Reason: The applicant requires the WEF’s name to be changed as per the above proposed amendment, in order for the applicant to bid the project as part of the Government’s REIPPP Programme and to avoid confusion between the difference projects.</i>

Authorised Description	Proposed Description
<p>The Umsinde Emoyeni wind energy facility will include the following infrastructure:</p> <ul style="list-style-type: none"> • Up to 35 wind turbines; • Hardstanding area of up to 45 m by 25 m; • Temporary laydown areas of up to 150 m by 60 m • Electrical cabling and onsite substation; • Existing farm access tracks and watercourse crossings will be upgraded; • Onsite office compound, including site offices, parking and an operation and maintenance facility including a control room. • In addition to the key components outlined above, the WEF will also require: <ul style="list-style-type: none"> – Anemometer masts; – Security fencing; and – CCTV monitoring towers. 	<p>The Khangela_Emoyeni wind energy facility will include the following infrastructure:</p> <ul style="list-style-type: none"> • Up to 33 wind turbines; • Hardstanding area of up to 55 m by 35 m; • Temporary laydown areas of up to 150 m by 60 m • Electrical cabling and onsite substation; • Existing farm access tracks and watercourse crossings will be upgraded; • Onsite office compound, including site offices, parking and an operation and maintenance facility including a control room. • In addition to the key components outlined above, the WEF will also require: <ul style="list-style-type: none"> – Anemometer masts; – Security fencing; and – CCTV monitoring towers.
	<p><i>Motivation/Reason: The proposed amendment would align the description with the proposed specification changes.</i></p>

Authorised Description		Proposed Description	
Technical details of the proposed facility:		Technical details of the proposed facility:	
Component	Description / Dimensions	Component	Description / Dimensions
Number of turbines	Up to 35 turbines	Number of turbines	Up to 33 turbines
Hub height	Up to 135 m	Hub height	Up to 160 m
Blade length	75 m	Blade length	Up to 90 m
Rotor diameter	Up to 150 m	Rotor diameter	Up to 180 m
Area occupied by transformer stations/ substation	200 x 250 m single storey substation compound	Area occupied by transformer stations/ substation	200 x 250 m single storey substation compound
Capacity of on-site substation	33/132 kV	Capacity of on-site substation	33/132 kV
Area occupied by both permanent and construction laydown areas	150 m x 60 m	Area occupied by both permanent and construction laydown areas	150 m x 60 m
Areas occupied by buildings	200 m x 250 m	Areas occupied by buildings	200 m x 250 m
Length of internal access roads	35.8 km	Length of internal access roads	Up to 29.3 km
Width of internal roads	9 m during construction, 4 -6 m during operation	Width of internal roads	Up to 12 m_during construction, 4 -6 m during operation
Height of fencing	2m x 2.5 m	Height of fencing	2m x 2.5 m
Type of fencing	Steel palisade fencing around construction camp. Concrete palisade around substation.	Type of fencing	Steel palisade fencing around construction camp. Concrete palisade around substation.
		Motivation/Reason: The proposed amendment would align the description with the proposed specification changes.	
Conditions of the Environmental Authorisation			
Condition	Authorised Description	Proposed Description	
Condition 1	Phase 2 of the Umsinde Emoyeni WEF near Murraysburg, Western Cape Province with a maximum of 35 wind turbines as described above is hereby approved.	The Khangela_Emoyeni WEF near Murraysburg, Western Cape Province with a maximum of 33 wind turbines as described above is hereby approved.	
		Motivation/Reason: The proposed amendment would align the description with the proposed specification changes.	

Conditions of the Environmental Authorisation		
Condition	Authorised Description	Proposed Description
Condition 7	This activity must commence with a period of five (05) years from the date of issue of this environmental authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for environmental authorisation must be made in order for the activity to be undertaken.	This activity must commence with a period of 10 years from the date of issue of this environmental authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for environmental authorisation must be made in order for the activity to be undertaken.
		<i>Motivation/Reason: To date there has only been four bidding windows in the REIPPPP, with the last of these bid windows having occurred in 2015. Due to various socio-economic, political and legal reasons the fifth bid window has been delayed since 2015. Currently it is not known when the fifth bid window will take place, and the applicant would like to extend the validity date of the EA to allow enough time for the REIPPPP process to take place, including finalisation of the project for construction (i.e. micro-siting, finalisation and approval of the EMP, appointment of contractors, etc.).</i>
Condition 14.1	Position of solar facilities and its associated infrastructure.	Position of wind turbines and its associated infrastructure.
		<i>Motivation/Reason: The proposed amendment allows for the correction of an incorrect technology reference.</i>
Condition 49	Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of plants listed in the National Forest Act and from the relevant provincial department for the destruction of species protected in terms of the specific provincial legislation. Copies of the permits must be kept by the ECO.	Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Land Reform and Rural Development for the removal of plants listed in the National Forest Act and from the relevant provincial department for the destruction of species protected in terms of the specific provincial legislation. Copies of the permits must be kept by the ECO.
		<i>Motivation/Reason: The proposed amendment allows for an administrative correction of the name of the competent authority which was changed in 2019 by the President of South Africa.</i>
Condition 53	No activities must be allowed to encroach into a water resource without a water use license being in place from the Department of Water and Sanitation.	No activities must be allowed to encroach into a water resource without a water use license being in place from the Department of Human Settlements, Water and Sanitation.
		<i>Motivation/Reason: The proposed amendment allows for an administrative correction of the name of the competent authority which was changed in 2019 by the President of South Africa.</i>

Conditions of the Environmental Authorisation		
Condition	Authorised Description	Proposed Description
Condition 119	The placement of the 35 approved turbines and all associated infrastructure must not be placed in high ecological bird and bat sensitive areas. This includes “no-go” areas and its buffers.	The placement of the 33 approved turbines and all associated infrastructure must not be placed in high ecological bird and bat sensitive areas. This includes “no-go” areas and its buffers.
		<p><i>Motivation/Reason: The proposed amendment would align the description with the proposed specification changes.</i></p> <p><i>Please note that less turbines are likely to be constructed should turbines with a greater generation capacity be installed, thereby reducing the disturbance footprint for the Phase 2 Umsinde/ Khangela Wind Energy Facility even more (i.e. the more powerful the turbine that can be used, the fewer turbines are needed to achieve the authorised generation capacity).</i></p>

4 Assessment of impacts related to the proposed changes

This section documents the impacts during construction and operation, as originally assessed for the authorised activities and as assessed for the proposed amendments. Any additional mitigation measures to be included in the EMPr have been identified. The original summary tables, and new proposed changes due to the amendment are provided for comparative purposes.

4.1 Specialist input

A number of impacts were identified and assessed in the Revised Final EIR (Arcus, 2018). These impacts have been revisited by the same specialists for the construction, operational and decommissioning phases and where relevant they have provided their opinion on the changes to these original impacts should the amendments be approved.

These specialists are shown in Table 6 and the respective reports or statements attached as Appendices. The soil and agriculture and socio-economic studies were not updated.

The socio-economic findings were not deemed to change as the total capacity of the wind farm will remain the same and therefore the negative impacts and benefits will largely remain of the same scale. Soil and agriculture was not assessed as the entire site is dominated by shallow and rocky soils as well as extensive rock outcrops which have a very low agricultural potential, and furthermore, the agricultural footprint will not be increased as discussed in Section 3.3 above with reference to the listed activities.

Table 6: Specialist studies

Specialist Study	Consultant	Company	Appendix
Terrestrial Ecology (Flora and Fauna)	Simon Todd	3Foxes Biodiversity Solutions (Pty) Ltd	D1
Aquatic Ecology	Dr Brian Colloty	EnviroSci (Pty) Ltd (previously Scherman, Colloty & Associates)	D2
Avifauna	Dr Owen Davies ⁴	Arcus Consulting	D3
Bats	Kate McEwan	NSS Environmental	D4
Heritage	Dr Tim Hart	ACO Associates	D5
Palaeontology	Dr Almond	Natura Viva cc (c/o ACO Associates)	D6
Visual	Bernard Oberholzer	Bernard Oberholzer Landscape Architects	D7
	Quinton Lawson	Meirelles Lawson Burger Architects	
Noise	Momé de Jager	Enviro-Acoustic Research	B8

⁴ Mr Andrew Pearson originally undertook the avifauna assessment but is no longer employed by Arcus Consulting (he is currently working for a renewable energy company). Dr Owen Davies, of Arcus Consulting, was subsequently appointed to undertake the amendment application. Dr Davies was previously involved with the avifauna monitoring for Umsinde Emoyeni Phase 1 and Umsinde Emoyeni Phase 2 projects and is consequently familiar with the sites and its sensitivities.

4.2 Summary of original impacts

A summary of the original impacts assessed in the Final EIR (Arcus, 2018) are provided in Table 7. A summary of the cumulative impacts is provided thereafter in Table 8.

Table 7: Summary of potential impacts as authorised (adapted from Arcus, 2018)

Environmental aspect	Impact	Without mitigation	With mitigation
Construction			
Geology soils and agriculture	Turbine footprint construction	Low (-)	Low (-)
	Construction of buildings and infrastructure	Low (-)	Low (-)
	Construction of roads	Low (-)	Low (-)
	Vehicle operation and spillages	Low (-)	Insignificant (-)
	Dust generation	Low (-)	Insignificant (-)
Terrestrial ecology (flora and fauna)	Impacts on vegetation and listed or protected plant species resulting from construction activities	High (-)	Medium (-)
	Alien plant invasion risk	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Very low (-)
	Direct faunal impacts during construction	Medium (-)	Low (-)
Wetlands and freshwater ecology	Loss of riparian systems and watercourses	Medium (-)	Low (-)
	Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function	Medium (-)	Low (-)
	Increase in sedimentation and erosion within the development footprint	Medium (-)	Low (-)
	Impact on localised surface water quality	Medium (-)	Low (-)
Avifauna	Habitat destruction	Medium (-)	Low (-)
	Disturbance and displacement	Low (-)	Very low (-)
Bats	Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction	Medium (-)	Insignificant (-)
	Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction	Medium (-)	Low (-)
Socio-economic	Creation of employment and business opportunities	Low (+)	Medium (+)
	Benefits associated with providing technical advice to local farmers and municipalities	N/A (n)	Low (+)
	Improved cell-phone coverage	Low (+)	Low (+)
	Presence of construction workers and potential impacts on family structures and social networks	Medium (-)	Low (-)
	Influx of job seekers	Low (-)	Low (-)
	Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Low (-)	Very low (-)
	Increased risk of veld fires	Medium (-)	Low (-)
	Impact of heavy vehicles and construction activities	Medium (-)	Low (-)
	Loss of farmland	Low (-)	Very low (-)
Heritage	Impacts to archaeological material and rock engravings (Pre-colonial heritage)	Medium (-)	Very low (-)

Environmental aspect	Impact	Without mitigation	With mitigation
	Colonial heritage	Medium (-)	Medium (+)
	Cultural landscape / setting	Medium (-)	Medium (-)
	Palaeontology: Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)	Medium (-)	Low (+) Low (-)
Visual	Construction of turbines	Low (-)	Low (-)
Noise	Construction noise	Very low (-)	(No rating)
Operation			
Terrestrial ecology (flora and fauna)	Alien plant invasion risk	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Low (-)
	Faunal impacts during operation	Medium (-)	Medium (-)
Birds	Disturbance and displacement	Medium (-)	Low (-)
	Electrocution	Medium (-)	Low (-)
	Power line collisions	High (-)	Medium (-)
	Wind turbine collisions	Very high (-)	Medium (-)
Bats	Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity	High (-)	Low (-)
	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.	Very high (-)	Low (-)
Socio-economic	Creation of employment and business opportunities	Low (+)	Low (+)
	Establishment of Community Trust	Medium (+)	High (+)
	Promotion of renewable energy projects	Medium (+)	Medium (+)
	Visual impact and impact on sense of place	High (-)	Medium (-)
	Impact on tourism	Medium (-)	Low (-)
Visual	Wind turbines	High (-)	Medium (-)
Noise	Operational noise	Very low ⁵ (-)	(No rating)
Decommissioning			
Terrestrial ecology (flora and fauna)	Alien plant invasion risk	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Low (-)
Birds	Disturbance and displacement	Low (-)	Very low (-)
Socio-economic	Loss of jobs and associated income	Very low (-)	Very low (-)

In Table 8 below, not all specialists used the same terminology for the ratings, therefore the exact terminology has been used to avoid misinterpretation.

⁵ Rated as very low significance for the 175 MW layout which more closely resembles the current layout of 147MW than the 245 MW layout which was rated as low significance.

Table 8: Summary of potential cumulative impacts as authorised (Arcus, 2018 and associated specialist studies)

Environmental aspect	Impact	Without mitigation	With mitigation
Geology soils and agriculture	Turbine footprint construction	Small (-)	
	Construction of buildings and infrastructure	Small (-)	
	Construction of roads	Small (-)	
	Vehicle operation and spillages	Small (-)	
	Dust generation	Small (-)	
Terrestrial ecology (flora and fauna)	Impact on CBAs and broad-scale ecological processes	High (-)	Low (-)
Wetlands and freshwater ecology	Overall cumulative impact during the construction and operational phases.	Medium (-)	Low (-)
Birds	Electrocution during operation	Very high (-)	Medium (-)
	Power line collisions during operation	Very high (-)	High (-)
	Collisions with wind turbines during operation	Very high (-)	Very high (-)
Bats	Bat fatalities during operation	Unrated	Unrated
Socio-economic	Visual impact and impact on sense of place	Unrated	Medium (-)
	Positive cumulative impacts from the creation of employment, skills development and training opportunities, creation of downstream business opportunities	Unrated	High (+)
Heritage and palaeontology	Cultural landscape / setting	Significant	
Visual	Effect on the visual character and scenic resources of the area	Significant	
Noise	Increase in ambient sound levels	Insignificant	

4.3 Assessment of proposed changes

The following sections provide a comparison between the original impacts that were assessed (where relevant) and the revised assessments based on the proposed changes. Additions and amendments to mitigation measures and conditions of the EA are also provided. Specialists addressed the following to satisfy the requirements of a Part 2 Amendment in terms of Regulation 32(1)(a) of the 2014 NEMA EIA Regulations (GN R 982, as amended) as follows:

- An assessment of all impacts (including cumulative impacts) related to the proposed changes;
- A description of advantages and disadvantages associated with the proposed changes; and
- Identification of additional measures to avoid, manage and mitigate impacts associated with the proposed changes for inclusion in the EMPr.

Where applicable, the EMPr has been updated (see Appendix E) to include the additional mitigation measures identified by the specialists, refer to Appendix E. All additional mitigation measures have been recorded per specialist field in the sub-sections that follow.

Note that all assessments were undertaken in terms of the original EIA assessment methodology to ensure comparable results.

4.3.1 Terrestrial ecology (flora and fauna)

4.3.1.1 Introduction

A terrestrial ecology specialist study was conducted in 2015 by Mr Simon Todd Consulting of 3Foxes Biodiversity Solutions (Pty) Ltd in collaboration with Anchor Environment Consultants. In 2018 Simon Todd compiled an Addendum report to be resubmitted with the FEIR. Due to the potential changes that the proposed amendments may have on the assessed impacts, Mr Todd was appointed to assess the proposed amendments and compare them against the original assessments. Please refer to Appendix D1 for a copy of the revised assessment.

4.3.1.2 Original findings

The initial assessment undertaken in 2015 by 3Foxes Biodiversity Solutions (Pty) Ltd and Anchor Environmental Consultants documents that three vegetation types occur in the study area, Upper Karoo Hardeveld, Eastern Upper Karoo and Southern Karoo Riviere. The site is dominated by Eastern Upper Karoo and is the most extensive vegetation type in South Africa and form a large portion of the central and eastern Nama Karoo Biome. The vegetation type is classified as Least Threatened and about 2% of the original extent has been transformed largely for intensive agriculture. Dominant species within the study area include *Pentzia incana*, *Rosenia Humilis*, *Pteronia sordida*, *Zygophyllum* and *Ruschia intricata* with variable grass layers.

The Upper Karoo Hardeveld vegetation type is associated with 11,743 km² of the steep slopes of koppies, butts mesas and parts of the Great Escarpment covered with large boulders and stones. The vegetation type occurs as discrete areas associated with slopes and ridges from Middelpoort in the west and Strydenburg, Richmond and Nieu-Bethesda in the east, as well as most south-facing slopes and crests of the Great Escarpment between Teekloofpas and eastwards to Graaf-Reinet. The Southern Karoo Riviere vegetation type is associated with the rivers of the central karoo such as Buffels, Bloed, Dwyke, Gamka, Sout, Kariega and Sundays Rivers. About 12% has been transformed as a result of intensive agriculture and the construction of dams. Although it is classified as Least Threatened, it is associated with rivers and drainage lines and those areas classified under this vegetation type should be considered sensitive. Compared to the other vegetation types, this is the only vegetation at the site which contains a significant number of trees.

The landscape of the site is diverse and has a rugged topography with hills, drainage features and more flat areas repeatedly interspersed across the site. The majority of the turbines are located on the flatter open plains of the site which is considered least sensitive habitat. However, there are also a number of turbines located on steeper slopes especially within dolerite outcrops. On the steeper slopes access roads and turbines will generate a significant erosion risk and have sensitive features present which include localised habitats such as rock fields and densely-vegetated south-facing slopes. The dolerite outcrops are considered sensitive as these habitats contain high diversity of fauna and flora.

The abundance of plant species of conservation concern is fairly low. Only five such species are known from the area, however *Gethyllis longistyla* which is classified as Rare was observed in the rock fields near one of the wind measuring masts near the eastern margin of the site.

The site falls within the distribution range of approximately 53 terrestrial mammals, indicating that the mammalian diversity at the site is potentially high. The site is extensive and topographically diverse, suggesting that a large proportion of these species are likely to occur at the site. Although some impact on these species may occur as a result of development in the area, they are widespread species and this would not be likely to compromise the local or regional populations. Three listed species potentially occur at the site, the Black-footed Cat *Felis nigripes* (Vulnerable), Leopard *Panthera pardus* (Near Threatened) and Honey Badger *Mellivora capensis* (SARDB Endangered). According to the SARCA database, 23 reptiles have been recorded from half degree squares but rises to 50 species when the area of interest is expanded. There are a few listed reptiles that are likely to be present at the site. The amphibia diversity in the study area is low with only 11 species known from the area.

Under the layouts assessed in 2015 there were a number of turbines within areas considered sensitive. These turbines were however relocated in order to reduce the overall impact of the development. This was especially applicable to turbines within area of plains wash which are highly sensitive to disturbance as well as those within the dolerite outcrops which are foci of diversity and faunal activity.

Examination of the 2018 revised layouts as authorised (as shown in Figure 9) confirmed that there were no turbines in no-go areas or high sensitivity areas which are considered unsuitable for turbine placement. No roads traversed no-go areas while there were some roads which traversed minor drainage systems (such crossings were reduced as far as possible). The remaining crossings were not avoidable and considered acceptable by the specialist.

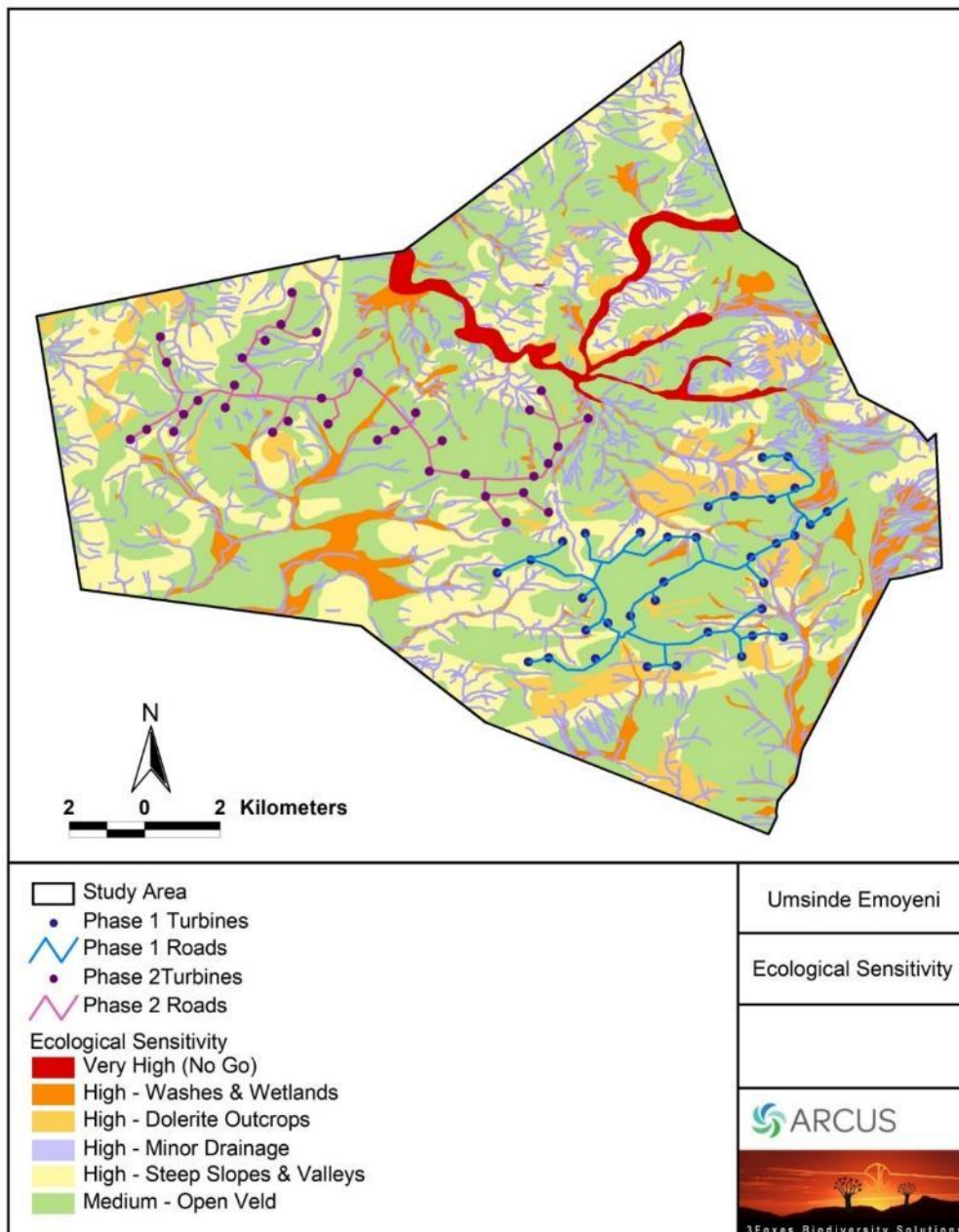


Figure 9: Ecological sensitivity map of the authorised Khangela Emoyeni site (2018).

4.3.1.3 Scope change of relevance

From an ecological perspective the change of greatest potential impact is the relocation of turbines from their original assessed positions and an increase in the footprint associated with each turbine. However, it is important to note that the final increase in the development footprint would depend on the size and hence also the number of turbines used. Depending on the scenario, this would result in a range of footprints from 50-54 ha during construction, reduced to 26-29 ha during operation. A review of these changes and their ecological implications indicates the following outcomes:

- No turbines have been relocated from areas of low sensitivity to areas of higher sensitivity with the result that an increase in impact as a result of the relocation of turbines would not occur. The total footprint of the development at construction has however increased from 54.7 ha to 59.4 ha, but in reality would range between 50 ha to 54 ha depending on what size turbines are used, this is as a

result of the increase in temporary road width and increase in turbine hard-stand size. However, in the long-term the roads during operation would be similar to the previous assessment with the result that there would be not be an overall increase in the development footprint for the operational phase.

- Although the drop in the total number of turbines would potentially decrease noise and disturbance impacts on fauna, the overall decrease in maximum turbine positions from 35 to 33 is not considered as being sufficient to warrant a change in impact as the original impact on fauna during operation has been assessed as being a minor negative impact, post mitigation and the amendment would not warrant a further reduction.

There have been significant changes to the CBA mapping in the area since the original EIA study was conducted. In 2018 the development was within CBAs and Ecological Support Areas (ESAs). Under the current revised layouts there are no turbines within these areas.

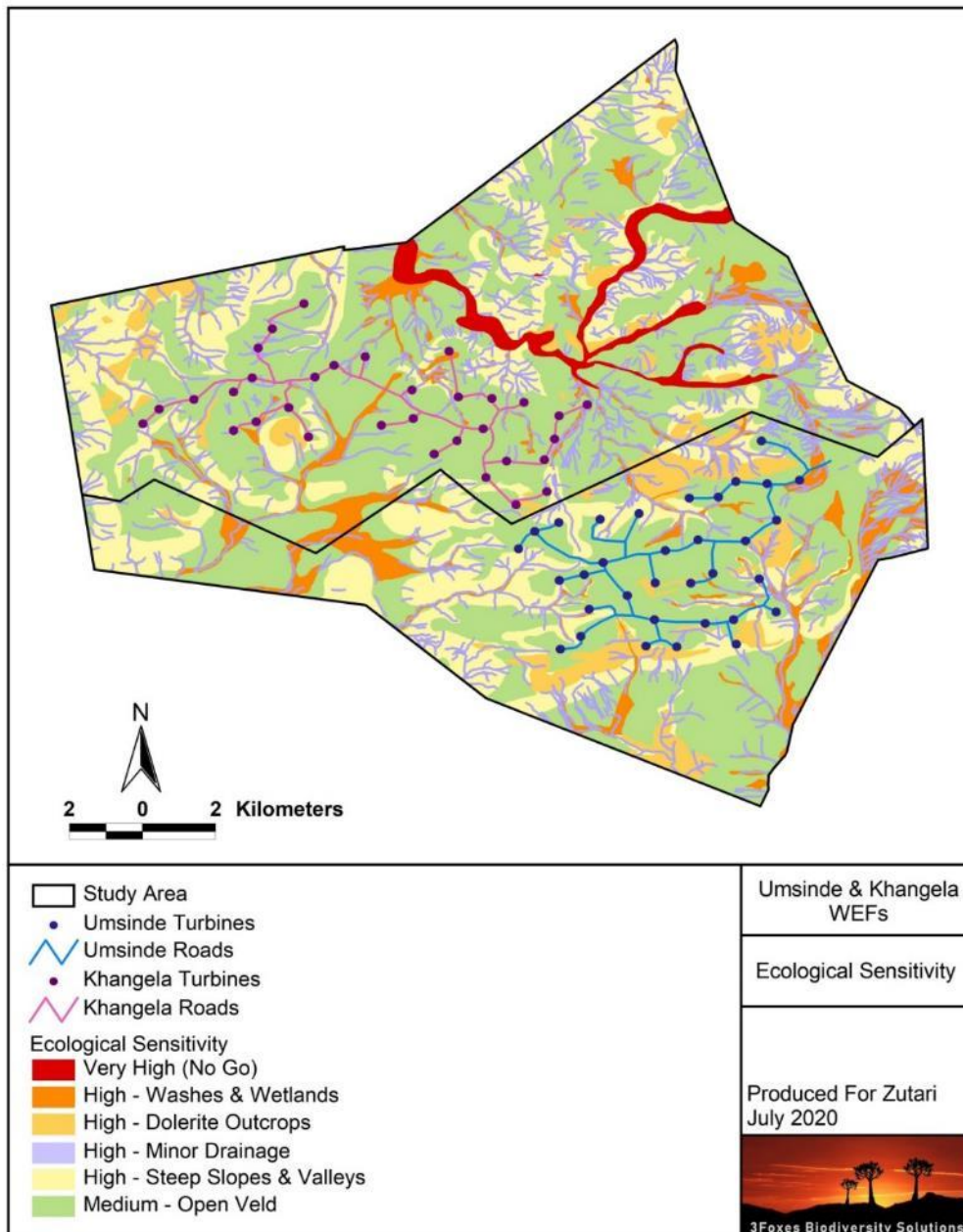


Figure 10: Ecological sensitivity map of the proposed amended Khangela Emoyeni site (2020)

4.3.1.4 Cumulative impacts

The cumulative impacts would remain similar and an increase in the overall cumulative impacts 'broad-scale ecological processes' is not anticipated. The decrease in the number of turbines associated with the project will ultimately reduce some of the cumulative impacts associated with the development.

4.3.1.5 Change in impact ratings and mitigation measures

The specialist has concluded that the significance of potential impacts on terrestrial ecology as a result of the proposed amendments remain unchanged for all potential impacts during each phase this is summarised in Table 9. The original mitigation and avoidance measures are considered applicable to the amendment and no new or additional measures are considered necessary.

Table 9: Summary of potential impacts on terrestrial ecology

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Impacts on vegetation and listed or protected plant species resulting from construction activities	High (-)	Medium (-)	High (-)	Medium (-)
	Alien plant invasion risk	Medium (-)	Low (-)	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Very Low (-)	Medium (-)	Very Low (-)
	Direct faunal impacts during construction	Medium (-)	Low (-)	Medium (-)	Low (-)
Operation	Alien plant invasion risk	Medium (-)	Low (-)	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Low (-)	Medium (-)	Low (-)
	Faunal impacts during operation	Medium (-)	Medium (-)	Medium (-)	Medium (-)
Decommissioning	Alien plant invasion risk	Medium (-)	Low (-)	Medium (-)	Low (-)
	Increased erosion risk	Medium (-)	Low (-)	Medium (-)	Low (-)
Cumulative	Impact on CBAs and Broad-Scale Ecological Processes	High (-)	Low (-)	High (-)	Low (-)

4.3.1.6 Advantages and disadvantages

The major changes to the development in terms of the current amendment which are of ecological relevance include the changes to the number and distribution of turbines and the size of turbine hard stands. These changes are minor but can be seen as being neutral or slightly positive in nature and the significance of impacts as assessed in the original study are considered still valid and applicable for the current assessment.

4.3.1.7 Summary

The impacts of the amended layout on Flora and Fauna would be similar to the authorised layout and there are no fatal flaw or critical issues associated with the proposed changes. The cumulative impacts associated with the amended layout are similar to the authorised layout and considered acceptable.

4.3.2 Wetlands and freshwater ecology

4.3.2.1 Introduction

An aquatic assessment was conducted by Dr Brian Colloty of Scherman Colloty & Associates (SC&A) in 2015 with an addendum to the findings prepared in 2018. Due to the potential changes that the proposed amendments may have on the assessed impacts Dr Colloty, through EnviroSci (Pty) Ltd was appointed to assess the proposed amendments and compare them against the original assessment. Please refer to Appendix D2 for a copy of the revised assessment.

4.3.2.2 Original findings

The study site is located approximately 35 km north west of Murraysburg, falling within three quaternary catchments of the Gamtoos Water Management area (Quaternary catchments L21C, L21D & L21E). Several main stem rivers are found within these catchments which forms part of the Brak River. Main tributaries to these rivers include: Skietuilspruit, Brak River, Snyderskraal River and Buffels River.

Water bodies and aquatic systems are found at the site. Based on the six (6) levels of the National Wetland Classification System, these systems are typical of inland “Systems within the Drought Corridor Eco” region. Wetland landscape units were valley floors with riparian/Palustrine or unchanneled valley bottom hydrogeomorphic units. Several of these have been indicated in the National Wetland Inventory, however upon closer inspection during the site visit and the National Freshwater Priority Ecosystems Areas (NFEPAs) database, most of the indicated wetlands are man-made systems. Based on this and field observations no natural wetlands would be affected by the proposed WEF.

The study area does however contain river FEPAs that are important due to their role in containing fish species of special concern or their potential to act as support habitats. These habitats include lower and upper mountain foothills, important for the Chubbyhead barb (*Barbus anoplus*) and Smallscale redbin (*Pseudobarbus asper*) fish species. The latter species is endemic to South Africa and is listed as Endangered.

The Present Ecological State (PES)⁶ ratings for the drainage lines and rivers in the study area are shown in Table 10 (DWS, 2014- where C = Moderately Modified & B = Largely Modified):

Table 10: Present Ecological State scores (PES) for the drainage lines and the rivers in the study area

Subquaternary Catchment Number	Present Ecological Status	Ecological Importance	Ecological Sensitivity
6621	C	Moderate	Moderate
6748	D	Moderate	Moderate
6756	C	Moderate	Moderate
6810	C	High	Moderate

It is thus evident that the freshwater systems in the study area are largely functional, however significant impacts as a result of current land use practices and alien trees (e.g. Weeping willow (*Salix babylonica*)) do occur. This was confirmed for each of the affected reaches located within the development footprint. The observed systems are natural, with small or narrow riparian zones, dominated by karee (*Searsia lancea*) and sweet thorn (*Vachellia karroo*) trees. The only obligate species observed include small areas of *Juncus rigidus* and common reed (*Phragmites australis*) associated with small pools created by road culverts found throughout the study area.

The 2018 proposed layouts for the facility appear to have limited impact on the aquatic environment, as many of the authorised structures will avoid the delineated watercourses with the exception of the 31 watercourse crossings (within both Phase 1 and Phase 2⁷). Based on the condition of some of the present crossings, the project presented an opportunity to improve flow and erosion protection where culverts/crossings exist.

⁶ Represents the extent to which a river has changed from its reference or near pristine condition towards a highly impacted system where there has been an extensive loss of natural habitat and biota, as well as ecosystem functioning.

⁷ The Final EIA report does not indicate the number of stream crossings for each project.

4.3.2.3 Scope change of relevance

When compared to the original impact assessment, the overall risks associated with the proposed changes will remain low with mitigation, i.e. the proposed layout avoids the important watercourse and wetland areas and make use of existing tracks/road crossing points of a similar number as the original layout. Changes such as an increase in temporary and permanent turbine hardstands and widening of the construction road footprint has no material effect on the impacts and ratings as previously ascribed.

4.3.2.4 Cumulative impacts

No additional cumulative impacts or changes to the previously assessed would be required due to the proposed amendments.

4.3.2.5 Change in impact ratings and mitigation measures

The specialist concluded that the significance of potential impacts on aquatic ecology as a result of the proposed amendments would remain unchanged for all potential impacts during each project phase as summarised in Table 11 below. All mitigation measures originally identified by the specialist remain applicable to the project. No additional mitigation has been identified

Table 11: Summary of potential impacts on aquatic ecology

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Loss of riparian systems and water course	Medium (-)	Low (-)	Medium (-)	Low (-)
	Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function	Medium (-)	Low (-)	Medium (-)	Low (-)
	Increase in sedimentation and erosion within the development footprint	Medium (-)	Low (-)	Medium (-)	Low (-)
	Impact on localised surface water quality	Medium (-)	Low (-)	Medium (-)	Low (-)
Cumulative	Overall cumulative impact during the construction and operational phases.	Medium (-)	Low (-)	Medium (-)	Low (-)

4.3.2.6 Advantages and disadvantages

No advantages or disadvantages were identified.

4.3.2.7 Summary

The significance of the impact on the aquatic environment would remain low after mitigation during the construction, operation and decommissioning phases. Based on the findings of this study the specialist has no objection to the approval of the proposed amendments.

4.3.3 Avifauna

4.3.3.1 Introduction

An Avifaunal Assessment Report was drafted in 2015 by Dr Andrew Pearson⁸ of Arcus Consultancy Services (Pty) Ltd and an addendum compiled in 2018. Due to the potential changes that the proposed amendments

⁸ Mr Andrew Pearson originally undertook the avifauna assessment but is no longer employed by Arcus Consulting (he is currently working for a renewable energy company). Dr Owen Davies, of Arcus Consulting, was subsequently appointed to undertake the amendment application. Dr Davies was previously involved with the avifauna monitoring for Umsinde Emoyeni Phase 1 and Umsinde Emoyeni Phase 2 projects and is consequently familiar with the sites and its sensitivities.

may have on the assessed impacts, Arcus was appointed to assess the proposed amendments and compare them against the original assessment. Please refer to Appendix D3 for a copy of the revised assessment.

4.3.3.2 Introduction

The original findings documented by Arcus were informed by 24 months of pre-construction monitoring. The monitoring was conducted between October 2013 and October 2014 followed by additional monitoring between July 2016 and April 2017. The results of this monitoring were used to create an Avifaunal sensitivity map and Avifaunal No-Go areas to inform turbine placement and identify potential impacts.

A total of 713 birds of 23 target species were recorded during vantage point monitoring in four seasonal surveys. Verreaux's Eagle (*Aquila verreauxii*) accounted for 30.5% of target birds recorded, followed by Blue Crane (*Anthropoides paradiseus*) (18.8%) and Jackal Buzzard (*Buteo rufofuscus*) (15.8%). Of all the target species flight recorded, 72% included at least some time at a height between the lowest and highest blade tip heights (i.e. within the potential rotor swept area of a turbine) or at-risk height.

The highest number of flights at risk height was recorded for Verreaux's Eagle, followed by Jackal Buzzard and Rock Kestrel. Blue Crane had the third highest number of flights of which the majority were low flights and only 20 included time at risk height. Verreaux's Eagle was identified by the initial monitoring as the main species of concern for the proposed development and was therefore a particular focus for the 2016/2017 survey period.

A total of 63 flights recorded 94 birds of 14 target species during 31 hours of Nest Vantage Point (NVP) monitoring across both spring and autumn. NVP1 was established near a suspected Verreaux's Eagle nest which, as monitoring progressed in spring, was found to be an active Jackal Buzzard nest. No flights of Verreaux's Eagle were recorded. However due to the presence of a river near NVP1, other water associated target species were recorded e.g. South African Shelduck (*Tadorna cana*), Grey Heron (*Ardea cinerea*), Egyptian Goose (*Alopochen aegyptiaca*) and African Spoonbill (*Platalea alba*). NVP1b and NVP2 recorded the presence of Verreaux's Eagle and a juvenile Verreaux's Eagle. Driven transects resulted in moderate to low numbers of target species being recorded. The most frequently recorded was Blue Crane.

Across all the seasonal surveys, the total number of recorded species was 158. These included 10 Red Data species and 24 priority species, two of which (African Rock Pipit and Black Harrier (*Circus maurus*)) are endemic. The Rock Kestrel (*Falco rupicolus*) is not a Red data species or a priority species, but its population of the area remain substantial and the species was abundant in 2016/2017. This species has been known to collide with turbines in South Africa and is therefore potentially at risk. Some protection can be obtained by buffering the prominent cliff and ridgeline habitats as well as the identified nest sites of this species.

Considering the observed wind turbine fatalities of Red Data species in South Africa to date, five species effected by mortality from wind turbines have been recorded on the WEF site. They are Verreaux's Eagle (6 mortalities), Black Harrier (5), Lanner Falcon (*Falco biarmicus*) (4), Martial Eagle (*Polemaetus bellicosus*) (4), Blue Crane (6), Southern Black Korhaan (*Afrotis afra*) (3), Greater Flamingo (*Phoenicopterus roseus*) (1) and Secretarybird (*Sagittarius serpentarius*) (1). These Red Data species are susceptible to collision, along with the following more common species that have been worst impacted upon in South Africa to date, and may occur in relatively moderate abundance on the Umsinde Phase 1 site: Jackal Buzzard, Rock Kestrel, Egyptian Goose, Bokmakierie (*Telophorus zeylonus*), Booted Eagle (*Hieraaetus pennatus*) and Steppe Buzzard (*Buteo vulpinus*).

4.3.3.1 Scope change of relevance

A site visit was undertaken from 22 to 26 June 2020 to establish if any changes to the receiving environmental have occurred since the pre-construction monitoring in 2013/14 and 2016/17. It was confirmed that the land use on site has not changed since the previous studies were undertaken, however, there appeared to be a reduction in the number of Blue Crane in and around the project site (the reasons for this are unclear to the specialist). This did allow for the identification of a potentially important local site for the persistence of Blue Crane in the area which resulted in an additional no-go buffer for the turbines and overhead powerlines.

The Verreaux's Eagle Risk Assessment Tool (VERA) model was additionally used to model areas of particular sensitivity to Verreaux's Eagle and identified additional no-go buffers to inform the site layout. Additional rocky ridge buffers have also been included based on the Verreaux's Eagle guidelines as shown in the revised

avifaunal sensitivity map (Figure 11 below). The incorporation of the VERA risk model into the avifaunal sensitivity map has **improved the confidence level of the assessment and further reduced the potential risks** imposed on Verreaux's Eagle by the proposed development.

Collision of birds with turbines is the largest potential impact on avifauna associated with wind energy facilities. The main factors relate to the number of turbines, their dimensions and layout and therefore the amendment has relevance. The authorised rotor diameter of up to 150 m translates into a rotor swept area (RSA) of approximately 17,671m² per turbine. The proposed increase of the rotor diameter to 180 m translates into a RSA of approximately 23,447 m² per turbine. This is an increase of 44% in the RSA per turbine. The maximum number of turbines will however be reduced from the authorised 35 to the proposed 33 turbines. The total RSA of the 35 authorised turbines is approximately 618,485 m² and the total number of the 33 turbines is approximately 839,751 m² when using maximum blade lengths at the same time. This translates into an increase of 35.8% increase in collision risk window.

Worst case scenario, the increase of 35.8 % of the overall collision risk window (that would occur if the maximum number of turbines at their maximum proposed dimensions were to be constructed) is a moderate increase, and would be considered significant at this location due to the presence of Verreaux's Eagles in the area. It is however highly unlikely that the proposed amendment would translate into a significantly increased RSA without exceeding the maximum generation capacity as authorised (please keep in mind that this impact is reduced for Verreaux's Eagles through the implementation of the additional VERA model no-go buffers as explained in the earlier paragraphs).⁹.

4.3.3.2 Cumulative impacts

Arcus 2018 assessed the cumulative impacts based on the assumption that the Umsinde Emoyeni, Khangela Emoyeni, Modderfontein Wind Energy Facility on a site near Victoria West, Mainstream wind and solar energy facility at Victoria West and the Ishwati Emoyeni Wind Farm Project would be constructed in the broader area. The assessment (Arcus 2018) noted that the extent of these impacts will depend largely on the final turbine numbers and layouts of each facility which can be reduced if turbine placement is informed by pre-construction monitoring and nest surveys, and the minimum number of turbines is constructed.

The improvements of technology that allow for increased individual generation capacity of turbines and potential for the reduction in the number of turbines required to meet the maximum generation capacity of a facility has the potential to reduce the risks of turbine collisions and the associated impacts imposed on avifauna through the reduction in the number of obstacles in the airspace within an area. The ongoing research into mitigation measures such as painting on blade per turbine black, has also shown encouraging results.

These factors, combined with the availability and implementation of tools such as the VERA model used to predict areas of high risk to resident Verreaux's Eagle and to inform and improve layouts of wind energy facilities is predicted to significantly reduce the cumulative risk of collisions, particularly if employed at nearby developments to further inform their layouts.

The updated assessment for the cumulative impact of collisions from turbines is that prior to mitigation the significance is very high, but if the appropriate mitigation measures and oversight occurs at the surrounding developments in the area this could potentially lower the intensity of the impact from high to medium, resulting in an impact reduced from very high significance to high significance. The cumulative impacts for electrocution, power line collisions remain unchanged

⁹ Please refer to Section 3.3 of this report, which explains that the total number of turbines constructed would reduce based on size of the selected turbine.

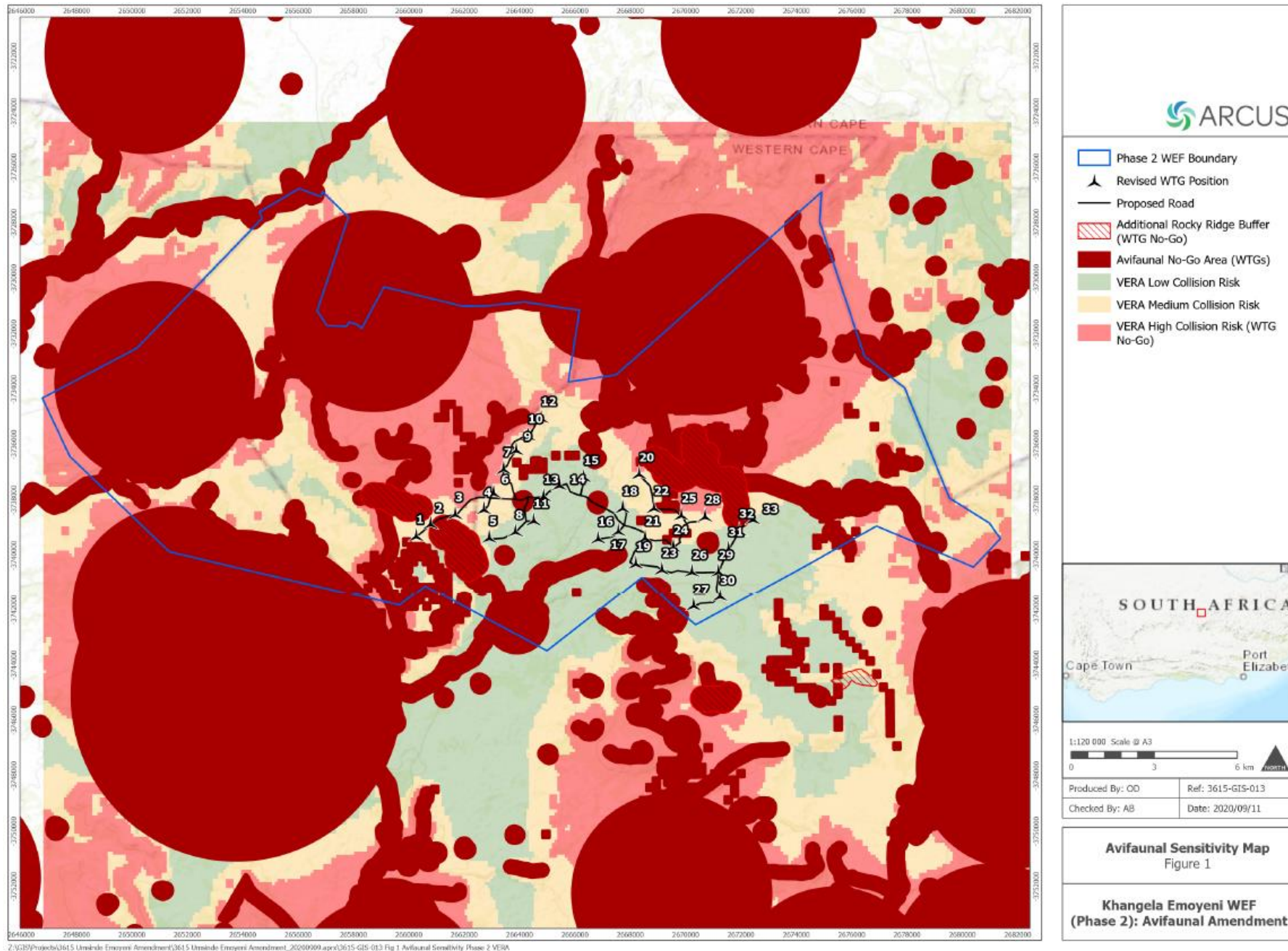


Figure 11: Avifaunal sensitivity map (Arcus, 2020). Note that cables will only be above ground where conditions does not allow for underground cabling. Also, not that some turbines may appear to be inside no-go areas due to the scale of the mapping. No turbines will in fact be constructed inside any of these areas.



4.3.3.3 Change in impact ratings and mitigation measures

The cumulative impact for collisions with turbines as rated as Very High pre- and post-mitigation and with the amended layout will remain Very High (-) with mitigation but will reduce to High (-) post-mitigation. This is summarised in Table 12 below.

Table 12: Summary of potential Avifauna impacts

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Habitat destruction	Medium (-)	Low (-)	Medium (-)	Low (-)
	Disturbance and displacement	Low (-)	Very Low (-)	Low (-)	Very Low (-)
Operation	Disturbance and displacement	Medium (-)	Low (-)	Medium (-)	Low (-)
	Electrocution	Medium (-)	Low (-)	Medium (-)	Low (-)
	Power line collisions	High (-)	Medium (-)	High (-)	Medium (-)
	Wind turbine collisions	Very high (-)	Medium (-)	Very high (-)	Medium (-)
Decommissioning	Disturbance and displacement	Low (-)	Very Low (-)	Low (-)	Very Low (-)
Cumulative	Electrocution	Very high (-)	Medium (-)	Very high (-)	Medium (-)
	Collisions with Power Lines	Very high (-)	High (-)	Very high (-)	High (-)
	Collisions with WTGs	Very high (-)	Very High (-)	Very high (-)	High (-)

New information in the form of additional best practice guidelines and the results from other operational WEFs has been considered and incorporated into the revised mitigation measures where considered to be relevant, including additional ridge buffers and analyses (i.e. VERA) conducted to further reduce the risks for Verreaux's Eagle. The following revised mitigation measures are recommended:

- The EMPr must be updated to include the revised avifaunal sensitivity map.
- Areas identified by the updated sensitivity map as 'no-go' areas for the placement of turbines and overhead powerlines should be explicitly stated as such in the EMPr.
- The final layout must be informed by the updated avifaunal sensitivity map and turbines that fall inside the revised 'no-go' areas must be moved to lower sensitivity areas or removed completely from the layout (this has been done).
- The maximum generation capacity of the development should be met through the deployment of fewer, larger turbines as far as practically possible.
- Should fewer turbines be required to meet the maximum generation capacity of the development than the number authorised, turbines closest to 'no-go' areas and those in areas identified as being of Medium collision risk by the VERA model must be the first up for consideration to forgo where practically possible.
- Construction-phase monitoring as recommended by the Verreaux's Eagle guidelines must be conducted through construction and include vantage point surveys, as uncertainty exists regarding the extent to which displacement may occur as this intense period of disturbance may trigger changes in eagle presence and behaviour.
- Excavated rock piles and animal carcasses must be removed to avoid increasing the prey population (e.g. of rock hyrax) on the facility to reduce the chances of attracting Verreaux's Eagles into the project site.

- Animal carcasses encountered on the facility (e.g. roadkill, turbine collisions) must be recorded and reported to the Environmental Control Officer (ECO) for removal during the operational phase to reduce the changes of attracting avifauna into the project site.
- The EMPr must include additional requirements for post-construction monitoring. Manual searching of the site for carcasses is recommended as a strategy and these data are essential in identifying potentially problematic turbines and critical to inform an effective curtailment plan.
- Post-construction/operational monitoring must be done in line with the latest Best Practice Guidelines and must be conducted as soon as the turbines become operational, any mortalities must be reported to BirdLife SA (BLSA). As a minimum this monitoring programme must:
 - Continue for the first two years of operations, longer if a need is identified;
 - Record the numbers/densities of birds regularly present or resident within and around the operational WEF;
 - Document patterns of bird movements in the vicinity of the operational WEF.
 - Compare these data with baseline figures and hence quantify the impacts of displacement and/or collision mortality; and
 - Carcass surveying at the WEF for fatalities should also be done for a minimum of two years after construction and should be repeated again at year five and every five years thereafter.
- Results of post construction bird monitoring must be used to design mitigation measures where necessary.
- Mitigation measures (e.g. curtailment or shut-down-on-demand) must be implemented on any turbines responsible for the fatalities of two or more Verreaux's Eagle.
- Consultation with the South African Civil Aviation Authority (SACAA) should be undertaken to determine the potential mitigation measures of painting on turbine blade per turbine black to reduce the risk of bird collisions, this mitigation measure is recommended by the facility should SACAA agree to its implementation.
- No construction activities (e.g. new roads) is allowed within 1 km of nests during the breeding season (May, June, July and August) as per the Verreaux's Eagle guidelines.
- Nests of Verreaux's Eagle must be monitored for breeding activity throughout the lifespan of the facility as per the Verreaux's Eagle guidelines, including during construction.
- Additional vehicle based transects of the project site and control site must be conducted at once per season over 12 months prior to the commencement of construction activities with the aim of recording the status of Blue Crane to allow for more reliable BACI analyses to be conducted.
- It is recommended that tracking of sub-adult and non-territorial adult Verreaux's Eagles be considered in close consultation with BLSA and an academic institution to gain a better understanding of the movement of these birds across the landscape, should the timing and utility of such a study be considered to be of value by those institutions.

4.3.3.4 Advantages and disadvantages

The advantages of the proposed amendment relate to the significantly improved layout and increase in the individual generating capacity of the turbines considered allowing for a reduction in the total number of turbines required to achieve the maximum generation capacity of the facility. The layout associated with the proposed amendment has been informed through the use of the latest available information such as the Verreaux's Eagle Risk Assessment Tool (VERA, which was not previously available), resulting in updated expanded buffers, revised turbine positions and an expected reduction in the risk of negative impacts of the facility on avifauna compared to the original authorisation.

The disadvantages of the proposed amendment relate to the increase in the RSA should the maximum number of turbines (33) be constructed. This scenario is unlikely however as the maximum generation capacity of the

facility would be exceeded if the maximum number of turbines with the maximum rotor diameter were to be constructed.

4.3.3.5 Summary

As the project has already received environmental authorisation and the proposed amendment would likely significantly reduce the potential risk of the Verreaux's Eagles and other avifauna compared to the original authorisation post-mitigation (i.e. through a vastly improved layout and a potential reduction in the number of turbines), it is the specialist opinion that the project should proceed through the proposed amendment process without additional monitoring being required specifically for the amendment authorisation.

4.3.4 Bats

4.3.4.1 Introduction

A bat assessment was conducted in 2015 by Kate MacEwan of Inkululeko Wildlife Services (IWS) and an addendum submitted in 2018. Due to the potential changes that the proposed amendments may have on the assessed impacts, Kate MacEwan and Dr Caroline Lötter of IWS were appointed to assess the proposed amendments and compare them against the original assessments. Please refer to Appendix D4 for a copy of the revised assessment

4.3.4.2 Original findings

The bat assessment was informed by 12 months of bat monitoring from July 2013-July 2014, followed by a brief site inspection in 2017¹⁰. Many bat species are vulnerable to severe population crashes. Compared to other similar sized mammals, bats have low reproductive rates. They are also long-lived, reaching up to 30 years of age. Cave-dwelling and/or migratory bats are especially vulnerable to disturbance because large numbers of individuals may be concentrated in a few restricted localities. Consequently, disturbance of only a few populations can have devastating impact on a species.

It is reported that 60% of South African bat species are of conservation concern. Wind energy is the single biggest threat faced by bats in South Africa to date. There are four main groups of bats that are at risk from collision or barotrauma fatality by wind turbines in South Africa, these being:

1. Open-air foragers. These bats fly across a range of elevations but mostly feed in the open-air, high above tree canopy height, possibly reaching heights of approximately 2 km above ground. This group is made up of the families *Molossidae* and *Emballonuridae*.

2. Clutter-edge foragers. These bats forage amongst and above the tree canopy. They consist mainly of bat species of the *Vespertilionidae* family.

3. Migrating bats. Whilst the three bats most well-known for seasonal movement or migration events in South Africa are *Miniopterus natalensis*, *Myotis tricolor* and *Rosettus aegyptiaca*, evidence from the pre-construction monitoring studies in South Africa suggested that other high-risk species may also be making seasonal movements. In SA migrating bats are generally cavity roosting species. As they occur in large numbers in caves, they possibly migrate in large numbers, which could result in large scale fatalities by WEFs. The data from the Umsinde Emoyeni WEF shows strong evidence for mass migration and/ or seasonal movements of this group at some of the monitoring stations.

4. Fruit bats. Whilst the likelihood of fruit bats occurrence at the site is unlikely, it is worth mentioning that this group are at a Medium to High risk fatality, especially elsewhere in the country. They are clutter-edge foragers and travel long distances nightly to find food.

Of the 14 potentially occurring bat species at the site, six have been confirmed and two additional ones suspected- *Miniopterus natalensis*, *Tadarida aegyptiaca*, *Rhinolophus clivosis*, *Rhinolophus capensis*, *Cistugo lesueri* (suspected), *Eptesicus hottentotus*, *Neoromicia capensis* and *Nycteris thebaica* (suspected). All of these have a provincial conservation status of being a Protected Wild Animal, and the *Cistugo lesueri* is globally classified as Vulnerable.

¹⁰ Please note that the bat specialist confirmed that the monitoring data remains valid for this amendment assessment.

Most bat activities occur in the lower lying warmer areas of the site (less than ± 1450 m), with bats being found along the higher ridge areas only during warmer periods. November and Autumn had the most number of nights with distinct peaks in activity. There was also evidence of seasonal movement or migration events happening, particularly *Miniopterus natalensis* migrating to the site in late summer and then leaving in early winter. *Tadarida aegyptiaca* showed peaks in activity from spring until mid-summer. The *Vespertilionidae* family showed an increase in activity from mid-summer to autumn. Six confirmed and 14 potential bat roosts were located at Umsinde Emoyeni WEF (Phase 1 and 2 sites combined). In terms of the activity at different heights, overall, the monitoring showed that there was approximately 71% less activity at 60 m compared to 10 m.

The site is considered a medium bat sensitive site, with certain seasons considered as highly sensitive. It has a medium to high bat activity compared with other sites for the Nama Karoo, but lower activity compared with sites in the coastal Lowland Fynbos or Coastal Forest.

A sensitivity map was compiled for the study area highlighting bat sensitive areas of varying classes and has been updated for the amendment (Figure 12).

4.3.4.3 Scope changes of relevance

The description of each class used in the sensitivity map (Figure 12) is presented in Table 13. Based on the most recent pre-construction bat monitoring guidelines (Sowler *et al.* 2017 and MacEwan *et al.* 2020), the buffer around high sensitive ephemeral streams and dams has been increased from 50 m to 200 m. In accordance with this, the proposed layout ensures the avoidance of the high sensitive areas. No turbines encroach into high sensitive habitats and/ or buffers; however eleven turbines encroach into medium sensitive habitats and or buffers.

No turbine or road under the authorised or amended layout will encroach into the respective 1 km and 500 m buffers around nearby confirmed and potential bat roosts therefore there is no difference in significance of the potential impact on bat roosts.

Compared to the authorised infrastructure and layout if 33 turbines with a 180 m rotor diameter are developed for the proposed Khangela WEF, this will have a slightly greater impact on the fragmentation of, and displacement of bats from, suitable foraging habitats. This is because under the worst-case scenario¹¹, 63,655 m² or 6.37 ha more terrestrial habitat will be lost or degraded with construction of the:

- 24,150 m² or 2.42 ha larger combined hard stand areas;
- 9,105 m² or 0.91 ha combined temporary hard stand areas (including crane boom areas); and
- 29,400 m² or 2.94 ha larger construction road surface area.

More “safe” aerial foraging space will also be lost during operation 221,266 m² or 22.13 ha larger rotor swept areas. The slight increase in the extent of this impact is however not substantial enough to effect a change in the significance.

In terms of bat fatalities from collisions or barotrauma, there is likely to be a reduced fatality as there is zero encroachment of turbines into high sensitive areas, and the higher reach of the lowest blade tip is expected to outweigh the probable increased fatality of bats from the greater total rotor swept area under the worst-case scenario of 33 turbines with a 180 m rotor diameter.

¹¹ As explained in Section 3.3 of this report, the larger the generation capacity of the selected turbine, the fewer turbines will be constructed, which in turn also decrease the overall disturbance footprint of the WEF.

Table 13: Relative sensitivity of different habitats and buffers for bats in and around the Khangela WEF (IWS, 2020)

Sensitivity	Description
High	<ul style="list-style-type: none"> Confirmed bat roosts, and a 1 km buffer around these. FEPA (Nel <i>et al.</i> 2011) rivers and wetlands, and a 500 m buffer around these. Ephemeral streams and dams rated as High sensitive after ground-truthing by IWS (2017), and a 200 m (NOT 50 m) buffer around these.
Medium-High	<ul style="list-style-type: none"> Upper Karoo Hardeveld vegetation (Mucina & Rutherford 2006).
Medium	<ul style="list-style-type: none"> Potential bat roosts, and a 500 m buffer around these. Ephemeral streams and dams rated as medium sensitive after ground-truthing by IWS (2017), and a 50 m buffer around these. Rocky gullies rated as Medium sensitive after ground-truthing by IWS (2017), and a 50 m buffer around these. All areas below 1 440 m a.s.l., which are not rated as Medium-High or High sensitive.
Low-Medium	<ul style="list-style-type: none"> All areas above 1 440 m a.s.l., which are not rated as Medium-High or High sensitive. All remaining areas, which are not rated as Medium, Medium-High or High sensitive. <p>These remaining areas mostly represent higher-lying plateau areas, which were rated with Low-Medium (not Low) sensitivity because here, the risk of bat fatality is not necessarily low. Whilst high activity does normally equate to high fatality, low activity does not necessarily equate to low fatality (IWS pers. comm. Chris Hein, 28 August 2014). Indeed, in this region, IWS suspects that although bats pre-occupy the lower valleys for most of the year, during harsher conditions they move and forage along the higher lying plateaus in optimal low wind speed and warm conditions.</p>

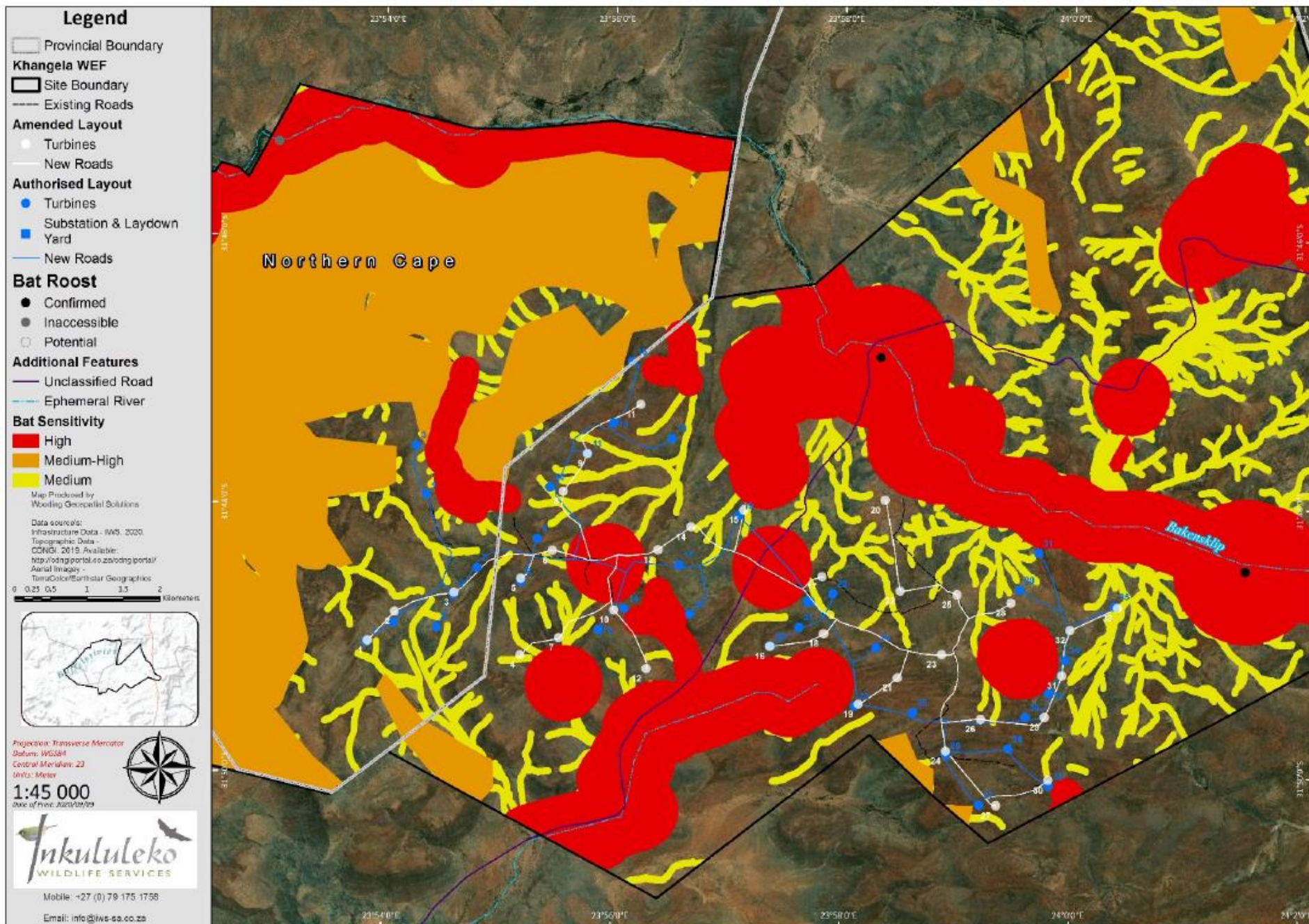


Figure 12: Proposed layout relative to the sensitive areas for bats (IWS, 2020)



4.3.4.4 Cumulative impacts

The significance of indirect impacts cannot be rated with confidence, neither accuracy. This is similar for the worst-case scenario of 33 turbines with a 180 m rotor diameter under the proposed amendment due to slightly greater impact on bat foraging but slightly reduced impact on bat fatality. Impacts from the project cannot be considered in isolation. A growing concern is the cumulative effect of the afore-mentioned potential direct and indirect impacts from all the various authorised and proposed WEFs in the broader region. Without effective bat impact mitigation, operational bat monitoring and adaptive management of bat fatalities at all WEFs in the region (local and regional), bat populations, species and ecosystems services could be significantly impacted

4.3.4.5 Change in impact ratings and mitigation measures

The specialist has concluded that the significance of potential impacts on bats as a result of the proposed amendments would remain unchanged for construction. However, the fatalities during the operational phase pre-mitigation has changed from very high (-) to high (-) significance, and remains low with mitigation. This is summarised in Table 14 below

Table 14: Summary of potential bat impacts

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction	Medium (-)	Insignificant (-)	Medium (-)	Insignificant (-)
	Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction	Medium (-)	Low (-)	Medium (-)	Low (-)
Operation	Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity	High (-)	Low (-)	Medium (-)	Low (-)
	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.	Very high (-)	Low (-)	High (-)	Low (-)
Cumulative	Fatalities of Bats	Unrated			

With diligent, effective mitigation as recommended below (and detailed in IWS, 2020) the project's impact on bat roosts can be reduced to insignificant, and the impacts on bat foraging as well as fatalities can be reduced to low significance. The mitigation measures recommended replace those that were previously prescribed by IWS (2015 and 2018) and are provided below.

- Avoid High and Medium-High sensitive areas (already implemented in the amended layout). Ensure that all lay down areas, turbine bases, blades and hardstands, office and sub-stations are only situated in Low-Medium or otherwise (but preferably not) Medium sensitivity areas.
- Minimise road impacts. Do not construct roads within 500 m of a confirmed roost. Minimise clearing and degradation of all natural (especially wetland and riparian) and agricultural areas, and obtain a water use license for each watercourse crossing. Effectively rehabilitate all 12 m wide roads to 6 m after construction.
- Avoid blasting within 2 km of a confirmed roost.
- Minimise artificial lighting. Apart from compulsory civil aviation lighting, minimize artificial lighting especially high-intensity, steady burning, sodium vapour, quartz, halogen and other brighter lights at substations, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination.

- Minimise degradation of terrestrial habitat and water resources (especially near bat roosts and used by bats during foraging). Implement and maintain effective invasive alien plants, storm water erosion, sediment and dust control measures.
- Report any new discovered roosts and incorporate their protection into the WEFs adaptive management plan.
- Prioritise dropping turbines in closest proximity to High, Medium-High and Medium sensitive areas (in descending priority) and/or on the periphery of the WEF (to reduce its overall footprint), if fewer than 33 turbines are developed.
- Do not construct turbines within 200 m of any buildings or substation
- Ensure that turbines can be fitted with bat detectors and deterrent devices, Turbine engineers must consult with bat specialist to incorporate the necessary turbine adaptations for this during the design phase, so there are no unexpected surprises or concerns after turbines are built.
- Implement curtailment as shown in IWS (2020; Box 1).
- Perform acoustic bat monitoring during construction. A detector(s) should be installed on at least one meteorological mast just before construction commences, and monitoring should occur through construction (and into operation).
- Perform operational bat monitoring according to the latest SABAA guidelines (Aronson *et al*, 2020, or later).
- Adaptively manage bat fatalities by consulting the latest SABAA guidelines (Aronson *et al*, 2018, or later) and the best relevant scientific information.

Best practice mitigation, although not essential, is as follows:

- Continue performing roost searches during construction and operation (best practice mitigation).
- Forward all (live and fatality) bat monitoring data to SANBI's database for this, or the database recommended by SABAA to expand the scientific knowledge base for more informed decision-making mitigation.
- Submit quarterly carcass searching reports to SABAAP.
- Submit quarterly progress and annual operation monitoring reports to SABAAP, EWT and the DEFF.

4.3.4.6 Advantages and disadvantages

Infrastructure amendments which are expected to reduce potential impacts on bats include (advantages):

- Fewer number of turbines;
- Higher reach of the lowest blade tip-which is expected to reduce the fatality risk of clutter and clutter-edge foraging's bat species; and
- Smaller operational road surface area.

Infrastructure amendments which are expected to increase potential impacts on bats include (disadvantages):

- Potentially wider rotor diameter and greater rotor swept area if individual turbines, and potentially for all turbines combined;
- Potentially larger permanent handstand area of individual turbines and potentially for all turbines combined;
- Larger temporary construction handstand area of individual turbines and potentially for all turbines combined; and
- Greater widening of internal roads at certain places during construction.

4.3.4.7 Summary

It can be concluded that without mitigation, the proposed infrastructure and layout under the amendment is expected to have a Medium significant impact on bats roost, and bat foraging and a High significant impact on bat fatalities.

With diligent, effective mitigation as recommended in this report the project's impact on bat roosts can be reduced to insignificant, and the impacts on bat foraging and also fatalities can be reduced to low significance. Recommended mitigation measures include but are not limited to: curtailment where and when necessary, operational bat monitoring, and adaptive management of bat fatalities

4.3.5 Heritage and palaeontology

4.3.5.1 Introduction

A heritage and palaeontological assessment was conducted by Mr Tim Hart (ACO Associates) and Dr John Almond (Natura Viva cc) respectively in 2015 and an addendum submitted in 2018. Due to the potential changes that the proposed amendments may have on the assessed impacts Mr John Gribble (ACO Associates) and Dr John Almond (Natura Viva cc) were appointed to assess the proposed amendments and compare them against the original assessment. Please refer to Appendix D5 (Heritage) and D6 (Palaeontology) for a copy of the revised assessments.

4.3.5.2 Original findings

According to ACO Associates (2015), the study area lies in the eastern part of the Great Karoo, above the escarpment of the Camdeboo Plains in the Western Cape and Northern Cape Provinces. Since this landscape is generally only moderately transformed, it contains a wealth of well-preserved archaeological sites; one of the deepest palaeontological sequences in the world, and in later years was the last refuge of the Southern African San before their ancient lifestyle became extinct during settlement of the land by Dutch colonists. Figure 13 depicts a typical Karoo landscape.



Figure 13: Typical Karoo landscape within the study area; mudstone plains punctuated by dolerite dykes and sills (ACO Associates, 2015)

Palaeontological landscape

According to Almond (2015), the project area is largely underlain by Permian fluvial sediments of the Lower Beaufort Group (Karoo Supergroup) that have yielded a wealth of important fossil remains from the Murraysburg region over the past century or more. These include diverse vertebrate fossils of the Late Permian Cistecephalus and Dicynodon Assemblage Zones such as gorgonopsian, therocephalian and cynodont predators as well as small- to large-bodied herbivorous dicynodonts, among others. Recent palaeontological

fieldwork confirms that well-preserved fossils belonging to a range of tetrapod groups are present at the surface in a high proportion of sites where Lower Beaufort Group bedrocks are well-exposed. Other fossil groups represented here include concentrations of medium to large vertebrate burrows, low-diversity invertebrate trace fossils and vascular plant remains (e.g. horsetail ferns). The palaeosensitivity of the study area is therefore rated as high.

Destruction, damage or disturbance of fossils from the ground surface or below ground level during construction is possible however serious impacts are not inevitable based on (a) the generally scattered, unpredictable distribution of exceptional, well-preserved fossils within the bedrocks as well as within the overlying superficial sediments (e.g. older alluvium), (b) the mantling of the bedrocks with thick superficial sediments in many areas, so that major impacts on potentially-fossiliferous fresh (i.e. unweathered) bedrock are limited, and (c) the comparatively small proportion of the proposed footprint that overlies sedimentary rocks rather than unfossiliferous dolerite.

Pre-colonial landscape

A survey by ACO Associates (2015) collected information gathered about the spatial patterning of identified heritage sites to inform the no-go mapping. These features included historic farm complexes, identified archaeological sites, structures like historical kraals and rock engravings, heritage sensitive landscapes such as river valleys and canyons (the latter were defined by topography). All of these requiring suitable buffers zones for protection.

The archaeological impact assessment found that the pre-colonial heritage of the study area consists of occasional open-air artefact scatters, several rock shelters and San rock painting sites. The spatial patterning of the heritage sites indicates that they were generally linked to sources of water. Valley bottoms and sides thus proved to be the most sensitive areas, most of which were subsequently excluded from the proposed WEF area (see river valley exclusion zones on Figure 14).

Rock engraving sites were found to be fairly common throughout the study area, including some that appear to be ancient. The range of engravings includes very complex patterns, animal forms and mere scribbles.

The HIA did not anticipate significant impacts on archaeological sites and shelters / overhangs by the proposed project. However, it found that the construction of the project would impact rock engravings on dolerite surfaces and boulders and that mitigation would be required to identify, record and avoid or move these engravings.

Colonial period heritage

A number of historical farmhouses and structures of interest were noted within the project area (see Figure 14). These are 19th century farm houses and barns that are of heritage interest, graded between 3A and 3B, many of which are no longer lived in and are deteriorating.

The HIA found that none of the historical structures recorded would be physically impacted by the project, but encouraged the sensitive re-use of abandoned farm houses wherever possible.

Numerous stone kraals and lesser stone features were noted in many areas and a large informal cemetery was recorded east of the Groot Driefontein farmstead. The cemetery would not be affected by the proposals.

Cultural landscape and setting

The overall project area was assessed by the HIA to be highly scenic, comprising of varied topography: from high dolerite plateaus and ridges to canyons and plains. Overall a landscape quality grading of 3A – 3B was suggested.

It was noted that the proposed layout avoided many sensitive areas by siting the facility on the more remote and desolate high dolerite hills. Nonetheless, there will be a tangible change to the sense of place through a loss of remoteness and wilderness qualities after the industrial presence of the WEF is established.

Because wind turbines are typically so large, their visibility radius is up to 20 km which will affect the scenic qualities of the area well beyond the borders of the Umsinde Emoyeni WEF. This impact has been assessed as part of the visual impact assessment for the project as found to be acceptable.

The accumulative impact of this and other proposals in the area could result in impacts to the iconic context of the Great Karoo at large.

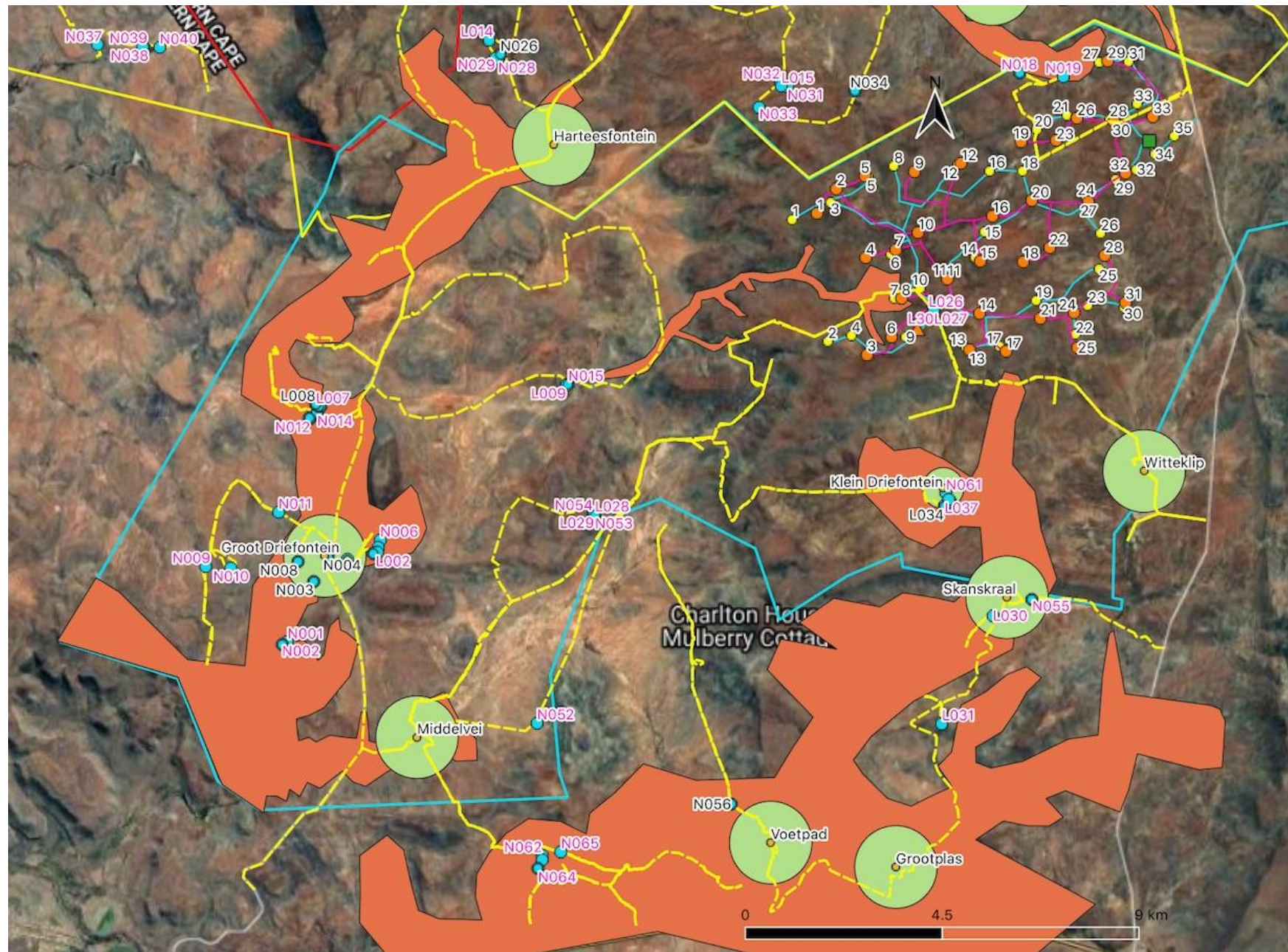


Figure 14: Historical and archaeological sites (blue points) and buffers (green = historical farm complexes and orange = river valleys / canyons) generated from the 2015 HIA field survey overlain on the authorised and proposed Umsinde Emoyeni footprint. Yellow lines are the 2015 survey track plots (ACO, 2020)



Figure 15: Examples of Rock painting, Rock engravings and Built environment and ruins

4.3.5.3 Scope changes of relevance

The changes to the authorised specifications of the WEF being proposed in this amendments that are relative to heritage resources and landscape and setting are the increased size of the temporary and permanent hardstanding's, internal construction road widths and the increase in wind turbine hub height/ blade length.

According to ACO Associates (2020), these potential negative changes are offset by the decrease in the number of turbines and the fact that the maximum authorised length of internal roads will reduce, the areas occupied by the substations and the permanent and construction laydown areas remain the same. The disadvantage of archaeological sites and materials, particularly for rock engravings, of an expanded physical footprint of development-related ground disturbance are not deemed to be significant in light of relatively low archaeological potential of the WEF area.

In terms of the layout, the infrastructure remains outside the identified areas of heritage sensitivity as documented by ACO Associates (2015) and shown in Figure 14, which avoids the historical farm complexes, the identified graveyard and the river valleys within the development area which have the greatest archaeological sensitivity. The siting of the WEF on the more remote and desolate high dolerite hills also goes some way to addressing the issue of landscape and setting

As confirmed by Almond (2020), most of the core infrastructure will now be situated within areas that are not paleontologically sensitive and underlain by Karoo dolerite. The changes since the 2015 study, together with the slightly reduced number of turbines compared to the 2018 authorised layout, tend to reduce the palaeontological impact significance of the WEF and are partially offset by the anticipated larger volume of bedrock excavations for the turbine footings as well as a slight increase in total area of surface clearance only in the case of 4.5 MW scenario (with reference to Table 4 earlier in this report).

4.3.5.4 Cumulative impacts

The Karoo is generally considered to be significantly scenic and is well-known for its largely undeveloped, wide-open spaces and semi-desert qualities. The cumulative impacts for the Umsinde WEF in combination with other renewable energy projects in the areas on the general landscape qualities of the environment within and around the project area will be significant.

Anticipated cumulative impacts on palaeontological heritage were not considered or assessed in the original palaeontological study in 2015. There are no authorised renewable energy projects highlighted within 30-50 km radius of the project areas for the amended Umsinde Emoyeni Wind Energy Facility. Given the low (-) impact significance assigned to the amended WEF and in combination with low (-) impact significance for the Khangela WEF (assessed separately), it is concluded that the cumulative impacts on local palaeontological heritage resources posed by the developments in concert are likely to be of low significance.

4.3.5.5 Change in impact ratings and mitigation measures

The specialists have concluded that the significance of the potential impacts on heritage as a result of the proposed amendments would remain unchanged for both the construction and operational phases. While the palaeontology impact rating was medium (-) significance pre-mitigation and low (-) significance post- mitigation, it has now reduced to low (-) significance pre-mitigation and very low (+ & -) significance post-mitigation. These are summarised in Table 15 below.

Table 15: Summary of potential heritage impacts

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Palaeontology: Disturbance, damage or destruction of well- preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)	Medium (-)	Low (+) & (-)	Low (-)	Very low (+) Very low (-)
	Pre-colonial heritage: Impacts to archaeological sites and rock engravings	Medium (-)	Very low (-) / Neutral	Medium (-)	Very low (-) / Neutral
	Colonial heritage	Medium (-)	Medium (+)	Medium (-)	Medium (+)
	Cultural landscape / setting	Medium (-)	Medium (-)	Medium (-)	Medium (-)
Cumulative	Cultural landscape / setting	Significant			
	Local palaeontological heritage resources	Unrated		Low (-)	Very low (-)

All mitigations that were originally identified in the HIA and endorsed by the addendum remain applicable to the project. In addition, it is recommended by Almond (2020), that that the detailed conditions regarding the palaeontological heritage conservation and management specified in the Final Comment of SAHRA regarding the original Umsinde WEF (SAHRA Case ID: 6021) should be applied. These are as follows:

- A walk-down of the final positions of the turbines and access road routes must be completed prior to construction by a qualified palaeontologist. The locations of construction camps and laydown yards must also be assessed as part of the walk-down report. The report must CLEARLY state which heritage resources are located within the Northern Cape and Western Cape Provinces to allow the relevant Heritage Resource Authority (HRA) to provide comments. The report must also clearly state the distance between each proposed project activity and identified resources via detailed descriptions, photographs and a map;
- A buffer zone of 50 m must be maintained from all identified heritage resources (*Almond, 2020 has stated that this is a possible exception as it is his opinion that only fossil sites of high scientific / educational / cultural or other conservation significance that cannot be effectively mitigated through professional palaeontological recording and collection require buffer zones; most recorded fossil finds are of low scientific / conservation value and can be effectively mitigated in the pre-construction or construction phase. This caveat would need to be approved by the responsible heritage regulatory authorities, viz. Heritage Western Cape*);
- A Conservation Management Plan (CMP) must be developed for all heritage resources that are to be retained in-situ. This CMP must be submitted to SAHRA for comment;
- Turbine placements must avoid areas underlain by the Lower Beaufort Group rocks. Should this not be possible, a Watching Brief must be conducted during the construction phase of the project. This must include the on-site presence of a qualified palaeontologist who will monitor excavations for turbine foundations, access roads and underground cables within the Lower Beaufort Group rocks. A Watching Brief Report detailing the results of the monitoring must be submitted to SAHRA for comment;
- Chance Finds and Fossil Finds Procedures must be developed and implemented for the project. These procedures must include standard protocol, steps and reporting structures to be followed should any heritage and/or fossil heritage is uncovered during all phases of development;

- If any evidence of fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted. A professional palaeontologist must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.

4.3.5.6 Advantages and disadvantages

There are no advantages in terms of heritage. The disadvantage for archaeological sites and materials, particularly for rock engravings, of an expanded physical footprint of development-related ground disturbance are not deemed to be significant.

4.3.5.7 Summary

Both ACO Associates (2020) and Almond (2020) find the proposed amendments acceptable as long as the recommended mitigation is implemented.

The impacts on the cultural landscape are the most significant, however, the siting of the WEF on the more remote and desolate high dolerite hills also goes some way to addressing the issue of landscape and setting. The cumulative impact in terms of the landscape and setting will remain, albeit reduced in significance by the mitigation measures recommended in the Visual Impact Assessment (VIA).

4.3.6 Visual

4.3.6.1 Introduction

A VIA was conducted in 2015 by Mr Bernard Oberholzer Landscape Architect (BOLA) and Mr Quinton Lawson (MLB Architects) and an addendum submitted in 2018. Due to the potential changes that the proposed amendments may have on the assessed impacts Mr Oberholzer and Mr Lawson were appointed to assess the proposed amendments and compare them against the original assessments. Please refer to Appendix D7 for a copy of the revised assessment.

4.3.6.2 Original findings

Table 16 provides a description of the landscape and scenic features identified for the Khangela Emoyeni Wind Farm site, as well as potential receptors identified by the specialists.

Table 16: Description of the project site in terms of the visual assessment

Characteristic setting	Description
Landscape setting	The proposed WEF is located near the Karoo town of Murraysburg in the Western Cape Province, with part of the site spilling over the border into the Northern Cape Province ¹² . The project site which covers about 93km ² is accessed via the R63 tarred road, which passes through the southern portion of the project area and local gravel roads. Graaff-Reinet and the Camdeboo National Park lie some 60km to the south-east on the R63.
Geology and landforms	The geology of the area is characterised by the mudstone and sandstone of the Beaufort Group creating a fairly mountainous to gently undulating landscape, typical of the Karoo. The dolerite dykes and sills which intrude the Beaufort sedimentary formations, are more resistant to erosion, creating the scenic ridges and koppies of the area, which in turn are more visually sensitive. The topography is a reflection of the geology area, with flattish plains often interspersed by flat-topped dolerite koppies. The higher areas are more exposed to wind, and at the same time more visually exposed. The landscape is dissected by a number of seasonal rivers and tributaries.
Vegetation cover and land use	The vegetation of the plains is classified as 'Eastern Upper Karoo', consisting of white grasses (<i>Aristida</i> and <i>Eragrostis</i>), interspersed with low hardy shrubs and succulents. The higher lying dolerite koppies are classified as 'Upper Karoo Hardeveld' with sparse dwarf Karoo scrub and

¹² Please note that Phase 1 of Umsinde Emoyeni is fully located within the Western Cape. The original assessment considered both projects however, resulting in this reference to the site "spilling in the Northern Cape Province".

Characteristic setting	Description
	<p>drought-tolerant grasses. Exotic trees, including gums, poplars and pines have typically been planted around the farmsteads for shade and wind protection. The exotic copses and shelterbelts provide some visual screening for the farmsteads.</p> <p>The relatively low rainfall and sparse vegetation limit the agriculture potential to mainly extensive grazing, the area being noted for Marino sheep wool and mohair, as well as 'Karoo Lamb'. There are no National Parks or known nature reserves in the immediate surrounding areas. There are also no large settlements, and except for gravel roads and farms dams, there is little infrastructure within the WEF project area.</p>
Scenic features and receptors	<p>The study area forms part of the Great Karoo, an area renowned for its wide-open spaces, serenity, quiet and starry skies at night, qualities which attract both local and overseas visitors. The dolerite koppies, scarps and rock outcrops are attractive scenic features, being also visually sensitive. The rural character of the study area is noticeably intact and free of visual intrusion.</p> <p>Sensitive receptors include Murraysburg, an historic settlement with a number of noteworthy buildings, commuters and visitors using the R63, an important arterial route linking Graaf-Reinet and Murraysburg with the N1, the two gravel roads connecting the R63 with Richmond, as well as game farms and guest farms, such as Ratelfontein, Badsfontein and Brandkraal.</p>

On this basis the site sensitivity can be summarised in Table 17 below. An explanation of each visual criteria identified in the Visual Impact Assessment (VIA methodology) is provided.

Table 17: Summary of the site sensitivities

Visual Criteria	Description	Wind turbines	Related infrastructure
Visibility of facilities	Large number of turbines	High	High
Visual exposure	Most visual exposure is to the south and west.	Medium	High
Visual sensitivity	Includes topographic feature, skyline ridges, steep slopes, road corridors and farmsteads.	Medium	High
Landscape integrity	Largely intact natural/ rural landscape would be affected by industrial type wind energy development.	Very High	High
Visual absorption capacity (VAC)	The surrounding ridges provide some visual enclosure/absorption, but vegetation is law/sparse	Medium	Medium

4.3.6.3 Scope changes of relevance

The main difference between the authorised WEF of 2018 and the current layout is that there would be up to a maximum of 33 turbines instead of 35, (but still 147 MW capacity), and that the hub height and rotor diameter would increase in direct relation to the reduced number of turbines given the increased generation capacity per turbine.

The layout of the turbines has also slightly changed. The visual informants to determine sensitivity are indicated in Figure 17 and [Figure 18](#), and have been taken into account in the authorised and current layouts.

In the previous amendment of 2018, the turbines were moved further north, away from the Trouberg sensitive receptors. Distances from sensitive receptors increased in some cases, and with the fewer turbines, the viewshed would be less extensive, particularly towards the south. A comparative assessment of the previous (2018) and current (2020) viewsheds, shown in Figure 16, indicates that the zone of visual influence would hardly change. In reality, the increased size of the turbines would probably only be noticeable within a range of about 5 km. Figure 19 and Figure 20 show a photomontages of the amended layout from various viewpoints.

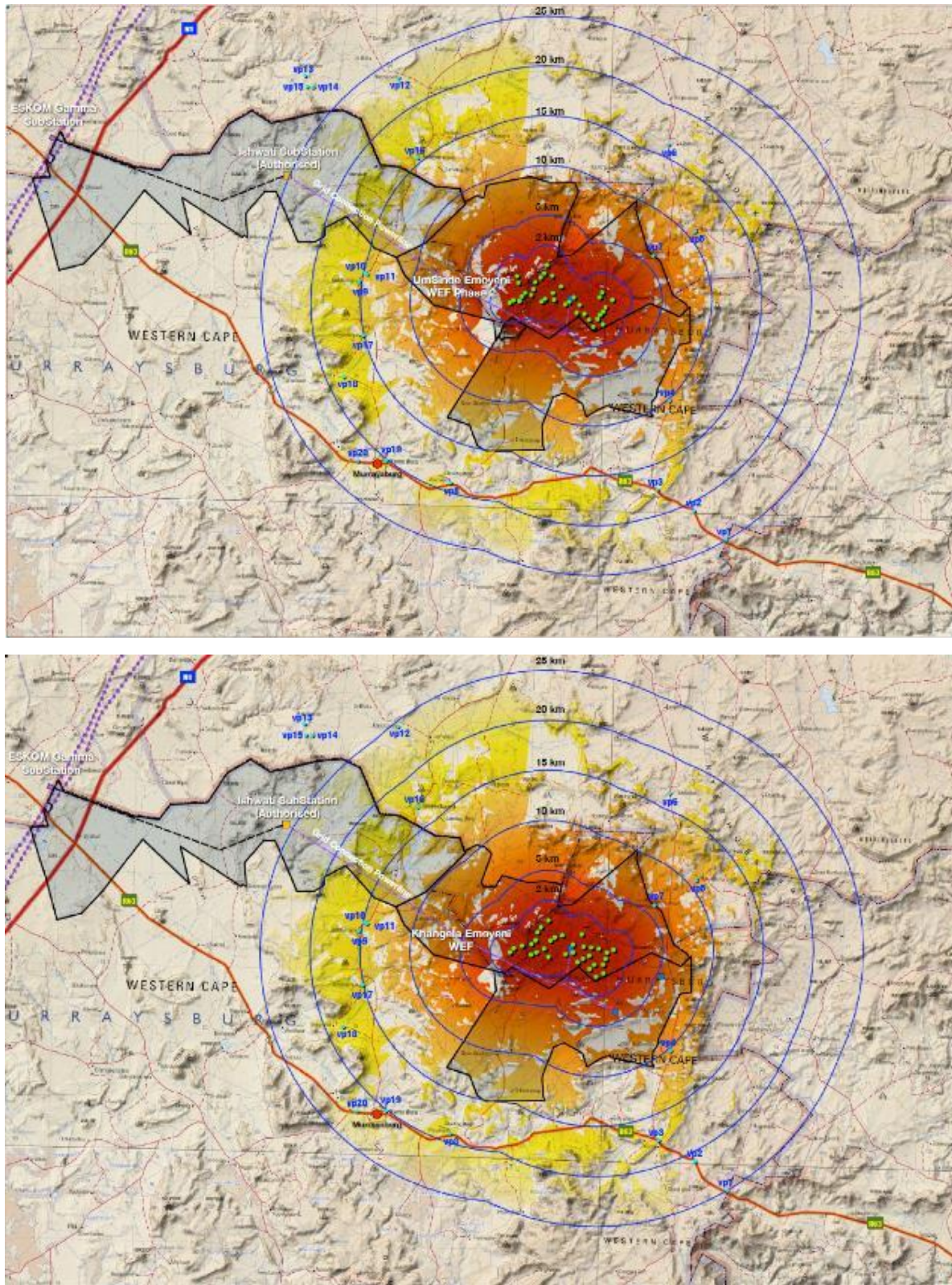


Figure 16: Viewshed (top map showing authorised 2018 layout, bottom map showing amended 2020 layout) (Oberholzer and Lawson, 2020)

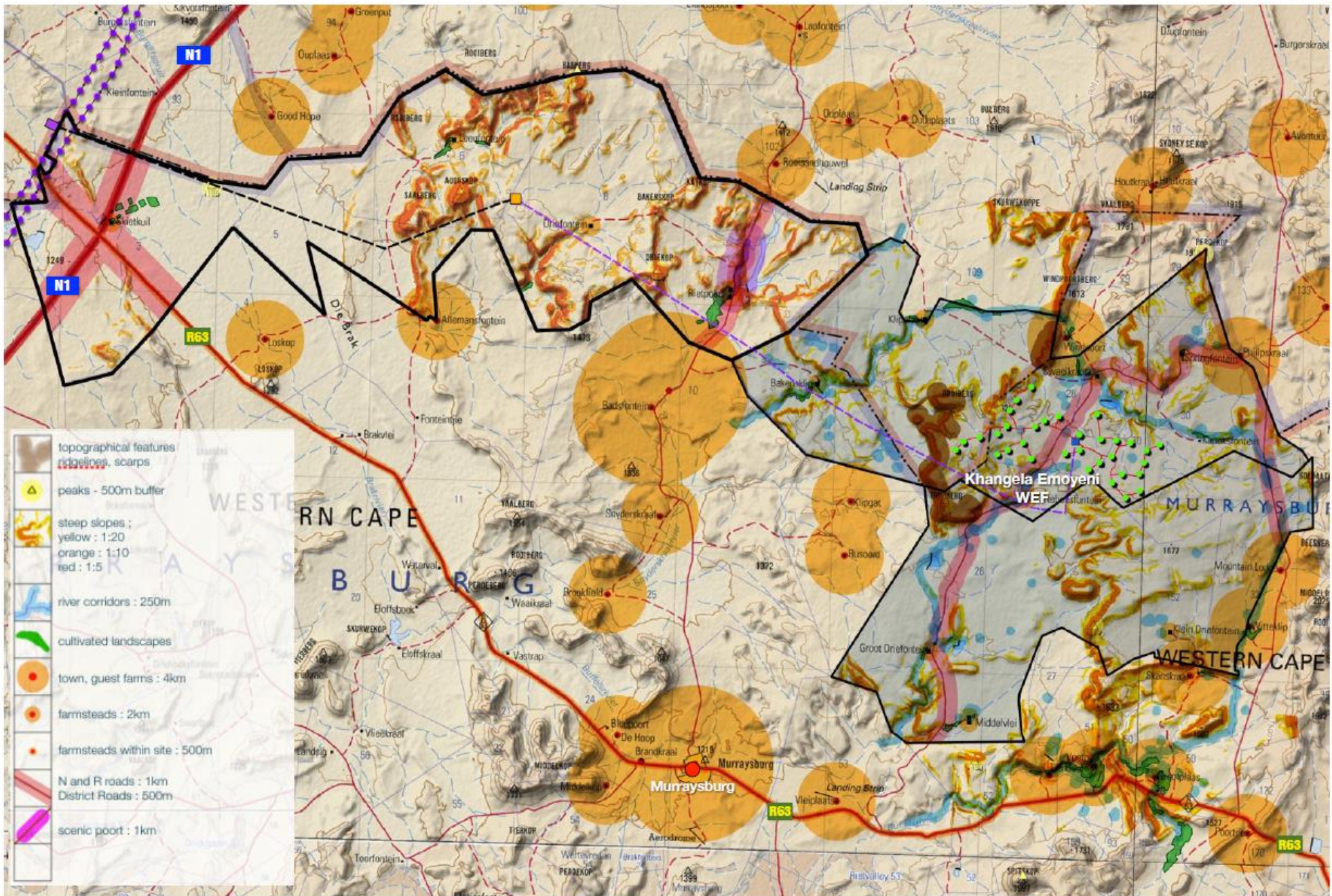


Figure 17: Visual informants composite map for amended layout (Oberholzer and Lawson, 2020)



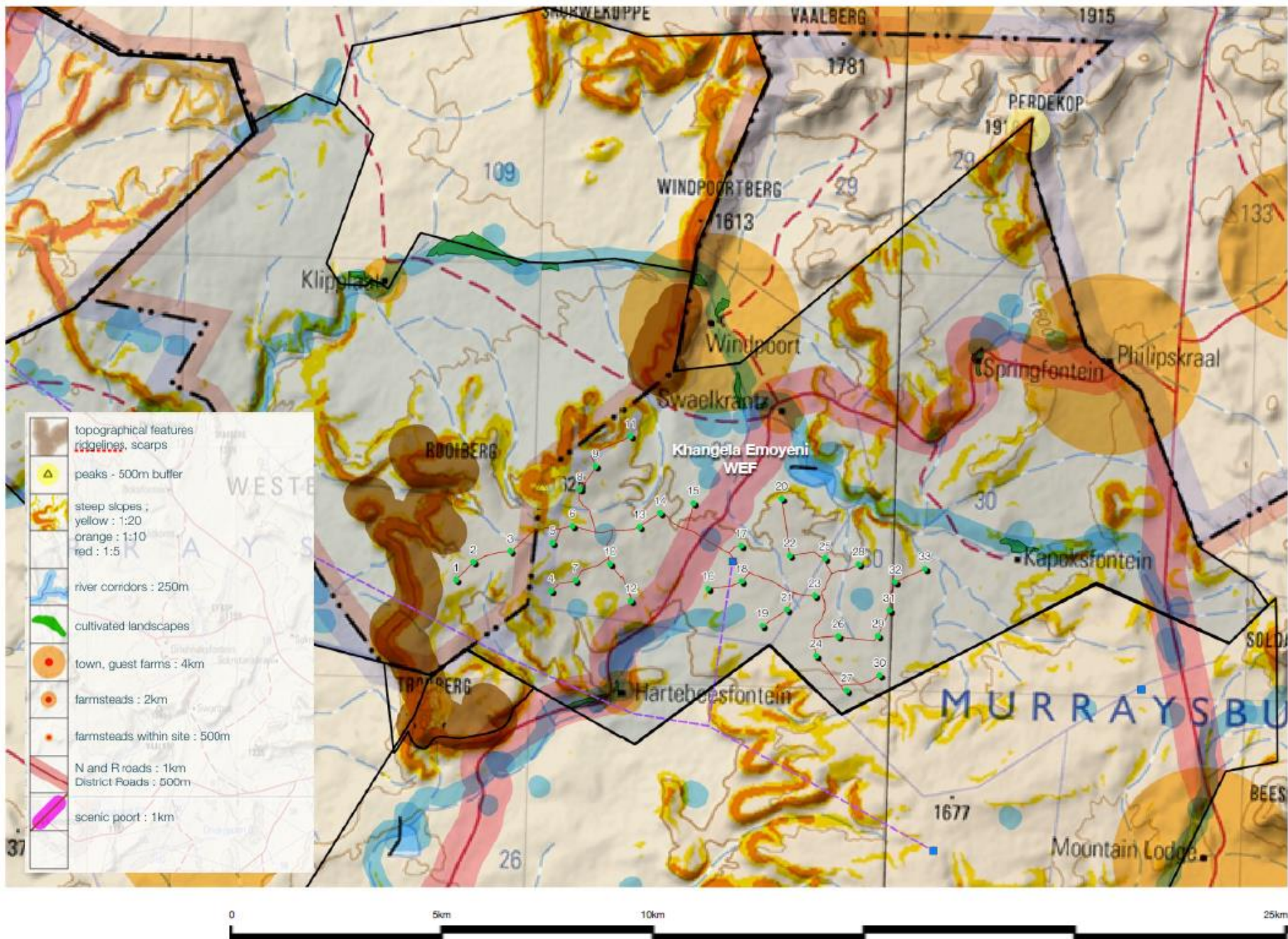


Figure 18: Visual informants composite map for amended layout (enlarged) (Oberholzer and Lawson, 2020)



viewpoint 4 • regional road at Witteklip - looking west towards WEF site, Phase 2 WEF would be marginally visible in the distance.

31.9014S, 24.0702E 10.21km



viewpoint 5 • near Rhenosterfontein farmstead - looking south-west towards WEF site. Phase 2 WEF would be moderately visible but partly obscured by foreground ridges.

31.7482S, 24.0921E 10.75km



viewpoint 7 • Phillipskraal - looking south-west on boundary of WEF site. Phase 2 WEF would be moderately visible beyond ridges.

31.7712S, 24.0484E 6.03km

Figure 19: Viewpoint photomontages (Oberholzer and Lawson, 2020)





viewpoint 10 • Badsfontein Opstal - looking east towards WEF site. Phase 2 WEF would be marginally visible in the distance.

31.7935S, 23.7433E 14.85km



viewpoint 11 • Badsfontein Dam - looking east towards WEF site. Phase 2 WEF would be marginally visible in the distance.

31.7949S, 23.7455E 14.62km

Figure 20: Viewpoint photomontages (Oberholzer and Lawson, 2020)

4.3.6.4 Cumulative impacts

The proposed Ishwati Emoyeni WEF adjacent to the project site would increase the cumulative visual effect. Seen together, these WEF projects, along with their associated substations and powerlines, could have a significant visual effect on the visual character and scenic resources of the area.

The existing Victoria West WEF (30 wind turbines), the Noblesfontein WEF, (under construction), and the approved Modderfontein WEF, are all to the west of the N1, about 50 km away, and would not be visible from receptors in the Khangela Emoyeni project area.

The cumulative visual impact of the original authorised Khangela Emoyeni WEF was indicated as 'significant', and there would be no change in rating for the current amended layout.

4.3.6.5 Change in impact ratings

No changes to the visual impact ratings for the construction and operational phases of the project. Similarly, the cumulative impact remains potentially significant. The ratings are summarised in Table 18 below.

Table 18: Summary of potential visual impacts

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Construction of turbines	Low (-)	Low (-)	Low (-)	Low (-)
Operation	Wind turbines	High (-)	Medium (-)	High (-)	Medium (-)
	Powerlines / infrastructure	High (-)	Medium (-)	High (-)	Medium (-)
Cumulative	Effect on the visual character and scenic resources of the area	Significant			

Buffers around topographic features, settlements and roads have been recommended and these mitigations have been implemented in both the authorised and proposed amended layouts. No additional mitigations have been recommended for the current amended layout.

4.3.6.6 Advantages and disadvantages

There are no specific advantages or disadvantages discussed by the specialists.

4.3.6.7 Summary

Based on the comparative study, the visual impact significance of the currently proposed WEF would be similar to that of the authorised 2018 WEF and therefore no fatal flaws are anticipated. The amendment to the authorised WEF could therefore be approved from a visual perspective, provided the visual mitigations are implemented.

The visual effect on the proposed WEF has been significantly reduced through the elimination and relocation of many turbines in previous iterations. It was determined that the visual impacts significance of the currently proposed WEF would be similar to the previous authorised layout of 2018, given the slightly reduced number of wind turbines (up to 33 turbines). There would be about 5 km less internal roads, which would reduce visibility but would not change overall visual significance ratings.

4.3.7 Noise

4.3.7.1 Introduction

A noise assessment was undertaken in 2015 by Mr Morné de Jager from Enviro Acoustic Research (EAR) and an addendum was submitted in 2018. Due to the potential changes that the proposed amendments may have on the assessed impacts EAR was appointed to assess the proposed amendments and compare them against the original assessment. Please refer to Appendix D8 for a copy of the revised assessment.

4.3.7.2 Original findings

According to EAR the word “noise” is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as “noise: These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and
- Offensiveness.

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources that are associated with components of the power train within the turbine, such as the gearbox, generator and control equipment. These sources generally have different characteristics and can be considered separately. In addition, there are other lesser noise sources, such as the substations themselves, traffic (maintenance) as well as transmission line noises.

The study area is described in terms of environmental components that may contribute or change the sound character in the area. The environmental components considered included topography, surrounding land use, roads and rail roads, residential areas, other industrial and commercial processes, ground conditions and vegetation and existing ambient sound levels.

Further, the study identified potential sensitive receptors also known as noise-sensitive developments (NSDs) and is indicated in Figure 21 below. Buffers of 1,000 m around the NSDs has been implemented as it is unlikely that there will be a noise impact at locations further than 1,000 m from the turbines.

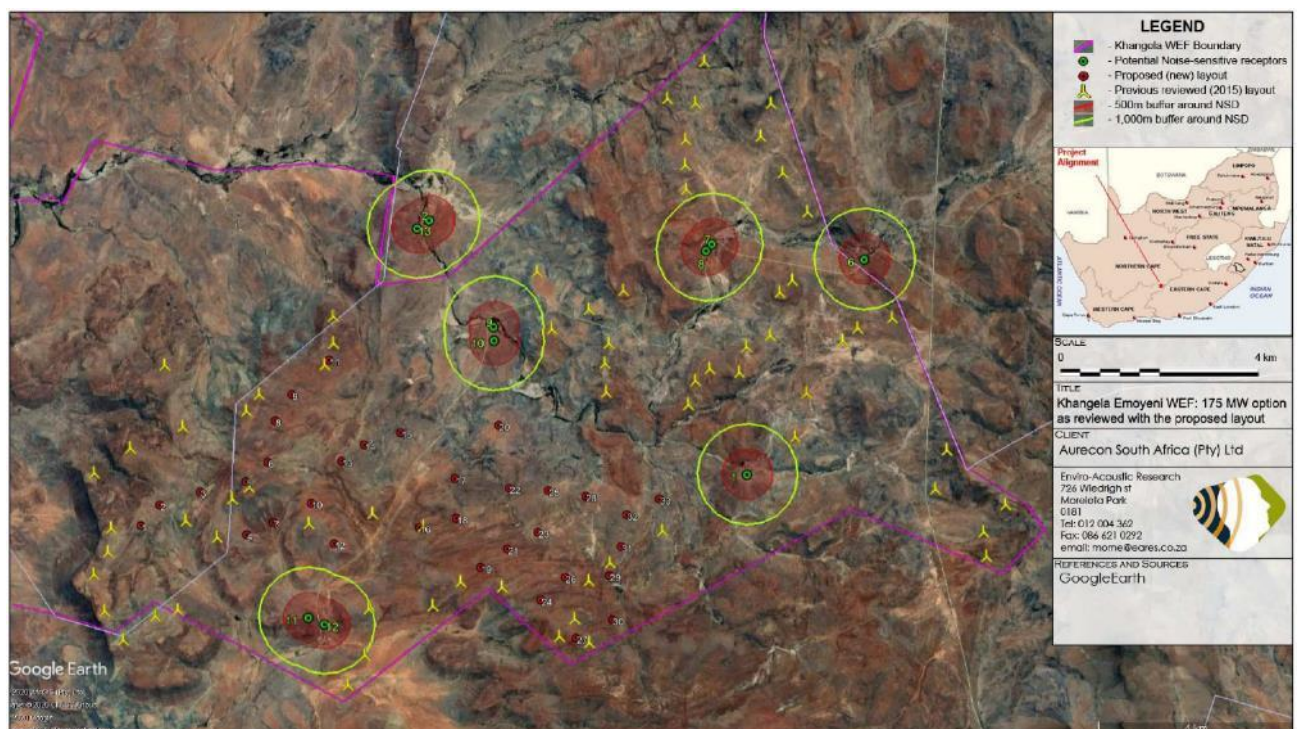


Figure 21: The NSDs identified during the EIA application in relation to the amended layout (EAR, 2020)

The measured data indicated daytime ambient sound levels typical of a rural noise district with night-time levels indicating an urban noise district. As most of the area were considered naturally quiet, it was selected to assign an acceptable noise rating level of a rural noise district (as per SANS 10103:2008). The assessment used the sound power emissions levels of the Vestas V117 3.3 MW wind turbine with a maximum sound power level of 107.0 dBa.

It was found that the original modelled layout¹³ would result in a slight impact on ambient noise levels, with only one NSD (NSD06) experiencing an exceedance in noise rating levels which was less than 3 dBA. Overall, the potential noise impacts are very low and the significance is low.

4.3.7.3 Scope changes of relevance

The assessment indicated that the proposed project will have a noise impact of a low significance on all identified NSDs in the area during both construction and operational phase as the proposed layout locates the turbines further than 1,000 m from any identified NSD. The change in wind turbine specifications such as wind turbine hub height and rotor diameter does not relate to sound power emission levels which depends on model and make of a turbine. Therefore, selecting a turbine model with a lower sound power emission will reduce noise emissions.

4.3.7.4 Cumulative impacts

The cumulative noise impact will not change, as there are no new or proposed wind turbines (from a different WEF), located within 2,000 m from identified NSDs that will cumulatively increase the noise levels. Therefore, the cumulative noise impact will remain as insignificant.

4.3.7.5 Change in impact ratings and mitigation measures

The specialist has concluded that the significance of potential impacts on noise as a result of the proposed amendments would remain unchanged. These ratings are summarised in Table 19.

Table 19: Summary of potential impacts on noise

Phase	Impact	Authorised (2018)		Amended (2020)	
		Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Construction	Construction noise	Very low (-)	Very low (-)	Very low (-)	Very low (-)
Operation	Operational noise	Very low (-)	Very low (-)	Very low (-)	Very low (-)
Cumulative	Increase in ambient sound levels insignificant.	Insignificant			

Due to the low significance of the proposed amendments, mitigations was not required for the construction or operational phases, however generic construction mitigation measures were included in the original assessment for the developer to consider to ensure that any potential noise impacts are minimized. The generic construction mitigation measures remain applicable.

4.3.7.6 Advantages and disadvantages

There is no advantage or disadvantage in terms of acoustics by changing the wind turbine specifications such as turbine hub height as well as rotor diameter. By selecting a wind turbine model and make with lower sound power emission levels however will have a significant advantage on acoustics (reduced noise emissions).

4.3.7.7 Summary

The amendment was found to have no significant impacts regarding noise therefore a full noise impact assessment was not required, and the findings, mitigations measures and recommendations as contained in the original assessment in 2015, as reconsidered in 2018, are still valid. In terms of noise, the amendments are acceptable.

¹³ Note that 2018 authorise layout was not modelled, since the NSD's had not changed, and therefore the 2015 results are used for reference.

5 Summary and conclusions

5.1 Summary of changes from the proposed amendments

The amendments as detailed in Section 3 are in respect to the turbine specifications being larger, the hub height, blade length and rotor diameter have increased, and each turbine requires a larger permanent hardstand area. There is a reduction in the total number of turbines due to the increased generational capacity per turbine; with associated changes to the layout. In addition, the road alignments have changed in respect to turbine placement changes, along with the underground cables which follow these. Roads will also be temporarily widened further for construction access roads due to the larger turbine components and vehicles.

Developing all 33 turbines at the maximum turbine specification is not possible since the total capacity (in MW), as authorised, would be exceeded. With special reference to the listed activities whereby certain footprint thresholds would trigger a new environmental authorisation process, Table 4 has been prepared to demonstrate likely scenarios by way of number of turbines, and specifications. This provides justification that certain thresholds would not be exceeded in any of these scenarios and provides for a worst-case scenario. Furthermore, the applicant, has committed to ensuring that the authorised thresholds are not exceeded and will provide proof thereof when the final layout and EMPr is submitted to the Department of approval in terms of Condition 14 of the EA.

Section 4 above details the impacts as originally assessed in comparison to the impacts arising from the proposed amendments. In summary, the main implications of this are as follows:

- **Terrestrial ecology:** The overall footprint in natural areas increases slightly from 54.7 ha to 59.4 ha (due to increased temporary and permanent turbine hardstand areas, and wider construction roads). However, in reality it would likely not exceed 54 ha based on the generation capacity. Permanent infrastructure footprints will also be reduced. The reduced number of turbines means fewer areas of disturbance during construction, the change in which is not significant. Overall, none of the impacts are significant enough to warrant a change in original impact significance ratings.
- **Wetlands and freshwater ecology:** The amended layout and footprint have little consequence as the most sensitive areas of the delineated aquatic zones are avoided, with the exception of watercourse crossings which remain similar in number. None of the changes are significant enough to warrant a change in original impact significance ratings.
- **Avifauna:** The Rotor Swept Area (RSA) would increase in the worst-case scenario of 33 large turbines (by 35.8%) and this moderate increase would normally be considered to be significant at this location due to the presence of Verreaux's Eagles in the area. It is however highly unlikely that the proposed amendment would translate into a significantly increased RSA without exceeding the maximum generation capacity as authorised and these scenarios have been demonstrated. The no-go areas have also been revised and expanded based on additional fieldwork, the results of the Verreaux's Eagle Risk Assessment Tool (VERA) model as well as further rocky ridge buffers based on the Verreaux's Eagle guidelines. In summary, the proposed amendment would likely significantly reduce the potential risk of the Verreaux's Eagles and other avifauna compared to the original authorisation post-mitigation, through a vastly improved layout and a potential reduction in the number of turbines. All significance ratings remain the same except for the cumulative impact rating which is lower post-mitigation for the amendment, and new mitigation has been proposed based on the more recent field work and additional best practice guidelines.
- **Bats:** As with avifauna, the RSA increases by 35.8% for the amendment and represents a worst case and unlikely scenario given the maximum generation capacity. In terms of bat fatalities from collisions or barotrauma, there is likely to be a reduced fatality as there is zero encroachment of turbines into high sensitive areas (with only eleven turbines in medium sensitive habitats / buffers), and the higher reach of the lowest blade tip is expected to outweigh the probable increased fatality of bats from the greater total rotor swept area under the worst-case scenario of 33 turbines with a 180 m rotor diameter. Under the same worst-case scenario, there will be a slightly greater impact on the fragmentation of, and displacement of bats from, suitable foraging habitats as demonstrated by the increase in construction footprint. The only impact rating to change is that of operational fatalities and

this reduces from very-high to high negative significance without mitigation, remaining low negative significance with mitigation. Revised mitigation relating to design, construction and operational phases is provided which includes monitoring and curtailment.

- **Heritage:** The potential negative changes from the increased hardstand footprints and construction road widths are offset by the decrease in the number of turbines and the fact that the maximum authorised length of internal roads will reduce. There is a relatively low archaeological potential within the site therefore the slightly increased footprint is not of significance. Furthermore, the infrastructure remains outside the identified areas of heritage sensitivity. The siting of the WEF on the more remote and desolate high dolerite hills also goes some way to addressing the issue of landscape and setting. In terms of palaeontology, the infrastructure will now be situated within paleontologically insensitive areas underlain by Karoo dolerite (compared to the 2015 study). These changes, together with the slightly reduced number of turbines compared to the 2018 authorised layout, tend to reduce the palaeontological impact significance of the WEF but are at least partially offset by the anticipated larger volume of bedrock excavations for the turbine footings as well as a slight increase in total area of surface clearance in the case of the 4.5 MW scenario (as demonstrated in Table 4). The impact rating for palaeontology has reduced both with and without mitigation, whilst cumulative palaeontology impacts which were unrated before are rated as very low negative significance with mitigation. Cumulative impacts on the cultural landscape remain significant. Recommendations from SAHRA should be implemented.
- **Visual:** The increased hub height, rotor diameter and blade tip height would have a limited effect on the zone of visual influence and the change in turbine size may only be noticeable within a range of 5 km. Therefore there are no changes to the impact ratings and no additional mitigation proposed.
- **Noise:** The proposed project will have a noise impact of a low significance on all identified NSDs in the area during both construction and operational phase as the proposed layout locates the turbines further than 1,000 m from any identified NSD. The change in wind turbine specifications such as wind turbine hub height and rotor diameter does not relate to sound power emission levels which depends on model and make of a turbine. Therefore, selecting a turbine model with a lower sound power emission will reduce noise emissions. There are no changes to the impact ratings and no additional mitigation proposed.

5.2 Cumulative impacts

The cumulative impacts of the wind farm in the context of the other proposed renewable energy projects in the area were previously assessed in the Final EIR (Arcus, 2018). The following cumulative impacts have resulted in a change when compare to what was assessed in 2018:

- **Avifauna collisions:** very high negative significance with mitigation, reduced to high negative significance with mitigation.
- **Bat fatalities due to collision or barotrauma:** very high negative significance without mitigation, reduced to high negative significance with mitigation; remaining at low negative significance with mitigation.
- **Impact on local paleontological resources:** previously unrated, rated as low negative significance with mitigation, to very low negative significance with mitigation.

5.3 Summary of proposed mitigation

The following specialists recommended revised or additional mitigation to that recommended in the Final EIR (Arcus, 2018) and associated EMPr. These disciplines are as follows, and the revised EMPr has been updated to include this:

- Avifauna (refer to Section 4.3.3.3);
- Bats (refer to Section 4.3.4.5); and
- Heritage (based on SAHRA's recommendations) (refer to Section 4.3.5.5).

5.4 Disadvantages and advantages

In terms of the change in turbine specifications and layout, the main factors affecting impacts have been the increase in temporary and permanent hardstands and greater construction road width; along with the increase in turbine size (hub height and rotor diameter) albeit slightly fewer turbines. It is noted that the positioning of the turbines still avoid the environmentally sensitive areas, identified as no-go areas as shown in Appendix B. Table 20 summarises the advantages and disadvantages of the changes associated with the amendment

Table 20: Advantages and disadvantages of the amendment

Change	Advantage	Disadvantage
Terrestrial ecology	None identified.	None identified.
Wetlands and freshwater ecology	None identified.	None identified.
Avifauna	The advantages of the proposed amendment relate to the significantly improved layout and increase in the individual generating capacity of the turbines considered allowing for a reduction in the total number of turbines required to achieve the maximum generation capacity of the facility. The layout associated with the proposed amendment has been informed through the use of the latest available information such as the Verreaux's Eagle Risk Assessment Tool (VERA, which was not previously available), resulting in updated expanded buffers, revised turbine positions and an expected reduction in the risk of negative impacts of the facility on avifauna compared to the original authorisation.	The disadvantages of the proposed amendment relate to the increase in the RSA should the maximum number of turbines (33) be constructed. This scenario is unlikely however as the maximum generation capacity of the facility would be exceeded if the maximum number of turbines with the maximum rotor diameter were to be constructed.
Bats	There are a fewer number of turbines. The higher reach of the lowest blade tip is also expected to reduce the fatality risk of clutter and clutter-edge foraging's bat species; and there is a smaller footprint required for the operational road surface area. All of these factors reduce the impacts on bats.	Factors likely to increase the impact on bats include the potentially wider rotor diameter and greater rotor swept area of individual turbines, and potentially for all turbines combined in a worst-case scenario; the potentially larger permanent handstand area of individual turbines and potentially for all turbines combined in a worst-case scenario; the larger temporary construction handstand area of individual turbines and potentially for all turbines combined in a worst-case scenario; and the greater widening of internal roads at certain places during construction.
Heritage	None identified.	In terms of archaeological sites and materials, particularly for rock engravings, an expanded physical footprint of development-related ground disturbance (in a worst-case scenario) is a disadvantage but is not deemed to be significant.

Change	Advantage	Disadvantage
Visual	None identified.	None identified.
Noise	None identified.	None identified.

In conclusion, there are both advantages and disadvantages to the proposed amendments and these appear to be balanced. Developing all 33 turbines at the maximum turbine specification is not possible since the total capacity (in MW), as authorised, would be exceeded. This worst-case scenario has been considered by the specialists, but they have also considered several more realistic scenarios relating to turbine size and number that demonstrate less significant impacts. The amended layout avoids all the no-go areas, which includes additional sensitive areas as a result of the amendment studies. Therefore, risks have been further avoided through the application of the mitigation hierarchy.

As a whole the environmental impacts due to the amendments are not considered to differ significantly from the project as originally assessed and authorised. In some cases, impact ratings have been reduced to be of lesser significance. A number of additional mitigation measures, many of which have come to light through new information, guidelines and field work have been recommended to further ensure unavoidable impacts are at least mitigated. These have been updated in the EMPr attached as Appendix E.

Should the application for amendment not be granted, the proposed wind farm, as authorised based on the older technology, may potentially not be competitive in the REIPPPP bidding process and therefore may not be constructed. Whilst no negative environmental impacts are anticipated if the project does not go ahead, the positive environmental and social impacts associated with the Khangela Emoyeni WEF, such as the provision of competitively priced renewable energy for South Africa, reduction in the countries reliance on coal powered electricity generation and the upliftment of the local communities would not be realised.

On this basis, after considering the limited effects of the proposed changes, and the fact that the only changes in impact significance ratings relate to ratings of lower significance, the EAP is of the opinion that the proposed project based on the amended layout is acceptable and should be authorised

5.5 Public Participation Process

The Draft Amendment Report was subjected to a 30-day public participation process (PPP) to comply with Regulation 32 of the EIA Regulations (GN R 982). The PPP was also agreed to by DEFF during the pre-application meeting. The commenting period was between **28 September and 29 October 2020**. The aim of the PPP was to inform the potential and registered I&APs (including organs of state, that have any jurisdiction in respect of any aspect of the relevant activity and the competent authority) of the proposed amendment and associated changes in impacts and allow for them to comment on the application. The I&APs are listed in Appendix C.

The PPP included the following:

- An advert was placed in a regional newspaper, *Die Burger* (in Afrikaans), and the local newspapers *The Courier* and the *Graaff-Reinet Advertiser*, on 25 September 2020;
- Nine (9) site notices advertising both Umsinde and Khangela Amendment Applications were placed at the site on 23 September 2020, notifying the public of the comment period, where reports can be accessed and their right to register as I&APs;
- Posters advertising both the Umsinde and Khangela Amendment Applications, notifying the public of the comment period, where reports can be accessed and their right to register as I&APs were put up at the Karoo-vleis boerdery Ko-op, Richmond Post Office, Murraysburg E-Centre, Murraysburg Police Station, Ubuntu Municipality and Kays Kafee. The notices were put up on 22 September 2020;
- Written notices were emailed to I&APs and where no email address existed, a sms or letter was sent by registered mail. The notifications informed I&APs of the comment period and where reports can be accessed. The following notification letters were distributed for the Umsinde Amendment Application;
 - On 23 September 2020 postage notification letters were mailed and sms notification were sent to I&APs;

- On 25 September 2020 email notifications were distributed;
- On 27 October 2020 notifications informing I&APs of a correction to the comment period were distributed via email and sms, whilst postage letters were sent on 29 October 2020. The correction letter informed the public that the comment period for the Khangela Amendment Report had been extended by 2 days, ranging from **28 September 2020 to 29 October 2020** (31 days).
- The documentation was made available in electronic format on Dropbox; and
- Copies of a one-page pamphlet that summarises the Amendment Report were made available in English and Afrikaans at Kays Kafee (6 Pastorie Street, Murraysburg), Murraysburg Farmers' Co-operative/ Karoo Vleisboere Kooperasie (36 Leeb Street Murraysburg) and Richmond Post Office (Pienaar Street, Richmond). The pamphlets were delivered to these venues on 22 September 2020.
- Proof of all the public participation actions (e.g. site notices, notification etc.) are included in the Public Participation Report in Appendix C of this Final Amendment Report.

Comments were received from the following parties:

- Karoo New Group
- Eskom
- Department of Agriculture, Land Reform and Rural Development
- Department of Agriculture, Land Reform and Rural Development: Directorate Land and Soil Management
- South African Heritage Resources Agency
- Department of Environment, Forestry and Fisheries
- Department of Environmental Affairs and Development Planning: Development Facilitation
- AVDS Environmental Consultants representing Mr. Izak van der Merwe

All comments received and responses thereto (Comments and Responses Report), together with proof of the correspondence, are included in the Public Participation Report in Appendix C.

The Final Amendment Report is now being submitted to the DEFF for decision-making.

In diversity there is beauty and there is strength.

MAYA ANGELOU

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